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BARGAINING OVER SURPLUS ; OLIGOPOLIES, WORKERS
AND THE DISTRIBUTION OF INCOME

One Volume

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DECLARATION

I am responsible for the contents of this thesis and any errors within it.

SUMMARY

The thesis examines the interaction of labour and product markets in determining income distribution. It presents evidence on a marked shift in the distribution of income in the UK, in the early 1980s, towards profits and away from manual earnings, a shift which is attributed in part to a secular rise in manufacturing price-cost margins contemporaneous with a massive increase in unemployment. Evidence that labour strength affects real wages and income distribution is contrasted with apparently contradictory theory and evidence of oligopolistic employers' ability to determine profit margins constrained only by product market conditions.

Oligopoly theory is examined along with an analysis of Stackelberg and Cournot duopoly. Results are derived illuminating the links between product market and labour market conditions on the one hand and income distribution on the other. In particular it is shown that employers will generally prefer not to bargain over employment levels; but if they do bargain over jobs, then price-cost margins will be directly affected by workers' bargaining strength.

An empirical study examines the effect of labour strength on price-cost margins in UK manufacturing industry. The analysis uses cross-section regressions for the years 1975, 1979 and 1982. Qualified support is found for the hypothesis that workers and employers do bargain over employment. There is also some econometric evidence that unemployment has undermined the bargaining position of manual workers. Taken together, these studies imply that unemployment has played an important role in shifting the distribution of income in the UK in the early 1980s.

A further empirical study examines changes in import levels and manufacturing margins between 1979 and 1982. While single equation estimates appear to show that import penetration reduces domestic margins, simultaneous estimation shows no competitive impact of imports.

CHAPTER 1

INCOME DISTRIBUTION AND RECENT HISTORY IN THE UK

1.1 Introduction

Baran and Sweezy (1968) argue that conflict over the pay and process of labour will not affect the distribution of income since: "the working class as a whole is (not) in a position to encroach on surplus ...under monopoly capitalism employers can and do pass on higher labour costs in the form of higher prices" (p.85). Kalecki (1971) adds the important qualifications that only if the economy is closed and the mark-up on direct costs is unchanged can we conclude "that a general increase in money wages in a closed economy does not change the distribution of national income" (p.161).

However, the massive shift in the distribution of income in the UK during the recession of the early 1980s raises serious doubts over whether employers' power in product markets really does transcend conflict over the process and pay of labour. In particular, the coincidence of mass unemployment and record profitability pose the possibility that a severe decline in workers' bargaining strength consequent upon the swelling of the reserve army of labour has contributed significantly to the dramatic shift in income distribution.

In this Chapter I present and discuss evidence on recent changes in income distribution in the UK and examine the extent to which these changes are attributable to movements in international terms of trade or

to movements in domestic price-cost margins. I explore the question of the extent to which changes in margins reflect compositional changes, or changes in product market conditions, or changes in labour markets.

Chapter two sets out a more formal discussion of the determination of price-cost margins, referring to the empirical and theoretical literature, and investigates the implications of oligopoly price-setting for income distribution, class conflict and inflation. I examine the empirical evidence of the effect of workers' bargaining strength on mark-up pricing and look at a number of possible explanations of how labour market conditions might affect product market behaviour: slow adjustment of pricing in response to wage rises; 'kinked demand' expectations which inhibit firms from passing on wage rises for fear that rivals will not do likewise; the threat of foreign competition; bargaining over employment as well as over wages. This chapter ends with a look at the reserve army hypothesis, that unemployment may have the effect of boosting profits at the expense of wages.

Chapter three examines in closer detail models of employer-union bargaining. I show that if workers and employers bargain over employment as well as over wages, then employers' relative bargaining strength will be directly reflected in the mark-up; I also argue that employers will generally prefer not to bargain over employment. I discuss some of the likely determinants of workers' bargaining power, and strategies employers may use to circumvent them.

In chapter 4 I report an empirical investigation into the determinants of workers' bargaining power and its effect on price-cost margins in UK manufacturing industry, through cross-sectional analysis for the years 1975, 1979 and 1982. The bargaining model explored in chapter 3 suggests that workers can bargain up wages etc. only when employers are (potentially) earning economic surplus, so the empirical

work centers on estimating the amount of economic surplus that workers in an industry are able to win, the factors which determine workers' share of the surplus, and the question of whether or not employers do pass on higher labour costs into higher prices. This last question is central in considering whether or not workers' relative bargaining power is able to alter the distribution of income in aggregate.

1.2 UK Income Distribution and the recession of the 1980s

The early 1980s have seen massive deflation and unemployment in the UK. At the same time we have witnessed a dramatic rise in profitability and a shift in the distribution of income away from earnings. Table 1.1 shows that the share of company profits in GDP had risen by the beginning of 1985 to over 18%, nearly double the level of the mid 1970s, well above the levels of the 1960s, and higher even than the previous post-war record of 16% in 1955. The rise in the share of profits has come almost entirely at the expense of earnings, for the share of the remaining categories of income (the surplus of public corporations and government, and income from rent and self-employment) has remained remarkably steady in the range of 18-21% throughout the post-war period. The very latest figures for company profit shares in the beginning of 1985 are affected somewhat by the transfer of British Telecom to the private sector, but the share of earnings in GDP is still lower than at any time since 1946.

There are a number of possible explanations for this shift in the distribution of income: i) the rise and fall in the rate of inflation over the period of concern may have affected the measurement of profits; ii) the development of North Sea oil since the mid 1970s has brought in high rents; iii) restructuring of the non-oil economy towards high profit activities; iv) changes in international terms of trade and competitiveness; v) changes in domestic product market conditions; vi) changes in labour market conditions. I will consider these possible explanations in turn.

TABLE 1.1

UK PROFITABILITY 1960 - 85

YEAR	SHARES IN GDP		SHARE IN	REAL RATE OF RETURN (4)		
	EARNINGS(1)	PROFITS(2)	NDP	ALL COMPANIES	EXCLUDING NORTH SEA	
			PROFITS(3)		PRE-TAX	POST-TAX(5)
	%	%	%	%	%	%
1960-73 (av)	67.3	13.4	12.1	9.2	9.2	6.5
1974-79 (av)	69.3	10.5	8.0	5.7	5.3	5.4
1980-84 (av)	66.9	13.3	-	-	-	-
1974	70.2	8.9	7.3	5.1	5.3	5.3
1975	72.5	7.9	5.4	4.0	4.3	3.5
1976	70.8	8.4	5.8	4.2	4.3	4.3
1977	67.5	12.4	9.7	7.0	6.4	7.0
1978	67.0	13.0	10.4	7.5	6.8	7.2
1979	67.7	12.6	9.3	6.5	4.9	5.0
1980	69.0	11.8	8.8	6.1	3.7	4.5
1981	68.5	11.5	9.5	6.5	3.4	4.2
1982	66.6	12.8	10.8	7.8	4.3	4.5
1983	65.7	14.2	13.0	10.0	5.8	5.8
1984	64.9	16.0			8.5 (7)	8.5 (7)
1985 Q1	63.8	18.5				

Sources: Bank of England Quarterly Bulletin September 1984, 352-359.
 British Business, 21 September 1984, 119-120.
 Central Statistical Office Press Release, CSO(85)59, Table C.
 Economic Trends April 1985, p.14, and Annual Supplement 1985, p.38.
 National Income and Expenditure 1984, Tables 3.5 and 5.4

Notes

1. Wages and salaries, forces' pay and employers' contributions.
2. Gross trading profits of companies, net of stock appreciation, including financial institutions.
3. Net trading profits and rent of industrial and commercial companies.
4. Net operating surplus on UK operations, before interest and tax, on net capital stock of fixed assets (excluding land) at current replacement cost plus book value of stocks.
5. Estimated from BEQB chart p.358, backward-looking measure.
7. Bank of England estimate, BEQB p.353, for 1984 Q1.

Price inflation can distort profit measures if the change in the nominal value of stocks is attributed to company profits; but the figures quoted in Table 1.1 are all net of stock appreciation. Accounting for depreciation of capital stock presents greater problems, but Hill (1979) recommends judicious comparison of gross and net measures of rates of return. Table 1.1 shows that the share of company profits, net of depreciation, in net domestic product follows the same trend as the gross measures up until 1983, the last year for which the net series has been published. So it seems clear that the dramatic rise in company profit shares is not a distortion due to the vagaries of inflation accounting.

At the same time as profit shares were rising, real rates of return on capital had risen by the beginning of 1984 to ten-year record levels (see Table 1.1). These record profitability figures are not an artefact of the profits slump in the mid-1970s; the real rate of return for all companies stood at 10% in 1983, above the average return for the 1960s. Some of the rise in profitability is no doubt due to the high profits on North Sea oil operations, which by 1984 account for around one third of company profits. But even if a substantial proportion of North Sea earnings is put down to 'natural resource rent' rather than profits, it is evident that the share of (redefined) profits in GDP is still well above the levels of the 1970s, and probably still above the average level of the 1960s. Indeed, the real rates of return on non-North Sea operations (see Table 1.1) at the beginning of 1984 were estimated by the Bank of England to be well above the levels of the 1970s, and just below or above the average of the 1960s depending on whether one considers pre-tax or post-tax rates of return.(1)

The rise in real rates of return (excluding North Sea activities) in the 1980s might be due simply to a restructuring of UK industry, with the demise of the less profitable sectors in the deep recession of 1980

and 1981 leaving a lean rump of efficient, high profit industries. The Bank of England studied the performance of the large companies (Bank of England Quarterly Bulletin, September 1984, p.360-367) which account for 75% of aggregate capital employed in the UK. They break down the rise in non-oil real rates of return by 23 sectors and find that only in two sectors (office equipment and 'shipping and transport') did real rates of return fall over the period 1980-83. Their figures do include the overseas activities of UK companies, but they indicate nevertheless that profitability has risen in almost all sectors, indicating that we are observing more than just a restructuring of the economy towards high profit industries.

Moreover, although substantial restructuring of UK industry undoubtedly occurred in the early 1980s, and might account for some of the rise in rates of return above the levels of the 1970s, it does not account for the dramatic switch in the proportions of GDP accruing to capital and labour. There is ample evidence that high profit industries tend to pay higher wages (see Chapter 3), so we might expect that a straightforward restructuring towards profitable industries would lead to higher wages as well as higher profits.

Tables 1.2 and 1.3 summarise growth in productivity and real wages between 1965 and 1984 in the whole economy (based on weekly data) and in manufacturing (based on hourly data). It is apparent that the product wage grew roughly in line with productivity up until 1973, but has since fallen behind productivity growth, particularly after 1979. Real earnings (deflated by consumer price indices rather than producer price indices) have also fallen substantially behind productivity growth since 1979. Here we see confirmation of the previously observed shift in the distribution of income from earnings to profits, and can see that the shift away from earnings has been substantial in the manufacturing

sector, even if not as marked as in total production industries which include oil.

TABLE 1.2

GROWTH IN PRODUCTIVITY AND EARNINGS: UK ECONOMY 1965-84

Average annual rates of growth

YEARS	PRODUCTIVITY(1)	AVERAGE EARNINGS(2)		MANUAL EARNINGS(3)		NON-MANUAL EARNINGS(4)	
		PRODUCT WAGE(5)	REAL WAGE(6)	REAL WAGE(6) MALE(7)	REAL WAGE(6) FEMALE(8)	REAL WAGE(6) MALE(7)	REAL WAGE(6) FEMALE(8)
1965-69	2.8	3.4	2.4	1.8	1.7	1.8	1.6
1969-73	2.8	2.7	3.8	4.2	5.7	3.0	3.8
1973-79	1.1	0.4	0.5	0.0	2.0	0.1	2.3
1979-83/4	3.7	2.3	1.8	1.7	2.1	3.0	2.9

- Notes:
1. Output per person employed in whole economy 1965-79, in total production industries, 1979-84.
 2. Average earnings indices, average of April and October each year.
 3. Weekly earnings, October each year.
 4. Index of average earnings, April each year.
 5. Deflated by GDP deflator.
 6. Deflated by Retail Price Index.
 7. Full-time men, 21 years and over.
 8. Full-time women, 18 years and over.

Sources: Employment Gazette and Economic Trends.

TABLE 1.3

GROWTH IN PRODUCTIVITY AND REAL HOURLY EARNINGS: UK MANUFACTURING 1965-84

Average annual rates of growth

YEARS	PRODUCT- IVITY(1)	PRODUCT WAGE(2)	REAL (3) AVERAGE EARNINGS	MANUAL EARNINGS(4)		NON-MANUAL EARNINGS(4)	
	% p.a.	% p.a.	% p.a.	MALE % p.a.	FEMALE % p.a.	MALE % p.a.	FEMALE % p.a.
1965-69 (av)	3.9	3.7	2.4	2.1	2.2	1.9	2.6
1969-73 (av)	4.3	4.6	3.8	4.4	6.0	2.7	6.2
1973-79 (av)	1.1	0.1	1.0	1.1	3.3	0.5	3.6
1979-84 (av)	3.8	2.9	2.1	0.9	0.4	2.8	2.4
1974	0.6	-4.5	1.0	-1.8	2.3	-2.8	1.6
1975	-1.9	3.4	2.4	4.0	8.9	1.1	11.3
1976	5.2	0.0	-0.3	2.5	7.5	1.7	5.0
1977	0.9	-6.7	-4.8	-6.8	-5.4	-6.7	-4.4
1978	1.1	5.5	7.0	5.5	5.0	7.4	5.5
1979	0.6	3.5	1.2	3.8	2.2	2.9	3.0
1980	-1.3	2.5	-0.9	-1.4	-1.4	1.0	0.4
1981	4.7	3.3	1.1	0.2	-0.8	1.8	2.0
1982	5.1	3.2	2.4	0.6	-1.1	1.6	1.5
1983	6.5	3.6	4.4	3.4	4.8	4.5	5.0
1984	4.0	2.0	3.5	1.8	0.5	5.0	3.4

- Notes:
1. Output per person hour (pre-1970, per person) in manufacturing industries.
 2. Average Earnings Index (average of April and October) deflated by manufacturing producer price index for home sales.
 3. Average Earnings Index deflated by General Index of Retail Prices.
 4. Hourly earnings deflated by RPI. Pre-1973, based on October series of manual hourly earnings and on April series of non-manual earnings indices. 1973-84 figures are based on April series of adult hourly earnings, excluding overtime.

Sources: Employment Gazette and Economic Trends.

Table 1.3 shows that productivity in manufacturing has outgrown the product wage since 1979. This does not necessarily imply that profit margins have changed, since the relative cost of other inputs, including imports of raw materials, may have risen over this period due to changes in terms of trade and/or exchange rates. But, in fact, the index of input prices for materials and fuels purchased by manufacturing industry has grown, by 47%, slightly slower over the period 1979-84 than the index of output prices for home sales which rose by 50% over the same period (source: Economic Trends, April 1985). The apparent implication is that

manufacturing profit margins have risen since 1979, reflecting the rise in productivity relative to earnings.

Indeed, the changing distribution of income in manufacturing is confirmed by Census of Production data - available only up to 1982. Table 1.4 lists manufacturing price-cost margins defined alternately on gross and net revenues and with salaries treated alternately as fixed and variable costs. I also give estimates for 1983 and 1984 based on the rise in productivity in these years ahead of the growth in the product wage (a gap of 3% and 2% respectively), making the assumption that the ratio of materials costs to revenue remained the same as in 1982. It is evident that although the recession of the early 1980s was deeper than that of the mid 1970s, manufacturing profit margins did not fall so far, and they recovered by 1982 to levels above the late 1970s. The estimated profit margins for 1983 and 1984 are well above those even of the peak years in 1972 or 1973.(2)

It is evident that the dramatic shift in income distribution in the UK post-1979 is not simply due to a restructuring towards oil, but has been caused in part by a rise in profits in the non-oil manufacturing sector too. Moreover, the rise in non-oil rates of profit is seen to be not just a consequence of increasing capacity utilisation, nor just of changes in terms of trade, but of a substantial rise in profit margins. I have already argued that the shift in income distribution cannot be attributed simply to compositional changes, for we expect more profitable industries to pay higher wages, and it is the falling of earnings behind productivity growth that is in need of explanation. In particular, is the change in price-cost margins and in income distribution attributable to changes in labour market conditions or to changes in product markets? Some insight can be gained if we break down the figures for wage growth to distinguish between manual and non-manual workers.

TABLE 1.4

MANUFACTURING PRICE-COST MARGINS 1970-84

From 1970-79, manufacturing classified by SIC 1968, excluding coal and petroleum products.
From 1979 classified by SIC 1980.

YEAR	$\frac{(P + F + S)}{\text{Gross output}}$	$\frac{(P + F)}{\text{Gross output}}$	$\frac{(P + F + S)}{\text{Net output}}$	$\frac{(P + F)}{\text{Net output}}$		
1970 (1)	0.256	0.183	0.621	0.443		
1971 (1)	0.259	0.181	0.620	0.434		
1972 (1)	0.274	0.197	0.633	0.455		
1973	0.271	0.199	0.633	0.463		
1974	0.267	0.194	0.642	0.467		
1975	0.250	0.170	0.607	0.412		
1976	0.257	0.182	0.625	0.444		
1977	0.254	0.181	0.636	0.453		
1978	0.262	0.185	0.637	0.449		
1979	0.263	0.264	0.639	0.445	0.446	
1980		0.261		0.172	0.625	0.413
1981		0.276		0.183	0.646	0.429
1982		0.281		0.192	0.661	0.450

1983 (2)		0.285		0.198	0.671	0.466
1984 (2)		0.288		0.202	0.677	0.477

Definitions: P = profit = value added - wages - salaries - employers' N.I.
F = overhead costs = non-industrial costs.
S = Salaries = salaries of non-manual employees + (est) N.I.

Source: Census of Production, annual summary tables, 1970-82.

Notes: 1. Assuming 10% employers' national insurance on wages and salaries.
2. 1983 and 1984 estimates - see text - based on rise in productivity compared with rise in earnings.

Tables 1.2 and 1.3 show that post-1979 the earnings of non-manual employees have risen fairly well in line with the growth in productivity - both in manufacturing and in the combined production industries. It is the earnings of manual workers which have been held back, particularly in the manufacturing sector.

Between 1979 and 1984, hourly productivity in manufacturing rose by over 20%, and the non-manual hourly product wage rose 23% for males and 21% for females. But for non-manual male and female workers the hourly product wage rose only by 12% and 9% respectively - and their real hourly wage (relative to consumer prices) rose by only 4% and 2% over the five-year period.

The dramatic nature of this disparity between manual and non-manual earnings is illustrated by the figures in Table 1.5 which show the ratio of manual to non-manual earnings since 1963, both weekly and hourly, in manufacturing and in the whole economy. For the whole economy, manual workers in 1984 were in much the same position relative to non-manuals as they had been in the mid-1960s (with respect to weekly earnings) and in the same relative position as they had been in 1970 (with respect to hourly earnings) - the changes in manual workers' relative weekly earnings between 1970 and 1984 were largely attributable to changes in hours. The substantial improvement of the position of manual workers in the early and mid 1970s was reversed post 1979. In manufacturing, the rise and fall in the relative fortunes of manual workers is more dramatic, with relative hourly earnings peaking in 1976 and falling sharply post-1979 to leave both men and women manual workers substantially further behind their non-manual counterparts than they had been in 1970 and throughout the 1960s.

TABLE 1.5

RATIO OF MANUAL TO NON-MANUAL EARNINGS IN THE UK, 1963-84

YEAR	<u>A. WHOLE UK ECONOMY</u>				<u>B. MANUFACTURING</u>			
	<u>INDEX OF WEEKLY EARNINGS RATIO (1)</u>		<u>ACTUAL HOURLY EARNINGS RATIO (2)</u>		<u>INDEX OF WEEKLY EARNINGS RATIO (1)</u>		<u>ACTUAL HOURLY EARNINGS RATIO (2)</u>	
	<u>MALE</u>	<u>FEMALE</u>	<u>MALE</u>	<u>FEMALE</u>	<u>MALE</u>	<u>FEMALE</u>	<u>MALE</u>	<u>FEMALE</u>
1963	100	100			100	100		
1964	101	100			100	100		
1965	102	100			101	100		
1966	102	100			101	98		
1967	102	100			101	97		
1968	102	101			101	97		
1969	103	101			102	97		
1970	103	100	0.63	0.70	102	96	0.67	0.83
1971	103	102	0.63	0.72	102	97	0.66	0.84
1972	105	104	0.63	0.72	103	100	0.67	0.85
1973	109	109	0.65	0.74	107	104	0.68	0.87
1974	112	115	0.66	0.77	111	107	0.69	0.88
1975	108	105	0.68	0.77	106	99	0.71	0.86
1976	106	104	0.67	0.76	106	100	0.72	0.88
1977	107	107	0.68	0.77	107	100	0.71	0.87
1978	106	109	0.67	0.78	103	98	0.70	0.86
1979	109	112	0.68	0.79	104	99	0.71	0.86
1980	101	104	0.67	0.77	97	94	0.69	0.84
1981	100	102	0.64	0.72	97	94	0.68	0.82
1982	100	104	0.64	0.72	95	93	0.67	0.80
1983	100	103	0.63	0.72	96	93	0.66	0.80
1984	99	104	0.62	0.71	95	92	0.64	0.77

Source: Employment Gazette.

- Notes:
1. Based on ratio of (a) average of full-time manual weekly earnings in current and previous October, to (b) non-manual April indices of weekly earnings.
 2. NES April series, excluding those whose pay was affected by absence, excluding overtime, for full-time men and women over 21 years and 18 years.

The significance of the relative decline of manual wages in manufacturing can be seen by estimating price-cost margins for 1982 (reported in Table 1.4) with manual wages inflated to their 1979 relative level (ie. reversing the decline in manufacturing male manual hourly earnings, relative to non-manuals, as shown in Table 1.5). Table 1.6 shows what 1982 margins would have been (ceteris paribus) if manual workers had maintained the position, relative to non-manuals, which had prevailed throughout the second half of the 1970s. It is evident, whichever definition of margins is used, that most if not all of the post-1979 rise in price-cost margins could be accounted for by the decline in manual workers' relative pay.

TABLE 1.6

A COMPARISON OF ACTUAL AND HYPOTHETICAL MARGINS IN MANUFACTURING - IF MANUAL WORKERS' PAY HAD NOT DECLINED RELATIVE TO NON-MANUALS' BETWEEN 1979 AND 1982

YEAR	PRICE-COST MARGINS (1)			
	$\frac{(P + F + S)}{\text{Gross output}}$	$\frac{(P + F)}{\text{Gross output}}$	$\frac{(P + F + S)}{\text{Net output}}$	$\frac{(P + F)}{\text{Net output}}$
1979 actual	0.264	0.184	0.640	0.446
1982 actual	0.281	0.192	0.661	0.450
1982 hypothetical(2)	0.273	0.184	0.641	0.432

Notes: 1. Margins defined as in Table 1.4 for manufacturing classified by SIC 1980.
2. Multiplying actual wages by the ratio of 71:67 (from Table 1.5, part B, column 3).

Definitions: P = Profit
F = Non-industrial costs
S = Salaries of non-manual employees + N.I.

The beginning of the decline in manual workers' relative pay in 1976 coincides with a large increase in UK unemployment to a post-war record of over 1 million; and the accelerated decline in manual workers' position post-1979 coincides with the rise of unemployment to over 3 million. This evidence appears to give the lie to the argument that mass unemployment in the UK has been the result of workers' pricing themselves out of jobs, indicating rather the reverse, that unemployment has undermined the bargaining position of manual workers. This supposition is supported by Layard and Nickell's (1985) econometric model of UK aggregate wages and employment over the period 1954-83 which is one of the first to cover the post-1979 period. They take account of any impact of real wages on employment in their 3-equation model, and they find that unemployment has a marked, and statistically significant, depressant effect on the real wages of manual workers.

The striking coincidence between the rise in manufacturing profit margins in the early 1980s and the decline in the relative earnings of non-manual workers does suggest that labour market conditions may have contributed significantly to the rise in profitability. However, the same period has seen changes in product market conditions which may provide alternative or complementary explanations. For instance, Cowling (1983) argues that in recessions most firms' level of excess capacity will rise, and therefore their actual and perceived ability to retaliate against price-cutting rivals will be enhanced, allowing an oligopoly group to maintain a higher mark-up after, perhaps, an initial price-war. This tendency may have allowed margins to rise somewhat during the deep recession of the early 1980s, but we would expect its effect to diminish as plants were scrapped and as output began to rise slowly in 1983 and 1984.

Another significant factor which may have affected product market

conditions is the decline in the nominal (and real) exchange rate since its peak in 1980. To the extent that foreign price competition restrains domestic price-cost margins, the decline in the exchange rate since 1980 may have allowed margins to rise. But the real exchange rate(3) in 1982 was still higher than it had been in the years 1976 and 1977 - a similar cyclical period of mild recovery from a deep recession - so the secular rise in margins in the 1980s does not appear to be attributable to exchange rate movements. Even by 1984, the real exchange rate was not significantly below its 1970-76 average.

1.3 Summary

I have shown that the rise in profit margins in UK manufacturing since 1979 has contributed to the remarkable shift in income distribution that has occurred since then. The evidence for all production industries, and for manufacturing alone, indicates that profitability has increased mainly at the expense of manual rather than non-manual workers. In manufacturing, at least, the change in income distribution has its origins in rising price-cost margins rather than in changing terms of trade. The rise in margins reflects directly the weakened position of manual workers, and aggregate time-series analysis appears to suggest that this weakening of manual workers' position is attributable at least in part to the rise of mass unemployment. The shift in margins and in distribution of income may be due in part to changing product market conditions, viz. Cowling's (1983) argument that oligopolistic industries tend to more collusive (and jointly profitable) behaviour in the face of the mutual adversity of a slump and/or the decline in the real exchange rate after 1980. But these arguments alone do not appear to account for the rise of profitability to record levels, nor for the marked decline in the position of manual workers relative to non-manuals. There is indeed a prima facie case that the huge growth in the reserve army of labour in the UK since the late 1970s has undermined manual workers' bargaining position, contributing to a drastic shift in income distribution towards profits.

The question posed by Baran and Sweezy still remains: whether, and how, workers' bargaining position can affect the profit margins set by oligopolistic industries. This is the guiding question which runs through the following theoretical and empirical investigations.

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OLIGOPOLY, PROFIT MARGINS AND LABOUR STRENGTH

2.1 Oligopoly and the Determination of Price-Cost Margins

One of the prime features of British industrial structure is the dominance of a relatively small number of firms. Prais (1976) finds that the share of manufacturing net output accounted for by the top 100 firms rose from 16% in 1909 to 41% in 1970. Hart (1982) reports a slight decline in aggregate concentration (by employment) in manufacturing over the period 1971-8. But when Hughes and Kumar (1984) investigate aggregate concentration by employment in the UK private sector (including financial and other non-manufacturing sectors) they find a rise in the share of the top 100 companies from 23.2% in 1968 to 25.8% in 1975, falling back slightly to 25.4% in 1980. These high levels of aggregate concentration are a reflection of the dominance of giant enterprises in the world economy. Dunning and Pearce (1981) measure the share of the top 25 firms as constituting nearly one third of the sales of the world's largest 500 industrial enterprises in 1962, falling in 1972, but rising back to the same level in 1977. Over this period, the average share of the world's top 3 firms in each broadly defined industry was over half of the total sales of the top 20 firms. The UN Centre on Transnational Corporations (1981) report that nearly half of the assets of the world's largest 300 banks were held in 1975 by only 43 transnational banks.

In the UK, the high degree of aggregate concentration is reflected also in a high degree of concentration in individual markets. George

(1975) finds that the average share of the top 5 firms in 209 UK product groups in 1963 was nearly 60%, rising even further by 1968. Curry and George (1983) report that the growth in average concentration has since levelled off. The general picture is clear whether we examine individual markets, or the national and international economy: that the UK economy is dominated by a small number of giant companies.

The pricing behaviour of oligopolies can be analysed in terms of the tension between the conflicting motives of collective interest, which is to restrict industry output to maximise industry profits, and individual interest, to cheat or chisel by increasing a firm's own sales whilst rivals restrain their sales. A central concern to any firm in an oligopoly must be the question of how its rivals will react to its own decisions and strategies, and it is in the assumptions about such expectations that there lie the key differences between many models of oligopoly. The analysis of strategies and expectations can be illuminated by exploration of an oligopoly's underlying structure of information and uncertainty about costs, demand and behaviour - though I note the suspicions of Kreps and Wilson (1982, p.276) that "by cleverly choosing the nature of that ...uncertainty ...one can get out of a game-theoretic analysis whatever one wishes".

The simplest single-period models of non-cooperative duopoly are the Cournot and Bertrand models where each firm expects its rival's decision (on output or on pricing) to be independent of its own. But these solutions lose their justification as Nash non-cooperative equilibria if firms are presumed to anticipate that their rival will treat their decisions as fixed, ie. if firms can act as Stackelberg leaders. I show in Appendix A that firms will often conflict over the choice of roles of Stackelberg leader or follower, each preferring to lead or each preferring that the other should act as leader according to

whether reaction functions are negatively or positively sloped (which in turn is likely to depend on whether the expected decision variable is quantity or price). But if both take the preferred role, the outcome, Stackelberg warfare, is the least profitable of all. Given choice over roles of follower and leader, the Cournot solution is no longer a Nash equilibrium. It will only hold if each firm desists from taking the role of leader, perhaps for fear that if it did not desist its rival would retaliate by acting as Stackelberg leader too. But if fear of retaliation can hold firms to the Cournot solution, it can also support more profitable collusive arrangements. In this case, the Cournot solution can be regarded as the lower bound to a range of possible collusive solutions which are held together by the threat of price-war, eg. by the threat of reversion either to the Cournot solution or to Stackelberg warfare.

Non-cooperative collusion requires monitoring, effective and credible threats of retaliation to stop chiselling, and entry deterrence. Cowling (1982) develops the notion of collusive rivalry, citing Stigler's (1964) argument that the effectiveness of monitoring is directly related to the numbers or concentration of firms in an industry, and citing the argument of Spence (1977) that investment in excess capacity enables the incumbents of an oligopoly to deter potential entrants with the threat of price war. I will return shortly to consider the question of whether such threats are likely to be believed or carried out, making the interim assumption that such deterrence is credible.

Given the protection of an effective strategy of entry deterrence based on threatened or potential behaviour rather than on current behaviour, oligopolistic collusion still has to deal with the problems of internal cohesion. A simple analytic approach to the complex of problems and interacting strategies of monitoring and retaliation over time is to

reduce the oligopoly model to a static equilibrium and attempt to capture the complex in a single parameter representing the degree of effective collusion. Conjectural variation models are based on a single period, non-cooperative game to which the Nash equilibrium solution is known in advance, where each firm conjectures that any change in its own decision from the equilibrium would provoke a certain response from its rivals. In these models the degree of effective collusion is captured in the sign and size of the conjectured response, leading to solutions which range from the competitive to the full monopoly outcome. For instance, the Bertrand or Cournot solutions arise when conjectured response is zero (in price or quantity). Increasing the size of the conjectured response tends to lead towards solutions on the profit frontier.

Cubbin (1983) shows that the conjectural variation term (which he measures in proportional terms, with price as the strategic variable) can equally well be interpreted as measuring the degree of retaliation by rivals, or the probability that such retaliation will occur, or the expected delay before the retaliation occurs. Presumably the conjectural variation term can capture the combined effect of magnitude, uncertainty and delay. So we can treat conjectural variation as a simple uni-dimensional index of the effectiveness of the complex strategy of mutual monitoring and threats which binds rivals into collusion. Following Stigler (1964) we may expect this index, the degree of effective collusion, to be a positive function of the degree of concentration in an industry. In Stigler's analysis, rivals' output is monitored imperfectly; he suggests that information will be clearer and monitoring more effective, the smaller the number of sellers in a market. Green and Porter (1984) extend and formalise this analysis in a multi-period non-cooperative game; Porter (1985, p.418) reports the prediction that: "the greater the number of symmetric firms or the greater the degree of demand uncertainty, the closer the cooperative

price is to competitive levels". The general thrust of the argument runs as follows: higher prices and/or greater uncertainty/numbers raise the expected gains from chiselling, requiring a correspondingly greater threat of retaliation to support that price level; but the threat of too severe retaliation is not credible if it would be too costly to carry out; so as uncertainty and/or numbers in an industry increase, the price level that can be credibly supported must drop.

Conjectural variation models provide a tractable means of modelling the effectiveness of rivalrous collusion, reducing it to a single period static equilibrium; but it does not follow that these models provide insight into the determination of such collusion. In particular I regard it as misguided to attempt to impose notions of internal 'consistency' in order to predict the degree of collusion, requiring that the adjustment of the (collusive) equilibrium be consistent with the conjectured response to 'chiselling'. For instance, Bresnahan (1981) requires that the conjectured linear response by a rival to an arbitrary move by a duopolist from the equilibrium configuration should be locally consistent with the shifting of equilibrium which would occur if that duopolist's equilibrium position should be so moved. If a firm's conjectures relate to quantity decisions and are a function only of that firm's own output, Bresnahan shows that consistent conjectures will generally be non-positive and lead to a solution somewhere between Bertrand and Cournot depending on the shape of marginal costs and the degree of product differentiation. (nb. Boyer and Moreaux (1983) implicitly question the usefulness of this notion of consistency by showing that if conjectures are a function of the outputs of both duopolists, any output configuration can satisfy such a criterion of consistency.)

However, when we treat models of conjectural variation simply as

convenient simplifications of a multi-period strategy of collusive rivalry, we see that there is no reason why a rival's response to perceived chiselling should be the same as their response to a change in cost or demand conditions which require that the duopolist's equilibrium output be increased. For instance, it is readily deducible from Seade (1985, p.19) that, in a parametric conjectural variation model with homogenous output and many firms, a reduction in marginal cost for one firm alone will lead to a shift in equilibrium whereby that firm's output will increase whilst its rivals will decrease their output. Such behaviour is not inconsistent in any substantial sense with conjectures that a unilateral increase in output away from the equilibrium configuration would meet with a retaliatory response from rivals, who would increase their output in order to punish the chiselling firm. At least, there is no inconsistency if firms are able to distinguish changes in output which have been occasioned by shifts in cost or demand parameters from opportunistic attempts to increase share in oligopoly profits.

Indeed, monitoring each other's cost and demand functions is an important prerequisite for firms to anticipate the oligopoly equilibrium. If such information is private, there is room for opportunistic behaviour by a firm in misrepresenting its cost and demand positions in order to be (implicitly) allocated a larger share of the equilibrium output. Roberts (1985) analyses incentive requirements in a cooperative duopoly game, showing that the cartel will generally choose to operate inside the profit frontier in order to reduce the incentive for firms to falsely claim lower costs. I would expect the same principle to hold true in non-cooperative models: that a lack of information about cost and demand conditions should have the same general effect as difficulty in monitoring rivals' output, namely to increase the scope for opportunistic behaviour and thus to move the viable non-cooperative solution away from

the profit frontier to a point where the gains from 'cheating' are lower. So we are again led towards the conclusion of Stigler and Porter that better information and smaller numbers in the industry will tend to raise the price level which can be supported by rivalrous collusion.

I have argued that models of conjectural variation capture the effectiveness of a strategy of threatened retaliation in response to chiselling. The important theoretical question is not whether such threats are consistent with shifts in equilibrium, but whether or not the threats are credible, ie. whether it will be in rivals' actual and/or perceived interest to carry out the threat if one firm does break ranks. The same question must be raised in relation to the effectiveness of excess capacity as a deterrence to entry. (Indeed, the issues of entry deterrence and oligopolistic collusion can be considered alike if we treat potential entrants as non-producing incumbents who face fixed costs, or an entry fee, before starting up production.) Threats of retaliation against incumbents or potential entrants are only effective if they are believed.(1)

Friedman (1971) shows that the threat of price-war can make an apparently collusive strategy a non-cooperative equilibrium, essentially a multi-period game-theoretic extension of the single period conjectural variation model. But this still begs the question of whether retaliation will be an optimal response if an incumbent does break ranks or a new firm enters the market. Dixit (1982) follows Kreps and Wilson (1982) and Milgrom and Roberts (1982) in arguing that fighting entrants may be an optimal sub-game strategy if a successful fight will help deter future entrants by establishing a 'strong' reputation. Temporary losses suffered during the price war may be expected to be offset by future gains from higher oligopoly profits as long as there is not expected to be a continuous or protracted price-war against successive challengers,

hence the importance of reputation. Green and Porter (1984) show that it can be optimal for firms to carry out threats against incumbent rivals who are suspected of chiselling on a collusive strategy, for reasons of reputation and credibility of the collusive equilibrium. They go further to explain the occurrence of occasional price wars as a rational response to imperfect information about random demand conditions which make it impossible to be sure whether an observed price drop is the result of rivals' cheating or not - in which case occasional short bursts of price-war are not signs of collapsing collusion, rather they are essential to maintain the credibility of the incentive to collude.

I conclude that strategies of threatened retaliation against chiselling incumbents and potential entrants are likely to be credible and effective in raising oligopoly prices above competitive levels, and that the effectiveness of such rivalrous collusion will tend to be the greater the smaller the number of firms in the industry and the better the information incumbents have about each other. Complex models of repeated interactions can be conveniently approximated by single-period models where conjectural variation is a negative function of numbers and uncertainty. For instance, Clarke, Davies and Waterson (1984) develop the Cowling and Waterson (1976) oligopoly model to derive a testable prediction of the relationship between industry profitability, concentration, collusion and product differentiation. Each firm in the industry conjectures that the proportional response of rivals to any deviation from their equilibrium output is given by the effective collusion parameter a . They capture the extent of product differentiation with a parameter k which measures the ratio of the marginal response of price to rivals' output relative to its responsiveness to own price; so that $k = 0$ implies complete product differentiation and $k = 1$ implies product homogeneity. In order to derive testable propositions, they assume either product homogeneity or

that the own price elasticity of demand for each differentiated product is inversely proportional to its market share. In the latter case, denoting the constant of proportionality as e and assuming constant marginal costs, we can write their equation 3a for industry price-cost margins as:

$$\frac{P + F}{R} = (ak + (1-ak).H) / e$$

2.1

where P is profits, F is fixed costs, R is revenue, e is the industry elasticity parameter (the absolute value of demand elasticity in the case of homogeneous products), a represents the conjectured response of rivals (the degree of effective collusion), k represents the degree of product differentiation and H is the Herfindahl index of industry concentration.

Following the line of my previous argument, we should expect collusion to be greater in more concentrated industries where monitoring and retaliation are likely to be more effective and credible. There is a clear prediction that industry margins should be positively correlated with both collusion and concentration. Increased product differentiation (lower k) has contradictory effects: it reduces the collusive effect of threatened retaliation, but at the same time it reduces the incentive to chisel (because it is relatively more difficult to win customers from rivals with highly differentiated products). As product differentiation increases (in response to design and marketing strategies) we might expect firms to approach monopoly positions irrespective of rivals' behaviour; but it is not obvious from the Clarke, Davies and Waterson formulation whether or not the relationship between margins and product differentiation is monotonic. A clearer picture is provided by the approach of Schmalensee (1982) who incorporates the effect of product differentiation into the measure of market concentration. He defines a measure of 'effective concentration' based on firms' shares of their

'effective markets', where rivals' shares of the total market are weighted by cross-elasticities of demand. Effective market concentration exceeds the Herfindahl index to the extent that product differentiation is significant. So, given the argument that margins are positively related to concentration, it seems reasonable to conclude that margins are also a monotonically increasing function of product differentiation.

Clarke and Davies (1982) stress that the relationship between margins and concentration is derived from an analysis of industry equilibrium which does not imply causality in either direction. Indeed, the exogenous parameters in the derivation of equation 2.1 include industry numbers and the coefficient of variation of marginal costs rather than concentration per se. However, to argue that there is no direction of causation is to ignore the underlying processes which generate the parameters which appear as exogenous in this short-period static equilibrium analysis. The number of firms in an industry and their relative cost structures are not accidental data.(2) The thrust of this analysis, in the tradition of Marxist theories of monopoly capitalism, is that it is precisely because size, technological change and market power are necessary for survival and offer the possibility of increasing profits that capitalists pursue the long-term strategies of growth, take-over and merger which (in conflict with competitive tendencies) determine the numbers and costs in an industry.(3) Indeed, the impetus to win and exercise market power is also the driving force behind product differentiation and attempts to influence demand elasticities. So whilst at any one time we can analyse the equilibrium conditions which give the proximate determinants of market shares, the underlying causal relationship runs from the degree of centralisation of capital to profitability; collusion and industrial concentration can be seen as proxy measures for the success of that tendency towards centralisation.

2.2 The interaction of labour and product markets in determining income distribution

In Chapter 1 I referred to Kalecki's argument that price-cost margins fully determine income distribution in a closed economy. Here I will examine more fully the conditions under which, and the extent to which, wage pressure is able to alter income distribution in an open economy. I also examine the effects of wage pressure on the real (product) wage.

I start with the Kaleckian identity which expresses the share of wages in value added (W/VA) in terms of the ratio (k) of output price (p) to average variable costs (c), where unit variable costs consist of 1 units of direct labour, at wage w, and n units of 'materials' (including components and energy supplies as well as raw materials) at price p*:

$$W/VA = \frac{1}{1 + (k-1)(p^*n/wl + 1)}$$

2.2

It is convenient to measure values in relation to unit costs; so I define the share of direct labour and the share of other inputs in unit costs as:

$$\begin{aligned} a &= wl/c \\ b &= p^*n/c \\ a+b &= 1 \end{aligned}$$

in which case we can rewrite the wage-share identity as:

$$W/VA = a/(k - b)$$

2.2.1

and the product wage w/p, can be written

$$w/p = w/kc$$

It is clear that wage share is inversely related to the mark-up, but positively related to the ratio of direct labour to other variable costs. If the margin is fixed, workers can affect income distribution only to the extent that they can alter the composition of costs. The effect of, for instance, a wage rise on the composition of costs depends on the degree of substitution between labour and other inputs; this can be broken down into a scale effect and a pure substitution effect. In chapter 4 I argue that there is substantial evidence that the UK economy, particularly manufacturing, approximates constant returns to scale when operating below capacity. So I make the simplifying assumption of constant returns, in which case the cost-minimising mix of inputs, is independent of scale and the input ratio (l/n) depends only on relative input prices (w/p^*). I define the elasticity of input substitution, for a given technology, as:

$$s = - \frac{d(l/n)}{d(w/p^*)} \cdot \frac{(w/p^*)}{(l/n)}$$

I also note that with constant returns to variable inputs, average unit costs are the same as marginal costs; so we can regard k as the mark-up on marginal costs.

Under what circumstances will a wage rise alter the composition of costs? First, consider the impact of a nominal wage rise if the ratio of input to output prices (p^*/p) is fixed. This situation might occur if we are dealing with an open economy where p^* represents the domestic price of imports; if the nominal exchange rate is floating, domestic import prices may move in line with output prices to maintain a fixed real exchange rate. In this case, if the mark-up is fixed, import prices will rise at the same rate as wages and both the product wage and wage share

will be independent of nominal wage rises - since none of the real variables are affected by equiproportional rises in w , p and p^* .

Next, consider the impact of a wage rise if the real terms of trade are not fixed. This would be the case in an open economy where nominal exchange rates are stable (or sticky) it is also the case which applies to one sector or industry within an economy where we are considering a wage rise above the general level of inflation. Now, since relative input prices can be changed, wage pressure is capable of affecting real magnitudes through alteration of the composition of variable costs.

Without loss of generality, take the price of 'materials', p^* , to be fixed and consider the response of wage share and the product wage to a wage rise (more generally, a wage rise relative to the price of other inputs). I will write all differentials and elasticities with respect to the wage, i.e.

$$X' = dX'/dw \text{ and } e(X) = X' \cdot w/X.$$

From equation 2.3 we can derive the elasticity of the product wage with respect to a wage rise:

$$e(w/p) = e(w/kc) = e(w) - e(c) - e(k)$$

but, given constant returns and cost minimisation the elasticity of unit costs with respect to the wage is:

$$e(c) = c' \cdot \frac{w}{c} = \frac{1w}{c} = a$$

$$\therefore e(w/p) = b - e(k)$$

From equation 2.2.1, the elasticity of wage share with respect to the wage is given by:

$$e(W/VA) = e(a) + e(b) \cdot b/(k-b) - e(k) \cdot k/(k-b)$$

$$\text{but } a = \frac{(1/n)}{(1/n) + (p^*/w)}$$

$$\text{so } e(a) = e(1/n) - a \cdot e(1/n) - b \cdot e(p^*/w)$$

$$\text{but } e(1/n) = -s, \text{ and } e(p^*/w) = -1$$

$$\text{so } e(a) = b(1-s)$$

$$\text{and } e(W/VA) = b \cdot (1-W/VA) \cdot (1-s) - \frac{k}{k-b} \cdot e(k)$$

2.5

The results of equations 2.4 and 2.5 contain a number of points. A rise in wages (relative to other input prices) will obviously increase both the product wage and wage share if the wage rise has the effect of depressing margins, i.e. if $e(k) < 0$. However, if margins are fixed - $e(k) = 0$ - then the effect of wage rises depends on the composition of costs, the degree of substitution, and the size of the margin. In particular, we can draw the following conclusions for the case where margins are fixed:

1. The product wage responds to nominal wage rises only to the extent that non-direct labour costs are significant ($b > 0$). In the extreme case of a closed economy, where $b = 0$, wage rises are marked up in full. Any rise in the product wage depends on turning the terms of trade against suppliers of other inputs; so the magnitude of this effect is directly proportional to the size of imports.
2. The same conclusion holds true for the effect of wage rises on the share of wages in value added. But any effect in an open economy

(where $b > 0$) is modified by the degree of substitution and by the size of the mark-up. If there is unitary elasticity of substitution ($s = 1$), then wage pressure will not affect wage share - for the input ratio will always be adjusted to keep constant the ratio of labour to other variable costs. However, if the degree of substitution is less than unity, wage rises will result in an increase in wage share - but only to the extent that non-labour inputs (b) are significant.(4)

So the conditions under which wage pressure can alter the product wage and income distribution are either that profit margins can be eroded, or else that it is possible to turn the terms of trade against the suppliers of other inputs. In the latter case, wage share can be increased only if the elasticity of substitution is less than one. With this exception, Baran and Sweezy's claim is true: that workers cannot directly alter aggregate income distribution in the face of employers' monopoly power - unless workers' pressure is able to erode profit margins. Thus Rowthorn (1981) and Cowling (1982) can argue that aggregate wage share may be invariant to wage rises, given a fixed mark-up: in the former case because there are no non-direct-labour inputs; in the latter case, if the elasticity of substitution is unity.

However, it is only at the aggregate level that monopoly power appears to be able to neutralise conflict over wages and over the process of production. As Cowling (1982), p.99) points out, an individual employer (firm or industry) can raise profits by imposing (relative) pay cuts and/or by increasing work effort - and workers in a particular industry can increase their real wages at the expense of profits.(5)

The effect of disaggregating conflict when profit margins are fixed is illustrated in diagram 2.1, an adaptation of Rowthorn's (1981) presentation of Baran and Sweezy's (1968) profitability schedule. The diagram represents the profitability of the "typical" employer (firm or industry) which mirrors the whole corporate economy. Simplifying to a closed economy where labour is the only variable input, there are constant returns to labour below full capacity, and the price-cost margin is fixed, we can write:

the margin $(p-c)/p = m$

the value of the capital stock = pK

the full capacity output is Y'

actual output is Y

the (normalised) level of employment $L = Y/Y'$

the full capacity capital output ratio $K/Y' = a$

the ratio of fixed real operating costs F to the
capital stock is $F/K = f$

nominal profits = P

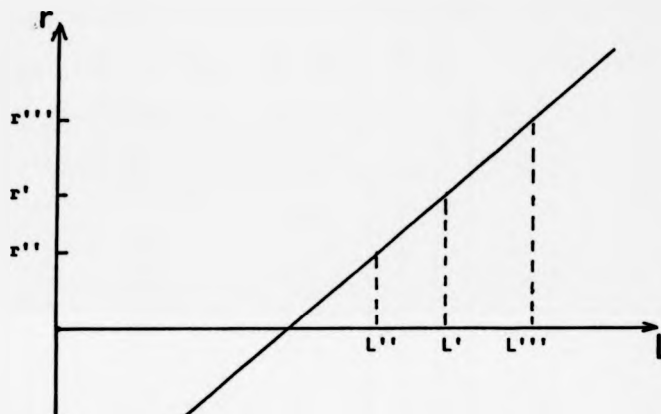
The rate of profit is $P/pk = r = (m/a).L - f$

The rate of profit is an increasing function of the level of real aggregate demand as reflected in the level of employment and capacity utilisation. If the economy is kept (by the government) at a given level of real aggregate demand, giving employment L' , then average profitability in the economy is r' . If workers force one employer to concede higher real wages, that employer raises price (given the assumption of a fixed margin) and demand for that product falls so that the employer reduces the number of jobs to, say, L'' . But the price rise reduces the real wage and relative prices in other sectors, where employment rises to L''' and profit to r''' .

DIAGRAM 2.1

THE PROFITS CURVE

The rate of profit is: $r = (m/a).L - f$



In a period of wage and price inflation, where oligopolistic employers maintain fixed margins, workers can win a rise in real wages in one sector only by winning a higher than average pay rise. But it is not just employers' profits in that sector which suffer. For monopoly power allows an employer to pass part of the costs they are forced to concede on to consumers through higher prices.

The ability of employers to maintain aggregate profitability in the face of worker pressure rests crucially on the real level of aggregate demand and on industries maintaining a stable mark-up. If each industry faced with militant workers were to reduce its margins, perhaps in an attempt to maximise their (conjectured) profits, then the whole economy would move to a lower profits curve. The maintenance of price-cost margins is a collective good for employers.

Given stable margins, it should be in employers' interest to run the economy at full capacity. Whether or not there is any trade-off between unemployment and inflation (or the rate of change in inflation), aggregate real profits would be maximised at full capacity. So the evidence described in Chapter 1, of rising profitability in a period of mass unemployment, suggests that a key question to be investigated is whether (and, if so, how) worker's strength is able to erode profit margins - for apart from changes in international terms of trade, this is the only route by which labour market conditions can affect aggregate income distributions.

2.3 The stability of price-cost margins and the effect of workers' strength

In section 2.1 I argued that there are sound theoretical reasons to expect oligopolistic industries to set, generally, monopoly margins which are a function of industry concentration and demand elasticity. If so, we would expect cost and demand conditions to affect margins only indirectly through any resultant changes in industry structure and demand elasticities.

Time-series studies of UK industrial pricing indicate that margins are fairly stable in the face of changes in demand. Coutts, Godley and Nordhaus (1978) report that: "if demand affects industrial prices, it does so only through factor prices". Sawyer (1982, p.90) finds: "considerable support for the view that price changes relative to cost changes are not strongly influenced by short-run variations in demandif we look at the actual price-cost margins, then we find considerable stability. Over the period 1970 to 1978 for British manufacturing as a whole, the ratio of gross profits to sales fluctuated between 0.194 and 0.217".

We can interpret their results not as evidence that demand is unimportant in pricing, but rather in support of the hypothesis: a) that oligopolistic industries operate in general with excess capacity and fairly constant short-run marginal costs; b) that they act as profit maximisers; c) that the factors which determine the optimal mark-up of price over marginal costs are fairly stable over demand changes. Given the assumption of constant returns to variable inputs and if the industry mark-up is stable, we can see that industry pricing will appear to depend on cost changes rather than on demand shifts. For example, an industry may experience a cost rise without knowing whether this is merely a

nominal, inflationary rise (with inverse demand rising in proportion) or whether it is a rise in costs relative to demand. In either case, the best response of the monopolistic industry is to apply the optimum mark-up to costs.

However, although these studies do indicate that profit margins over unit costs are fairly stable in the face of demand changes, there is a significant and surprising difference between the mark-up on labour and that on non-labour costs reported in the study by Sawyer (1983). It is important to note that while for the UK economy as a whole direct labour accounts for most of unit variable costs, at plant level in manufacturing direct labour accounts for only 20% of variable costs. This indicates a high level of vertical disintegration whereby the majority of inputs are raw materials, energy, intermediate goods and services, rather than direct labour (although the degree of integration will be somewhat higher at firm rather than plant level). Sawyer's surprising result is that although non-labour costs are fully marked-up, changes in wages do not have a significant effect on pricing. The implication is that wage pressure can cut into margins.

This suggestion is backed up by cross-sectional studies of the determination of price-cost margins and/or income shares, most commonly using unionisation as a proxy measure of wage pressure. Cowling and Molho (1982) and Henley (1984) find that unionisation tends to increase wage-share. This could be a result of union pressure increasing labour's share in variable costs, but Cowling (1982, p.170) reports that the aggregate materials : wage-bill ratio for UK manufacturing plants has shown little variability. So there is an apparent implication that unionisation can reduce price-cost margins.

Similar conclusions are drawn from US studies. Freeman (1983) studied a cross-section of 139 US industries 1958-76 and reports that:

"unionism has a statistically significant quantitatively important depressant impact upon the relevant profit indicatorslimited to the more concentrated industries" - the profit indicators being both the price-cost margin and the rate of return on assets. His general conclusions are backed up by the studies of Clark (1984) and Karier (1985) which I discuss in Chapter 4.

Most of these studies measure workers' strength only by the degree of unionisation. Of course other factors such as labour legislation, union morale and resources, and the level of unemployment will probably be significant too. Nevertheless, the evidence does strongly suggest that workers' strength can erode profit margins.

But why should employers who exercise a degree of market power cut their profit margins in response to wage pressure? Maintaining margins is in the collective interest of employers; but of course individual employers may find it advantageous to cut margins in some circumstances.

The earlier analysis of oligopoly pricing suggests that margins are a function of industrial concentration, demand elasticity and collusive forces. If these are the only determinants, we should expect industry margins to be independent of costs (and workers' strength) except to the extent that industrial structure, demand or collusion are systematically related to cost factors.

Cowling (1983) suggests that employers will recognize their collective interest most clearly in a slump, following an initial bout of price-cutting, leading to "an underlying tendency to raise the degree of collusion in the face of mutual adversity" (p.354). His main argument is that the increase in excess capacity, due to the slump, will make more credible the threats of retaliation which bind the members of the oligopoly to their collusive arrangement. In the terms of the argument

presented in section 2.1, we might say that an oligopoly solution closer to the profit frontier is sustainable if the perceived costs of retaliation to chiselling are lower in the slump. If workers' strength is correlated negatively with the business cycle, e.g. if unemployment weakens unions' bargaining power, we might then expect to observe a cyclical inverse correlation between workers' strength and profit margins. But this inverse correlation would appear only in a time-series context. Indeed, to the extent that workers' strength in an industry enables them to push the wage up the labour demand curve, resulting in a temporary increase in excess capacity, we would expect to find a positive (rather than inverse) correlation in cross-section studies between workers' strength and profit margins.

What about the relationship between costs and the other determinants of oligopoly margins? It is not at all obvious whether the elasticity of industry demand is likely to be systematically related to costs, eg. whether demand elasticity is likely to increase or decrease as an industry is moved up its demand curve by cost increases. However, cost increases may be expected to tend to reduce rather than increase industry numbers if the less efficient producers are squeezed out of the market when they hit some minimum profit constraint; with the result that industry concentration will tend to increase, and so will profit margins, in response to cost increases. For instance, Seade (1985 p.28) shows that profit margins must rise in response to an overall cost increase in an industry characterised by a model of parametric conjectural variation oligopoly with a fixed number of firms producing with linear costs, facing iso-elastic demand for a homogeneous good.

So, inasmuch as workers' strength is likely to have a systematic effect on the prime determinants of oligopoly margins - industry structure, collusion and demand conditions - the general expectation (in

cross-section comparisons) is that if there is any direct correlation between workers' strength and margins, it will tend to be a positive relationship. Although a cost rise specific to one firm may squeeze the margins of that particular employer, the average industry margin should not generally be eroded by wage pressure. However, there are a variety of amendments to the underlying oligopoly model which might provide some explanation for the contrary evidence cited earlier. I will examine some of these potential explanations:

- i) members of an oligopoly may have asymmetric conjectures about their rivals' response to price cuts and price increases, viz. the 'kinked demand curve', which inhibit them from passing on wage increases for fear that their rivals will not do likewise;
- ii) slow adjustment of prices in response to wage rises;
- iii) the threat of foreign competition;
- iv) bargaining between employers and workers over the level of employment as well as over wages, which might restrain employers from raising price (cutting output and employment) in response to bargained wage rises.

Kalecki (1971, p.161) argues that wage pressure may cause industries to lower the mark-up to avoid losing sales through excessive price rises. But there is no particular reason to expect a cost rise to reduce the optimal mark-up unless we introduce some other hypothesis such as that firms conjecture a kinked demand curve, expecting rivals to respond aggressively to price cuts but not to respond to an increase in price. This hypothesis may apply to a loose-knit, uncoordinated

oligopoly group; but it is less plausible for more concentrated or more collusive industries, especially where we are concerned with the impact of wage rises which are bargained over at the industry level. When all firms in an industry are aware of each other's wage rises, we should expect pricing to be adjusted accordingly.

However, if there are (anticipated) costs to immediate price changes, we might expect some delay in the response of price to wage changes, hence a temporary reduction in margins. The cost of rapid, unexpected price changes might arise from imperfect information between producers and customers; for example, customers' initial response to a price rise might be to search elsewhere, expecting to find cheaper prices (ie. sticky prices might be explicable in much the same way as search theory tries to explain sticky wages). Alternatively, imperfect information amongst producers may result in a temporary 'kinked demand curve' if it takes time for information about each others' cost rises to become common knowledge within the oligopoly group.(6)

Whatever the reason for slow adjustment of prices, we have here a possible mechanism by which workers' pressure might, at least temporarily, erode price-cost margins. But I note that this explanation implies that it is the unanticipated rate of change of wages, rather than the level of wages, which would be expected to affect margins.

The threat of foreign competition might put a ceiling on domestic prices, so that cost rises cannot be marked up beyond a certain point. This is the argument put forward by Glyn and Sutcliffe (1972) in their analysis of the decline of UK profitability in the late 1960s. Such arguments tend to suppose that foreign suppliers do not act, and anticipate other producer's reactions, as part of the collusive oligopoly group. But this ignores the international interdependence of transnational corporations and the extent of intra-firm international

trade - viz. the example of the United States in 1977, where Helleiner and Lavergne (1979) found that 48% of imports were transactions within international corporations.(7) Moreover, Glyn and Sutcliffe's evidence on the "profits squeeze" does not adequately confront the argument that margins over variable costs may be stable, and that it is the existence of quasi-fixed overhead costs (eg. of some salaried staff) which causes profit share to be reduced when capacity utilisation declines.

However, I note the implications of Seade's (1985, p.19) analysis of asymmetric cost changes in conjectural variation oligopoly, namely that if one section of international oligopoly (in this case, say, the UK producers) experiences a cost rise, the industry equilibrium tends to shift to give UK producers both lower output and lower margins. So, we might expect transnational oligopoly adjustments in favour of the more efficient foreign producers to squeeze domestic margins and market share in a similar manner to the effects of a fully competitive foreign threat. (The main difference in the collusive oligopoly model is that the margins of foreign producers would rise in response to UK cost rises.) On the other hand, the floating of exchange rates since 1972 has made it possible (in theory at least) for UK international competitiveness to be maintained by depreciation of the currency in response to domestic cost rises, in which case nominal cost rises do not necessarily squeeze margins. I discuss in Chapter 4 some of the empirical evidence concerning the impact of imports and price competitiveness on UK margins.

Bargaining between employers and unions over employment might also account for any observed tendency for labour strength to squeeze profit margins. It is commonplace to observe that if workers are concerned about the level of employment as well as about wages, and in particular if the union wishes to maximise wage-rent (ie. the total of wages above some minimum, opportunity cost, level) then any bargain which is pareto

efficient between unions and a profit-maximising employer will set output and employment independent of the bargained wage-premium. For if both sides wish to maximise their portion of economic surplus, an efficient bargain must maximise that surplus; conflict occurs only over the wage, reflected in the division of that surplus. The essence of the efficient bargaining hypothesis is that employers should be able to get lower wage settlements than would otherwise occur by offering unions some form of explicit or implicit job guarantees. Such guarantees remove employers' ability to cut output and employment and to pass on wage rises into price rises, but the resultant squeeze on margins is offset for the individual employer by the lower bargained wage and a higher level of output.(8)

Evidence on the extent of bargaining over jobs is mixed. US studies by Svejnar (1984), MaCurdy and Pencavel (1983) and Clark (1984) provide indirect evidence that bargaining does cover jobs - though both Svejnar and MaCurdy and Pencavel have to assume particular forms of firm's production functions to derive their results. On the other hand, Oswald (1984b) surveys actual union-employer deals in the UK and US and finds that explicit bargaining over jobs is conspicuously absent - but he does not deal with the possibility that job bargaining is implicit, nor with the possibility that job bargaining may be more prevalent in periods when workers are strong. It does appear that the question and implications of whether or not workers and employers do bargain over jobs is worthy of further investigation.

In Chapter 3 I will examine in some detail models of union-employer bargaining; and in Chapter 4 I present evidence from a cross-sectional study of UK manufacturing industry which examines the extent to which workers' strength does erode profit margins and tries to distinguish between the various explanations of such a phenomenon as discussed above.

2.4 The Reserve Army Hypothesis

In the last section I have presented some empirical evidence that workers' strength can erode profit margins, and some possible explanations of why this may occur in spite of employers' market power. I note here some of the implications, in particular for the 'reserve army of labour' hypothesis: that mass unemployment may actually have the effect of boosting profitability at the expense of workers' pay and conditions.

The Marxist theory of a reserve army of labour acting as a brake on labour's strength might appear not to be relevant under monopoly capitalism, for if employers maintain stable profit margins, class conflict is transformed in aggregate into price inflation without affecting aggregate real profitability. In which case, capitalists would make the highest real profits by running the economy at full capacity, viz. the upward-sloping profits curve in Diagram 1. However, if workers' strength can erode profit margins, it opens up the possibility that employers would choose to maintain a pool of unemployed in order to protect profits by weakening workers' bargaining power. This argument is illustrated in diagram 2.2. At increasing employment levels (L_1 to L_4) workers' bargaining strength and wage pressure increase, with the effect of lowering the average mark-up from m_1 to m_4 , so lowering (from PC_1 to PC_4) the appropriate notional profits curve which would hold if the mark-up was constant. We can trace out the actual profits curve (APC). If APC peaks below full employment, the reserve army hypothesis is validated. Of course it does not mean that increasing unemployment will always increase profitability, only that there will be, for capital as a whole, an optimal level of unemployment.

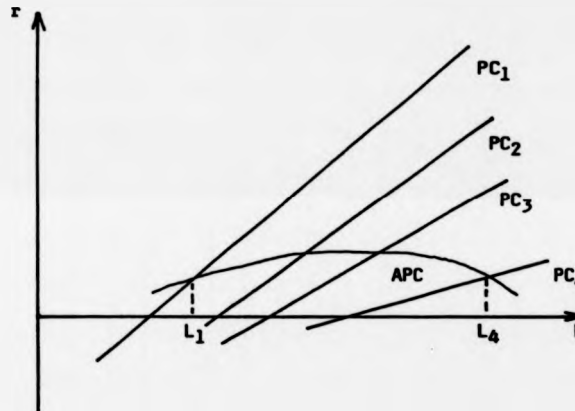
DIAGRAM 2.2

THE ACTUAL PROFITS CURVE - WHEN RISING EMPLOYMENT SQUEEZES MARGINS

PC_1 = the notional profits curve $r = m(L_1).L/a - f$

where the margin m is a function of employment : $m = m(L)$; $m'(L) < 0$

APC = the actual profits curve $r = m(L).L/a - f$



The crux of this argument is that unemployment should have a debilitating effect on workers' bargaining strength, which in turn should affect employers' price-cost margins. I report in Chapter 4 an empirical investigation into this thesis, based on an explicit model of bargaining. Here I note some time-series studies of the impact of unemployment on real wages, or on wage and profit shares, which clearly have some relevance to the reserve army hypothesis.

Weisskopf (1979, p.371) concludes in his study of the US economy that: "evidence on labour market conditions - both in a cyclical and in a longer-run context - was fully consistent with the argument that the

strength of labour vis-a-vis capital increases when the reserve army of labour is relatively depleted". The late stages of each of five successive cyclical expansions saw a fall in the rate of profit in the US non-financial corporate business sector. (The same is certainly true of the UK economy in 1979.) Weisskopf goes on to argue that his evidence also supports the reserve army hypothesis in the longer-run secular context.(9)

Many studies of wage growth have concentrated on the effect of unemployment on nominal values, particularly with regard to inflation in the 'Phillips Curve' literature, without directly examining the effect of unemployment on real wages.(10) In a survey on the literature concerning cyclical variation in real wages, Schor (1985) reports mixed evidence from other authors, but a tendency to find pro-cyclical patterns prior to the 1970s. Her own study of 9 OECD countries leads her to conclude (p.465): "in the period 1955-70 real wages displayed a strong procyclical pattern, a finding which is consistent with Marxian reserve army models, as well as neoclassical and Keynesians models, under certain assumptions"; but she finds this procyclical effect diminished in the 1970s. Unfortunately, her data goes only up to the mid to late 1970s - missing out the dramatic rise in unemployment which occurred in the UK and other countries at the end of the 1970s and the beginning of the 1980s.

Foster, Henry and Trinder (1984) analyse real earnings by sectors in the UK, 1965 to 1982. They find that sectoral unemployment reduces earnings growth significantly. An even more recent study by Layard and Nickell (1985) covers UK manual wages 1954-83, taking in the rise of mass unemployment. Taking account of the impact of real wages on employment in their 3-equation model, they also study the direct impact of unemployment on real manual wages - finding confirmation of the reserve

army effect.

These studies tend to confirm the argument I put forward in Chapter 1 that the recent UK experience of mass unemployment has shifted income distribution away from manual workers. Knight (1983) argues that the effectiveness of the reserve army has weakened as the unemployed lose (or never get the chance to acquire) the skills and motivation with which to threaten workers in employment. But his evidence of a rising product wage over the recession does not take account of the fact that the product wage has risen slower than productivity in the whole economy - ie. the share of wages and salaries has fallen. Even in manufacturing, where the share of wages and salaries rose 1979-81, this rise occurred when manufacturing output slumped by some 15% - and wage and salary share has fallen sharply since then (see Tables 2.1 and 1.3). This is entirely compatible with the hypothesis that the bargaining power and income share of production workers in manufacturing has fallen throughout the recession, whilst the salaries of many non-manual workers represent fixed overhead costs which inevitably constitute a bigger share of income when output falls. Moreover, in terms of real post-tax pay, manual workers in manufacturing made only minimal gains in hourly earnings and suffered a cut in weekly earnings between 1979 and 1983. Set against the strong rise in productivity, it is evident that manual workers' position has weakened considerably over the recession.

Nevertheless, it is not so evident that it is just the level of unemployment which weakens workers' position. Knight (1983) argues that it is the rate of increase of unemployment which strengthens capital. In particular, workers may be weakened by the threat of the sack which is directly related to the rate of loss of employment. If this is the case, workers may begin to restore their bargaining power and share of income as unemployment levels off. Kalecki (1971, p.140) argues that "under a

regime of permanent full employment, 'the sack' would cease to play its role as a disciplinary measure". But if the reserve army is debilitated by long stretches of unemployment, it may be that this effect occurs at any stable level of employment.

TABLE 2.1

GROWTH IN UNEMPLOYMENT, OUTPUT AND MANUFACTURING WAGES 1979-83

% growth over whole period, then annual % growth on previous year

	1979-83	1980	1981	1982	1983
UK unemployment	139	25	55	16	6
GDP	-1.1	-3.2	-1.9	1.6	2.5
Manufacturing output	-12.3	-8.5	-6.3	0.3	2.3
<u>real post-tax wages (1.2)</u>					
all adults	7.7	4.0	-1.0	0.3	4.3
male manual	3.0	2.5	-2.9	-0.3	4.2
female manual	1.6	2.5	-4.0	-1.6	4.9
male non-manual	10.5	5.5	-1.1	1.3	4.5
female non-manual	10.4	4.7	-0.9	1.2	5.1

Sources: Employment Gazette, February and August 1984, Blue Book 1984, Economic Trends No.371, September, 1984.

Notes: 1. April hourly earnings of full-time men, 21 years and over, and women, 18 years and over, all occupations, excluding those whose pay was affected by absence, excluding overtime pay and overtime hours.
2. deflated by Tax and Price Index

Kalecki goes on to argue (p.141) that "under a regime of full employmenteven the rise in wage rates resulting from the stronger bargaining power of the workers is less likely to reduce profits than to increase prices". However, if the arguments of section 2.3 hold, that workers' strength can in fact erode margins, then unemployment may well tend to increase profitability. But it is not clear whether the reserve army effect depends on a high level or a rising level of unemployment.

2.5 Summary

A considerable empirical and theoretical literature supports the hypothesis that oligopoly groups can generally sustain a price above marginal costs. Single period conjectural variation equilibrium models can be regarded as a convenient simplification of a non-cooperative dynamic strategy based on threatened retaliation to deviations from the equilibrium configuration. We can expect the deviation of price from marginal cost to be an increasing function of the elasticity of demand, of product differentiation, of industry concentration and of the level of public information about firms' costs, demand and behaviour.

If an oligopoly group does keep a stable margin over costs, and if there are constant returns to scale in production, then workers' wage rises can increase the product wage only to the extent that they can turn the terms of trade against the supplier of the other inputs, and the impact of wage rises on income distribution is further lessened by the degree of substitutability in production. Given stable margins, employers' collective interest should be to run the economy at full capacity. A key question is whether or not workers' pressure can erode price-cost margins.

There is apparently contradictory evidence that UK manufacturing margins are generally stable with respect to demand conditions and costs, but that, on the other hand, they are vulnerable to measures of workers' strength such as unionisation. US studies also find that unionisation tends to reduce margins. This apparent contradiction may be explicable by the hypothesis that prices are slow to respond to wage rises, in which case the rate of change of wages (or rate of acceleration) might explain erosion of margins; or the explanation might lie in the hypothesis that foreign competition restrains price rises or the hypothesis that workers

and employers bargain over employment as well as over wages. In either of the latter cases, we might expect margins to be eroded by a high level of wages rather than a high rate of change. These alternative hypotheses are the subject of further investigation in an empirical study to be reported in chapter 4.

Finally, a number of UK and US studies on real wages and income shares do support the reserve army hypothesis that unemployment may shift the distribution of income towards profits, although these studies do not generally address the question of the mechanism by which this occurs. There is an important but unresolved question of whether it is the level of unemployment or its rate of increase which affects workers' bargaining power.

UNION-EMPLOYER BARGAINING : THEORY AND EVIDENCE

3.1 Evidence on bargaining over economic surplus

I have argued that oligopolistic industrial structure allows the generation of economic surplus, defined here in the neo-classical sense of a surplus of revenue over and above the opportunity costs of capital and labour, rather than in the Marxist sense where surplus value is the gross return to capital, including its opportunity cost. An immediate implication of the generation of economic surplus is that workers have the potential to bargain for better wages, conditions etc. without the threat that the employer will necessarily move their capital elsewhere. In a fully competitive environment workers would be able to make only temporary gains, based on some short-run immobility of capital, for in the longer run employers paying higher wages would be bankrupt or could choose to switch out of that area.

Of course economic surplus is only a precondition for workers to be able to bid up wages etc; an employer may be able to hold on to all the surplus themselves and to pay in wages no more than the alternative (expected) wage which the workers would be able to earn elsewhere. Workers' ability to encroach on surplus at the micro-level of the individual employer is a question of relative bargaining strengths. So we might expect that workers' ability to raise wages (taking, for the moment, the conditions and pace of work as given) would be the joint product of the size of economic surplus and the balance of bargaining strengths.

A classic study of the relationship between monopoly rents, workers' strength and wages is Weiss' (1966) investigation of individual earnings in the US in 1959. He proxies workers' strength by the degree of unionisation and monopoly rents by the level of industrial concentration, finding that both unionisation and concentration tend to increase earnings. He reports (p.114-115) that "concentrated industries pay high incomes for given occupations" and that "the relationship is strongest for male production workers where the threat of unionisation is undoubtedly greatest". However, he goes on to argue that the higher wages found in concentrated industries are largely accounted for by the 'skill' characteristics of the workers: "the monopolistic industries do get superior 'quality' for the incomes they offerThe labourers in concentrated industries seem to receive no more for their services than they might in alternative employment for persons with similar characteristics. The earnings contain little or no monopoly rent". But this final conclusion rests on his identification of economic surplus with industry concentration and of workers' strength with unionisation, and also on his assumption that variables such as ethnic origins and family size measure the 'quality' of labour. When we consider that factors other than concentration will affect the size of the industry surplus over which workers can bargain, and that unionisation is only one of the determinants of workers' bargaining strength, Weiss' findings that these two variables still do have a positive impact on wages (even if not statistically significant when a full range of personal characteristics are included as explanatory variables) could well be taken to give qualified support to the view that workers do bargain over monopoly rents. A recent US study by Adams and Brock (1984) finds that where monopoly power has been supported by state regulation, for example in the airline industry between 1963 and 1976, wages rose much faster than the US average. And in 1972, both wages and revenues (per ton-mile) were

substantially higher in the regulated rather than non-regulated sectors of the trucking industry.

Evidence on UK wages is mixed. Tylecote (1975) reports a positive correlation between industry wage growth over the period 1954-70 and industry concentration. Wabe and Leech (1978) look at wage differentials amongst adult male manual workers in UK manufacturing industries in 1968, finding a generally positive effect of collective agreements on wages, but a generally negative effect of concentration and of profitability, (although none of these effects are statistically significant at the 5% level). Stewart (1983) investigates individual earnings of full-time manual males in UK manufacturing in 1975, with comprehensive information on training and personal characteristics. His main concern is to isolate the effects of individual union membership on earnings, finding an average union/non-union differential of 7.7% and a positive effect of collective agreement coverage. He reports that concentration has a positive impact on earnings (but the effect is statistically significant only for non-union members). Geroski, Hamlin and Knight (1982) look at UK manufacturing by industry in 1968 for the effects of strike activity on wages; they find that industry profitability does have a positive impact on wages when union activity and work-force characteristics are accounted for. A recent study of individual earnings in Australia in 1974 by Brown, Hayles, Hughes and Rowe (1984) also finds that wages are affected positively by employers' product market power. But Blanchflower's (1984) study of UK 1980 earnings of 'typical' employees (by skill groups and by establishment) reports similar conclusions to those of Weiss, ie. that the higher wages found in more concentrated industries are largely 'explained' by labour quality variables. But he finds a positive effect for the interaction of concentration and unionism; and he comments on the finding that wages are negatively correlated with rates of return on capital (in the industry in which the

establishment is located) that: "it is uncertain whether this relationship appears because workers are able to obtain higher wages where there are potentially high profits causing rates of return to be lower than they would otherwise be, or if high rates of return result from paying low wages". Moreover, some of his control variables - such as the percentages of the work-force who are manual workers, female or black - appear to be more relevant to bargaining strength than to labour quality.

All in all, there is support for the view that unionisation and industrial concentration tend to be correlated positively with earnings, and there is agreement that this correlation is diminished when a variety of skill and personal characteristics are taken into account. The disagreement is generally over whether or not this correlation diminishes altogether when personal characteristics are accounted for, and how we should interpret the diminution.

If some of the 'personal characteristics' are related to bargaining strength rather than to the productivity of labour, or if they simply capture some of the effects of higher earnings on behaviour, then a diminution of the correlation between earnings and concentration does not disprove the bargaining hypothesis. Moreover, unionisation may be a poor proxy for workers' bargaining strength and concentration a poor proxy for the size of the economic surplus. So I find the evidence gives qualified support to the view that workers bargain over economic surplus, but there is clearly a need to examine more closely the determinants of economic surplus and of workers' bargaining strength, and we need to model the process of bargaining.

3.2 Bargaining models

If unions and employers bargain over economic surplus, the bargaining must have some of the characteristics of cooperative games, rather than the (predominantly) non-cooperative game theory in terms of which I discussed the interaction between members of industrial oligopolies in the previous chapter. I use the term 'cooperative' in the technical sense defined by Roth (1979, p.20, footnote 1) of a game where "players can conclude a binding agreement as to what outcome should be chosen". For whereas oligopolists can choose output or pricing strategies independently of their rivals (although they may build interdependence into these strategies), employers and employees cannot function independently: they need at the very least to agree to work together, and they usually strike enforceable agreements on wage rates. If they do not agree on at least the minimum conditions for production to take place, then the potential economic surplus over which they might bargain will not be realised. So, in the technical sense, wage-bargaining is co-operative, even though there may be a high level of conflict over the division of surplus between wages and profits. Important elements of the worker-employer relationship may be decided non-cooperatively; for example, the level of work effort and the level of supervision may be set non-cooperatively by workers and employers respectively, viz. Reich and Devine (1981). But I wish to discuss first the cooperative, or contractual, aspect of bargaining over economic surplus.

Of course, union-employer bargaining is only one part of the process by which are determined wages, prices, profits, etc. The outcome of any particular bargain will be heavily conditioned by the economic alternatives available elsewhere to employers and to workers. The opportunity costs of labour and capital will determine the boundaries within which bargaining occurs, for neither side will settle for a

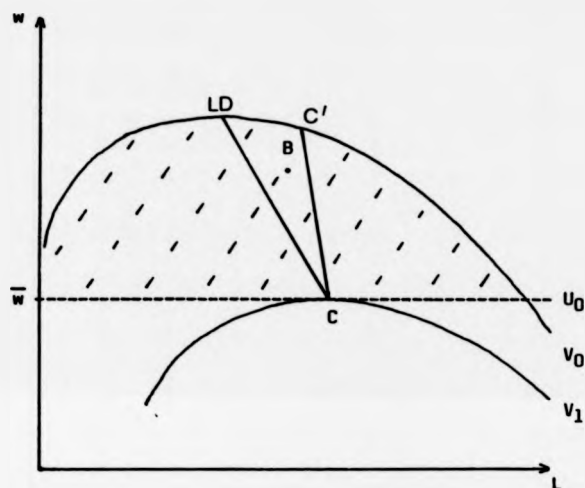
bargain inferior to what it could obtain elsewhere; and there is room for bargaining only if the industrial structure and behaviour allows the creation of surplus.

We can decompose bargains into: a) the base position where employers have full bargaining power and the union can win no share in the surplus; this may be thought of as the market-determined, no-bargaining position; and b) the bargained variation from the base position, reflecting the division of surplus. The base position is determined by the alternative wage which workers can expect to earn elsewhere and by the constraints which the employer faces in production and in product markets. The bargained variation depends on the size of the (potential) surplus, the scope of bargaining and each side's preferences and bargaining strength. (In general the outcome of bargaining will have macro-economic repercussions which will in turn affect opportunity costs. So in a macro-economic analysis the base position and the bargained variation are not independent. But for micro-economic analysis, we can assume independence).

For example, Diagram 3.1 shows the range of possible bargains over the wage and number of jobs - assuming convex preference sets and taking other variables such as hours, work effort and capital stock as given. Faced with a given alternative wage and demand and production constraints, both employer and union can rank their preferred outcomes relative to their no-bargaining alternatives. For instance, the diagram shows the alternative wage \bar{w} as a lower bound to the union's preferred bargains and the lower bound for the employer is set by the indifference curve V_0 which corresponds to the opportunity cost of capital. If the employer is a profit maximiser, their indifference curves are the iso-profit lines which peak on the labour demand curve LDC. The base position is point C where the employer has to pay workers only the

DIAGRAM 3.1

THE RANGE OF WAGE-JOB BARGAINS



\bar{w} = alternative wage

U_0 = union's minimum utility indifference curve

V_0 = employer's minimum utility indifference curve

V_1 = employer's maximum utility indifference curve

LDC = labour demand curve

$C'C$ = contract curve

B = an actual bargain

////// = the range of bargains

alternative wage. The actual outcome might be any point B within the union's and employer's lower bounds, and it may or may not lie on the labour demand curve. The outcome can be thought of as the result of superimposing the bargained variation BC on to the base position C. The bargaining problem is, of course, to choose the point B given that the

union's preferred outcome is some point C' on the employers minimum utility indifference curve and the employers' preferred bargain is at C on the unions' minimum utility indifference curve (and there is no mutually preferred outcome).

Roth (1979) describes the solution to the bargaining problem arrived at by both Edgeworth and von Neumann-Morgenstern as the contract curve (C'C in the diagram) which is the entire set of pareto-efficient outcomes which are also individually rational (ie. within the bargaining range). If any point off the contract curve was proposed, a bargain on the contract curve could be found which would be preferred by both sides. But although it is appealing to argue that bargaining outcomes should be 'efficient' (in the limited, pareto sense) the unresolved problem of 'equity' is to choose the point on the contract curve - and we can expect the two parties to conflict over that choice. If the 'equity' problem is somehow resolved first (as, for example, in McDonald and Solow's (1981, p.903) notion of a historically determined "fair" division of surplus) then the case for an efficient solution is overwhelming. But if 'equity' is in dispute, then either party may gladly settle for a solution which is inefficient but which they find preferable to the point on the contract curve which they would expect otherwise to prevail. 'Strategic' tactics aimed at winning a larger share of surplus may dominate the mutual advantages of efficiency.

However, Roth (1979) provides a series of models of bargaining which lead to a specific solution on the contract curve: the Nash solution. This is characterised as the point which maximises the product (or geometric average) of the incremental utilities (incremental to some alternative non-agreement outcome, with utility measured on some cardinal scale, eg. by a von Neumann-Morgenstern expected utility function) of each of the parties to the bargain.

Roth shows how this solution can be derived from Nash's four axioms : i) independence of equivalent utility representations to linear transformations (viz. the arbitrary origin and scale of the von Neumann-Morgenstern functions); ii) a principle of symmetry, such that if all players have the same no-agreement utilities and if the range of possible outcomes is symmetric, then the solution must give each player the same utility; iii) the addition or subtraction of "irrelevant alternatives", ie. possible outcomes which are not the solution, should not affect the solution; iv) that the solution be pareto-efficient. Roth demonstrates that axioms ii) and iv) require the Nash solution to be chosen in a symmetric game, for there is only one pareto-efficient outcome where all utilities are equal, and that must satisfy the Nash solution; but axioms i) and iii) allow any game to be transformed into a symmetric game, and the solution to the maximisation of the product of utilities is invariant to linear transformations. Moreover, Roth shows that the axiom of pareto-efficiency - which, I have argued, is a strong and perhaps unwarranted assumption - can be replaced by the much weaker assumption of individual rationality, whereupon pareto-efficiency can be deduced rather than assumed (with the only alternative to the Nash solution being the no-agreement outcome).

The appeal of the Nash solution, apart from its simplicity, still rests on the appeal of its axioms. But Roth shows that the same solution can be derived from models of a process of two-person bargaining, as developed by Harsanyi from Zeuthen, where each player can announce, simultaneously, a demand and an offer (ie. a proposed solution). If the respective demands and offers are compatible, each player's demand is met. If demands exceed the other's offer, each player has the chance to either repeat their proposal or accept the other's proposal. If the proposals are still not compatible, the disagreement outcome holds. The key to Harsanyi's model is that if each player maximises expected

utility, they will hold out if and only if the ratio (this ratio is called the 'risk limit') of the potential gain to the potential loss from holding out is greater than their subjectively held expectation of the probability that the other will hold out. The critical assumption is, then, that each player knows that the player with the lower risk limit will concede, which is tantamount to assuming that the players hold symmetric subjective expectations. The solution is characterised by the non-cooperative equilibrium condition that each player makes the best possible proposal given the other proposal - and the Nash solution emerges. A player cannot do better than propose the Nash solution if the other does just that, since the Nash solution maximises the product of the potential losses, so to propose any individually better deal would involve lowering one's risk limit below the other players', which would (by assumption) require one to concede in the next round.

Roth goes on to expound the argument of Aumann and Kurz that at the Nash solution the "fear of disagreement" of each player is the same - where fear of disagreement is defined as the ratio of the incremental utility to marginal utility at a point - a measure of the value placed on a marginal gain relative to the threat of total loss. Svejnar (1984) generalises from the restrictive assumption of symmetry in Nash's axioms, which is paralleled by the assumption of symmetric expectations about each other's probability of holding out in the Harsanyi-Zeuthen model. He replaces the symmetry axiom with an assumption that, at the bargaining solution, the fear of disagreement of each player is proportional to some exogenously determined measure of each player's bargaining power. (This notion can presumably be paralleled in the Harsanyi-Zeuthen model by an assumption that the stronger player is more likely to 'hold out' than the weaker player.)(1) The result is the 'asymmetric Nash solution' which maximises the weighted geometric average of utilities, where the weights are the players' bargaining powers, and the symmetric Nash solution is

the outcome of the special case where bargaining powers are equal.

The asymmetric solution has the considerable appeal of allowing us to model formally the notion of asymmetric bargaining power which is particularly relevant in the case of union-employer bargaining where - whatever the union's preferences and the range of feasible outcomes - we expect to find at least some situations where the employer clearly holds the upper hand. Once we can model asymmetric bargaining power, we can then begin to investigate its determinants.

Svejnar (1984) provides a story of the bargaining process to back up his solution: any proposal is evaluated by each party in terms of their 'fear of disagreement' relative to their own bargaining power; the player with the greater relative fear then makes a concession, and bargaining converges on the asymmetric Nash solution.

A convenient way of grasping this bargaining solution is to first define the bargaining frontier, the set of outcomes which may be reached depending on the distribution of bargaining strength. These points will be pareto-efficient within the constraints of the bargain. If all the variables which enter the two sides' utility functions are subject to bargaining, then the result will be fully efficient. But there may well be some variables such as effort, supervision and the level of employment which are determined unilaterally - in which case the bargaining frontier is efficient only in the limited sense of not being pareto-dominated by any other bargain given that the 'non-cooperative variables' are determined outside the scope of the bargain. For instance, if the wage and the level of employment enter the utility functions of both union and employer the bargaining frontier is the contract curve CC' in Diagram 3.1. This may be efficient only in the limited sense if, for example, work effort and supervision are set non-cooperatively. Efficiency may be further limited if cooperative bargaining is restricted further to cover

only the wage, ie. if the employer sets the level of employment unilaterally (conditional on the bargained wage). If the employer chooses the number of jobs to maximise profit, then the bargaining frontier becomes the labour demand curve LDC (or at least that part of the labour demand curve along which the union prefers to raise the wage).

So, the bargaining frontier is given by: a) the (institutional) factors which determine the scope of bargaining; b) the non-cooperative behaviour of each party with respect to variables outside the scope of bargaining; and c) the preferences of the two parties, which influence the shape of the bargaining frontier. For example, if the scope of bargaining covers wages and jobs and the employer aims to maximise profits, the bargaining frontier is the contract curve C'C which slopes upwards/backwards as the union is more or less concerned about jobs rather than wages - and the contract curve is vertical if the union aims to maximise rents from employment.

The solution point on the bargaining frontier is determined by each side's fear of disagreement - a function of preferences and of the disagreement or 'threat' points - and by their relative bargaining strengths. The solution is characterised (see Svejnar (1982)) by the condition that the elasticity of substitution of utilities along the bargaining frontier equals the ratio of the bargaining strengths:

$$-\frac{dU}{dV} \cdot \frac{V}{U} = \frac{1-b}{b}$$

3.1

where U and V are the incremental utility functions of the two parties along the frontier and b and (1-b) are their respective bargaining strength indices.

Alternatively, we can write

$$\frac{V(x)}{U(x)} = \frac{1-b}{b} \cdot \frac{V_1(x)}{U_1(x)} \quad \forall i$$

3.1.1

where $V(\cdot)$ and $U(\cdot)$ are cardinal indices of utility incremental to the disagreement outcome, and functions of the bargaining variables vector x (indexed by i).

This simple formulation clarifies the important points which influence bargains between an employer and union facing a given set of demand and production constraints:

- i) opportunity costs are represented as the zero-utility levels of the incremental utility functions; they define the upper and lower bounds to feasible bargains.
- ii) preferences are represented by the utility functions.
- iii) the scope of bargaining - whether, for example, bargaining deals with the wage only or whether it includes the number of jobs, effort, supervision, etc. - acts as a constraint on the utility frontier, so influencing the marginal rate of transformation of utilities.
- iv) bargaining strengths are represented by the parameter b .

The intuitive appeal of this model of bargaining lies in its identification of these four elements which together determine the outcome. The solution still implies efficiency (within the scope of bargaining) which arises, essentially, from the assumption of full information. Svejnar (1984) suggests that disagreements - strikes, lock-outs etc. - are potentially explicable by relaxing the assumption of full information with regard to bargaining strengths, hence a period of

trial and error (and perhaps bluff) may occur during which the parties test out each others' strengths. Equally, I would suppose that imperfect information concerning each other's preferences and threat points could explain failure to agree. Moreover, there may well be scope for 'strategic' behaviour in determining the scope of bargaining.

The four elements of bargaining are, however, not entirely independent of each other. For instance, there is some overlap between the concepts of preferences and bargaining power. Even in the symmetric Nash solution, the utility gained by one player increases as his opponent becomes more risk averse - ie. one is better off if one's rival becomes more timid (fear of disagreement increases) (see Roth (1979)). This same effect is, in general, mirrored by assigning less bargaining power to the rival. It might seem, then, that bargaining power could be captured solely by the degree of risk aversion in each player's utility function. But each player's preferences with regard to their choices - eg. the union's degree of 'risk aversion' as displayed by their preferences between wages and jobs - is not necessarily a reflection of their relative 'boldness' or their expectation that their rival will concede before they do. So, for instance, a rent-maximising union's objective function can be represented as $U = L.(w-\bar{w})$ and the symmetric Nash solution, when the firm is a profit maximiser, is the point mid-way up the vertical contract curve C'C in Diagram 3.1. The asymmetric solution moves up and down the contract curve as the union's bargaining power rises or falls (see later section for mathematical proof). This effect can be mimicked in the case of the symmetric Nash solution by representing the union's utility as $U' = V[L(w-\bar{w})]$, where increasing the convexity/concavity of the function $V(.)$ has the same effect as varying bargaining power. The advantage of treating bargaining power separately is that it helps us to distinguish the factors which determine the shape of the bargaining frontier - the ordinal preference rankings - from the

factors which determine the bargained position on the frontier. The former factors may be regarded as more subjective, eg. a union's attitude towards unemployed members and prospective members, and the latter as more likely to be external and institutional, eg. the legal and historical framework which conditions bargaining and the relative size and resources of union and employer. Of course some factors may influence both the shape of preferences and the balance of bargaining strength: unemployment may make unions more concerned about jobs, but give them less bargaining strength.

Svejnar (1984) argues that factors which determine bargaining strength may have spill-over effects on the disagreement outcomes, eg. if an increase in the union wage leads to an increase in the alternative (non-union) wage as well. I argue later that the scope of bargaining may well be influenced by some of the same factors which influence bargaining strength, in particular that strong employers may choose not to bargain over jobs. So the four elements of bargaining may well be interdependent. Nevertheless, their identification and separation gives us some analytic grasp on the problem of bargaining.

The asymmetric Nash solution has the added advantage of subsuming a number of other approaches to and models of bargaining. The traditional symmetric Nash solution is one example, where the bargaining parameter b is set to 0.5, as used by de Menil (1971), McDonald and Solow (1981) and Osborne (1984). Treatment of monopsony and of wage-bargaining (eg. Mulvey, 1978) can be dealt with by allowing the 'alternative wage' to be a function of labour supplied (viz. an upward-sloping labour supply function) and by restricting the scope of bargaining to cover only the wage, assuming that employers set the level of employment to maximise profit. The (unlikely) case of the 'monopoly union' which can set whatever wage it chooses - as analysed by McDonald and Solow (1981),

Oswald (1982, 1984a, 1984b), Sampson (1983), Gylfason and Lindbeck (1984) - is modelled by imposing the further restriction that employers' bargaining power is zero and the opposite case of pure monopsony can be dealt with by setting union bargaining strength to zero. Grout (1984) extends the model to multi-period bargaining, analysing the implications of immobility of capital for bargaining over both the wage and levels of employment.

There are other models of bargaining which are not readily subsumed into the asymmetric Nash model, for instance the models of Hicks (1963) and the later developments of Cross (1969) and Coddington (1968) which focus on the bargaining process as a sequence of offers over time where expectations of the others' concessions are adjusted by some error-correction mechanism. Hicks' analysis does not readily lead to a determinate solution, rather exploring the range of indeterminacy of the solution and the costs which different lengths of strike might impose on employers and unions; these are concepts which might inform analysis of the determinants of bargaining power.

The asymmetric Nash model has a number of attractions and advantages: its analytic separation of opportunity costs, preferences, bargaining scope and bargaining power; the intuitive appeal of its axioms, backed up by plausible stories of the bargaining process; its generality which allows it to incorporate as special cases a variety of other bargaining solutions; its mathematical tractability. It offers the most appealing and productive means of investigating bargaining. (2)

3.3 Implications of Bargaining over Employment

Leontief (1946) and Fellner (1947) both point out that if unions are at all concerned with the level of employment, then efficient contracts must cover jobs as well as wages. Fellner goes on to argue that bargaining over jobs is unlikely, however, because uncertainty over product demand would put too much risk on an employer who is bound by a contract which prevents her from reducing employment in recession. The bargaining model presented in the previous section, however, refers to bargains over one period only and allows for recontracting when revenue conditions change. The problems of cyclical fluctuations in demand, wages and employment and the sharing of the consequent risk are dealt with in the literature on 'implicit contracts' which is conceptually quite different from the single period bargaining problem, though no doubt the two problems can (and perhaps should) be dealt with together.

There is some disagreement over the empirical evidence of whether employers and unions bargain over jobs as well as wages. Oswald (1984b) reports survey evidence that most US and UK employers do not bargain (explicitly) over employment levels. Nevertheless, there may be implicit agreement on jobs, backing up formal wage-bargaining. Indeed, MaCurdy and Pencavel (1983) study employment in US newspaper composing rooms comparing models of wage-only bargaining and wage-job bargaining, concluding that the latter "comes closer to providing a satisfactory explanation" (p.31). Ashenfelter and Brown (1983), on the other hand, examine the implications of bargaining on a (vertical) contract curve and find the prediction, that the wage and employment should be uncorrelated, disproven. But both Svejnar (1984) and Clark (1984) report evidence from the US in favour of the existence of bargaining over jobs. I seek here to explore some of the implications of the hypotheses that bargaining does or does not cover jobs.

First, suppose that the workers' collectively expressed preferences over jobs and wages can be represented by the commonly used utility function (see de Menil, 1971; McDonald and Solow, 1981; Svejnar, 1984):

$$V(L,w) = L \cdot [u(w) - u(\bar{w})]$$

where L is the level of employment, \bar{w} the alternative wage, and the function $u(\cdot)$ captures the relative importance to workers of jobs and wages. This function could express the ex-ante risk attitude of a typical worker facing the threat of random lay-offs (see Oswald, 1982), or, alternatively, the ex-post inequality attitude of the union. For instance, concavity of $u(\cdot)$ implies risk- (inequality-) aversion; the indifference curves illustrated in Diagram 3.2 become steeper as risk-aversion increases and workers require relatively large wage increases to compensate for job losses. Attitudes to risk or inequality can be conveniently parameterised (adapting the approach of Svejnar, 1984) by assuming constant relative risk aversion of the incremental utility function:

$$\text{let } -v''(W) \cdot W / v'(W) = r$$

3.2

where W is the wage increment, $W = (w - \bar{w})$; and $v(W)$ is the incremental utility function, $v(W) = u(w) - u(\bar{w})$. In this case we can write:

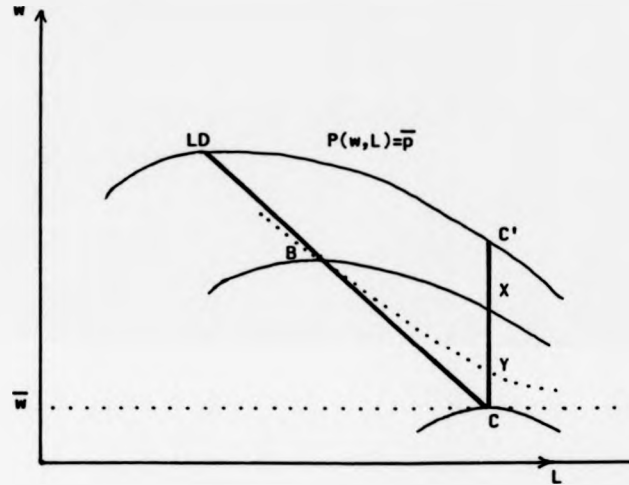
$$v(W) = W^{1-r} / (1-r)$$



3.2.1

and see that $1 > r > 0$ implies risk aversion, $r = 0$ implies risk-neutrality, and $r < 0$ implies risk-loving. As r approaches minus infinity, indifference curves become horizontal and workers' collective utility is a function of the wage alone.

DIAGRAM 3.2

Comparison of bargaining on the labour demand curve with bargaining on the contract curve.



- LDC = labour demand curve
- C'C = contract curve
- B = a bargain on the ldc
- XY = the range of pareto-superior efficient bargains
-  = iso-profit lines
-  = the union's indifference curves

Second, let the employer's incremental profit function be:

$$P(L,w) = R(L) - wL - F ; R''(L) < 0$$

where concavity of the revenue function can result from decreasing returns to the labour input and/or from a down-sloping marginal revenue schedule in the product market.(3)

If the employer aims to maximise profits $P(x)$ and the union to maximise a utility function $U(x)$, the asymmetric Nash-bargaining problem is:

$$\max. \text{ w.r.t. } x \quad [P(x)]^{1-b} \cdot [U(x)]^b$$

where x is the vector of variables which are subject to bargaining and the ratio $(1-b)/b$ is the parameter representing the bargaining strength of the employer relative to that of the workers. The solution is characterised by the condition:

$$\frac{P(x)}{U(x)} = \frac{(1-b)}{b} \cdot -P_1(x) / U_1(x) \quad \forall i$$

3.3

If bargaining covers both jobs and wages, the partial derivatives of the incremental profit and utility functions of employer and union are as follows:

$$\begin{aligned} P(w,L) &= R(L) - wL - F & ; & \quad V(w,L) = L \cdot [u(w) - u(\bar{w})] \\ P_L(w,L) &= R'(L) - w & ; & \quad V_L(w,L) = u(w) - u(\bar{w}) \\ P_w(w,L) &= -L & ; & \quad V_w(w,L) = L \cdot u'(w) \end{aligned}$$

3.4

Defining the division of surplus as the ratio of employers' incremental profit to workers' incremental wage bill, we can write the division of surplus as:

$$D(w,L) = P(w,L) / L(w - \bar{w})$$

So the bargaining solution (3.3) can be written:

$$D(b) \cdot \frac{b}{1-b} = \frac{w - R'(L)}{w - \bar{w}} = \frac{u(w) - u(\bar{w})}{(w - \bar{w}) \cdot u'(w)} = \frac{1}{1-r}$$

3.5

We see here the established result that if the union is risk-neutral ($r = 0$) the level of employment is independent of bargaining

strength (since $R'(L) = \bar{w}$). In this case, the division of surplus between union and employer is in direct proportion to their bargaining strengths. So the wage will be a positive linear function of workers' bargaining strength and the employers' profit (and profit margin) will be a negative function of workers' strength. The stronger the union, the higher up the contract curve will be the outcome. If the union is risk-averse (the case analysed by McDonald and Solow, 1981), ie. if $r > 0$, then we can see that the marginal revenue of labour must be less than the alternative wage, ie. the level of employment must be greater than the 'competitive' level; and the level of employment will be less if the union is risk-loving, as it is more prepared to sacrifice employment in order to win higher wages.

Many authors restrict their analysis of bargaining to the 'efficient' case which includes job-bargaining. But we may equally well investigate the results of bargaining over wages alone - in which case the bargaining frontier is the labour demand curve (LDC in Diagram 3.2). We can then write the incremental profit and utility functions as functions of either the bargained wage w or the level of employment given by the labour demand curve: $L(w) = L^*$.

$$P[w, L(w)] = Q(L^*) = R(L^*) - R'(L^*) \cdot L^* - F ; U(L^*) = L^* \cdot [u(R'(L^*)) - \bar{u}]$$

$$Q'(L^*) = -L^* \cdot R''(L^*) ; U'(L^*) = L^* \cdot u' \cdot R'' + (u - \bar{u})$$

3.6

Equation 3.3 allows us to derive the division of surplus $d(b)$ which results from bargaining on the labour demand curve:

$$d(b) \equiv \frac{Q(L^*)}{L^* \cdot (w - \bar{w})} = \frac{1-b}{b} \cdot \frac{L^*}{L^* \cdot (w - \bar{w}) \cdot u' + (w - \bar{w}) \cdot L'(w)}$$

3.7

From 3.2 we can write the elasticity of the incremental utility function:

$$E(w) \equiv v'(W) \cdot W/v(W) = (w-\bar{w}) \cdot u'(w)/(u-\bar{u}) = (1-r)$$

and we can define the elasticity of the labour demand curve with respect to the wage increment as $e(w) = L'(w) \cdot (w-\bar{w})/L^*$. So

$$d(b) = \frac{1-b}{b} \cdot \frac{1}{E(w) + e(w)}$$

3.7.1

The division of surplus - the ratio of incremental profits to wage rents - cannot be negative; the labour demand elasticity, e , is negative; so we can see from 3.7.1 that the bargained outcome must be at a point on the labour demand curve where the elasticity of incremental utility exceeds the absolute value of the elasticity of labour demand. The more elastic is labour demand, the greater is the share of surplus won by the employers as they present workers with a less favourable trade-off between jobs and higher wages - whereas in the case of wage-job bargains (equation 3.5) the division of surplus is a function only of bargaining power and the union's attitude to risk or inequality. In both cases, the more risk-averse the union the greater is the share of surplus won by the employer (though this last result depends on the definition of bargaining power, see the discussion on page 3.14).

In the case of bargaining on the contract curve, we have seen that as employers' bargaining strength rises, the bargaining solution moves down the contract curve - giving employers higher profits. The same will generally be true for bargaining on the labour demand curve, at least if labour demand has a constant elasticity (with respect to the wage increment) less than unity and if the unions' risk-aversion parameter is fixed. In this case, a rise in employers' bargaining strength will unambiguously increase the share of surplus accruing to profits, which must involve a move down the labour demand curve - increasing profits and decreasing wage rents.

With this preliminary analysis, we are now in a position to explore critically McDonald and Solow's (1981) conclusion that: "Our partial-equilibrium bargaining models ...do quite generally confirm a tendency for fluctuations in real product demand at the firm or industry level to be accompanied by large correlated fluctuations in employment and small changes in real wage rates that could go in either direction." (p.908)

Their conclusion rests crucially on their assumption concerning changes in the reservation wage, and on an implicit assumption that bargaining strength is independent of the business cycle. Following their presentation, the employers' revenue $R(L,B)$ is a function of the level of employment L and of the parameter B which represents the state of product demand such that $R_B > 0$ and $R_{LB} > 0$. Their bargaining problem and solution is defined as above, except that bargaining strength b is set to one half. The locus of efficient outcomes, the contract curve, is defined by the first order condition: $w - R_L(L,B) = [u(w) - u(\bar{w})]/u'(w)$.

Extending their results, note that the contract curve slopes up or down as $u(\cdot)$ is concave or convex. As product demand rises, both the labour demand curve $L^*(w,B)$ and the contract curve $L^C(w,B,\bar{w})$ (HC and CC' in diagram 3.3) shift to the right if the reservation wage is unchanged:

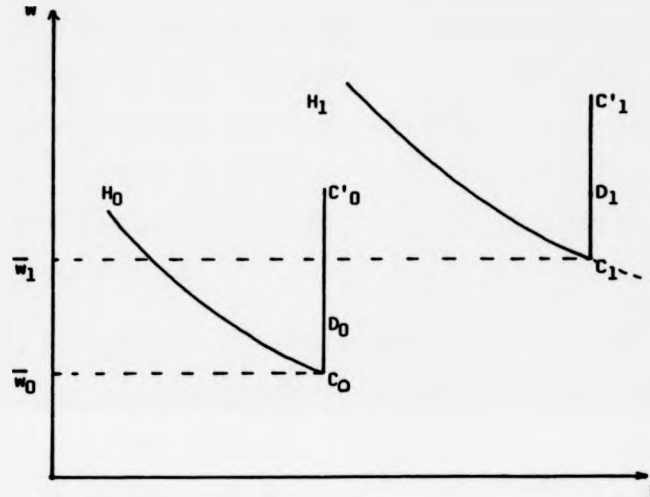
$$\text{labour demand} \quad L^*_B(w,B) = - R_{LB} / R_{LL} > 0$$

$$\text{contract curve} \quad L^C_B(w,B,\bar{w}) = - R_{LB} / R_{LL} > 0$$

3.8

DIAGRAM 3.3

Wage and Job Changes over the Business Cycle



- HC = labour demand curve
- CC' = contract curve
- D = an efficient bargain
- \bar{w} = reservation wage
- subscript 0 = recession
- subscript 1 = boom

But, as the reservation wage rises, so the contract curve shifts left as its base point C moves up the labour demand curve:

contract curve $L^C(w, B, \bar{w}) = u'(\bar{w}) / [u'(w) \cdot R_{LL}] < 0$

3.9

The first crucial assumption made by McDonald and Solow (p.908) is that "cyclical changes in product markets dominate those in the effective

reservation wage", which I interpret to mean that the move illustrated in Diagram 3.3 from one base position to another, from C_0 to C_1 , exhibits a greater change in employment than in the wage. Since the bargained outcome is some deviation from the base position, fluctuations in bargained outcomes must be strongly influenced by the assumed fluctuations in the base position. The assumption of a sticky reservation wage (which does not move enough to keep employment steady) begs precisely the macro-economic question which this micro-analysis seeks to illuminate, the relationship of the wage to fluctuations in demand and unemployment.

The significance of variable bargaining strength can be illustrated by considering the simple case of a risk - or inequality - neutral union which reaches an efficient bargain with the employer, in which case the contract curve is vertical. In diagram 3.3 the outcome is some point D whose position between the base position C and the top of the contract curve C' (the point where profits are driven to zero) measures the union's relative strength. In McDonald and Solow's example where union and employer strength are assumed to be equal, D lies half-way between C and C'. Now, if C' rises by as much as C during the boom, and if bargaining strength is unchanged, then D_0D_1 is parallel to C_0C_1 and the changes in negotiated wage and job levels are exactly the same as the (assumed) changes in the reservation wage position. But if union strength declines in recession, then the change in the negotiated wage is enhanced, for D will move closer to C in recession. Furthermore, if the contract curve slopes backwards (or if bargaining is restricted to the down-sloping labour demand curve) then the recession-induced fall in union strength decreases the fluctuation in jobs as well as increasing the fluctuation in wages. If unions are more concerned about jobs in recession than they are in boom - eg. if they are more concerned about current workers than potential recruits, viz. the point made by Chapman

and Fisher (1984) - this last tendency will be reinforced.

It appears then that the implications of bargaining for wage and job movements are highly dependent on movements in the reservation wage, on the scope of bargaining, on union attitudes to job losses, and on the impact of unemployment on union and employer bargaining strengths. There is no general tendency for bargaining to cause jobs to fluctuate more than wages.

We can be somewhat clearer with regard to the effect of variable bargaining power on movements in profits. In general, whether or not bargaining covers employment, an increase in an employer's bargaining power will increase their profit - even in the case analysed by Grout (1984) where non-binding labour contracts and sunk investment make bargaining inefficient. If unions are weakened by unemployment, there is a possibility that profits may move anti-cyclically. For even though the total (potential) surplus may decline in recession, profits may rise if an employer is enabled to win a sufficiently large increase in their share of surplus. (In the macro-economic context, this is only true in aggregate if average profit margins rise sufficiently in recession to offset the decline in capacity utilisation).

The possibility that employers might actually prefer a higher to a lower level of unemployment is also argued by Osborne (1984) who makes the same point by assuming a symmetric Nash bargain, but makes the employer's no-deal pay-off dependent on the number of unemployed.

3.4 The determination of Bargaining Power

The analysis of the previous section suggests that the relative bargaining strength of unions and employers has highly significant implications for the relationship between wages and employment and for the distribution of income. So it is important to investigate the determinants of bargaining power. However, much of the literature on union-employer relationships avoids this question by simply assuming a given balance of power.

On the one hand it is common, eg. in the industrial economics literature, to assume that wage costs are taken parametrically by individual employers and are not related to the firms' strategies and performance in product markets. This approach is often tantamount to an assumption that unions have no bargaining power. On the other hand, some authors investigating union behaviour make the extreme contrary assumption that unions can set whatever wage they choose within the bargaining range - eg. Oswald (1982, 1984a, 1984b), Sampson (1983), Pencavel (1984), Gylfason and Lindbeck (1984). Law (1977) and Greenwald (1979) show that in this case, if the union's objective is to maximise the wage, the outcome is the same as that for a worker-controlled firm pursuing the same objective, reaching the highest point on the labour demand curve which allows non-negative profits. If union utility depends on the level of employment too, an all-powerful union would usually choose some point lower on the labour demand curve. But as long as the union-preferred wage exceeds the reservation wage, any reduction in that wage would simultaneously reduce the unions' utility and increase the employers' profits. There is a direct conflict of interest over the distribution of surplus. To assume that unions have full bargaining power is to beg all the questions of the determination of relative bargaining strength. Moreover, such an assumption flies in the face of

evidence that employers use, and carry out, threats to close down factories, lock out unions, employ non-union labour, sub-contract work, reduce wages, intensify the pace of work, etc. Employers are far from powerless. The assumption that unions can choose the wage stems, perhaps, from a confusion between a necessary precondition for all-powerful bargaining - that workers should have some collective organisation - and the sufficient conditions for such success.

Rather than assume that either unions or employers are all powerful, both de Menil (1971) and McDonald and Solow (1981) model union-employer bargaining with the symmetric Nash bargain, equivalent to assuming an equal balance of strength between the two sides. But this approach still avoids examination of the determination of bargaining power, though I note McDonald and Solow's (1984, p759) comment that "in the absence of any direct measure of bargaining power, it becomes one of these self-sealing explanations. Do wages rise in an upswing? The union's bargaining power has increased. Do they not? Ah, this time it didn't". However, the bargaining model described here does lead to empirically testable hypotheses which can, in principle, lead to direct measures of bargaining strength. Svejnar (1984) investigates changes in wages, profits and employment in twelve major unionised US companies between 1954 and the late 1970s. He reports two-thirds of his point estimates of union bargaining strength (b in equation 3.3) lying in the range of zero to one-quarter.

I will examine a number of hypotheses concerning the determination of bargaining strength.

One hypothesis is raised in a survey of literature on worker participation in management by McCain (1982, p.22). He suggests the hypothesis that the degree of participation, in particular in the "extreme" form of co-determination in the German Montanindustrie, may be

positively correlated with workers' bargaining power. But this proposition appears to stem from a confusion between the form of conflict (industrial dispute, or round-table bargaining, or formal participation schemes) and the relative strengths which underlie the conflict over the distribution of surplus. A firm may be formally co-determined, yet the owners of capital may hold all the bargaining cards; or an employer may shun formal participation yet be forced to concede union demands. If there is found to be an empirical link between participation and union strength, the direction of causality is ambiguous. I would suggest that participation may be correlated with the potential gains to be made from bargaining over non-wage variables - however those gains are to be shared out between employer and union - in response to the costs of contracting under uncertainty. For instance, if the contract curve diverges sharply from the labour demand curve there may be significant gains to be made by a strong employer trading job increases in return for a lower wage; and some participation scheme may be introduced in order to allow the union to monitor the agreement. Or participation may be introduced to remove some of the inefficiencies arising out of non-cooperative behaviour over work effort and supervision. But such participation schemes motivated on efficiency grounds are not necessarily either the cause or the product of union strength.

Alternatively, we might suppose that a significant influence on bargaining outcomes is exerted by costs of search, selection, hiring and training. These raise the cost to employers of hiring new workers above the alternative wage. For example, Doyle (1984) analyses the implications of hiring costs for the evolution of wage bargains over time; but, even in his dynamic framework, the overall distribution of the present value of surplus still depends on the assumed degree of competition or monopoly in both the supply of and demand for labour. Hiring costs drive a wedge between the alternative wage available to

workers and the alternative cost to the employer of labour. But this wedge is not won automatically by either labour or capital; rather, it constitutes part of the surplus (of revenue over opportunity costs) which may be won by either side. If there is sufficient competition amongst employers, unions may be able to drive the wage above the alternative wage to the level of the alternative cost of labour. On the other hand, a monopsonistic employer who can easily hire new workers may be able to keep the wage down to the alternative wage. Indeed, hiring costs may act as a barrier to entry and enhance employers' monopoly/monopsony power.

I conclude that neither participation nor hiring costs are primary determinants of bargaining strength. We need to examine union and employer control over labour supply and demand,(4) and each side's (perceived) ability and determination to impose and suffer sanctions. I put forward here only some tentative suggestions.

A preliminary point to clarify is a distinction between: a) the sanctions which may be threatened in a dispute - strike, lock-out etc. - which are essentially short-term threats; and b) the 'disagreement outcomes' which set the limits to the range of feasible bargaining solutions. The latter 'disagreement outcomes' I see as essentially medium- to long-term factors, determined by the opportunities available to unions and employers in the eventuality of being unable to reach agreement in the longer term. Workers will have some notion of what they can expect to earn elsewhere in the longer term (taking into account both union and non-union wages and the extent of unemployment and the level of benefits) and will presumably not settle for less than this 'alternative wage' - but in the short term, in furtherance of an immediate dispute and in anticipation of winning a wage above the alternative, they are often prepared to suffer a temporary loss of earnings well below the alternative wage. Similarly, employers will have some view of the rate

of return they can expect to earn on their realisable capital, setting a minimum profit constraint on bargaining. But they will be prepared to suffer temporary losses in the expectation of a better bargain. Hence the need to distinguish short-term sanctions, which influence bargaining strength and the division of surplus, from the longer-term alternatives which determine the boundaries to bargaining and the size of the surplus - a distinction which is all too often confused.

The effectiveness of the short-term sanctions of strike and lock-out will depend partly on the magnitude of the losses each side can threaten on the other, partly on the (perceived) ability of each side to both carry out and withstand such threats, and partly on perceptions of each other's 'toughness'. So, for instance, labour legislation, union and employer history and morale and the political climate will presumably influence each side's ability and willingness to carry out threats. Pronouncements and legislation on unions and industrial relations coming from governments may be seen as an attempt to influence the real outcomes of bargaining between wages and profits. Furthermore, employers will be at an advantage if they have numerous sources of supply of labour and are able to switch production and investment between one bargaining unit and another. So there will be an important effect on bargaining due to the size and scope (national or transnational) of firms and employers' organisations relative to the size and scope of union organisation.(5)

I want to pay particular attention here to the impact on bargaining strength of unemployment. The level of unemployment will affect workers' expectations of the wage they can receive elsewhere, hence their reservation wage. But high unemployment will also lower workers' ability to finance a strike through temporary alternative employment; and unemployment will generally enhance employers' ability to withstand a strike or impose a lock-out on the union by making it easier

to employ temporary non-union labour or to temporarily sub-contract work. The level and rate of change of unemployment will also affect employers' attempts to lower the efficiency wage through intensification of work, by sharpening the threat of dismissal for those workers who do not comply (see Kalecki, 1971, p.140).

Svejnar (1984, p.17) finds in his empirical study of bargaining in a sample of unionised US corporations that "union bargaining power is affectedpositively by unemployment". He points out that this result is a corollary of the observation that the union/non-union wage differential varies positively with unemployment. But there is no explanation why unemployment should increase workers' bargaining power when there is an obvious expectation that unemployment should have the reverse effect. It is possible that his finding is the result of inter-temporal wage contracts (implicit or explicit) which provide some cushioning against cyclical fluctuations in the wage of unionised workers.

In summary I have argued in this section that neither the existence of unions, nor the form or scope of bargaining and participation schemes, nor the existence of hiring and training costs, is necessarily any indication of the balance of union-employer bargaining strength. Rather, we should look to employers' and unions' relative sizes and financial resources, to labour history and legislation, and to the level of unemployment and its rate of change.

3.5 The scope of bargaining (or why employers prefer not to bargain over jobs)

I have reported the disagreement in the literature on whether or not the level of employment is in fact usually subject to bargaining between unions and employers. The question I raise here is whether there may be a conflict of interest over the inclusion of jobs in bargaining.

Bargaining over the wage alone leads to inefficient outcomes if the union is at all concerned with the level of employment. Nevertheless, employers may prefer not to bargain over jobs if the consequent lessening of the threat of job losses (in response to any bargained wage rise) would enable workers to win a larger share of the economic surplus. I will show that this is often the case if bargaining is characterised by the (asymmetric) Nash co-operative game where the bargained outcome is affected not just by the exogenous bargaining strengths of the two parties, but also by the marginal rate of transformation of utilities along the bargaining frontier. Changing the shape of that frontier by including or excluding jobs from the bargaining agenda will alter the division of surplus. Thus, the evidence cited by Oswald (1984b) that most US and UK employers do not explicitly bargain over employment levels may be the result of an employers' strategy to pre-set the bargaining agenda in their own favour.

In principle, a move towards an efficient bargaining solution could be facilitated by compensating side-payments. But agreements to make such payments may be unenforceable and unreliable. Workers need only know that they will be able to win job guarantees (implicit or explicit), then they will press wage demands more strongly than if they are faced with a trade-off between wages and jobs.

Oswald (1984b) argues an alternative explanation for the

prevalence of explicit bargaining over wages alone, namely that unions are indifferent to the threat of job losses since lay-offs are often characterised by seniority rules which give effective job-security to the median union voter.(6) On the other hand we should consider the growing evidence from the last few years of no-redundancy deals, agreements to restrain wage rises or accept wage cuts in the face of threats to jobs, and - most notably - industrial action against the threat of job losses as exemplified by the year-long UK pit strike. These examples imply that workers are concerned not only about risks to their own employment but also about the job chances of family, community and fellow worker. Such concern may be more pronounced in times of high or rising unemployment.(7) I argue here that although workers are concerned about the level of employment it will often be in the employers' interest to restrict bargaining to cover only the wage.

My first proposition is that if a) the workers' utility function exhibits constant relative risk aversion and b) the bargaining outcome is characterised by the asymmetric Nash solution;(8) and c) relative bargaining strengths are fixed, then the employers' share of the surplus (of revenue net of opportunity costs) is higher if they restrict the scope of bargaining to cover wages only than if they bargain over employment as well.

This proposition is easily demonstrated by comparing the results given in equations 3.5 and 3.7.1 for the division of surplus on the contract curve and on the labour demand curve respectively. As we have seen, the share of profits is proportional to the degree of workers' risk aversion in both cases but is also positively related to the elasticity of the labour demand curve when bargaining covers only the wage. So the employers' share of surplus is always less on the contract curve than their share of surplus on the labour demand curve:

$$\frac{D(b)}{d(b)} = 1 + \frac{e(w)}{(1-r)} < 1$$

3.10

this ratio must be less than unity because the elasticity of the labour demand curve (e) is negative, and the elasticity of the incremental utility function ($1-r$) is positive.(9)

We can explain this result through examination of the necessary condition for the bargaining solution (3.1) which tells us that the division of incremental utility is determined not only by the ratio of bargaining strengths, but also by the marginal rate of transformation of utility along the bargaining frontier. A down-sloping labour demand curve threatens workers with loss of jobs if they win a higher wage, so putting workers at a disadvantage relative to the employer who chooses employment optimally. We can see from 3.10 that the greater is the threat of job losses along the labour demand curve (the greater the absolute value of the labour demand elasticity e) the more pronounced is the shift in the division of surplus in the employers' favour if bargaining is switched from the contract curve to the labour demand curve. This shift in favour of the employer is also the more pronounced the greater the emphasis that workers put on jobs (ie. the greater the risk- or inequality-aversion parameter r), for the more that workers value jobs, the more effective is the deterrent threat of job losses.

Now, in order to argue that employers earn higher profits by bargaining over the wage alone, it is not enough to demonstrate that the employer can thus win a larger share of surplus; for the size of the surplus varies with the level of output and employment.

$$\text{Surplus is } S(L) \equiv P(w,L) + L.(w-\bar{w}) = R(L) - \bar{w}.L - F$$

A convenient benchmark case for analysis is when the workers' are

risk- or inequality-neutral. In this case the utility function is linear in the wage, so we can write $u(w) = w$ and the union's maximand is the wage-surplus $L.(w-\bar{w})$. Since both union and employer want to maximise their portion of surplus, it is evident that any efficient bargain must maximise the total surplus. Surplus is divided between employer and workers in direct proportion to their bargaining strengths. In this case we can show the following proposition to be true:

if a) the union is risk-neutral;

b) the bargaining outcome meets the asymmetric Nash condition;

c) the labour demand curve is linear or concave;

then the employer wins a higher level of profit by bargaining over the wage alone rather than over wages and jobs.

PROOF

It is convenient to normalise the level of employment L so that the efficient level of employment $L^e = 1$. So bargaining over both jobs and wages will yield:

$$\text{Surplus } S^e = S(1) = R(1) - \bar{w} - F$$

$$\text{Profit } P^e = (1-b).S^e$$

$$\text{Wage } w^e = \bar{w} + b.S^e$$

Consider the point B on the labour demand curve where the employer would earn the same profit P^e as the efficient bargain (see diagram 3.4). Let employment at this point be t , so the wage is $w = R'(t)$. Using equation 3.6 we can compute the marginal rate of transformation of utility along the labour demand curve at point B as:

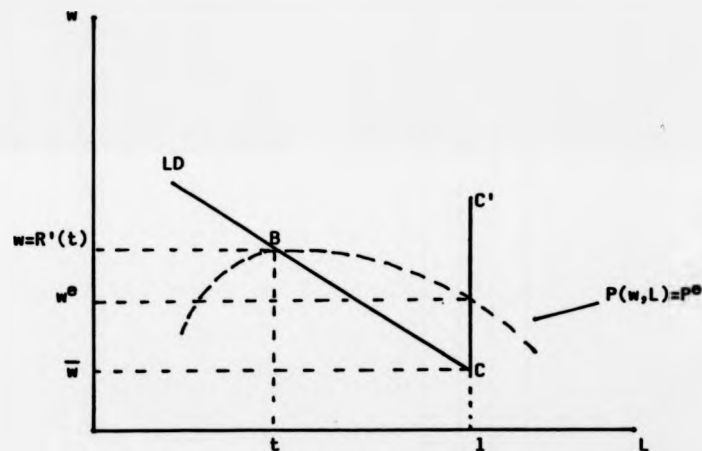
$$M(t) \equiv \frac{-Q'(t)}{U'(t)} = \frac{t.R''(t)}{t.R''(t) + (w-\bar{w})}$$

and the division of surplus at this point is:

$$D(t) \equiv \frac{Q(t)}{U(t)} = \frac{(1-b) \cdot S^e}{t \cdot (w-\bar{w})}$$

DIAGRAM 3.4

Comparison of a bargain on the (vertical) contract curve with the iso-profit point on the labour demand curve.



LDC = labour demand curve

C'C = contract curve

We can now compute the elasticity of transformation of surplus between wages and profits along the labour demand curve. This ratio would be equal to the ratio of bargaining strengths if this were the solution point to bargaining over the wage (see the bargaining condition 3.1).

$$\frac{D(t)}{M(t)} \cdot \frac{b}{1-b} = \frac{b \cdot S^e}{(w-\bar{w})t} \cdot \frac{t \cdot R''(t) + (w-\bar{w})}{t \cdot R''(t)}$$

or

$$\frac{D(t)}{M(t)} \cdot \frac{b}{1-b} = \frac{(w^e - \bar{w})}{(w - \bar{w})} \cdot \left[1 - \frac{t(t-1)R''(t) - (R'(t) - R'(1))}{t^2 \cdot R''(t)} \right]$$

3.11

We know that $w^e < w$, so the value of the first term in 3.11 must be less than unity. Note that $R''(t)$ is the slope of the labour demand curve at point B. If the labour demand curve is linear or concave (if $R''(L) \leq 0$, $t \leq L \leq 1$) then we know that:

$$R''(t) \cdot (t-1) \leq R'(t) - R'(1)$$

3.12.1

and, since $t < 1$,

$$t \cdot (t-1) \cdot R''(t) < R'(t) - R'(1)$$

3.12.2

So the value of the second term in 3.11 must also be less than unity.

$$\therefore \frac{-Q(t)}{Q'(t)} \cdot \frac{U'(t)}{U(t)} < (1-b)/b$$

3.13

This result tells us that the ratio of the elasticity of transformation of surplus at point B is less than the ratio of bargaining strengths. In terms of Svenjar's (1984) exposition of the bargaining process, if the deal represented by point B is proposed by the union which is bargaining over the wage only, then the employers would find that their bargaining power relative to their fear of disagreement (measured by the ratio $Q(t) / Q'(t)$) is greater than the union's bargaining power relative to its fear of disagreement; so the employer would be able to win a better deal further down the labour demand curve, where they would make more profit than they can make through bargaining on the contract curve.

$$\frac{D(t)}{M(t)} \cdot \frac{b}{1-b} = \frac{b \cdot S^e}{(w-\bar{w})t} \cdot \frac{t \cdot R''(t) + (w-\bar{w})}{t \cdot R''(t)}$$

or

$$\frac{D(t)}{M(t)} \cdot \frac{b}{1-b} = \frac{(w^e - \bar{w})}{(w - \bar{w})} \cdot \left[1 - \frac{t(t-1)R''(t) - (R'(t) - R'(1))}{t^2 \cdot R''(t)} \right]$$

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This last argument can be shown more formally. We can ignore the trivial case where the iso-profit point B is on a section of the labour demand curve where union utility is an increasing function of employment (in which case a move down the labour demand curve is an improvement for both parties). So we are concerned only with cases where $U'(t)$ is negative. Of course, $Q'(t)$ is positive, so we know that the ratio $Q(t) / U(t)$ is an increasing function of t . Employers' share of surplus is strictly increasing as we move down the labour demand curve. We can also show that the marginal rate of transformation of surplus, the ratio $-U'(t)/Q'(t)$, is an increasing function. Given the assumption that $u''(w) = 0$, we can write equation 3.6 as:

$$Q'(t) = -t.R''(t) > 0; \text{ and } -U'(t) = -t.R''(t) - (R'(t) - \bar{w}) > 0$$

therefore

$$\frac{d(-U'(t)/Q'(t))}{dt} = \frac{d(1+R'(t)-\bar{w})}{dt} = \frac{t.R'' . R'' - (R' - \bar{w}) . (t.R''' + R'')}{(t.R'')^2} > 0$$

This ratio must be positive given the assumptions that $R''()$ and $R'''()$ are not positive. So, since the term on the left of inequality 3.13 is the product of two functions of t which are both positive and increasing, this term must itself be an increasing function at point B and along all relevant sections of the labour demand curve. So the necessary bargaining condition can be satisfied only when employment is greater than t , ie. lower down the labour demand curve where profits are higher. QED.

Note that while this result must hold if the labour demand curve is linear or concave and if the union is risk-neutral, it may well hold more generally. For instance, even if $R'''(L) > 0$, so that inequality 3.12.1 is reversed, inequality 3.12.2 may still be satisfied. Even if this inequality is reversed, so that the second term in 3.11 is greater than unity, the first term may be small enough to maintain the result.

Given the more general result that, with constant relative risk-aversion, employers' share of surplus is always higher on the labour demand curve, it seems reasonable to conclude in favour of a general presumption that bargaining on the labour demand curve will be more profitable for employers than bargaining on the contract curve.

The implication of this analysis is that there will usually be conflict between unions and employers over whether or not to include employment in the scope of bargaining.(10) The tradition that employers retain the power to set employment levels unilaterally is one which we may expect employers to guard jealously.(11)

This analysis begs the question of who defines which variables will be the subject of bargaining. The Nash bargaining model simply treats the scope of bargaining as exogenous (as it treats the setting of each side's threat point). The bargaining parameter (b) captures only one dimension of power - the division of surplus within the exogenous constraints. The ability to set the scope of bargaining should be recognised as another dimension of bargaining power. So we may interpret evidence that employers bargain over wages alone as an indication of employers' power, and evidence of bargaining over jobs as some indication of workers' power.

An obvious implication of this argument is that we should look to cyclical evidence, expecting to observe a wider prevalence of bargaining over jobs when workers are strong and able to win substantial concessions out of employers - and that employers should return to unilateral employment-setting when workers' bargaining strength is relatively weak. However, a counter-tendency is implied to the extent that workers' strength is negatively related to the level of unemployment, but their valuation of the importance of jobs is positively related to unemployment. When unemployment is high we might expect workers to be

relatively more concerned about jobs, but lacking the power to win job deals; on the other hand, when unemployment is low and workers are able to win job guarantees, they may be relatively unconcerned about job levels, expecting little trouble in finding employment elsewhere, with the result that the contract curve will be closer to the labour demand curve and it may be difficult to observe significant effects of job bargaining. This is not to argue that the thesis that employers prefer not to bargain over jobs is empirically untestable! Rather, the implication is that cyclical evidence may reflect the two opposing tendencies of incentive and ability to win job deals; so we should perhaps look to other sources of variation in workers' bargaining strength - either in cross-sectional studies or in secular trends - in order to pick up the effect on the prevalence of bargaining over employment.

Finally, I note that many of the results of this section are anticipated by Cowling (1982, p.111-115) in his discussion of "all-or-none" contracts.

3.6 Capital structure and the minimum profit constraint.

So far I have assumed that the opportunity cost of capital invested in the firm or industry is simply the market rate of return. This cost is, in effect, deducted from gross revenue before the union and employer divide up the surplus. But if some parts of capital costs are sunk, their post-investment opportunity cost is zero and the post-investment surplus is increased correspondingly. If the pre-investment contract is not binding, efficient contracting is distorted according to the analysis of Grout (1984). The situation is similar to the horizon problem of "participatory" firms analysed by Ireland (1984), where the current owners face a dis-incentive to invest to the extent that part of the future surplus generated by the investment will be won by the future work-force.

It is recognised in the worker-control literature (eg. Ireland and Law 1982) that the distortionary effect of sunk investment may be nullified if the investment is financed externally or rented. The same argument applies to bargaining (or participatory) firms; with external finance the employer faces a financial constraint, enforced by the threat of bankruptcy, to cover the full cost of capital. External financing removes the return to capital from the bargaining arena even if capital costs are not recoverable. So owners have an incentive to seek external funds to cover their investment costs, particularly if capital is not fully and readily mobile.

The owners of a firm have an incentive to carry this financial strategy a stage further by finding external funds not only to cover the cost of capital but also to cover the expected stream of monopoly surplus. To give an extreme example, the owners of a firm which is in a position to earn monopoly profits could sell or rent their assets at a

valuation which assumes that workers will in future be paid only the alternative wage. Even if capital costs are sunk and the firm faces a strong union, as long as the new employers are renting the assets or have borrowed in order to purchase them (and have limited liability), the firm then faces the union with a zero financial surplus. The threat of bankruptcy will ensure that workers do in fact settle for the alternative wage, as long as the lenders (or lessors) are seen to be determined to enforce bankruptcy in the case of default. It will be in the interests of the lenders to acquire a reputation for strictly enforcing bankruptcy.

Of course, in practice risk and moral hazard may limit the feasible financial gearing. But it is still clear that there is a strong incentive to capitalise expected surplus through external funding in order to pre-empt bargaining.⁽¹²⁾ This is similar to the point made by Cowling (1982, p.114) in the context of worker-controlled firms where he argues that capitalists may choose to withdraw from the fray of industrial conflict to the role of finance capital "supplying capital at arms' length to worker-controlled enterprises".

Cowling's point applies generally to employers facing strong unions as well as to worker-controlled firms (or 'co-determined' firms); and the same motive is applicable to capitalists seeking to hire out, licence or franchise assets which are capable of earning monopoly profit. For if surplus has already been capitalised, employers have nothing to lose to workers' bargaining power (short of expropriation!).

3.7 THE INTERACTION OF MONOPOLY AND BARGAINING POWER

Having examined in this chapter the model of Nash bargaining in the context of a single union-employer deal, we are now in a position to examine the implications of disaggregated bargaining in an oligopolistic economy. In particular we can examine more formally the proposition advanced in Chapter 2 that employers' monopoly power in product markets can nullify workers' attempts to alter aggregate income distribution, unless employers bargain over jobs as well as bargaining over wages. We can also examine how bargaining and monopoly power interact to determine relative prices and real wages, and investigate the necessary conditions for the price level to be stable.

I will consider a two-sector economy, though the principles of the analysis are generally applicable to any number of sectors. I will treat each sector as an oligopoly group, noting that appropriate behavioural assumptions allow us to model competitive behaviour (and we can regard one of the sectors as the foreign sector if we so wish).

In each sector an oligopolistic group of firms produces an homogenous product. Within a sector each firm (indexed by $i = 1, \dots, n$) has labour as its only input, operates under constant returns to scale and faces a wage which is the result of bargaining between that firm and its workers. Wage bargaining satisfies the cooperative Nash

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bargaining solution described earlier and the bargaining is carried out anticipating (correctly) the product market outcome which will result, taking the wage bargains in rival firms as given. I start by considering a general model of conjectural variation oligopoly, which I then simplify to a symmetric duopoly in each industry of an economy where demand is generated by a Cobb-Douglas utility function. I consider two general cases : first where bargaining covers the wage alone; I will later consider the effects of bargaining over jobs as well as wages.

3.7.1 Product Market Behaviour

Within each sector / industry we can conveniently parameterise product market behaviour using the model of proportional conjectural variation described in Chapter 2 (see Clarke and Davies [1982]). Given the set of negotiated wages, each firm faces a profit-maximising problem :

$$\begin{aligned}
 \text{max. w.r.t. } L_1 & : P_1 = p(X) \cdot X_1 - W_1 \cdot L_1 \\
 \text{s.t. } & X_1 = k \cdot L_1 \\
 & \frac{dX}{dX_1} = 1 + a \cdot \frac{(X - X_1)}{X_1} \quad -1 < a < 1
 \end{aligned}$$

where X is industry output, L employment, W is the wage, P is profit, and subscripts denote the relevant values for the firm. The conjectural variation parameter a captures the anticipated punishment strategy in retaliation against any deviation from equilibrium. I take the absolute value of a to be less than one. This parameterisation allows us to represent neatly the whole range of oligopoly behaviour from pure competition to outright monopoly. The lower limit of -1

captures the Bertrand assumption (in a symmetric duopoly) which leads to the competitive outcome; and the upper limit of 1 captures joint-profit maximising behaviour. X is industry output, which I normalise to be equal to employment L . The first order condition for profit maximisation is :

$$W_i = p \left[1 - \frac{s_i(1-a) + a}{e} \right]$$

where s is market share (L_i / L) and e is the absolute value of the elasticity of industry demand. Summing over all firms in the industry we can write the ratio of the industry price to the (unweighted) average cost (w) as :

$$\frac{p}{w} = e / \left[e - \frac{(n-1)a + 1}{n} \right]$$

$$\text{where } w \equiv \frac{\sum W_i}{n}$$

3.14

We can see here the result, well-known in conjectural variation models, that the degree of monopoly, as measured by industry price relative to costs, is inversely related to demand elasticity and to industry numbers, and positively related to the collusion parameter a - but the margin (as defined here in relation to the average wage) is independent of the level of costs.

Of course, the demand in each industry in an economy will not in general be independent of the wage and price outcome in other industries. But I am interested here in simplifying the analysis in order to concentrate on the interaction of bargaining power and monopoly power. So for the purposes of this model I shall assume that consumers have identical Cobb-Douglas utility functions which generate demand of unit elasticity for each good. I shall also simplify the analysis of interactions in product markets by assuming duopoly in each industry. These simplifying assumptions reduce the determination of firms' monopoly power in product markets to just the collusion parameter, a , allowing a more straightforward investigation of the interaction between product market and labour market power. I will first deal with monopoly and bargaining within an industry. We can write the industry price, each firm's output/employment level, and profit margins as functions of the bargained wages (W), monopoly power (a), and industry demand (R):

$$\text{industry price} \quad : \quad P = \frac{W_1 + W_2}{1-a} \quad \underline{3.15}$$

$$\text{employment in firm } i \quad : \quad L_i = R(1-a) \cdot \frac{W_i}{(W_1+W_2)^2}$$

$$\text{firm profit margin} \quad : \quad m_i = \frac{P-W_i}{P} = \frac{aW_i + W_j}{W_1+W_j}$$

$$\text{industry profit margin} \quad : \quad m = \frac{R-W_1L_1-W_2L_2}{R} = 1 - \frac{2(1-a)W_1W_2}{(W_1+W_2)^2}$$

Industry price is a positive mark-up on average costs if the collusion parameter $a > -1$. Each firm's market share, margin and total profits are inversely related to its own costs (the bargained wage) relative to the costs of its rival. The firm with the lower wage has both a larger share of the market and a higher margin (and therefore higher profits) than its rival. The aggregate industry price-cost

margin m is positively related both to the degree of collusion and to the dispersion of wages (because the more dispersed the costs, the greater the market share going to one firm and the greater the concentration in the market).

We can see from 3.15 that a change in the bargained wage in a firm will affect not only its own performance, but also the performance of the rival firm and of the industry. These effects are summarised in Table 3.1.

TABLE 3.1

The effects of increasing the wage in firm i , with exogenous W_j

	firm i	firm j	industry
employment L	-	- iff $W_i > W_j$	-
market share s	-	+	
concentration H			+ iff $W_i > W_j$
profit margin m	-	+	+ iff $W_i > W_j$
profits P	-	+	+ iff $W_i > W_j$

From 3.15 we see that if both firms face proportional pay rises, their market shares and margins are protected (and so too are their profits, because of the assumption of unitary elasticity of demand).

However, if the wage in the rival firm is presumed to be independent of a firm's own bargain, then bargaining will be expected to affect market shares and profits. Indeed the table shows that bargaining at the level of the firm does involve a direct conflict between wages and profits. (I assume that each firm and union are concerned in bargaining only with nominal values, ignoring for the moment any effect of their bargaining on the overall price level). Employers will want to keep wages in their firm down, while workers will want to push up the wage to their preferred point on the labour demand curve (the point where consequent job losses would outweigh the value of further wage rises).

3.7.2 Bargaining Over The Wage

I assume here : i) that bargaining occurs at the level of the firm; ii) that workers aim to maximise their utility above some alternative wage \bar{w} , with their preferences over wages and jobs captured by the 'risk-aversion' parameter r (see page 3.18); iii) that firms aim to maximise profits, anticipating the product market outcomes as described in the last section; iv) that bargaining covers only the wage and satisfies the Nash bargaining conditions, with the relative bargaining strength of the workers captured by the parameter b . Union utility and employers' profit in firm 1 (in an industry where total revenue is R) are given by :

$$U_i = L_i (W_i - \bar{w})^{1-r} = R(1-a_i) \cdot \frac{W_i}{(W_i + W_j)^2} \cdot (W_i - \bar{w})^{1-r}$$

$r < 1$

$$P_i = R \cdot \frac{W_j (a_i W_i + W_j)}{(W_i + W_j)^2}$$

The Nash bargaining solution gives the result :

$$\frac{(1-b_i)a_i}{a_i W_i + W_j} + \frac{b_i(1-r_i)}{W_i - \bar{w}} - \frac{2}{W_i + W_j} = 0$$

3.16

which defines implicitly the bargained wage in firm i as a function of the following parameters or exogenous variables : the alternative wage; the wage in the other firm of the duopoly ; the risk-aversion and bargaining power of workers in firm i ; and the level of employers' monopoly power in the industry.

In the case of a Cournot duopoly, where $a = 0$, the bargained wage is :

$$W_i^c = \frac{2\bar{w} + b_i(1-r_i)W_j}{2 - b_i(1-r_i)} \quad b_i(1-r_i) < 2$$

where the bargained wage is an increasing function of the rival wage, of the alternative wage and of bargaining power. The assumption of unitary demand elasticity implies that the bargained wage will tend to infinity if workers are sufficiently risk-loving (if r is sufficiently negative) to ignore the consequent job losses.

In the general case where the collusion parameter a is not necessarily zero, I assume that workers are sufficiently risk-averse to settle for a finite wage. Bargained wages are, of course, interdependent, but the industry outcome is easily established in the case where the duopolists face similar profit functions and where the risk-aversion and bargaining strength parameters of the workers in each of the firms of the industry are the same; for then we can impose a condition of symmetry on the bargained outcomes. I take the symmetric duopoly equilibrium in wage bargaining to be the wage W^* which satisfies the bargaining solution in each firm, given that the same wage holds in the rival firm.

$$W^* = \frac{\bar{w}'(1+ab)}{1-b[1-r(1+a)]}$$

$$\frac{\delta W^*}{\delta a} > 0, \quad \frac{\delta W^*}{\delta r} < 0, \quad \frac{\delta W^*}{\delta b} > 0 \quad \text{if } a > -1, \quad 0 < b < 1$$

$$a = -1 \quad \text{or} \quad b = 0 \quad \rightarrow \quad W^* = \bar{w} \quad \underline{3.17}$$

We can see here that as the degree of monopoly power disappears (as the collusion parameter a approaches a lower limit of -1) workers are unable to raise the wage at all, for no surplus is generated over which they can bargain. The greater the degree of monopoly power exercised by employers, the greater the nominal wage which workers are able to win with a given level of bargaining power; and the greater their bargaining power, the higher their wage. We can also see that as workers' concern over job losses diminishes (as the parameter r decreases) the bargained wage increases, a phenomenon which mimics an increase in bargaining power (as discussed in section 3.2).

Since the purpose of this exercise is to examine the interaction of bargaining and monopoly power, I will simplify the analysis by considering the case where the risk aversion parameter r is zero, i.e. the case of the rent-maximising union. In this case the symmetric duopoly bargained wage and the industry price are:

$$r = 0 \rightarrow \begin{aligned} W^* &= \frac{\bar{w}(1+ab)}{1-b} \\ p &= \frac{2\bar{w}(1+ab)}{(1-a)(1-b)} \end{aligned}$$

$$\text{the product wage } \frac{W^*}{p} = \frac{1}{2}(1-a)$$

$$\text{price-cost margin } m = \frac{1}{2}(1+a)$$

3.18

The product wage and the distribution of income in the industry are determined solely by the employers' monopoly power in product markets, since they pass on symmetric bargained wage rises in full. Nevertheless, workers' bargaining power in an industry enables them to increase their nominal wage. But the real wage depends on the price level in the whole economy. Here, we treat the rest of the economy as just one sector, characterised also as a bargaining duopoly. So prices in the economy are :

$$p_h = \frac{2\bar{w}(1 + a_h b_h)}{1 - a_h b_h}$$

$$0 < b_h < 1$$

$$-1 < a_h < 1$$

where the subscript h indexes the sectors (industries) of the economy.

The assumption of identical Cobb-Douglas utility functions allows us to define the consumer price index :

$$p^* = p_1^x \cdot p_2^{1-x}$$

where x is the Cobb-Douglas parameter for sector 1 (that sector's share in total expenditure). Deflating the bargained wage by this index gives us a measure of the real wage v (the indirect utility function of a typical worker) in sector 1. The real wage can also be expressed as a function of relative wages and monopoly power :

$$v_1(W_1^*, p_1, p_2) = \frac{W_1^*}{p^*} = \left(\frac{W_1^*}{W_2^*}\right)^{1-x} \cdot \frac{(1-a_1)}{2} \cdot \left(\frac{1-a_2}{1-a_1}\right)^{1-x}$$

We see that if monopoly power is fixed, real wage gains in one sector can be made only at the expense of real wages in the other sector. We can in turn express real wages as a function of both bargaining and monopoly power in the two sectors :

$$v_1(a_1, a_2, b_1, b_2) = \left[\frac{1}{2}(1-a_1)\right]^x \left[\frac{1+a_1b_1}{1-b_1}\right]^{1-x} \left[\frac{\frac{1}{2}(1-a_2)(1-b_2)}{1+a_2b_2}\right]^{1-x}$$

$$\text{sign } \frac{\delta v_1}{\delta a_1} = \text{sign } b_1(1-x-a_1) - x$$

$$\frac{\delta v_1}{\delta a_2} < 0$$

$$\frac{\delta v_1}{\delta b_1} > 0 \quad \text{if } a_1 > -1$$

$$\frac{\delta v_1}{\delta b_2} < 0 \quad \text{if } a_2 > -1$$

3.19

A first point to note is that real bargaining outcomes are independent of the nominal value of the alternative wage (I consider price stability later). We can explain real wages in the different sectors of the economy purely in terms of the structure of demand

(parameterised by x), bargaining power (parameterised by b), and monopoly power (parameterised by a). Although I present here results only for a two industry economy, the general principles apply to an economy with many sectors.

If monopoly and bargaining power are the same across sectors, we can see that the real wage is independent of bargaining power, being determined solely by employers' monopoly power. Bargaining power is effective at increasing real wages in one sector only if they can be lowered in another.

In the case where sector 1 is competitive (in the sense that the collusion parameter a is at the lower limit of -1) we have already shown that workers cannot push up their wage, whatever their bargaining power. In order to be able to bargain for an increased wage, workers have to be in an industry where employers have some degree of monopoly power. Any increase in monopoly and/or bargaining power in sector 1 will push up the price of good 1 and thereby reduce the real wage in sector 2. It is interesting to note that as far as sector 2 workers are concerned, the effects of labour market bargaining power and product market monopoly power in sector 1 are the same - they both appear to push up the price of good 1. However, workers in one sector are made worse off by the bargaining strength of workers in the other sector only to the extent that the other sector is not competitive. Employers' monopoly power creates potential divisions amongst workers by first generating surplus which makes wage rises possible and then

passing on any such wage rises into higher prices. In this sense, employers' monopoly power sets workers against workers.

However, although employers' monopoly power is a prerequisite for workers to bargain for real wage rises, it does not follow that increasing the monopoly power of employers will always benefit workers in that sector. As monopoly power rises, the bargained nominal wage will rise (3.17), but so too will the consumer price index. If the good that workers produce is an important constituent of their consumption, they may actually become worse off as their employers' monopoly power increases. The condition for workers to gain from an increase in their employers' monopoly power is :

$$\frac{\delta v_1}{\delta a_1} > 0 \quad \text{iff} \quad b_1 > \frac{x}{1-a_1-x}$$

i.e. workers' bargaining power should be high enough for them to win a pay rise large enough (in relation to the importance of the product in their consumption) to compensate for the rise in the price of the product.

The greater the number of sectors in the economy, and the greater is the level of workers' bargaining power, the more likely it is that x will be low enough for employees to be able to afford to ignore the price of their own product, in which case they will have a vested interest in the monopoly power of their own employers, since that monopoly power generates the pool of surplus over which they bargain.

For example, we might take the typical value of the collusion parameter a in UK manufacturing industries to be of the order of one third (the mid-point of the range estimated by Clarke, Davies and Waterson [1984,p.466]). In this case the critical level of workers' bargaining strength in a particular industry, above which level they have a vested interest in their employers' monopoly power, is approximately equal to one and a half times the share of that industry product in consumption.

In this simple model, then, we see that workers' bargaining power over surplus can raise their real wage at the expense of the real wages of workers in the rest of the economy. But what is the impact on profits in either sector and what is the impact on aggregate income distribution? We have seen that income distribution in each sector is determined only by the degree of monopoly, since symmetric wage rises are passed on in full. So the aggregate distribution of income depends on the degree of monopoly in each sector and on the relative sizes of the sectors. With Cobb -Douglas demand, the relative sizes of the two sectors are fixed, so aggregate income distribution is given by :

$$M = \frac{1}{2} \{ x.(1+a_1) + (1-x).(1+a_2) \}$$

where M , the aggregate price-cost margin, equals the share of profits in value added.

Increased bargaining power in one industry pushes up the wage and price proportionally, so that income distribution in that industry is not altered. Of course, if demand is not of unit elasticity, changes in bargaining power will alter the relative sizes of the sectors and thereby affect aggregate income distribution to the extent that the degree of monopoly varies between sectors.

Although workers are unable to directly affect income distribution when bargained wage rises are passed into price rises, the real value of profits will of course be eroded by the price rises consequent on workers' bargaining, except to the extent that the level of nominal aggregate demand in the economy rises in line with prices. For instance, an accomodating monetary policy would insulate aggregate real profits from workers' strength.

3.7.3 Bargaining, Monopoly Power And The Price Level

So far we have considered the impact of bargaining and monopoly power on real magnitudes : the product wage, the real wage, and income distribution. But we have formulated the bargaining and price-setting problems in nominal terms which imply certain expectations of the price level. What does this model imply for price stability ? The bargaining problem assumed a given nominal alternative wage \bar{w} from which we derived the bargained wage and price for each industry :

$$P_h = \bar{w} \cdot k_h \quad h = 1,2$$

where $k_h = \frac{2 \cdot (1 + a_h b_h)}{(1 - a_h)(1 - b_h)}$

The real value of the alternative wage is derived using the consumer price index :

$$\frac{\bar{w}}{p^*} = (k_1)^{-x} \cdot (k_2)^{x-1}$$

For simplicity we can assume that bargaining power is the same in each sector and that monopoly power in each sector is also the same, so the real value of the alternative wage is :

$$\frac{\bar{w}}{p^*} = \frac{(1-a)(1-b)}{2(1+ab)} \equiv f(a,b)$$

$$f_a < 0 \quad , \quad f_b < 0 \quad \text{if } 0 < b < 1 \quad , \quad -1 < a < 1 \quad \underline{3.20}$$

I assume that the expected real value of the alternative wage is fixed at some value z which captures the expected value of the alternatives to employment in a particular firm. The value of z will depend partly on historical expectations of wages, partly on the level of unemployment in the economy (which affects the probability of finding alternative employment). I assume that z is a non-increasing function of unemployment (u).

If the expected price level is p^{\sim} , then the expected alternative wage is $z \cdot p^{\sim}$. But the expected price level will be realised, i.e. $p^* = p^{\sim}$, only if :

$$f(a,b) = z(u)$$

which I take to be a condition for price stability. Should the bargaining and monopoly parameters generate a higher price level than expected, then the actual value of the alternative wage will be less than expected. If workers upgrade their expectations of the price level (or its rate of change) then prices will rise further, but the real outcome will be unchanged - leading, presumably, to accelerating prices and expectations.

This condition implies a fine balance between competing strengths of capital and labour if prices are to be kept stable. For instance, if z is fixed (i.e. if $z'[u] = 0$) there is a unique, negatively-sloped correspondence between values of the bargaining parameter b and the monopoly parameter a which allow price stability. Any tendency for either monopoly or bargaining power to rise must be counter-balanced by some reduction in such power if a price explosion is to be avoided.

If either workers' bargaining power or the expected real value of the alternative wage are declining functions of unemployment, then we can see that price stability requires that any tendency for monopoly or bargaining power to increase must be countered by a rise in unemployment:

e.g. if $z'(u) < 0$, $b_u(u,B) < 0$ and $b_B(u,B) > 0$

$$\left. \frac{du}{da} \right|_{p^*=p^e} > 0 \quad \text{and} \quad \left. \frac{du}{dB} \right|_{p^*=p^e} > 0 \quad \underline{3.21}$$

where u is the level of unemployment, and the parameter B represents other exogenous determinants of workers' strength.

In this case, unemployment acts as a regulator which dampens workers' bargaining position and strength to a level where aspirations can be satisfied by a given degree of monopoly power. The "non-accelerating-inflation rate of unemployment" is an increasing function both of workers' bargaining power and of employers' monopoly power. This "natural" rate of unemployment is the product of conflict over income distribution.

3.7.4 Bargaining Over Jobs

If bargaining covers employment as well as the wage, the previous results are substantially altered because workers' bargaining power can now impinge on profit margins in an industry.

In the simplest case of efficient bargaining between a rent-maximising union and a profit-maximising employer we know that the price is set as if the employer faced just the alternative wage; surplus is divided in proportion to bargaining power. So in each

sector the price is a mark-up on the alternative wage rather than on the actual wage, and wage rises are deducted directly from profit margins (see 3.5).

More generally, if workers' collective utility function exhibits constant relative risk aversion with respect to the wage, we have seen (3.5) that we can write the division of surplus (D) and the efficient bargained wage (W) for a particular firm as follows :

$$D_i = \frac{\bar{p} - W_i}{W_i - \bar{w}} = \frac{1 - b_i}{b_i(1 - r_i)} \quad \text{and} \quad W_i - R'(L_i) = \frac{W_i - \bar{w}}{1 - r_i}$$

where r is the 'risk-aversion' parameter and where $R()$ is the (conjectured) revenue function facing the duopolist at the conjectural variation equilibrium.

But the price-cost margin can be expressed :

$$\begin{aligned} m_i &= \frac{p - W_i}{p} = \frac{p - R'(L_i)}{p} - \frac{W - R'(L_i)}{p} \\ \therefore m_i &= \frac{p - R'(L_i)}{p} - \frac{b}{1 - b} \cdot m_i \end{aligned}$$

Taking the case which we analysed previously of a symmetric duopoly with bargaining covering only the wage, we know that if each firm were to face an exogenous wage of $R'(L)$ they would choose to set employment at L and an industry price p such that each firm's profit

margin would be equal to $(1+a)/2$ (see 3.18). p is of course the same industry price which emerges when job-bargaining duopolists each settle on an employment level of L . So the value of the expression $[p-R'(L)]/p$ in the above equation must equal $(1+a)/2$. Accordingly we can solve the symmetric duopoly efficient bargaining problem as follows :

$$\begin{aligned}
 m' &= \frac{1}{2} (1 + a) \cdot (1 - b) \\
 w' &= \bar{w} \cdot \frac{1 - a + b(1 + a)}{1 - a + rb(1 + a)} \\
 p' &= 2\bar{w} \cdot \frac{1}{1 - a + rb(1 + a)} \\
 -1 &\leq a < 1 \quad , \quad 0 < b \leq 1 \quad , \quad r < 1
 \end{aligned}$$

3.22

These results in the case of efficient bargaining can be compared with the results for wage-only bargaining (3.18) noting that the latter results assume the risk-aversion parameter r to be zero. When bargaining covers only the wage, we have seen that workers' strength does not affect profit margins within an industry, since employers use their monopoly power to pass on any wage rises in full; workers' strength affects inflation rather than income distribution. However, if bargaining is efficient, these results are reversed. When bargaining covers jobs as well as wages, employers bargain (by implication) over the level of output; so the price of the product, and therefore margins and income distribution, are affected directly by bargaining. If unions are rent maximisers ($r=0$), then bargaining strength has no effect on prices. Indeed, bargaining strength only causes price rises to the extent that monopoly power generates surplus $(a>-1)$ and to the extent that unions are prepared to trade rents for

higher wages ($r < 0$).

We can also see from 3.22 that the more risk-loving the union (the lower the parameter r) the greater the resultant wage - for, as I have argued earlier, with this specific union utility function, greater risk-loving mirrors the effects of greater bargaining power. However, the risk aversion parameter does not affect profit margins, since the effect of job bargaining on margins is exactly offset by the effect of risk-aversion on the division of surplus.

3.7.5 Summary

This simple model of bargaining in an oligopolistic economy has illustrated and clarified a number of arguments presented earlier.

If bargaining covers the wage alone :

1. Workers' strength can erode profit margins within a firm by driving up the wage; but other firms in the industry, whose relative costs are thereby lowered, will increase their margins and their share of the market. The aggregate industry margin is eroded by an increase in the bargaining power of workers in one firm only to the extent that the dispersion of wage costs is reduced (3.15). If the oligopoly is symmetric, workers' bargaining power has no effect on margins at all, only on employment and price - and even then only

if employers do generate some surplus in the first place (3.18). Industry margins and income distribution are largely determined by employers' monopoly power; workers' bargaining gains are passed on via higher prices.

2. However, although workers do have a collective interest in reducing employers' monopoly power, such monopoly power can also divide workers if they bargain in separate sectors of the economy. For workers in one industry can increase their real wage through bargaining, but only to the extent that their employers wield monopoly power which generates some surplus over which to bargain, and only to the extent that such gains are made at the expense of workers in the other (domestic or foreign) sectors of the economy (3.19).
3. In aggregate, workers' strength affects price inflation, but only alters income distribution to the extent that bargained wage rises alter the balance of sectors in the economy.
4. Real wages in an industry will be an increasing function of the monopoly power of the employers if bargaining power enables workers to win a large enough share of the surplus and if the industry product is not too important in their consumption (3.19). So the more bargaining is disaggregated into separate industries, the more likely it is that workers will have a vested interest in the degree

of monopoly in their own industry, at the expense of workers in other industries.

5. Price stability requires that bargaining power and monopoly power must change in opposite directions. Unemployment may preserve price stability through its dampening effect on workers' bargaining power (3.21).

However, if bargaining covers jobs as well as wages, our conclusions are substantially different :

1. Workers' strength does erode profit margins not only in the firm where the bargaining occurs, but also in the industry as a whole. So bargaining does directly affect real wages and income distribution (3.22).
2. If bargaining over jobs is efficient, the impact of workers' strength on prices depends on workers' 'risk-aversion'. If unions aim to maximise wage rents, then workers' strength does not affect relative prices : gains in real wages in one sector do not impinge at all on real wages in other sectors (3.22).

These conclusions have been derived from a model with a number of restrictive assumptions. Nevertheless, we can expect the results to be relevant more generally. Introducing non-homogenous industry products and larger oligopoly groups will merely add the degree of product differentiation and industry numbers to those factors which determine monopoly power (simplified to a single parameter in the analysis above). Introducing asymmetries into oligopolies will complicate the analysis without radically altering the results (see for instance the analysis of shifting asymmetric conjectural variation equilibria in Seade [1985]). Allowing for variation in demand elasticities and in returns to scale implies that margins over average costs will vary according to the level of output - in which case wage-only bargaining will have an impact on industry-level income distribution. But unless demand elasticities and productivity vary both substantially and systematically with scale, these effects are unlikely to nullify the general thrust of the results which have been derived from the simplified model.

3.8 Summary

There is substantial evidence that workers bargain over the economic surplus which their employers' market power enables them to win. The most promising and tractable model of bargaining appears to be the asymmetric Nash cooperative solution which allows us to analyse bargaining in terms of opportunity costs, preferences, the scope of bargaining, and the distribution of bargaining power.

If bargaining covers employment as well as wages, a point which is disputed in the literature, we can draw out a number of implications. There is no general expectation that wages should exhibit relatively more or less cyclical variability than employment, but we can expect workers' bargaining power to erode profit margins to some extent. On the other hand, if bargaining covers only the wage, there is no particular expectation that workers' bargaining power should affect aggregate margins.

A vital question is what determines the balance of bargaining strength between workers and employers. Rather than making arbitrary assumptions, we need to look at the relative competitive positions of each side, their alternative supplies of labour or jobs in the short term, their history, relative resources and organisation, and the legal and institutional framework within which bargaining occurs.

Although it is usually more efficient for unions and employers to bargain over employment as well as over wages, we can expect to find that employers would generally prefer not to bargain over jobs, preferring to pose the threat of job losses as a deterrent to workers pushing up wages. Moreover, owners have an incentive to capitalise potential surplus through capital re-structuring or leasing/franchising arrangements in order to impose on the direct employers financial constraints which have the effect of removing economic surplus from the bargaining arena.

A model is developed highlighting interactions between firm-level union-employer bargaining and industry-level oligopolistic price-setting, combining models of conjectural variation oligopoly and asymmetric Nash bargaining. Income distribution is found to be largely determined by employers' ability to set price-cost margins, and price stability requires a trade-off between oligopoly power and union bargaining strength, except to the extent that the level of employment is important in bargaining. These results provide a more formal extension to the analysis of oligopoly and income distribution which was presented in Chapter 2.

AN EMPIRICAL INVESTIGATION OF WORKER-EMPLOYER BARGAINING AND PRICE-COST MARGINS IN UK MANUFACTURING INDUSTRY

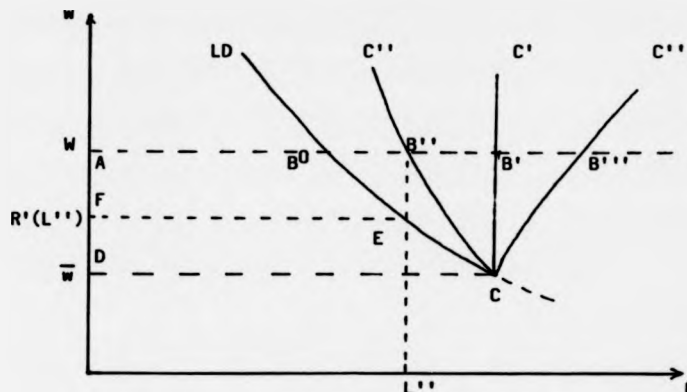
4.1. The theoretical model and the empirical specification

I have argued earlier (see section 2.2) that workers influence the aggregate distribution of income if they can alter employers' price-cost margins; I have shown that one way in which this might happen is if workers succeed in bargaining over jobs as well as over wages, noting that in general it may well be in employers' interests to bargain only over wages. In Diagram 4.1 I illustrate a number of possible wage-job deals for the 'typical' employer of an industry, making the simplifying assumption that outcomes at this level will be directly reflected at industry level. The various possible bargains - B^0 , B' , B'' and B''' - are illustrated lying respectively on the labour demand curve, a vertical contract curve, a negatively-sloped contract curve and a positively-sloped contract curve. For illustrative purposes I assume that the bargained wage is the same, W , in each case.

If bargaining covers only the wage, so that the deal is at B^0 on the labour demand curve, I assume that employment and output have been chosen by the employer to maximise (conjectured) profit given the bargained wage and the employer's cost and (conjectured) demand functions. From the earlier discussions (section 2.1) of the model of collusive oligopoly developed by Clarke, Davies and Waterson (1984) from the Cowling-Waterson (1976) model, we can predict that for the typical

DIAGRAM 4.1

The effect of employment-bargaining on price-cost margins



LDC = labour demand curve

CC = various possible contract curves

firm and for the industry as a whole, price-cost margins will be positively related to industrial concentration and the degree of product differentiation, and negatively correlated with the elasticity of industry demand. So the price-cost margin at B^0 can be written as:

$$m(B^0) = m(X)$$

4.1

where X is a vector representing industry concentration, etc. We could make the further simplifying assumption that X is independent of the bargained wage, ie. that industry concentration and demand elasticity will be the same at whatever point on the industry demand curve they operate. This assumption is not unreasonable for short-run variations in wage costs, for at the 3-digit level of disaggregation in UK manufacturing - the level I am studying in the empirical work reported here - wage and salary costs comprise on average only one quarter of

total costs. So even a 10% change in real labour costs will change total costs directly by (at most) only 2.5%, inducing only a small movement along the industry demand curve.(1)

Now, consider the result of the bargain on a vertical contract curve, represented in the diagram by point B'. If the bargain were at point C we know that the price-cost margin would be $m(X)$, since C is on the labour demand curve. But, when the contract curve is vertical, employment, output and price are independent of the bargained wage. So we know that at B' the profit has been reduced (in comparison with the profit at point C) by the area of the rectangle AB'CD, the surplus of total wages over the alternative wage \bar{w} . The price-cost margin is definitionally equal to the sum of profits and overhead costs divided by revenue, so the margin which results from a bargain at B' is:

$$m(B') = m(X) - (\text{wage surplus/revenue})$$

4.2

Another possible bargain is illustrated by point B", which might be the outcome either of efficient bargaining on a down-sloping contract curve or of inefficient bargaining resulting in an outcome between the labour demand curve and a vertical contract curve. If the bargain was at the point E on the labour demand curve vertically below B", the margin would again be $m(X)$. We can see that the bargained wage rise will reduce profit (in comparison with its value at E) by the area of AB"EF which is less than the full amount of surplus of wages over the alternative wage. The margin at B" is:

$$m(B'') = m(X) - d'' \cdot (\text{wage surplus/revenue}); 0 < d'' < 1$$

$$\text{where } d'' = \frac{W - R'(L'')}{W - \bar{w}}$$

(Comparing this result with equation 3.5 on page 3.20, we see that in fact $d'' = 1/(1-r)$, ie. d'' is a direct measure of workers' risk aversion if bargaining is efficient).

4.3

Similarly, if the bargain is at B'' , the price-cost margin will be:

$$m(B'') = m(x) - d'' \cdot (\text{wage surplus/revenue}); d'' > 1$$

4.4

So, if we use a linear estimating equation:

$$m_1 = a \cdot X_1 + d \cdot (\text{wage surplus/revenue})$$

4.5

where m_1 is the price-cost margin in industry 1, then the estimated value of the coefficient d indicates that bargaining is on a vertical contract curve if it equals -1 , or that bargains lie on the labour demand curve if it equals zero, etc. The estimated value of d is a direct measure of the extent to which bargained changes in wage costs affect profit margins, and it gives an indication of the importance of employment in bargaining. (2)

Equation 4.5 forms the basis of my empirical investigation. Detailed data on industry costs, wages and profits at the 3 digit level is given in the annual Census of Production which has formed the basis of many empirical studies of the market-structure-performance relationship in the UK. I have used generally accepted specifications of the first part of equation 4.5, following the surveys of the literature in Hay and Morris (1979), Hart and Morgan (1977) and Clarke, Davies and Waterson (1984). The novel part of this empirical investigation is the attempt to model and test for the interaction between labour and product markets, represented by the last term in this equation.

Some studies in industrial economics have looked at the effect of labour markets on product market performance. Cowling and Molho (1982) look at the effect of unionisation on wage share in value-added in 1968 and 1973, finding that unionisation tends to increase wage-share and, by

implication, depress price-cost margins.(3) Henley (1984) has extended this approach to cover 1973-78 and to distinguish between local and national collective agreements, also finding that unionisation tends to increase wage-share. Freeman (1983) finds that unionisation lowers margins and rates of return in US manufacturing 1958-76 amongst the more concentrated industries. Karier (1985) analyses US manufacturing price-cost margins in 1972 by State and by 2-digit industry. He finds that "unions significantly lower the potential excess profits of highly concentrated industries, but have little effect on profits in competitive markets". (He also shows that omitting unionisation biases downwards the estimated coefficient on the concentration term.) But all these studies lack a specific model of how union pressure affects profits, and they lack detailed analysis of what, apart from the level of unionisation, determines workers' bargaining strength.

The literature of labour economics is replete with analyses of the factors which affect wage differentials, but studies tend not to make clear the crucial distinction (as implied by explicit models of bargaining) between those factors which affect the alternative wage - the baseline position from which workers bargain - and those factors which influence bargained wage premia (ie. wage rises above the alternative wage). We can expect that skill levels, working conditions and the influence of local labour market conditions will affect the alternative wage; whilst unionisation and profitability will be amongst the determining influences on wage premia. So, for instance, Weiss (1966), Wabe and Leech (1978), Stewart (1983), Brown et al. (1984) and Blanchflower (1983 and 1984) use as explanatory variables one or more of unionisation (coverage or membership), industrial concentration and profitability in order to explain wage differentials. The implication of bargaining models is that strong unionisation will not make higher wages possible unless the employer has a (potential) surplus, and that high

profits or potential surplus will not lead to high wages if workers' bargaining strength is low. Geroski, Hamlin and Knight (1982) do use a two equation model which tries to capture this interaction, but they do not test any specific model of bargaining.

Clark (1984) does employ specific bargaining models in his study of 900 US "product line businesses" between 1970 and 1980. He compares two models: a) efficient bargaining on a vertical contract curve where the stock of capital, the level of employment, output and price are shown to be unaffected by bargaining; in this case rates of return and absolute profits are reduced by workers' strength; and b) a model of wage-bargaining where absolute profit is reduced by workers' bargaining up wages (as long as demand is elastic), but where capital stock is also reduced in response to higher wages (unless the elasticity of substitution between labour and capital in the constant returns CES production function is greater than the elasticity of demand), with the result that the response of the rate of return on capital to wage rises depends solely on the elasticity of substitution. Clark concludes from his study that while unionisation reduces firms' profitability, it has little effect on growth and on capital-labour substitution, supporting the model of bargaining on a vertical contract curve.

One of the deficiencies of Clark's study is that it treats workers' bargaining strength as a function of unionisation alone. Svejnar (1984) investigates the asymmetric Nash-bargaining model applied to data on 12 major US unionised companies. He concludes that bargaining power is influenced significantly by both inflation and unemployment.

However, the study of the determination of bargaining power is generally underdeveloped, both theoretically and empirically - Svejnar cites the absence of any literature as necessitating an ad hoc specification of the functional form. So I choose here to estimate

bargained wage premia directly from investigation of inter-industry wage differentials, correcting for those factors which affect the alternative wage. I then treat the estimated wage premia as data - much as other researchers use, for instance, seasonally adjusted data - to estimate equation 4.5.(4) I also use these estimates of industry wage premia to conduct a preliminary investigation into the determinants of bargaining power. Then I check for the possibility that the omission of bargaining variables may have biased estimation of wage premia. I also check for the effects of possible heteroscedasticity on the reported tests of statistical significance. My estimating equations for the wage and for the determination of bargaining power are derived as follows.

I take the observed wage, W_i , in industry i to be the sum of the alternative wage, \bar{W}_i , which faces workers in that industry and a bargained wage premium, WP_i :

$$W_i = \bar{W}_i + WP_i \quad \underline{4.6}$$

The alternative wage is approximated by a linear function of workforce skill and other characteristics, and of regional labour market characteristics, Y_i , with a normally distributed random error term:

$$\bar{W}_i = c' \cdot Y_i + e_i \quad \underline{4.7}$$

and the wage premium is assumed to be distributed normally and independently of e_i , with an average premium \bar{WP} . So the estimating equation is:

$$W_i = c.Y_i + U_i$$

$$(U_i = WP_i - \overline{WP} + e_i)$$

4.8

where the average premium(5) is incorporated in the constant term of c , and the composite random term satisfies the assumptions required for ordinary least squares regression (some of which assumptions will be tested). In this case we can derive the estimated wage premia as:

$$\hat{WP}_i = \overline{WP} + W_i - \hat{c}.Y_i$$

4.9

The earlier analysis of bargaining allows us to derive a simple expression for the share of wage surplus in total surplus in the case where workers are 'risk-neutral'.(6) From equation 3.5, putting $r = 0$:

$$L.WP / (\Pi + L.WP) = b$$

where b is the normalised index of workers' bargaining strength, L is the level of employment, Π represents excess profits and the product $L.WP$ is wage surplus. I represent the vector of variables which determine workers' relative bargaining strength by Z (covering unionisation, unemployment, etc.) and use a linear estimating equation:

$$(L.\hat{WP} / (\Pi + L.\hat{WP}))_i = f.Z_i + e'_i$$

4.10

It would be desirable to estimate equations 4.8 and 4.10 simultaneously, but the unobservability of WP introduces severe non-linearities, compounded by the paucity of guidance for the correct specification of 4.10. A more tractable form of the bargaining equation is found if it is the bargaining ratio $b/(1-b)$ rather than the bargaining parameter b which is a linear function of the bargaining variables, for then the bargaining equation is:

$$(L.WP / \Pi)_1 = g.Z_1 - e^*_1$$

4.10a.

which we can combine with 4.8 to derive the following estimating equation:

$$W_1 = c^*.Y_1 + g.(Z.\Pi/L)_1 + e_1 + (e^*.\Pi/L)_1$$

4.11

This embodies the principle that wages are determined partly by skill and other characteristics (Y) and partly by the determinants of workers' collective bargaining strength (Z) weighted by profits per worker, following the reasoning that if employers cannot win (super-normal) profits, workers cannot push wages above the alternative wage (in the long run). I estimate 4.11 using the weighted least squares and maximum likelihood techniques suggested by the hypothesised error structure. However, I note here the reservation that equation 4.10a. from which 4.11 is derived is inherently less plausible a representation of the determinants of bargaining power than 4.10 because the former implies that profits can never be driven to zero.(7)

Moreover, I have noted that there is little guidance as to which factors should be expected to determine bargaining power. So I prefer to estimate wage premia from equation 4.9 and to use 4.11 both as a preliminary investigation of the bargaining power hypothesis and as a check on whether the omission of bargaining variables from 4.9 is a source of serious bias. I then use the estimated wage premia as data with which to estimate the effect on price-cost margins (equation 4.5) and to further investigate what must necessarily be ad hoc specifications of the bargaining equation 4.10.

4.2 The Data

One of the problems in assembling data is the need to match the data units for labour and product markets. The oligopoly model underlying the estimating equation 4.5 relates price-cost margins to concentration etc. at industry level. Industry data on revenue, profits etc. for UK manufacturing are available from the annual Census of Production, although I note that the 3-digit Standard Industrial Classification (SIC 1968, revised SIC 1980) does not necessarily correspond to actual product markets in all cases. Data on earnings and on some characteristics of jobs and of workforces are published in the Employment Gazette, broken down by the SIC (but not covering all industries). The most detailed breakdown of earnings is given by the annual 'October Survey' which covers only manual workers. Since manual workers comprise around 70% of the manufacturing workforce, and since I advance arguments that employment of non-manual workers is treated by employers as an overhead rather than as a short-run variable cost, I estimate wage premia only for manual workers. Moreover, I estimate wage premia only for male workers, who outnumber women in manufacturing by three to one, and I make the simplifying assumption that female manual workers win the same proportionate premium as their male colleagues.

The 1982 Census of Production breaks down industries by SIC 1980, but 1982 earnings data is classified by SIC 1968. Accordingly, I use 1983 earnings data (available by SIC 1980) and make the assumption that the ratio of wage premia to earnings in 1982 was the same as that in 1983.

The most elusive information is that on skill and training levels, hypothesised to be important influences on the alternative wage. I have used industry breakdowns of skill and training levels from the National Training Survey which is available only for 1975 (but I assume it to be

valid for 1979 as well). Unfortunately there is no direct industry-level data on capital stock, so I am forced to construct rough indices from series on annual net investment in order to control for employers' minimum profit constraints in bargaining. Lack of data makes it impossible to test the hypothesis advanced in section 3.6 that capital gearing has a significant effect on bargaining through its effect on minimum profit constraints.

I have chosen to conduct cross-sectional analyses on each of three years: 1975, 1979 and 1982. I start with 1975 because of the availability of detailed data on skill levels. This year was a cyclical trough when the rate of profit in manufacturing was at a record low. 1979 is chosen to test the bargaining relationships at a cyclical peak (when, however, unemployment was higher than in 1975). Finally, 1982 is the latest year for which Census of Production information is available, a year which comes at the end of the trough of the very deep recession of the early 1980s amidst record unemployment levels.

The full sample of industries which I use comprises the 3-digit industries for which both the Employment Gazette and the Census of Production give data, excluding the residual and miscellaneous categories, giving a sample of 106 3-digit industries by the 1968 SIC and 91 by the 1980 SIC. For the estimation of the price-cost margin and bargaining relationships I have followed the example of Hart and Morgan (1977) in excluding mineral oil refining on the grounds that net output is largely determined by valuation methods, and the steel and ship-building industries on the grounds that, as largely nationalised industries, they are not subject to the same profit objectives and constraints as our theory of pricing and bargaining supposes.

The variables I have used are defined in Table 4.1, and their means and standard deviations are given in table 4.2.

TABLE 4.1

DEFINITIONS OF VARIABLES

All variables refer to industry averages at the 3-digit industry level on the Standard Industrial Classification.

A. Wages and characteristics of workforce and jobs

WAGE: gross hourly earnings (pence) of full-time adult male manual workers in October 1975, 1979 and 1983. (EG 1976, 1980 and 1985.)

HOURS: weekly hours worked (as above).

REGIONS: proportion of industry workforce employed in each region at June 1975, June 1978 and September 1981 respectively. (Labour Statistics Year Book 1975, EG March 1981, and December 1983 (Occasional Supplement no.2).)

0-5 YEARS: proportion of full-time manual male workforce with less than 5 years of service, 1979 and 1983. (NES 1979 and 1983.)

AGE: average age (years) of male manual workers in 1975, expressed as deviation from the overall mean of 38.9 years. (NTS)

FURTHER EDUCATION: proportion of workforce in 1975 with further education or adult education experience since starting work. (as above)

TRAINED: proportion of workforce who needed some form of special training to obtain current job. (as above)

JOB TRAINING: proportion of workforce given training for the current type of work since starting. (as above)

OVERTIME: average industry overtime hours for male manual workers (taking normal hours as 40 in 1979 and 1975, and 39 in 1983) expressed as a proportion of total hours worked, multiplied by the hourly wage.

SHIFTWORK: the percentage of male manual gross earnings made up by shift premium payments. (NES 1975, 1979 and 1983.)

PBR: the percentage of male manual earnings made up by payment-by-result payments. (as above)

Notes

1. The data from the National Training Survey and the New Earnings Survey is not given - or is not reliable - for the smallest industries; in which case the average figure for the appropriate industry group or order is used.

B. Bargaining variables

CAPITAL INTENSITY = $(\sum_t^T \text{net investment}) / \text{value added } T$

for 1975, t = 1971, T = 1975

for 1979, t = 1971, T = 1979

for 1982, t = 1979, T = 1982.

(COP 1975 - 1982.)

UNION COVERAGE: proportion of workforce covered by national and/or local collective agreements in 1973 (for 1975 regressions) and in 1978 (for 1979). (NES.)

UNEMPLOYMENT RATE: number of registered unemployed (in June 1975 or June 1979) / number of employed operatives (1975 or 1979); number of registered unemployed in May 1982 (end of series broken down by industry) / total employment March 1982. (1982 figures adapted from SIC 1968 to SIC 1980). (EG and COP.)

GROWTH RATE: proportional growth in total employment over previous year, for 1975 and 1979; growth over previous four years for 1982. (COP.)

CONCENTRATION: industry 5 firm concentration ratio by gross output of enterprises ranked by employment. (COP.)

FEMALE RATIO: female employment as proportion of total employment. (EG.)

STAFF RATIO: employment of clerical, technical, administrative and managerial staff / employment of operatives. (COP.)

PLANT SIZE: natural logarithm of the average number of operatives (for 1975 and 1979) or employees (for 1982) employed per plant by the five largest enterprises in the industry. (COP.)

C. Price-cost margin variables

NET OUTPUT: is calculated by deducting from gross output the cost of purchases (net of any change in stocks), the cost of industrial services - including amounts payable to other firms for out-work, repairs and maintenance, and sublet contracts - and, when applicable, duties etc. (COP)

WAGES: gross amount paid during year to operatives (broadly speaking, all manual wage earners) including the value of redundancy payments, net of government reimbursements. (COP)

SALARIES: gross amount paid during year to administrative, technical and clerical employees, employed directors, managers, superintendents, foremen, research and design employees, draughtsmen, etc and all office employees. (COP)

NATIONAL INSURANCE: employers' national insurance contributions. (COP)

CONCENTRATION RATIO: see above.

PRODUCT CRS: weighted average of product concentration ratios in 1975. (Business Monitor PD 1006.)

ADVERTISING INTENSITY: ratio of other non-industrial costs (advertising, royalties, etc.) to value added. (COP)

GROWTH: see above.

WAGE PREMIUM: excess of actual wage over estimated alternative wage (see text).

WAGE SURPLUS: (wage premium/wage) x wages.

WAGE RISE: proportional rise in hourly earnings over previous year, less the average wage rise (25.3% in 1975, 17.4% in 1979). (EG.)

WAGE BILL RISE: = wage rise x wages.

PCH1-4: alternative definitions of price-cost margins - see text.

PROFITS: value added - wages - salaries - national insurance. (COP)

MANUAL SHARE OF SURPLUS: wage surplus / (profits + wage surplus).

SOURCES

EG = Employment Gazette, published monthly by the Department of Employment.

COP = Census of Production, Summary Tables, published by the Department of Industry.

NTS = National Training Survey 1975, see "People and their work", published by the

Manpower Services Commission (1978). Data tape kindly provided by Mark Stewart.

TABLE 4.2

MEAN (AND STANDARD DEVIATION) OF VARIABLES

broken down by 106 3-digit industries on the SIC 1968 for 1975 and 1979, and by 91 3-digit industries on the SIC 1980 for 1982/3.

VARIABLE	1975	1979	1982/3
WAGE (pence per hour)	133.9 (16.3)	218.8 (25.8)	331.7 (44.3)
HOURS (per week)	43.13 (2.1)	43.54 (2.4)	43.0 (2.5)
EAST MIDLANDS	0.085 (0.11)	0.094 (0.11)	0.092 (0.10)
NORTH WEST	0.158 (0.12)	0.156 (0.13)	0.141 (0.11)
SOUTH EAST	-	-	0.252 (0.14)
0-5 YEARS	-	0.377 (0.071)	-
AGE (years)	0 (2.5)	-	-
FURTHER EDUCATION	0.312 (0.11)	-	-
TRAINED	0.289 (0.12)	-	-
JOB TRAINING	0.342 (0.09)	-	-
SHIFTWORK (%)	3.5 (2.0)	3.6 (2.2)	4.0 (2.4)
PBR (%)	9.3 (5.0)	9.1 (5.4)	9.0 (4.7)
WAGE PREMIUM (pence per hour)	14.5 (10.5)	22.9 (16.8)	37.6 (33.9)
WAGE PREMIUM / WAGE	0.103 (0.069)	0.100 (0.067)	0.103 (0.085)
MANUAL SHARE OF SURPLUS	0.117 (0.12)	0.096 (0.092)	0.128 (0.13)
WAGE SURPLUS / PROFIT	0.184 (0.48)	0.117 (0.115)	0.180 (0.232)
CAPITAL INTENSITY	0.388 (0.225)	0.458 (0.275)	0.392 (0.207)
UNION COVERAGE	0.782 (0.133)	0.762 (0.128)	-
UNEMPLOYMENT RATE	0.049 (0.02)	0.069 (0.03)	0.158 (0.06)
GROWTH	0.954 (0.047)	0.966 (0.059)	0.770 (0.12)
FEMALE RATIO	0.339 (0.197)	0.333 (0.194)	0.293 (0.162)
STAFF RATIO	0.389 (0.223)	0.420 (0.241)	0.471 (0.258)
PLANT SIZE (ln)	6.33 (0.85)	6.26 (0.89)	6.38 (1.02)
CONCENTRATION (%)	51.2 (23.9)	49.2 (23.8)	45.0 (23.9)
ADVERTISING INTENSITY	0.098 (0.060)	0.129 (0.065)	0.168 (0.082)
WAGE RISE	0 (0.050)	0 (0.050)	-
WAGE BILL RISE / NET OUTPUT	0 (0.018)	0 (0.014)	-
WAGE SURPLUS / NET OUTPUT	0.034 (0.026)	0.031 (0.022)	0.034 (0.032)
PROFIT PER OPERATIVE (£'000)	3.15 (6.12)	6.70 (17.7)	6.66 (7.3)
PCM1	0.262 (0.078)	0.268 (0.085)	0.283 (0.100)
PCM2	0.181 (0.062)	0.189 (0.069)	0.190 (0.082)
PCM3	0.613 (0.117)	0.628 (0.119)	0.635 (0.119)
PCM4	0.432 (0.133)	0.448 (0.147)	0.430 (0.142)

4.3.1 ESTIMATING INDUSTRY WAGE DIFFERENTIALS

Estimating equation 4.8 involves correcting observed inter-industry wage differentials for differences in workforce composition. The variables I use are described in Table 4.1. In selecting regional variables I have tried preliminary specifications involving all of the standard regions (other than the South East, which I have taken as the base region in 1975 and 1979), progressively removing those with the lowest t-ratios.

From preliminary specifications I have eliminated other variables which are not statistically significant at the 20% level. These include measures of the proportion of the male manual workforce with the following characteristics: a) having responsibility for the work of others in the firm; b) having undertaken a trade apprenticeship; c) having undertaken training for the current type of work since starting.(8)

For 1983, data was not available on skills and training, nor on length of service or age, so the equation for this year has less explanatory power than for the other years. Perhaps because of the omission of these variables, the estimated coefficient on the overtime variable was not statistically significant in 1983; so I have imposed a value of 0.5(9) and calculated the hourly wage adjusted for overtime for use as the dependent variable in 1983.

The regressions (reported in Table 4.3) seek to explain that part of inter-industry wage differentials which are the result of differences in the alternative wage facing workers in different industries, explained by regional distribution of employment, age or length of service (as a proxy for job-acquired skills), and training and education. I take account also of differences in overtime worked, and the prevalence of shiftwork and of payment-by-results schemes.

TABLE 4.3

CORRECTION OF INTER-INDUSTRY WAGE DIFFERENTIALS FOR SKILLS, REGIONS, OVERTIME, ETC.

Reporting coefficients of OLS regressions on male, manual hourly earnings. t-statistics are in brackets. For 1975a and 1983 the second figure in brackets is the heteroscedasticity consistent t-statistic. The estimating equation is 4.8.

YEAR	1975		1979		1983
	a.	b. (1)	a.	b. (2)	a. (3)
Mean wage (s.d)	133.9 16.3	132.9	218.8 25.9	206.0 24.7	317.7 44.2

EAST MIDLAND	-22 (1.79,2.13)	-22 (1.86)	-36 (2.14)	-36 (2.15)	
NORTH WEST	-22 (2.23,2.91)	-23 (2.35)	-34 (2.30)	-34 (2.31)	
SOUTH EAST					114 (4.01,3.38)
AGE	0.87 (1.73,1.73)	0.77 (1.54)			
0-5 YEARS			-131 (4.76)	-130 (4.78)	
FURTHER EDUCN.	29 (1.93,2.24)	29 (1.99)	51 (2.45)	51 (2.48)	
TRAINING	41 (3.08,2.87)	40 (3.00)	39 (1.89)	39 (1.93)	
OVERTIME	0.47 (2.19,2.38)	0.52 (2.45)	0.66 (3.60)		
SHIFTWORK	3.59 (5.36,6.12)	3.56 (5.35)	3.29 (3.71)	3.20 (3.80)	8.44 (4.90,5.03)
PBR	0.43 (1.56,1.62)	0.46 (1.70)	0.72 (1.96)	0.73 (2.06)	

N	106	106	106	106	91
R ²	0.454	0.451	0.519	0.470	0.276
R ²	0.409	0.406	0.479	0.432	0.259

NOTES

1. The dependent variable is the logarithm of wage; all coefficients have been multiplied by the geometric mean of wage for comparison with 1975a.
2. The dependent variable is wage adjusted for an overtime rate of 0.8.
3. The dependent variable has been adjusted for overtime at a rate of 0.5.

The regression results are fairly clear, with coefficients of the expected sign. The overall explanatory power, as measured by R^2 , is 45% for 1975a, 52% for 1979a, and 27% for 1983 - the three preferred equations.

When the South East is excluded, the East Midlands and the North West are the only standard regions attracting a statistically significant coefficient (even at the 10% level) for 1975 and 1979. It is probable that these regional variables are picking up high concentrations of the low-paying clothing and textile industries. For although the East Midlands (at September 1981) had only 8.8% of total manufacturing employment, this region was the location of 29% of textile industry employment, and 14% and 16% of leather and clothing industry employment respectively. The North West had 13.2% of total manufacturing employment, but 19%, 15% and 18% of employment for these three industries, (and 24% of textile industry employment in 1979). We would expect that the alternative wage should be lower in those regions with a high concentration of low-paying industries.

For 1975 I have been able to use estimates of the average age of the male manual workforce. The result that industries with an older workforce tend to pay higher wages reflects, perhaps, a correlation with job-acquired skills. For 1979 I use a variable representing the proportion of the workforce with less than 5 years service with their current employer - perhaps a more direct proxy for job-specific skills - and find a significant negative effect.

Further education and training do, as expected, raise wages. The omitted variables representing apprenticeships and on-job training may have been statistically insignificant because of collinearity. Shiftwork and payment-by-results schemes also attract positive coefficients (with the exception of 1983 for the latter variable).

I have corrected for differences in overtime hours worked by including a variable which is calculated as the ratio of overtime to total weekly hours, multiplied by the hourly wage rate. For if the overtime premium is some fraction P of the normal hourly wage W*, if normal hours are 40, and actual hours are H, then the observed hourly wage W is given by:

$$W = W^* + P.W^*(H - 40) / H$$

or, since W* is unobserved, we can write the approximation:

$$W = W^* + P.W.(H - 40) / H ;$$

So the coefficient on the overtime variable I have defined is an approximation (a slight under estimate) to the estimated actual overtime premium. The estimates for 1975 and 1979 are 0.47 and 0.66 which fit well within the range which I would expect from hearsay evidence that overtime premia in manufacturing tend to vary between one third and one, depending on the day on which overtime is worked.

I have checked the use of this approximation by rerunning the regression for 1979 whilst imposing various values of the overtime premium to adjust the dependent variable according to the formula:

$$W^* = W.H / (H + P.(H - 40)).$$

The sum of the squared residuals is minimised with a value of P between 0.7 and 0.8, showing that the 1979 estimate of 0.66 is indeed a slight under estimate. In Table 4.3 I report the regression based on the imposed premium of 0.8 and note that the other estimated coefficients are altered only minutely in comparison with the regression (1979a) which uses the approximation. So I conclude that use of the approximation is justified.

The overtime variable is statistically insignificant in the 1983 preliminary specifications. I presume that this is the result of the omission of the skill variables (due to lack of data), so I impose an overtime premium rate of 0.5. I note that this is higher than the rate of 0.3 which Layard and Nickell (1985, Appendix, p.83) impose in their study of aggregate earnings, but the evidence for 1975 and 1979 suggests that that figure is too low for manufacturing industry.

It is common for researchers to use the log of the wage as the dependent variable in wage equations, and sometimes to use logarithms of the independent variables as well. I report in regression 1975b the results when the dependent variable is expressed in logarithms (as used, for example, by Stewart, 1983). The coefficients measure the proportional rather than the absolute effect of the independent variables, so I multiply each of the estimated coefficients by the geometric mean of the wage to give estimates of the effect of each variable which are comparable with the non-log specification (1975a). None of the coefficients are altered by more than a small fraction of their standard deviation. The explanatory power of the two regressions is almost identical. So I conclude that the non-log specification, which implies that factors have an additive rather than a multiplicative influence, is in no way inferior to the log specification.

I also check for the effect of possible heteroscedasticity on the validity of statistical inferences which can be drawn from the OLS estimates. (See discussion in Section 4.7.3.) In Table 4.3 I report in addition to the OLS t-statistics, the heteroscedasticity-consistent t-statistics for 1975 and 1982. In all cases they are close to the OLS statistics, usually slightly higher. So there is little evidence that heteroscedasticity is a serious problem, and I note that OLS estimates are still unbiased even in the event of heteroscedasticity.

4.3.2 THE INFLUENCE OF BARGAINING POWER ON WAGES

I repeat here the two versions of the wage equation used for estimation:

$$W_i = c.Y_i + U_i$$
$$(U_i = WP_i - WP + e_i)$$

4.8

$$W_i = c''.Y_i + g.(Z.\Pi/L)_i + e_i + (e''.\Pi/L)_i$$

4.11

Equation 4.11 provides a means of preliminary investigation of the determination of workers' bargaining strength, and at the same time provides a check on whether there is any serious omitted variable bias in estimations of equation 4.8. I report estimations of equation 4.11 in Table 4.4. For each year I report regressions: a) without any bargaining variables (ie. comparable to those in Table 4.4, but on slightly different samples); b) including the bargaining variables Z, representing a 'standard' specification of the wage equation(10); and c) including the bargaining variables weighted by profits per worker (ie. as in equation 4.11). The bargaining model I have investigated suggests that c) should be a superior specification to b).

I omit from the samples the steel and shipbuilding and oil refining industries (for reasons outlined in section 4.6) and also the photo industry in 1979 and the artificial fibre and clock industries in 1982 when they reported negative profits.

Since equation 4.11 predicts that the error term is heteroscedastic in a known form, we can construct appropriate weights for weighted least squares estimation:

4.3.2 THE INFLUENCE OF BARGAINING POWER ON WAGES

I repeat here the two versions of the wage equation used for estimation:

$$\begin{aligned} W_i &= c \cdot Y_i + U_i \\ (U_i &= WP_i - WP + e_i) \end{aligned} \quad \underline{4.8}$$

$$W_i = c'' \cdot Y_i + g \cdot (Z \cdot \Pi / L)_i + e_i + (e'' \cdot \Pi / L)_i \quad \underline{4.11}$$

Equation 4.11 provides a means of preliminary investigation of the determination of workers' bargaining strength, and at the same time provides a check on whether there is any serious omitted variable bias in estimations of equation 4.8. I report estimations of equation 4.11 in Table 4.4. For each year I report regressions: a) without any bargaining variables (ie. comparable to those in Table 4.4, but on slightly different samples); b) including the bargaining variables Z, representing a 'standard' specification of the wage equation(10); and c) including the bargaining variables weighted by profits per worker (ie. as in equation 4.11). The bargaining model I have investigated suggests that c) should be a superior specification to b).

I omit from the samples the steel and shipbuilding and oil refining industries (for reasons outlined in section 4.6) and also the photo industry in 1979 and the artificial fibre and clock industries in 1982 when they reported negative profits.

Since equation 4.11 predicts that the error term is heteroscedastic in a known form, we can construct appropriate weights for weighted least squares estimation:

$$Q_1 = k' + k.P_1$$

where P_1 is profits per worker in industry 1. But we need to choose k' and k .

Stewart and Wallis (1981, p.257) give the likelihood function for equation 4.11 (on the assumption that the error term is heteroscedastic but normally distributed) which can be written as:

$$-2\log L = n\log 2\pi + \sum Q_1^2 + \sum (R/Q)_1^2 \equiv n\log 2\pi + V(k', k) \quad \underline{4.12}$$

where R_1 is the residual: $W_1 - c^n.Y_1 - g.(Z.P)_1$.

The maximum likelihood estimate is given by finding those values of k' and k which minimise $V(\cdot)$, the sum of the squared weights added to the sum of the squared weighted (least squares) residuals.

I suggest here a method of reducing the dimensions of the search from two parameters to one, noting that the weighted least squares estimates of c^n and g depend only on the ratio $k'/k (=k^n)$, for it is the ratio of the weights, not their absolute values, which affect the coefficient estimates. So I define the following:

$$\begin{aligned} Q_1 &= k.(k^n + P_1) \\ A(k^n) &= \sum (k^n + P_1)^2 \\ B(k^n) &= \sum (R_1 / (k^n + P_1))^2 \end{aligned} \quad \underline{4.13}$$

where A and B are simply the sum of the squared weights and sum of the squared residuals (obtained from least squares regression with Q_1 as weights), with k set equal to unity.

In general, the sum of the squared weights is:

$$\sum Q_1^2 = k^2 \cdot A$$

and the sum of the squared weighted residuals is:

$$\sum (R_1 / Q_1)^2 = B / k^2 .$$

The sum of these two expressions ($\equiv V(k, k^n)$) is minimised with respect to k when: $k^2 = (B/A)^{1/2}$, in which case

$$V(k^n) \equiv V(k^*, k^n) = 2(AB)^{1/2} .$$

The maximum likelihood estimate is found by searching for that value of k^n which minimises the product AB from equation 4.13.

I have applied this technique to equation 4.11 for each of the three years studied. For 1975, I found $V(k^n)$ to be monotonically declining, indicating that the data did not meet the assumptions of equation 4.11. This is perhaps not surprising given that industry profitability was at a record, and perhaps unanticipated, low to which bargainers on both sides may not have yet adjusted. However, for each of 1979 and 1983 $V(k^n)$ does decrease monotonically before reaching a minimum and then rising monotonically. The maximum likelihood estimate of k^n is 55 in 1979 and 140 in 1983 (where, in each case, P_1 is measured in units of thousands of pounds per worker per year). The weighted least squares estimates which I report are therefore the maximum likelihood estimates for 1979 and 1983. For 1975 I report weighted least squares estimates based on a somewhat arbitrary choice of the weighting parameter, $k^n = 30$.

NOTES TO TABLE 4.4

1. FED = FURTHER EDUCATION; EM = EAST MIDLANDS; NW = NORTH WEST; SE = SOUTH EAST;
TRND = TRAINED; OVERP = OVERTIME; CAP = CAPITAL INTENSITY; FEM = FEMALE RATIO;
STAFF = STAFF RATIO; UR = UNEMPLOYMENT RATE(%); CR5 = CONCENTRATION $\times 10^{-2}$

2. For each year, equation c. is estimated by Weighted Least Squares, giving maximum likelihood estimates for 1979 and 1983. The weights are of the form $Q_i = (k + P_i)$, where P_i is profit per head in industry i (£'000 per year) and the parameter k takes the value 30 for 1975, 55 for 1979, and 140 for 1983. The bargaining variables (from 'CAP' to 'UNION') have each been pre-multiplied by P_i .

3. Coefficients are followed by t-values in brackets.

4. For the weighted least squares regressions, the statistics are based on the weighted residuals.

5. For 1983, the dependent variable wage has been adjusted for overtime at a rate of 0.5.

The bargaining variables I use are attempts to capture the determinants of workers' ability to wrest some part of industry surplus from the employers. Since I use measured gross profits, I need to correct for the employers' minimum profit constraint which I assume to be a positive, linear function of capital invested in the industry. Lacking data on capital stock, I have constructed proxies by summing net capital investment over the previous few years. Since investment is measured in current prices, I have, in effect, used the inflation rate as the depreciation factor on past investment. Capital intensity is measured as the ratio of this proxy to value added. Unfortunately, no data is available broken down by SIC for industry capital gearing, which I have argued in section 3.6 to be an important influence on the minimum profit constraint. Nevertheless, the bargaining theory predicts that the coefficient on the capital intensity term should be negative, since the higher the minimum profit constraint, the smaller is the pool of surplus which workers can bargain over.

The estimates shown in Table 4.4 do indeed show a negative coefficient on capital intensity in each of the three years when specification 4.11 - the 'bargaining' specification - is used. The coefficient is significant at the 1% level in 1979 and at the 20% level in 1975 and 1983. It is interesting to note that when the bargaining variables are not weighted by industry profitability - the 'standard' specification - the coefficient is positive in 1975, and statistically insignificant in 1983. If the underlying theory of bargaining is correct, we can see that erroneous inferences about the influence of bargaining variables could easily be drawn as a result of mis-specifying the estimating equation.

The significance of non-manual employees for the bargaining outcome is perhaps analogous to the role of the minimum profit constraint

and capital intensity. For I would hypothesise that non-manual workers also have the capacity to pre-empt some part of industry surplus, so reducing the size of the cake which manual workers can try to win. If, for instance, employers' bargaining strength gives them a certain share of industry surplus, and if the share of industry surplus which is paid to non-manual workers (through higher salaries and through perks) is an increasing function of their number, then manual workers' share of surplus must be a decreasing function of the ratio of non-manual to manual employees.

In the bargaining specifications, the coefficient on the staff ratio is indeed negative in each year, significant at the 5% level in both 1979 and 1983. The comparison with the standard specification is dramatic - for the sign of the coefficient is reversed in each year, but is not statistically significant at even the 10% level.

The proportion of the workforce which is female is found to have a significantly negative effect in both specifications in all years. We might expect this to be so if women workers are less strongly organised than men, and/or if less men choose to take jobs in low-paying industries.

The unemployment rate has, as expected, a negative coefficient for all years in both specifications. It is noteworthy that the effect is statistically significant at the 5% level only for 1983, a year when unemployment reached record post-war levels. The rate of growth of employment is generally found to attract a positive coefficient, but it is statistically insignificant. I have hypothesised that this variable should have a positive effect on workers' bargaining strength, hence on wages. It will tend, however, to be collinear with the unemployment rate.⁽¹¹⁾ Moreover, there may be some simultaneous equation bias if higher wages tend to reduce industry growth, though if bargaining does

occur on a vertical contract curve, this will not be the case.

The concentration ratio would be expected to have a positive coefficient in the standard specification, as a proxy for industry surplus. Indeed it does have a positive coefficient in 1975, but is statistically insignificant at the 10% level for all years (not reported for 1983). When industry profitability is introduced directly in the bargaining specification there is no obvious expectation for the sign of the coefficient on concentration. If a concentrated industry facilitates collusion and organisation between employers, the effect will be positive - unless it is outweighed by easier co-ordination for unions.(12) In fact, the coefficient is only significant at the 10% level in 1979, when it is negative.

I would expect union coverage to have a positive influence on workers' bargaining power - indeed many researchers treat it as the only such influence. The coefficient is however statistically insignificant in both specifications in the two years for which data was available (I report the results only for 1975), indicating perhaps that the other variables reported are more important determinants of bargaining strength, given that the union coverage variable is picking up relatively small variations in the highly unionised manufacturing sector.(13)

For both 1979 and 1983, the bargaining specification gives higher t-values on most variables than does the 'standard' specification. (The R^2 values are not strictly comparable because the bargaining specification has been estimated by weighted least squares.) The bargaining specification performs less well for 1975, when the hypothesised likelihood function does not have the predicted shape. I suggest that this may be the result of the exceptionally low profit levels of 1975 and the high rate of inflation in that year which may well have been incorrectly anticipated by the bargaining parties. So I take

the results for 1979 and 1983 as tentative support for the bargaining model. However, I note my previous qualifications about the specification of the bargaining relationship underlying the estimating equation 4.11, which imply that the bargaining relationship needs further investigation.

If we compare the coefficients on the 'skill' variables in Table 4.4 (ie. from FED to PBR) when bargaining variables are omitted altogether (equation a.) and when the bargaining specification is used (equation c.) we find that in all cases the inclusion of bargaining variables alters the estimated coefficients by less than one standard error, with the exception of the overtime variable in the unsatisfactory 1975 bargaining regression. In the 1979 and 1983 regressions, the inclusion of bargaining variables alters the coefficients generally by substantially less than one standard error. So I conclude that any omitted variable bias in the comparable wage equations reported in Table 4.3 is not likely to be substantial.(14)

4.4 ESTIMATING INDUSTRY WAGE PREMIA

The residuals from estimation of equation 4.8 give estimates of the deviation of the industry wage premia around their mean - but we still need some method of estimating that mean. This problem amounts to deciding which of the industries at the lower end of the distribution of the residuals are paying at or under the alternative wage. The method used by Svejnar (1984) is to assume a) that the alternative wage is the average wage for a particular class of workers across a sample of unionised and non-unionised firms, and b) that in unionised firms all the workers have the same proportionate premium as that particular class of workers. The method used here avoids assumption b) by taking into account the differing composition of the workforce in different industries. Assumption a) would require that we divide our sample into a unionised and non-unionised sector, assuming that the non-union sector is paying the alternative wage. But I have already noted that UK manufacturing is almost entirely highly unionised, with less than 50% coverage found only in the clothing industry. Moreover, I have argued that even if workers are highly unionised they may be unable to win wage premia if other factors have reduced their bargaining power or if there is no surplus in the industry; and even poorly unionised workers may have some bargaining power.

Another approach would be to take the lowest observed wage (adjusted for skill etc.) as the alternative wage. But there are two problems with this: a) it is likely that some industries will be paying below the reservation wage at any one moment if workers' bargaining strength is low and if bargainers in that industry have underestimated the rate of inflation and growth in the nominal value of the alternative wage, with the result that they have settled temporarily for a wage which in the long-run would be insufficient to keep workers in that industry;

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and b) some low paying industries will have particular circumstances, conditions of work and workforce characteristics, which have not been picked up by the explanatory variables in my wage equation - unidentified circumstances which lower the alternative wage for that industry below that which is predictable with the available data. For these two reasons, we might expect to find a number of industries paying a wage which is temporarily, or apparently, below the alternative wage. Taking the lowest observed wage as the alternative wage might lead to substantial overestimation of the actual wage premium in other industries.

Indeed, if the lowest (adjusted) pay level was the alternative wage, it is likely that there would be some clustering of observations around this wage, on the assumption that there will be a number of industries where workers' bargaining strength is around zero and/or where industry surplus is negligible. This suggests that we examine the lower end of the distribution of residuals from the preferred wage equations of Table 4.3. These residuals are listed in Table 4.5. There is no concentration of industries at the very bottom of the scales, but for each year there is a distinct clustering of industries paying roughly between 8% and 10% below the average. The clusters for each year are delineated by the dashed lines in the table. Within each cluster, the density of industries (per percentage point on the wage scale) is greater than, and usually at least twice as great as the density of the five industries above and below the cluster. For each year, approximately 10% of the sample of industries are paying wages (adjusted for skills, etc.) below the level of the clustering, and in each year approximately half of these lowest paying industries are textile or leather industries (which are very reasonable candidates for paying the minimum wage as a result of their long-term decline).

So I take the lowest-paying industry in the identified clusters for each year to be paying the alternative wage. For higher-paying industries I measure the wage premium relative to this line. I assume that the even lower-paying industries are paying a zero wage premium, allowing for the problems of mistaken expectations and inadequate data. I define the wage surplus for each industry to be the equivalent proportion of the industry's annual manual workers' wage bill, assuming that women workers receive the same proportionate wage premium over their alternative wage as the men. I will use these measures of industry wage surplus in the following sections to investigate the effect on price-cost margins and to investigate further the determinants of workers' bargaining power.

TABLE 4.5

THE LOWEST PAYING INDUSTRIES, AFTER ADJUSTMENT FOR SKILLS, ETC.

Wage differentials, after corrections for differentials in skills etc., expressed as percentage deviation from mean wage. These figures are derived from the residuals of the wage equation estimations shown in Table 4.3.

1975			1979			1983	
INDUSTRY (SIC 1968)			INDUSTRY (SIC 1968)			INDUSTRY (SIC 1980)	
MLH	ORDER	WAGE %	MLH	ORDER	WAGE %	MLH	WAGE %
273	5	-22.0	432	14	-17.5	494	-23.2
432	14	-20.8	273	5	-17.5	434	-21.0
414	13	-18.4	416	13	-15.2	419	-18.7
493	19	-17.9	261	4	-15.0	428	-16.6
422	13	-17.3	422	13	-14.1	442	-15.9
494	19	-16.2	421	13	-12.8	456	-15.9
421	13	-15.3	415	13	-12.4	431	-14.4
495	19	-13.1	495	19	-11.3	415	-13.9
415	13	-12.8	263	4	-11.1	432	-13.1
322	6	-12.1	493	19	-10.2	413	-12.6
391	12	-11.6	322	6	-10.1	255	-11.9
423	13	-10.9	365	9	-9.7	453	-10.7
363	9	-10.1	444	15	-9.5	346	-10.5
416	13	-9.4	414	13	-9.4	412	-10.2
261	4	-9.1	494	19	-9.1	466	-9.7
212	3	-8.9	278	5	-8.8	455	-9.4
445	15	-8.6	239	3	-8.7	231	-8.8
444	15	-8.5	221	3	-8.1	483	-8.7
354	8	-8.2	462	16	-7.9	462	-8.6
446	15	-7.6	363	9	-7.5	441	-8.4
338	7	-7.6	445	15	-7.3	464	-8.0
412	13	-6.8	370	10	-6.7	411	-7.7
214	3	-6.7				435	-5.5
						256	-5.2
						344	-4.9

SIC 1968: 3 = food, drink, etc.; 4 = coal and petroleum products; 5 = chemicals, etc.; 6 = metal manufacture; 7 = mechanical engineering; 8 = instrument engineering; 9 = electrical engineering; 10 = shipbuilding; 11 = vehicles; 12 = metal goods; 13 = textiles; 14 = leather, etc.; 15 = clothing and footwear; 16 = bricks, etc.; 17 = timber, furniture, etc.; 18 = paper, print, etc.; 19 = other manufacturing.

SIC 1980: 23 = extraction of stone, clay, etc.; 25 = chemicals; 34 = electrical and electronic engineering; 41/42 = food and drink; 43 = textiles; 44 = leather, etc.; 45 = footwear and clothing; 46 = timber and wooden furniture;

4.5 THE EFFECT OF BARGAINED WAGE PREMIA ON PRICE-COST MARGINS

4.5.1 Specifying the variables

Before estimating equation 4.5 we have to define the price-cost margin and the variables used to explain margins. The denominator of the margin is revenue (see equation 2.1), but Hart and Morgan (1977, p.188) prefer to measure revenue by net output rather than gross output. They argue that the use of gross output or sales brings in the influence of "prices of raw materials, duties, subsidies and changes in the amount of work given to other establishments. An alternative measure which avoids these problems is the ratio of profits to value added (net output)".

On the other hand, the conjectural variation equilibrium model of oligopoly does predict that sales (or gross output, the two measures are usually very close) is the correct measure of revenue. However, the model ignores the existence of vertical links between industries and the consequent possibility of bilateral bargaining. If vertical integration is prevalent, there will be a substantial intra-firm component to inter-industry trade and it may well be that firms operate and interact in terms of net rather than gross output. Cowling (1983) makes a similar point with regard to intra-industry inter-establishment transactions.

This issue is potentially quite serious, for there are wide variations in the ratio of net output to gross output, so variations in margins will be heavily dependent on the measure used. For instance, in 1982, on the sample of 91 3 digit manufacturing industries, the mean ratio of net to gross output is 0.445 with a standard deviation of 0.118. The lowest ratio of net to gross output is in grain milling.

We can see

from Table 4.6 that when revenue is defined on gross output, grain milling has a margin far below the average; but when net output is used as a measure of revenue, the grain industry has a higher margin. This reversal of rankings occurs also at the level of industry groups; comparing, for example, the food, drink and tobacco group with non-metallic mineral products. Clearly, any analysis of variations in margins will be heavily influenced by the choice of measure.

TABLE 4.6

THE INFLUENCE OF NET AND GROSS MEASURES OF REVENUE ON THE RANKING OF MARGINS
1982

INDUSTRY (SIC 1980)	NET / GROSS OUTPUT	PCM2	PCM4
Food, Drink and Tobacco (41/42)	0.304	0.184	0.607
Non-metallic mineral products (24)	0.527	0.284	0.539
Grain milling (416)	0.184	0.121	0.660
Average of 91 industries in sample	0.445	0.190	0.430

Source: Census of Production

PCM2 : price-cost / gross output

PCM4 : price-cost / net output

(see text for definitions)

Net output has the distinct advantage that it is a measure which is independent of the level of vertical integration of the industry. For the reasons advanced above, it is the measure I prefer. But since this issue has not been resolved either theoretically or empirically, I will follow the example of Cowling (1983) and Clarke, Davies and Waterson (1984) in reporting alternative definitions of price-cost margins based on both gross and net output measures.

Unfortunately, the problems in defining price-cost margins do not end here. The model of profit-maximising oligopoly indicates that mark-ups are determined relative to marginal costs. Most empirical studies measure margins relative to average variable costs, tantamount to an assumption of constant returns to the variable inputs. For instance, Cowling (1983) makes this assumption explicitly for UK manufacturing in the 1970s, arguing its validity for a period when capacity utilisation was falling from 93% in 1970 to 83% in 1979. This argument is supported by Sawyer's (1983) study of pricing in UK manufacturing over the period 1963-75, where, in the majority of industries studied, the preferred pricing model omits the level of output as a significant influence on prices; and in those cases where output is found to be significant, the effect is sometimes positive, sometimes negative. Clarke, Davies and Waterson (1984) examine the conjectural variation pricing model in terms of intra-industry margins in UK manufacturing from 1971-77 and posit the possibility of u-shaped (quadratic) marginal cost curves. But in two-thirds of the industries studied, their findings (p.445) are consistent with an assumption of constant marginal costs. On the basis of this evidence, I conclude that the assumption of constant marginal costs is indeed valid for the period under investigation.

A further issue is whether non-manual employees' salaries should be included in the definition of variable costs. Cowling (1983) follows

Kalecki in treating salaries as overhead costs. This assumption seems reasonable with regard to the indivisibilities of senior managerial, research and design functions, but it seems less plausible in the case of more menial office and clerical functions where tasks are more readily divisible and employment contracts allow for lay-off and dismissal. Unfortunately, the data does not allow us to make such distinctions, requiring that we treat staff salaries as a whole.

One approach to this problem is to compare the actual variability of manual and non-manual employment. Table 4.7 reports a simple comparison of the relative variations of annual levels of employment and average hours of work. Examining aggregate manufacturing employment over the period 1971-82, the coefficient of variation for manual workers is more than twice that for non-manuals. Breaking variations in employment down by 106 3-digit industries over the period 1974-79, the average of the ratio between the two coefficients of variation is nearly one and a half. However, the greater relative variability of manual employment is due, at least in part, to the relatively greater secular decline in manual employment in manufacturing; manual workers comprised 73.4% of the manufacturing workforce in 1971, but 68.4% in 1982. So the apparently much greater variability in employment for manual workers is not conclusive.

On the other hand, if we examine weekly hours of work the evidence is much clearer. Over the period 1972-79, examining annual averages of weekly hours worked in all manufacturing industry, the coefficient of variation for manual hours is twice that of non-manual hours; over the period 1977-83 it is three times as high (though this last figure is influenced by a decline in the normal manual working week in the early 1980s from 40 to 39 hours).

TABLE 4.7

1. THE VARIABILITY OF EMPLOYMENT OF MANUAL AND NON-MANUAL EMPLOYEES
IN UK MANUFACTURING

	a) annual measures of manufacturing employment 1971-82	b) annual measures of industry employment, averaged over 106 industries, 1974-79
	<u>'000s</u>	
<u>employment of operatives</u>		
mean	5021.3	41,237
standard deviation	637.4	8,500
coefficient of variation	0.126	0.162
<u>employment of others</u>		
mean	1,951	15,904
standard deviation	104.7	2,480
c.o.v.	0.053	0.137
<u>ratio of c.o.v.s</u>	2.38	1.44

2. THE VARIABILITY IN HOURS OF WORK OF MANUAL AND NON-MANUAL EMPLOYEES

annual averages of weekly hours for manufacturing industry, for full time adult men
excluding those whose pay was affected by absence

	<u>1972-79</u>	<u>1977-83</u>
<u>weekly hours worked by manual employees</u>		
mean	45.71	44.78
standard deviation	0.462	0.988
coefficient of variation	0.010	0.022
<u>weekly hours worked by non-manual employees</u>		
mean	39.21	39.20
standard deviation	0.196	0.267
coefficient of variation	0.005	0.007

Sources: Census of Production and Employment Gazette

It seems clear from this evidence that manual workers' employment is indeed more variable than that of non-manual workers, especially when hours of work are taken into account. This gives some credence to the hypothesis that employers treat manual wages as variable costs while treating non-manual salaries as overheads. But the case is far from proven, so I will report measures of price-cost margins which treat salaries alternately as overhead and as variable costs.

Employers' national insurance contributions should naturally be treated as overhead or variable costs according to whether they are levied with respect to overhead or variable incomes. But the Census of Production gives only aggregate employers' contributions, so I have to estimate the proportion of each industry's payments which are attributable to manual and non-manual workers. Since national insurance is a mildly progressive tax over much of its range, the average rate levied on manual workers' wages is likely to be less than the rate on the relatively higher salaries of non-manual staff. In Table 4.8 I show the results of regression of total national insurance payments on industry wage and salary bills. The estimated rate of national insurance levy on manual wages rises from 10.9% in 1975 to 17.3% in 1979, falling to 16.1% in 1982. The estimates for salaries are several percentage points higher. I use these estimated rates to derive estimates of industry wage costs including national insurance.

TABLE 4.8

ESTIMATION OF THE AVERAGE RATE OF EMPLOYERS' CONTRIBUTIONS ON MANUAL WORKERS' WAGES

OLS regression results; the dependent variable is employers' national insurance contributions; t-values are in brackets.

	<u>1975</u>	<u>1979</u>	<u>1982</u>
WAGES	0.109 (14.8)	0.173 (28.1)	0.161 (16.9)
SALARIES	0.157 (11.0)	0.195 (18.2)	0.191 (15.7)
R ²	0.958	0.987	0.976
N	106	106	91

Source: Census of Production

I define four alternative measures of industry price-cost margins, measuring the ratio of overhead costs plus profits to revenue, using the alternative definitions of both overheads and revenue which have been discussed above:

$$\text{PCM1} = (\text{net output} - \text{wages} - \text{N.I.}) / \text{gross output}$$

$$\text{PCM2} = (\text{net output} - \text{wages} - \text{salaries} - \text{N.I.}) / \text{gross output}$$

$$\text{PCM3} = (\text{net output} - \text{wages} - \text{N.I.}) / \text{net output}$$

$$\text{PCM4} = (\text{net output} - \text{wages} - \text{salaries} - \text{N.I.}) / \text{net output}$$

I use various proxies for the independent variables in estimating equation 4.5. Rather than the theoretically preferable Herfindahl index of concentration, I use the more readily available five-firm concentration ratio. Lacking direct measurement of the elasticity of

industry demand, I report the effects of the commonly used proxies, advertising intensity and industry growth (noting that the Census of Production category from which advertising expenses are taken does also cover expenditure on royalties, etc.). I am unable to find any measures of product differentiation, except for 1975 when I report the use of concentration ratios which are aggregated up from sub-industry product level concentration ratios. All concentration measures refer to domestic production rather than to domestic markets. The lack of data on exports and on imports (which can be intra-firm imports, or competitive imports) could be a serious omission. Lyons (1981) reports on UK manufacturing in 1968 and finds that both import and export intensities affect price-cost margins. But he ignores both the concentration of importers and the degree of intra-firm trade. Coutts, Godley and Nordhaus (1978, p.129-132) conclude that neither import prices nor import penetration affect UK domestic price-cost ratios. Murfin and Cowling (1981) study the effects of import penetration on UK manufacturing wholesale prices between 1954 and 1978, and they also find that import penetration appears not to affect pricing. On balance, it may well be that the omission of import and export data from this study is not problematic.(15)

TABLE 4.9.1 THE DETERMINATION OF PRICE-COST MARGINS (PCMI)

The results of OLS regression with PCMI as the dependent variable; t-statistics in brackets. PCMI = (P+f+S)/Gross Output

	1975a	1975b	1975c	1975d	1975e	1975f	1979b	1979c	1979d	1979e	1979f	1982b	1982d	1982e	1982c
CONC1	-0.47 (1.16)														
CONC	-0.63 (1.97)	-0.61 (1.89)	-0.60 (1.84)	-0.64 (2.00)	-0.68 (1.76)	-0.54 (1.56)	-0.55 (1.56)	-0.49 (1.35)	-0.64 (1.83)	-0.78 (1.81)	-0.52 (1.19)	-0.52 (1.19)	-0.54 (1.24)	-0.52 (1.17)	-0.63 (1.40)
AD	0.14 (1.08)	0.15 (1.2)	0.16 (1.2)	0.12 (1.0)	0.21 (1.66)	-0.004 (0.003)	-0.002 (0.01)	0.02 (0.12)	-0.04 (0.31)	0.093 (0.70)	0.034 (0.27)	0.079 (0.60)	0.033 (0.25)	0.033 (0.28)	0.061 (0.48)
GROWTH	-0.003 (0.01)	0.05 (0.30)	-0.01 (0.07)	0.06 (0.40)	-0.03 (0.19)	0.15 (1.03)	0.15 (1.03)	0.16 (1.04)	0.14 (0.95)	0.11 (0.78)	0.27 (3.16)	0.29 (3.34)	0.28 (3.04)	0.28 (3.71)	0.28 (3.22)
PREM			-0.09 (0.7)				-0.04 (0.29)								0.14 (1.08)
WAGE SURPLUS GROSS OUTPUT				0.52 (0.8)			0.47 (0.57)						0.97 (1.34)		
WAGE SURPLUS NET OUTPUT				-0.50 (1.63)	-0.54 (1.82)				-0.76 (2.01)	-0.81 (2.20)				-0.01 (0.03)	(0.04)
PLANT				0.19 (1.78)						0.24 (2.17)					
CAPITAL				-0.96 (2.30)						-1.94 (2.16)					
N	103	103	103	103	103	103	103	103	103	103	103	89	89	89	89
R ²	0.021	0.045	0.050	0.051	0.16	0.035	0.036	0.039	0.074	0.155	0.122	0.141	0.123	0.135	0.135
R ²	-0.009	0.016	0.011	0.012	0.032	0.10	-0.007	-0.001	0.036	0.102	0.092	0.100	0.081	0.093	0.093
PCMI	0.265			0.271								0.286			

TABLE 4.9.2 THE DETERMINATION OF PRICE-COST MARGINS (PCM2)

The results of OLS regression with PCM2 as the dependent variable; t-statistics in brackets. PCM2 = (P-F)/Gross Output

	1975a	1975b	1975c	1975d	1975e	1975f	1979b	1979c	1979d	1979e	1979f	1982b	1982d	1982e	1982c
CONC1	-0.48 (1.57)														
CONC	-0.46 (1.90)	-0.46 (1.85)	-0.45 (1.87)	-0.47 (1.97)	-0.32 (1.11)	-0.37 (1.54)	-0.37 (1.54)	-0.37 (1.55)	-0.38 (1.54)	-0.46 (1.69)	-0.43 (1.24)	-0.33 (0.97)	-0.33 (0.95)	-0.25 (0.72)	-0.29 (0.82)
AD	0.28 (2.85)	0.27 (2.82)	0.27 (2.85)	0.25 (2.66)	0.30 (3.16)	0.14 (1.37)	0.14 (1.36)	0.14 (1.36)	0.14 (1.31)	0.10 (1.01)	0.19 (1.78)	0.18 (1.77)	0.16 (1.58)	0.14 (1.34)	0.16 (1.63)
GROWTH	-0.05 (0.42)	-0.04 (0.35)	-0.02 (0.17)	0.004 (0.04)	-0.05 (0.47)	0.12 (0.99)	0.12 (1.00)	0.12 (1.00)	0.12 (0.98)	0.10 (0.90)	0.09 (0.90)	0.27 (3.87)	0.26 (3.73)	0.24 (3.40)	0.26 (3.82)
PREM			-0.05 (0.57)				-0.04 (0.4)								-0.05 (0.52)
WAGE SURPLUS GROSS OUTPUT				0.06 (0.13)				-0.11 (0.16)					-0.28 (0.49)		
WAGE SURPLUS NET OUTPUT				-0.43 (1.90)	-0.41 (1.83)					-0.74 (2.48)	-0.75 (2.55)			-0.51 (1.81)	-0.51 (2.05)
PLANT					0.04 (0.50)										
CAPITAL					-0.71 (2.5)					-1.4 (1.95)					
N	103	103	103	103	103	103	103	103	103	103	103	89	89	89	89
R ²	0.086	0.096	0.100	0.129	0.178	0.050	0.050	0.049	0.049	0.105	0.151	0.190	0.192	0.220	0.192
F	0.059	0.069	0.063	0.060	0.127	0.020	0.012	0.011	0.069	0.098	0.161	0.154	0.183	0.183	0.154
FCM	0.185					0.192									0.193

TABLE 4.9.3 THE DETERMINATION OF PRICE-COST MARGINS (PCM3)

The results of OLS regression with PCM3 as the dependent variable; t-statistic in brackets. PCM3 = (P+F+S)/Net Output.

	1975a	1975b	1975c	1975d	1975e	1975f	1979b	1979c	1979d	1979e	1979f	1982b	1982d	1982e	1982c
CONC1	1.28 (2.57)														
CONC	0.76 (1.90)	0.79 (4.50)	0.74 (1.84)	0.62 (1.60)	0.74 (1.91)	1.08 (2.21)	0.88 (2.13)	0.88 (2.13)	0.55 (1.34)	0.71 (1.79)	0.65 (1.27)	0.77 (1.77)	0.80 (1.91)	0.92 (2.19)	0.75 (1.68)
AD	0.75 (4.74)	0.79 (5.0)	0.79 (4.9)	0.73 (4.7)	0.75 (4.9)	0.76 (4.7)	0.66 (4.32)	0.66 (4.33)	0.56 (3.76)	0.58 (3.97)	0.56 (3.52)	0.42 (3.35)	0.34 (2.71)	0.34 (2.78)	0.42 (3.30)
GROWTH	0.28 (1.42)	0.27 (1.36)	0.23 (1.12)	0.37 (1.91)	0.38 (1.93)	0.36 (1.79)	0.34 (1.94)	0.33 (1.90)	0.32 (1.92)	0.31 (1.88)	0.31 (1.85)	0.48 (5.59)	0.45 (5.29)	0.43 (5.01)	0.49 (5.56)
PREM			0.10 (0.69)					0.12 (0.81)							0.02 (0.19)
WAGE SURPLUS GROSS OUTPUT				-2.18 (2.81)					-2.93 (3.14)				-1.71 (2.44)		
WAGE SURPLUS NET OUTPUT					-0.99 (2.69)	-0.90 (2.39)				-1.39 (3.22)	-1.40 (3.18)			-0.92 (2.68)	
PLANT						-0.13 (1.0)					-0.003 (0.02)				
CAPITAL						-0.37 (0.71)					0.36 (0.33)				
N	103	103	103	103	103	103	103	103	103	103	103	89	89	89	89
R ²	0.280	0.258	0.262	0.314	0.310	0.319	0.229	0.234	0.229	0.302	0.303	0.373	0.414	0.422	0.373
R ²	0.258	0.236	0.232	0.286	0.281	0.276	0.205	0.202	0.271	0.274	0.259	0.351	0.387	0.395	0.343
PCM	0.614						0.630					0.639			

TABLE 4.9.4 THE DETERMINATION OF PRICE-COST MARGINS (PCMA)

The results of OLS regression with PCMA as the dependent variable; t-statistics in brackets. PCMA = (P-F)/Net Output.

	1975a	1975b	1975c	1975d	1975e	1975f	1979b	1979c	1979d	1979e	1979f	1982b	1982d	1982e	1982c
CONCL	0.77 (1.40)														
CONC	0.63 (1.44)	0.61 (1.38)	0.48 (1.12)	0.61 (1.43)	1.39 (2.64)	0.59 (1.16)	0.59 (1.17)	0.20 (0.40)	0.39 (0.80)	0.77 (1.22)	0.61 (1.19)	0.68 (1.47)	0.92 (2.02)	0.85 (1.65)	
AD	0.92 (5.23)	0.94 (5.41)	0.93 (5.30)	0.87 (5.29)	0.90 (5.14)	0.81 (4.32)	0.81 (4.30)	0.69 (3.77)	0.72 (3.97)	0.71 (3.61)	0.60 (4.07)	0.44 (3.21)	0.45 (3.36)	0.54 (3.36)	
GROWTH	0.17 (0.77)	0.16 (0.73)	0.11 (0.69)	0.27 (1.28)	0.26 (1.19)	0.23 (1.09)	0.23 (1.08)	0.21 (1.04)	0.21 (1.00)	0.23 (1.09)	0.55 (5.40)	0.49 (5.18)	0.44 (4.78)	0.54 (5.35)	
PREM			0.11 (0.69)				0.04 (0.25)								-0.30 (2.11)
WAGE SURPLUS GROSS OUTPUT				-2.48 (2.93)				-3.45 (2.99)					-3.43 (4.45)		
WAGE SURPLUS NET OUTPUT				-0.98 (2.40)	-0.77 (1.89)				-1.67 (3.14)	-1.62 (3.03)				-1.84 (4.95)	
PLANT					-0.35 (2.47)					-0.17 (1.04)					
CAPITAL					-0.54 (0.95)					-0.23 (0.17)					
N	103	103	103	103	103	103	103	103	103	103	103	89	89	89	89
R ²	0.260	0.261	0.265	0.320	0.302	0.346	0.187	0.188	0.255	0.262	0.270	0.382	0.500	0.521	0.413
R ²	0.237	0.238	0.235	0.293	0.274	0.306	0.162	0.154	0.225	0.231	0.225	0.360	0.476	0.498	0.385
PCM	0.433						0.450					0.436			

TABLE 4.9.5 THE DETERMINATION OF PRICE-COST MARGINS (various samples)

YEAR	1975g	1975h	1979i	1982j	1982k
DEPENDENT VARIABLE	PCM3	PCM3	PCM3	PCM3	PCM3
CONCENTRATION	1.45 (3.31)	1.38 (3.2)	0.76 (1.70)	0.86 (2.00)	0.83 (1.62)
ADVERTISING(1)	2.0 (3.7)	1.96 (3.7)	1.4 (3.0)	0.42 (3.3)	0.44 (3.1)
GROWTH				0.47 (5.4)	0.46 (5.11)
GROWTH2		0.42 (2.2)	0.37 (2.1)		
PLANT					0.03 (0.27)
CAPITAL					-0.2 (0.30)
SURPLUS/N.OUTPUT	-0.85 (2.4)	-0.83 (2.4)			
SURPLUS2/G.OUTPUT			-0.73 (4.5)		
SALARIES/N.OUTPUT		0.13 (0.73)			
N	106	106	104	88	88
R ²			0.303	0.375	0.377
\bar{R}^2	0.184	0.200	0.275	0.353	0.339
\overline{PCM}	0.613	0.613	0.633	0.642	0.642

Notes

1. For 1975 and 1979, advertising intensity is measured relative to gross output rather than value added.

TABLE 4.9.6 DEFINITION OF VARIABLES FOR TABLE 4.9

All variables are as defined in Table 4.1, with the following additions and/or shorthands:

CONC1	=	PRODUCT CR5 /1000
CONC	=	CONCENTRATION RATIO /1000
AD	=	ADVERTISING INTENSITY
PREM	=	estimated wage premium / wage
\overline{PCM}	=	mean value of the dependent variable used in the regression
GROWTH2	=	growth rate (over previous year) in employment of operatives
SURPLUS2/G.OUTPUT	=	wage premium X employment of operatives / gross output X 100
PLANT	=	plant size / 10
CAPITAL	=	capital intensity / 10

NOTE: For specification e, 1975 and 1982, the second t-statistic reported is the heteroscedasticity consistent measure.

4.5.2 Price-cost margin regression results

$$m_1 = a.X_1 + d. \text{ (wage surplus/revenue)}$$

4.5

I report regression results for OLS estimation of equation 4.5 using various specifications of the independent variables, and using the four definitions of the price-cost margin variables, in Tables 4.9.1-5. If we examine for each year the specification labelled e which contains the ratio of wage surplus to net output as an explanatory variable, we see that the regressions have far less explanatory power (as measured by \bar{R}^2) when the denominator of the price-cost margin is measured as gross rather than as net output. Using the gross output definition, ie. PCM1 or PCM2, the explanatory power is less than 10% for every year except 1982 when it reaches 18% for PCM2. On the other hand, when revenue is defined as net output, the regressions explain between 23% and 49% of the variation in margins. The same comparison holds true for all the other specifications of the estimating equation. I take this as support for the argument put forward in the previous section that net output is a better measure for comparing revenues across industries, since it is not affected to the same extent as the gross output measure by differences in vertical integration.

Concentration

The coefficient on the concentration term comes out uniformly negative, but generally statistically insignificant at the 5% level, when margins are measured relative to gross output; but when margins are defined on net output, the effect of concentration is positive, as predicted, and significantly so in a number of specifications. This result echoes the findings of Clarke, Davies and Waterson (1984) in their

study of intra-industry margins, where they find that both the leading firms and the smaller firms have significantly higher margins in more concentrated industries, but only if margins are defined on net output. This dependence of the results on the definition of the measure of revenue is perhaps explicable at least in part by the food, drink and tobacco group of industries which buys in far more 'raw materials' than most industries (see Table 4.6), resulting in a lower than average margin on gross revenue, but a much higher than average margin on net revenue; at the same time, this group of industries has a particularly high average concentration ratio, 60% compared with the sample average of 45%; hence the dependence of the sign of the concentration coefficient on the definition of margins.

When I am able to use a measure of concentration which takes some account of product differentiation, available for 1975 only, I would expect it to increase the explanatory power of the regression. Comparing specifications 1975a and 1975b in Tables 4.9.1-4 we can see that in fact the apparent explanatory power only rises with the PCM3 definition of margins, based on net output. I take this to lend further support for preferring the net definitions of revenue.

Advertising

I would expect the effect of advertising intensity to be positive, as reported, for example, by Hart and Morgan (1977) or Comanor and Wilson (1967) both because the Dorfman-Steiner result on optimal advertising expenditure predicts a positive correlation between advertising and margins, and because advertising may have the effect of increasing product differentiation, hence lowering demand elasticities (although I note that only in the second of these two cases should advertising be treated as an independent variable). The results do indeed show a

positive relationship in almost all cases, generally significant at the 5% or 10% level. I note Hart and Morgan's (1977) concern that there may be some spurious correlation because the numerator of PCM contains advertising and market research expenditures as part of overhead costs. This might be a particular problem if advertising intensity is measured relative to the same measure of revenue as is used in the denominator of PCM. I have tried to minimise this problem by measuring advertising expenditures relative to value added.

Growth

I treat growth of demand as another proxy for price elasticity, on the assumption that demand will be relatively less elastic if demand grows faster (or, in the context of this study, if it falls more slowly). Hay and Morris (1979, p.213) claim that: "there is no theoretical agreement on this variable, apart from general agreement that it is likely to be of some importance". Comanor and Wilson (1967) find that the correlation is typically positive, as do Hart and Morgan (1977) in their survey of work in this field and in their own study. It is of course possible that the observed correlation results from the effects of profitability on growth, in which case our regressions might suffer from simultaneous equation bias. But the omission of growth from the regression, as reported in specifications 1975g and 1975h in Table 4.9.5, has a negligible effect on the estimated coefficients and t-values of the other variables; so I discount this as a serious problem in interpreting results on other variables.

Some researchers measure demand growth by growth in the value of sales. But this measure may be picking up changes in pricing, which are clearly not independent of the price-cost margin. Lacking industry level price indices, I prefer instead to proxy real industry output with the

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Some researchers measure demand growth by growth in the value of sales. But this measure may be picking up changes in pricing, which are clearly not independent of the price-cost margin. Lacking industry level price indices, I prefer instead to proxy real industry output with the

level of employment, assuming that inter-industry differences in the growth of labour productivity can be ignored.

The results in Tables 4.9.1-4 show that growth does have the expected positive impact on margins. The effect is significant at the 1% level in 1982 when demand changes are measured over the severe 1979-82 slump; in other years, when demand changes are measured over the previous year, it is significant at the 10% level only on the PCM3 measure of margins.

Barriers to entry

Hay and Morris (1979, p.209) comment that: "a criticism of all studies of concentration and profitability is that other important variables are omitted, notably barriers-to-entry variables". They seek to reconcile collusive and competitive theories of oligopolistic pricing by arguing: "concentration (is) a help to co-operation between firms, so that prices (can be) raised... But in long-run equilibrium a limit is given by the entry-limit price". Cowling's (1981) argument is that excess capacity, and the credible threat of price-war, can deter entry, so rendering conventional entry barriers irrelevant. Results in Tables 4.9.1-5 show that the inclusion of capital intensity and plant size variables (the most commonly used entry-barrier variables) has very little effect on the estimated coefficients of the other variables (compare specifications e and f for 1975 and 1979, and j and k for 1982). In all cases the estimates are within the range of one standard error, and are usually much closer. Moreover, the estimated effect of these barrier to entry variables is usually either statistically insignificant at the 10% level and/or negative, whereas the expectation is that the effect, if it exists, should be positive. Since there is so little evidence to support the claim that entry-barrier variables should be

included, I suggest that the Cowling hypothesis is supported and that it is valid to exclude these variables from the analysis. At the same time I note that this exclusion does not substantially alter the estimates of the other coefficients.

Wage Surplus

The main purpose of this study is of course to examine the impact of wage surplus on margins. Regressions of equation 4.5 are reported as specifications d and e in Tables 4.9.1-4, defining revenue as gross and net output respectively. Specification c uses the proportional wage premium directly as an explanatory variable (not weighting it by the share of wages in revenue) for purposes of comparison. The results of these regressions are summarised in Table 4.10.

The theory of bargaining which I have described does not imply that there need be any correlation between unweighted wage premia and price-cost margins. For even if workers' bargaining does erode margins, the extent of the erosion will depend not on the wage premium itself, but on the share of wage surplus (ie. the sum of all the wage premia in that industry) in revenue. So, for instance, workers in one industry may win a high wage premium; but if wages form only a small part of revenue we would expect the impact on margins to be correspondingly small.

Indeed, when the wage premium is expressed just as a fraction of the wage, this variable has a negligible and statistically insignificant partial correlation with price-cost margins.

TABLE 4.10

COEFFICIENTS ON THE WAGE PREMIUM AND ON WAGE SURPLUS IN PCM REGRESSIONS (equation 4.5)

derived from specifications c, d and e in Tables 4.9.1-4, where the other independent variables are concentration, advertising and growth.

<u>INDEPENDENT VARIABLE</u>	<u>(mean)</u>	<u>YEAR</u>	<u>Alternative definitions of price-cost margins</u>			
			<u>PCM1</u>	<u>PCM2</u>	<u>PCM3</u>	<u>PCM4</u>
<u>Wage premium / wage</u>	(0.103)	1975	-0.09	-0.05	0.10	0.11
	(0.100)	1979	-0.04	-0.04	0.12	0.04
	(0.103)	1982	0.14	-0.05	0.02	-0.30 (5%)
<u>WAGE SURPLUS/GROSS OUTPUT</u>	(0.014)	1975	0.52	0.06	-2.18 (1%)	-2.48 (1%)
	(0.012)	1979	0.47	-0.11	-2.93 (1%)	-3.45 (1%)
	(0.012)	1982	0.97	-0.28	-1.71 (5%)	-3.43 (1%)
<u>WAGE SURPLUS/NET OUTPUT</u>	(0.034)	1975	-0.50(20%)	-0.43 (5%)	-0.99 (1%)	-0.98 (1%)
	(0.031)	1979	-0.76 (5%)	-0.74 (5%)	-1.39 (1%)	-1.67 (1%)
	(0.031)	1982	-0.01	-0.51 (5%)	-0.92 (1%)	-1.84 (1%)

1% and 5% refer to level of statistical significance on t-test, using the heteroscedasticity consistent measures for (wage surplus / net output) in 1975 and 1982.

But when wage surplus is expressed as a proportion of industry revenue, the impact on price-cost margins is much larger and is statistically significant at the 5% level in 16 of the 24 specifications. Moreover, if we consider only those definitions of price-cost margins based on net output - and I have argued that there are both theoretical and empirical grounds for preferring this definition - the estimates are statistically significant at the 1% level in 11 out of the 12 specifications. In each case where the coefficient is statistically significant, the sign is negative, indicating that bargained wage premia do erode profit margins.

When the price-cost margin is defined in terms of net output (ie. PCM3 and PCM4) the appropriate measure of revenue in equation 4.5 is also net output, in which case we see that the estimated values of the coefficient d lie between -0.92 and -1.84. If we were to correct for the average rate of employers' national insurance contributions, which is an additional cost to employers of wage increases, the values of d would lie between -0.8 and -1.59. The implication is that bargained wage premia are deducted directly from profit margins and are not passed on into price rises.⁽¹⁶⁾ In terms of the analysis concerning possible bargaining over jobs, the evidence supports the hypothesis of bargaining on a vertical contract curve.

When the ratio of wage surplus to gross output is regressed on PCM3 and PCM4, the coefficients are still statistically significant and approximately twice the magnitude of the coefficients on the ratio of wage surplus to net output. This is as we might expect, given that the average ratio of gross to net output is around 2. However, this comparison does not hold when we consider the regressions which have price-cost margins relative to gross output as the dependent variable (ie. PCM1 and PCM2). For in these cases, the effect of wage surplus on margins is statistically significant only when expressed as a fraction of

net output. But even with these less preferred definitions of margins, the weight of evidence does still indicate that bargained wage premia do erode margins, even if the extent of such erosion is not so clear as in the case of net margins.

4.5.3 Comments on possible econometric problems

Heteroscedasticity consistent tests of significance

The OLS assumptions of homoscedastic error terms may be suspect in cross-section analysis, especially if industry size varies considerably with the result that the reliability of data derived from industry samples is variable. Moreover, other variables may be correlated with the variance of the error term in equation 4.5; we might speculate that the variance of margins is higher in industries with high growth rates, for instance.

OLS estimates are still unbiased even if heteroscedasticity exists, but the estimates are not necessarily efficient and the OLS t-statistics are not necessarily valid. Messer and White (1984) show that even when the exact form of heteroscedasticity is unknown, it is possible to derive a consistent estimator of the variance-covariance matrix of the OLS coefficients, by transforming the variables of the OLS regression (dividing them by the OLS residuals) and using instrumental variable estimation (with the independent variables multiplied by the errors as instruments). In Tables 4.9.1-4 I report these heteroscedasticity consistent t-values after the OLS t-values for specification e for 1975 and for 1982. Most of the t-statistics are

barely altered in the revised estimates, with the exception of the advertising measure, for which the t-statistic is reduced substantially in most cases. The important variable for this study is the wage surplus variable, and we find that the t-statistics are affected only slightly and in most cases are revised upwards. So I conclude that the inferences based on other OLS t-statistics are not likely to be substantially affected by heteroscedasticity. (I assume that the 1979 results behave similarly to the 1975 results, since both samples are based on SIC 1968.)

Simultaneous equation bias

It is possible that the estimated coefficient on the wage surplus variable, measuring its effect on margins, is biased by a simultaneous influence of the price-cost margin on wages. However, I have argued that wages are bargained in relation to surplus or profit levels rather than margins. (In order to estimate the relationships simultaneously, we would have to make assumptions about industry cost and revenue functions which would allow us to relate profit levels to margins; since, for example, profit margins might be high in an industry, but if fixed costs are high relative to the level of output, profits might be low.) Indeed, we see from specification c in Tables 4.9.1-4 (summarised in Table 4.10) that the partial correlations between margins and wage premia are of variable sign and statistically insignificant. So I conclude that any simultaneous equation bias is not likely to be substantial.

Hart and Morgan (1977) refer to the related problem of spurious correlation when explanatory variables are defined as ratios which are related through identities to the independent variable. This could be a problem in the regressions of PCM3, for when salaries are treated as fixed costs the price-cost margin is equal to unity minus the ratio of wages plus national insurance to revenue. When wage surplus is related to the same measure of revenue, there is a possibility that it is related

to the dependent variable through an identity. To give an extreme example, if the wage premium was the same in every industry - so that wage surplus was fixed at the average level of 10% of wages - and if the national insurance rate is, say, 15%, then we would be estimating the following equation:

$$\frac{\text{net output}}{\text{revenue}} - (1.15 \times \text{Wages/Revenue}) = a.X + d.(0.1 \times \text{Wages/Revenue})$$

in which case we would expect to find an almost perfect correlation with an estimated coefficient $d = -11.5$, especially when revenue is defined as net output.

In fact, of course, the wage premium varies considerably across industries, so the correlation between wage surplus and wages is weak. Indeed, the actual estimates of the coefficient d are around -1 rather than -11 . If we use the gross definition of revenue in relation to wage surplus when the margin is measured relative to net revenue, and vice versa, we find that the estimated t -values are usually as high or even higher as when the same definitions are used on each side of the equation - whilst if we were picking up bias due to an identity we would expect the reverse to hold. In Table 4.9.5 I report a further check on the 1979 data by calculating the industry wage surplus without any direct reference to the industry wage bill, and express it as a fraction of gross output whilst the price-cost margin is relative to net output. But the estimated coefficient is again negative and highly significant. So I find little evidence of spurious correlation.

4.5.4 Alternative explanations of the erosion of price-cost margins

I have argued that the evidence that wage surplus erodes price-cost margins supports the hypothesis that workers bargain over jobs as well as wages. But another explanation of the empirical results could be simply that prices adjust slowly to wage rises, so that at any one time margins will tend to be lower in those industries where workers have recently won relatively large wage rises. Indeed, this argument is supported by Sawyer's (1983, p.72) evidence that UK manufacturing prices respond to cost changes with a lag which is usually 2 to 4 quarters. It is, however, difficult to explain Sawyer's accompanying evidence that rises in labour costs (rather than fuel, materials, components, etc) are, on average, not passed on into prices at all. A suggested hypothesis is that pricing anticipates wage rises in advance, rather than responding after the event, with employers' responding to the state of bargaining in progress. If this were so, we might expect wage growth to be positively rather than negatively correlated with price-cost margins. In any case, any effect of wage growth on margins, positive or negative, does not directly explain the observed effect on margins of wage surplus, which is a measure of wage levels rather than wage growth.

Nevertheless, I do test for the effect of wage growth on margins to see if it provides an alternative explanation for the erosion of profit margins. The underlying hypothesis is that employers set prices on the assumption that they will have to concede the average nominal pay rise for that year - in which case any wage rise above the average will erode margins. I define a variable which is unanticipated wage growth weighted by the share of wages in revenue, giving a measure of the proportion of revenue which has to meet the unanticipated rise in total industry wage costs - a concept which corresponds to my definition of the share of wage surplus in revenue. If this measure of the unanticipated

wage bill is not passed on into price rises, we would expect a coefficient of -1 in the regression.

Results of OLS regressions, incorporating either wage growth or unanticipated wages as a proportion of revenue, are shown in Table 4.11. Wage growth is positively correlated with the various measures of price-cost margins, but when weighted by the share of wages in net output, the t-statistics all drop, so that only two are significant at the 10% level, and in all cases but one the coefficients are positive. The observed positive correlations between margins and both measures of wage growth might be the result either of some reverse causation (if high profit margins encourage workers to press for higher wage rises) or else if employers raise prices in anticipation of future wage rises. In any case, there is no evidence here that wage growth erodes profit margins. (Nor is there any evidence that the use of the ratio of wages to net output as weights leads to any spurious correlation, c.f. the discussion in the previous section).

I conclude therefore that it is the bargaining of high wage levels rather than high wage growth which has the potential to erode profit margins. I have put forward the hypothesis that this is the result of bargaining over jobs, but my expectation has not been confirmed that this effect would have diminished or evaporated altogether by 1982 when workers were suffering record job losses and unprecedented (post-war) attacks on union organisation and morale (for I have argued that the ability to bargain over jobs is likely to be a sign of workers' strength).

The other hypothesis which might explain the vulnerability of margins to high wage premia is the threat of foreign competition (as discussed in section 2.3). However, in this case we should expect margins to be eroded as much by the level of the alternative wage as by

the level of the wage premium and we should expect other domestic cost rises (of materials, components, etc.) to erode margins as well. To the extent that foreign competition does inhibit domestic pricing, the impact of high wages should be the same as the impact of high levels of other costs. Unfortunately, I have not had available the detailed price data on domestic costs and foreign prices which would enable a direct test of this hypothesis. However, I have previously noted the time-series evidence that UK manufacturing non-labour cost changes are generally marked-up in full, evidence which discounts the foreign competition thesis.

TABLE 4.11

THE EFFECTS OF (UNANTICIPATED) WAGE RISES ON PRICE-COST MARGINS

Reporting the estimated coefficients (t-statistics in brackets) of OLS regression of wage growth variables on price-cost margins; the other explanatory variables (not reported here) are concentration, advertising intensity and growth of demand. The samples are 103 industries.

<u>EXPLANATORY VARIABLE</u>	<u>(YEAR)</u>	<u>DEFINITION OF DEPENDENT VARIABLE</u>			
		<u>PCM1</u>	<u>PCM2</u>	<u>PCM3</u>	<u>PCMA</u>
Wage Rise	1975	-0.12 (0.72)		0.27 (1.36)	
Wage Rise	1979	0.38 (2.30)	0.39 (2.97)	0.60 (3.11)	0.71 (3.00)
Wages rise/revenue	1975	-0.25 (0.52)		0.64 (1.11)	
Wages rise/revenue	1979	0.67 (1.09)	0.77 (1.58)	1.39 (1.94)	1.78 (2.02)

Wage rise = 1975 hourly earnings / 1974 hourly earnings - 1.253
 = 1979 hourly earnings / 1978 hourly earnings - 1.174

Wages rise/revenue = (wage rise) X (wages / net output)

4.6 The Determinants of Bargaining Power

In section 4.4 I investigated the explanatory power of a number of bargaining variables in wage equations, finding that the results were mostly statistically significant and theoretically plausible for 1979 and 1983, but not satisfactory for 1975. These estimations were based on equation 4.11 which requires special assumptions about bargaining, in particular that it does not allow industry profits to be driven to zero. In this section I use the measures of wage surplus derived in section 4.4, express them as a ratio of total industry surplus, and use this index of workers' bargaining strength to investigate directly the bargaining estimating equation 4.10. The specification is necessarily fairly ad hoc, though I have discussed in section 4.3.2 the likely effects of the bargaining variables.(17)

Results of OLS regressions are reported in Table 4.12. In each year there are a few industries with exceptionally low or negative profits which result in a few very wide outliers for the dependent variable. (This is one reason why estimating the effect of bargaining through the wage equation may in fact be preferable, despite its other limitations.) Since industries cannot survive in the long run if they earn very low or negative gross profits (before payment of interest etc.) I assume that such industries are subject to short-term disturbances which have not been taken into account in wage-bargaining. So I exclude these industries from most of the samples, as well as excluding the oil industry in 1975 (when it had just been subject to extreme price changes) and excluding the nationalised steel and shipbuilding industries which are not subject to the same profit constraints.

TABLE 4.12

THE DETERMINANTS OF WORKERS' BARGAINING POWER

Reporting coefficients from OLS regression on workers' share of surplus (= wage surplus / profits + wage surplus). t-statistics in brackets (second set of t-statistics are the heteroscedasticity consistent values).

	1975a	1975b	1975c	1979a	1979b	1982a
CAPITAL INTENSITY	-0.08 (0.40) (0.48)			-0.079 (1.85)		-0.16 (2.90)
UNION COVERAGE	0.12 (1.64) (1.51)	0.15 (2.60)	0.15 (2.55)	0.001 (0)		
UNEMPLOYMENT RATE	-0.40 (0.99) (1.21)		-0.60 (1.66)	-0.36 (1.26)	-0.47 (1.73)	-0.27 (1.23)
CONCENTRATION (/1000)	-0.93 (2.45) (2.71)	-0.97 (2.72)	-0.92 (2.56)	-1.03 (2.42)		
FEMALE RATIO	-0.04 (0.75) (0.74)			-0.16 (3.10)	-0.14 (3.30)	-0.37 (5.88)
STAFF RATIO	-0.065 (1.85) (1.78)	-0.063 (1.90)	-0.042 (1.28)	-0.14 (4.03)	-0.13 (4.17)	-0.09 (2.15)
PLANT SIZE	0.025 (2.27) (2.41)	0.025 (2.38)	0.024 (2.23)	0.025 (2.45)	0.012 (1.46)	0.035 (3.41)
INVESTMENT RATIO					-0.25 (3.16)	
GROWTH	0.21 (1.21) (1.24)	0.33 (2.17)		-0.11 (0.85)		-0.28 (2.98)
<hr/>						
N	100	100	100	103	104	86
R ²	0.196	0.184	0.167	0.263	0.230	0.436
\bar{R}^2	0.125	0.141	0.123	0.200	0.190	0.394

Notes

1. INVESTMENT RATIO = net investment (1978 + 1979) / value added (1979)
2. 1975 sample excludes the oil, steel, shipbuilding, photo, vehicles, cans industries.
1979 sample excludes steel and photo industries (and shipbuilding in 1979a).
1981 sample excludes steel, fibres, clocks, shipbuilding, cycles industries.

Capital intensity has the expected negative coefficient in each year (though it is statistically insignificant in 1975) representing the minimum profit constraint. Union coverage has a positive coefficient in 1975, but is zero in 1979 (data is not available for 1982). The unemployment rate attracts the expected negative coefficient in each year, though it is barely significant at the 10% level in 1975 and 1979, and only when industry growth is dropped (an indication of collinearity). Industry growth is positively correlated with workers' bargaining strength in 1975, but negatively correlated in 1979 and 1982. I would expect growth in industry demand and employment to boost workers' bargaining strength, but at the same time there may be some reverse causation if workers' strength tends to reduce industry growth rates. Of course the 1982 figures cover a period when manufacturing as a whole had been plunged into deep recession, so 'high growth' usually means only less rapid decline.

The coefficients on industry concentration and on the proportion of women employees attract negative coefficients consistently, as does the ratio of non-manual to manual staff. I have argued previously that non-manual staff will tend to pre-empt some share of industry surplus, and that women workers may tend to be less strongly organised, so explaining these negative coefficients, while industry concentration might increase the bargaining power of both employers and workers. Plant size has a consistently positive coefficient, supporting the hypothesis that workers gain strength from economies of scale in organisation and solidarity.

This analysis of the bargaining equation is generally consistent with the results of the wage equation reported in section 4.3.2 (see Table 4.4) which included bargaining variables weighted by profits per worker.

Taking these results together, I conclude that workers' bargaining strength relative to employers' is a positive function of plant size, and

a negative function of the unemployment rate, the proportion of women workers in the workforce, and the ratio of non-manual to manual workers. The effects of union coverage, demand growth and concentration appear to be less conclusive or even ambiguous. The employers' minimum profit constraint does appear to be positively related to capital intensity.

Of particular interest is the evidence that the unemployment rate in an industry does erode workers' bargaining strength. The size of the coefficients in the bargaining equations (Table 4.12) indicates that a one percentage point rise in the unemployment rate will reduce workers' share of surplus in that industry by between a quarter and 0.6 percentage points. Since industry surplus, for manufacturing as a whole, is roughly equal to the total wage bill in any year we can see that the effect on wages will be of the same order of magnitude for the average industry. If we look to the wage equations in Table 4.4 we can compare the estimated effect of a 1% point rise in unemployment on wages, deriving our estimates from both the 'standard' wage equation (specification b) and from the bargaining wage equation (specification c), in the latter case multiplying the coefficients by average profits per worker. These estimates of the effect of unemployment are presented in Table 4.13. It is interesting to compare these estimates with those derived by Layard and Nickell (1985) in the very different context of their time series analysis of aggregate employment and wages in the UK over the period 1954-83. Their 3-equation model contains a real wage equation where they estimate the elasticity of the real wage of male manual workers with respect to the unemployment rate to be -0.07. So, taking the average unemployment rate in manufacturing for each year, we can estimate the effect that Layard and Nickell predict for a 1% point rise in unemployment. Their specification imposes a constant elasticity, so the effect that they predict necessarily declines as unemployment rises.

TABLE 4.13

THE EFFECT OF UNEMPLOYMENT ON WAGES

Estimates of the percentage change in the wage resulting from a rise in the unemployment rate of one percentage point.

<u>YEAR</u>	<u>'STANDARD' WAGE EQUATION</u> ¹	<u>BARGAINING WAGE EQUATION</u> ²	<u>BARGAINING MODEL</u> ³	<u>LAYARD AND NICKELL</u> ⁴
1975	- 0.8 %	- 0.4 %	- 0.5 %	- 1.4 %
1979	- 0.1 %	- 0.4 %	- 0.4 %	- 1.0 %
1982	- 0.5 %	- 0.3 %	- 0.3 %	- 0.4 %

Notes

1. From Table 4.4, specification b.
2. From Table 4.4, specification c.
3. From Table 4.12, taking the average of the coefficients for each year.
4. From Layard and Nickell (1985) p.75, Table 4, model no. 1, non-linear 3SLS estimate of the elasticity of the real wage with respect to the unemployment rate; using the average unemployment rate of the sample of industries as the baseline for each year.

My cross-sectional estimates of the impact of unemployment are very similar to Layard and Nickell's estimate for 1982, (and are lower for the earlier years). Taking the average of the 1982 estimates we can see that the rise in the average rate of unemployment in manufacturing industries from 7% in 1979 to 15% in 1982 will have reduced the bargained wage by some 3.2%.

Of course, real wages will be reduced in aggregate only if the changes in the bargained wage premia are not reflected in price movements. But that is precisely the implication of the results of section 4.5's

analysis of the impact of wage premia on price-cost margins; a rise or fall in the premium reduces or increases margins and, by implication, does not change price. Indeed, we have seen (Table 1.3) that between 1979 and 1982 the wages of male manual workers in manufacturing fell behind the growth of wages for all adults (including non-manuals) by 4.7%. It does appear that the rise of mass unemployment has played a considerable role in holding down manual workers' real wages and redistributing income in favour of employers.

4.7 Summary

The bargaining model described in chapter three predicts that oligopoly price-cost margins will be eroded by high wages only inasmuch as wages exceed the alternative wage that workers could earn elsewhere and to the extent that jobs are important in bargaining. For if bargaining covers only the wage, employers are free to mark-up wage costs in the same way as any other costs. This chapter reports an econometric cross-section study of the determination of UK manufacturing price-cost margins at the 3-digit industry level in 1975, 1979 and 1982, testing specifically for the effect of wage premia on margins.

The study follows generally accepted specifications of the performance-structure relationship, reporting alternative specifications where there is disagreement or uncertainty in the literature. In particular, I highlight the disagreement over whether to classify non-manual salaries as fixed overhead costs or as variable costs and whether to measure margins in relation to gross or net revenues. I investigate these questions and suggest preferred specifications, while noting that the issues are not fully resolved. When a measure of bargained wage premia is included in the price-cost margin regression it improves significantly the explanatory power of the preferred specifications. The point estimates indicate that wage premia are not marked up into price, rather that they have the effect of reducing margins. The evidence is consistent with the hypothesis of efficient bargaining over jobs and wages between profit-maximising employers and rent-maximising unions. However, the prediction that bargaining over jobs would be less prevalent in 1982, when workers' bargaining position is predicted to be very weak, is not confirmed. The evidence does reject the hypothesis of slow adjustment of pricing in response to unexpectedly high wage increases, but is not able to distinguish the job-bargaining

hypothesis from the hypothesis that margins are restrained by foreign competition.

Prior estimation of the magnitude of industry wage premia is required in order to assess the impact of the premia on margins. The method of estimation used here is to correct observed inter-industry wage differentials for those factors - skill, location, etc. - which are hypothesised to affect the alternative wage, then to identify a group of industries paying no more than the alternative wage and to attribute the residual inter-industry wage differentials to bargaining.

Having estimated wage premia it is then possible to construct measures of the division of surplus between wages and profits in each industry and to investigate what are necessarily adhoc and exploratory specifications of the determination of bargaining power. A reduced form equation which estimates the determination of bargaining power without using the prior estimates of wage premia confirms the general results of the bargaining equation and suggests that the estimation of wage premia was not biased substantially. The pertinent result from the various bargaining regressions is that unemployment has a consistently negative effect on workers' bargaining strength - though the statistical significance is usually weak. The estimates suggest that unemployment has played a considerable part in causing the redistribution of income described in Chapter 1. Bargaining power is also found to be related to plant size and workforce composition.

CHAPTER 5

IMPORT COMPETITION AND MANUFACTURING INDUSTRY MARGINS

5.1 INTRODUCTION

The primary hypothesis to be examined here is that the pressure of foreign imports on domestic industry will be competitive, forcing domestic producers to lower their margins below the level which their domestic oligopoly position would otherwise allow. This is the view of, for instance, Geroski (1982), Utton and Morgan (1983), Turner (1980), Glyn and Sutcliffe (1972) and Khalizadeh-Shirazi (1974), although these authors tend to assume that imports will be competitive rather than argue the case why importers should not be collusive partners in domestic oligopolies.

Some authors have presented the import competition hypothesis formally. For instance, Jacquemin (1982) argues that an infinitely elastic supply of foreign goods will limit the price which a domestic monopolist would wish to set (unless domestic costs are much lower than world prices). A different example which also argues for the import competition hypothesis is presented by Lyons (1981) who deals with the foreign sector in a model of conjectural variation equilibrium. He concludes that domestic margins will be reduced by the degree of substitutability between domestically and foreign produced goods and will also be reduced in line with the conjectured elasticity of imports with respect to home output. However, he assumes that foreign supply will react competitively rather than collusively (i.e. he assumes that

the foreign supply conjectural variation parameter is non-positive). He does not consider the case where importers join in the rivalrous collusion of the domestic oligopolists.

Should foreign supply react collusively to changes in domestic output, it is no longer obvious that imports should depress oligopoly margins. Rather, we should extend our definition of the oligopoly group to include both domestic and foreign, or transnational, producers. Most models of conjectural variation equilibrium do, however, imply that the firm with lowest costs will gain the highest market share and have the highest profit margins - see for instance result 3.15 or Table 3.1 summarising the effects of changes in costs in a simple duopoly model. In this model, if one firm is regarded as the domestic producer, its profit margin will be seen to be inversely related to the market share of the rival (importer), reflecting relative cost competitiveness. So, even in international oligopoly we should expect to observe that an increase in import penetration is correlated with lowered domestic margins, even though foreign producers' margins rise and the aggregate profit margin of the international oligopoly group may be constant. In such a case, I describe the imports as rivalrous rather than competitive. However, it may be difficult to distinguish empirically between competitive and rivalrous imports if we cannot observe how the margins of importers behave - for in either case we expect to observe a negative correlation between domestic margins and import penetration.

On the other hand, Jones et al (1973) and Cowling (1982) argue in the context of the Canadian and UK economies respectively that imports may actually increase domestic margins if the imports are controlled by domestic producers. Imports may comprise component parts for assembly or finished products, and in either case may be imported and then resold by a member of the domestic oligopoly. We can again expect that import shares will be positively related to the cost advantage of foreign producers, but in this case the consequent profits may be realised by domestic rather than foreign firms if the imports are priced at cost rather than at domestic market prices. In particular, a transnational producer will be able to choose where to realise profits through control of internal transfer pricing. For instance, Cowling (1982) notes that Ford is the leading importer into the UK car market and is also the dominant domestic firm. If Ford chooses to import at continental cost (which is presumably lower than UK cost) then Ford's UK profit margins will be positively related to the level of imports. As the leading UK producer, a rise in Ford's market share will tend to increase concentration in the industry and therefore to increase the aggregate industry profit margin as well as Ford's own profit margin. (This argument is made by Sugden, 1983a.)

On theoretical grounds alone, then, our expectation of the impact of imports on domestic margins is ambiguous. We need to distinguish between the three categories of imports discussed above : first, those which are truly competitive, where the foreign supply is a function of market price alone (the case which is often assumed to apply); second, the case where importers act in rivalrous collusion with domestic

producers, each expecting the other's supply to be dependent on their own supply; and third, the case where imports are controlled by leading domestic producers. In the case of competitive imports, we can expect the industry profit margins to be lowered by import competition. In the case of rivalrous oligopoly imports we can expect that aggregate oligopoly margins may be independent of import shares, but that domestic margins will tend to be negatively correlated with imports. In the third case, where imports are controlled by leading producers, domestic margins might be either positively or negatively correlated with import penetration in the industry. (The potential importance of this last category of imports is highlighted by the finding of Helleiner and Lavergne (1979) that some 48% of imports into the US in 1977 were either intra-firm transactions or transactions between related parties.) In order to distinguish between these three categories of imports, we would need data on the ownership and control of imports in each industry and data on foreign supply decisions. Lacking such data, we have to remain agnostic with regard to the relationship which we should expect to observe between imports and domestic profit margins. The inability of most researchers to distinguish between competitive and other imports may account to some extent for the very mixed bag of results reported in the literature, where imports are found to be sometimes positively and sometimes negatively correlated with domestic margins, and where the relationships are often found to be statistically insignificant.

A preliminary question which has to be clarified for empirical investigation is how best to measure import pressure. Marvel (1980), Jones et al. (1973,1977), Lyons (1981) and Murfin and Cowling (1981) use various measures of the share of imports in home sales, or the ratio of imports to home production. Coutts et al. (1978) use both a measure of import penetration and an index of the relative price of competing imports (inclusive of border taxes). A different measure again is used by Turner (1980) who argues that it is the elasticity of import supply (with respect to domestic prices), rather than import levels, which constrains home pricing. He constructs a proxy measure for import supply elasticity by assuming that the import supply curve is moving down at a uniform rate over time and that domestic producers have a well-defined supply curve (he does not consider oligopoly behaviour). He deduces that the change in import shares over time will be superior as a proxy for the elasticity of import supply to the more usual measure of the level of imports. (However, even given his restrictive assumptions, the rate of change of import shares may be measuring domestic supply elasticities as much as it measures the elasticity of foreign supply.)

5.2 PREVIOUS RESULTS

Both Marvel (1980) and Jones et al. (1973,1977) find that import levels have a negative impact on US price-cost margins in their cross-section studies which use data from the mid-sixties. However, Jones et al. (1973,1977) report a contrary result for Canada where they find that import levels are statistically significant in explaining margins only in producer goods industries, where the effect

is positive.

UK studies also show varying results. Both Coutts et al. (1978) and Murfin and Cowling (1981) analyse time series of industrial pricing from the 1950s to early 1970s and find no significant impact of import penetration; nor do Coutts et al. (1978) find any significant effect of relative import prices except in the clothing industry where the impact of foreign price competition is found to raise rather than to lower domestic prices. Khalizadeh-Shirazi (1974) finds the effect of import penetration on margins to be negative, but the statistical significance of this finding is dubious. On the other hand, both Geroski's (1982) and Lyons' (1981) studies of UK manufacturing in 1968 find import levels to be a significant factor in lowering margins. Turner (1980) analyses the performance of 32 UK manufacturing industries between 1974 and 1976, finding that import competition has a statistically significant depressant effect on margins only if competition is measured by changes in import shares (rather than by import shares themselves), and then only in concentrated industries.

The various contradictory results from these studies appear to reflect the uncertainty of the theoretical predictions concerning the relationship between imports and margins. However, a serious methodological flaw in most of these studies may account in part for the lack of consistency in the results. If we consider the various models which seek to explain the impact of imports on margins it is apparent that we can expect domestic pricing to have a simultaneous

effect on the measure of foreign competition. For instance, if imports are supplied competitively along an upward sloping supply curve, we can expect that higher domestic prices will tend to attract higher import levels and/or prices as importers are attracted by the higher profits to be made. If the relationship between margins and imports is indeed simultaneous, than any estimates which treat the relationship as uni-directional are likely to be both biased and inconsistent.

The problem of simultaneous equation bias has been dealt with to some extent in Marvel's (1980) study of US profitability and trade flows. Using instrumental variable estimation techniques on cross-section data for US manufacturing in 1967, he finds that at the same time as import shares are increased by higher concentration and by higher profits, the effect of import shares is to depress the rate of return in concentrated industries. Marvel explains variations in the level of import penetration across industries by variations in domestic margins and by a number of variables attempting to capture the sources of comparative advantage in trade. These variables include the capital-output ratio and the ratio of research and development employment to total employment. He also uses the concentration ratio to capture long-term influences on the stimulus to import. Geroski (1982) also uses simultaneous techniques in his study of UK data for 1968 (his study differs from that presented here in that he uses levels for his dependent variables rather than their rate of change, which latter measure I argue to be preferable).

The principal conclusions I draw from the foregoing discussion of existing theoretical and empirical studies are as follows :

1. There is no very strong a priori presumption that import pressure must reduce domestic margins. Imports may indeed have the opposite effect.
2. Using import levels as a proxy measure for competitive pressure is potentially misleading because it does not distinguish between competitive imports, rivalrous imports and domestically controlled imports. Lacking data on international oligopoly structure and intra-firm trade flows, estimation is liable to omitted variable bias and to misinterpretation. One way out of this problem is to estimate the relationship between margins and imports in terms of rates of change over time rather than levels (n.b. this is different from the procedure used by Turner (1980) who regresses the level of margins on the rate of change of import shares). This approach is tantamount to making an assumption that the omitted variables (international oligopoly structure and the level of intra-firm trade) remain constant within each industry over the period in question. This is a reasonable assumption if the time period is fairly short, more plausible than the alternative assumption which has to be made if import levels are used to explain the level of margins, namely the assumption that these omitted variables are constant across industries.

3. Several investigators report that the impact of foreign competition is significant only in the more concentrated industries, a finding which is consistent with the hypothesis that imports are competitive but have an effect only on industries where domestic competitive pressures are not strong enough to prevent prices being raised above competitive levels. So it is important to test for differences between industries with high and low levels of concentration.

4. The relationship between margins and imports should be modelled as a two-way, simultaneous interaction.

5. The independent variables in the import penetration equation should capture the sources of comparative advantage (disadvantage) in trade as well as measures of profitability and domestic monopoly power.

Accordingly I estimate the following model by Iterative Three Stage Least Squares :

$$\Delta PCM_1 = a_0 + a_1 \cdot \Delta IMPORTS_1 + a_2 \cdot X_1 + u_1$$

$$\Delta IMPORTS_1 = b_0 + b_1 \cdot \Delta PCM_1 + b_2 \cdot Y_1 + u'_1$$

where X and Y are vectors of exogenous variables explaining changes in

margins and imports. The error terms are taken to be normally distributed etc. but are not necessarily independent. The sample used is of 88 manufacturing industries at the three digit level, excluding those 'miscellaneous' industries which are not clearly defined, excluding the nationalised industries of steel and shipbuilding, and excluding textile finishing (which exhibited negative profits). Most of the variables used, including the dependent variables, are expressed as the ratio or difference between levels in 1982 and 1979 (or 1980 when 1979 data is not available, as in the case of the concentration and plant size variables). This period is chosen with a view to investigating whether or not import competition has played a role in the determination of UK manufacturing margins over the recession of the early 1980s. The use of differences rather than levels is indicated by the operator D. . The variables are described in the following tables.

TABLE 5.1

VARIABLES USED TO TEST THE IMPORT COMPETITION HYPOTHESIS

PCM	price-cost margins - using the four alternative definitions as used in Chapter 4. $PCM1 = (P+F+S)/(\text{Gross output})$; $PCM2=(P+F)/(\text{Gross Output})$; $PCM3=(P+F+S)/(\text{Net output})$; $PCM4=(P+F)/(\text{Net Output})$. P is gross profits, F is overheads and S is salaries.
IMPORTS	the ratio of the value of imports to the value of domestic gross output plus imports.
IMPORT GROWTH	the change in the value of imports from the previous year, expressed as a proportion of current imports plus gross output.
IMPORTS(CONC)	IMPORTS X concentration dummy (=1 iff CR5 > 50% in 1980).
CR5	the five-firm concentration ratio by gross output.(%)
DEMAND	[industry employment]/[1 - IMPORTS] (normalised 1979=1).
WAGES(IMP)	[wages per operative (normalised, 1979=1)] X import dummy (=1 iff IMPORTS 1979 > 20%).
SKILLS	non-operative salaries as a proportion of total wages and salaries.
SKILL DUMMY	=1 iff SKILLS 1979 > 33%.
INVESTMENT	aggregate net investment 1979-82 expressed as a proportion of value added in 1982.
PLANTSIZE	average employment per establishment amongst the leading 5 enterprises (normalised 1980=1).

Sources : Census of Production ; Overseas Trade Analysed in Terms of Industries

TABLE 5.2
MEAN AND STANDARD DEVIATION OF VARIABLES

<u>VARIABLE</u>	<u>MEAN</u>	<u>S.D.</u>
D.PCM1	+0.00944	0.03856
D.PCM2	-0.00201	0.03935
D.PCM3	+0.00581	0.04548
D.PCM4	-0.01698	0.06842
D.IMPORTS	+0.02018	0.03751
D.IMPORT GROWTH	-0.01397	0.05947
D.IMPORTS(CONC)	+0.00859	0.02370
D.CR5	-1.1364	4.4313
D.DEMAND	-0.20552	0.1165
D.WAGES(IMP)	+0.17837	0.22827
D.SKILLS	+0.02911	0.02736
SKILL DUMMY	+0.39773	0.49223
INVESTMENT	+0.38471	0.19872
D.PLANTSIZE	-0.07880	0.20810

TABLE 5.3

SIMPLE CORRELATION COEFFICIENTS FOR MARGINS AND IMPORTS

	PCM1	PCM2	PCM3	PCM4
<u>1979 LEVELS</u>				
PCM2	0.8970			
PCM3	0.4311	0.5430		
PCM4	0.2304	0.5425	0.8620	
IMPORTS	-0.1867	-0.2542	-0.0994	-0.1757
<u>1982 LEVELS</u>				
PCM2	0.8969			
PCM3	0.5339	0.6451		
PCM4	0.3430	0.6412	0.8753	
IMPORTS	-0.2273	-0.3047	-0.1979	-0.2751
<u>1979-82 DIFFERENCES</u>				
PCM2	0.9510			
PCM3	0.7897	0.8112		
PCM4	0.8069	0.9143	0.9080	
IMPORTS	-0.0461	-0.1343	-0.1375	-0.2031

5.3 EXPLAINING CHANGES IN MARGINS

I use the four alternative versions of the price-cost margin variable as defined in Chapter 4 (p.4.40). These measures differ according to their treatment of fixed costs and their treatment of variations in the level of vertical integration across industries. As we are dealing here with changes in margins we might expect that the four alternative measures should be much closer to each other than when we deal with levels (if the industry ratios of salaries to wages and of material costs to net output do not change substantially over the three year period). A simple comparison can be obtained by examining the simple correlation coefficients for the four measures of margins expressed alternatively in levels and in differences - see Table 5.3. It is indeed apparent that the four measures are more closely correlated in differences than in levels : the lowest correlation coefficient in differences is 79%, whereas in levels the lowest are 23% for 1979 and 34% for 1982. So we can expect that the four measures of changes in margins will give less widely differing results than the use of levels.

I use several measures of import pressure. The first, the most commonly used in the literature, is the ratio of imports to the sum of imports and domestic production, a direct measure of import penetration. This measure is negatively correlated with price-cost margins (see Table 5.3). Secondly I construct a variable to examine whether the impact of penetration in concentrated industries is different from its impact in less concentrated industries. The

competitive import hypothesis predicts that import penetration would have a greater depressant effect on domestic margins in industries where domestic competitive forces are weaker. So the import pressure variable is multiplied by a dummy variable equal to one in industries where the 1980 concentration ratio is greater than 50% (38 out of 88 industries). Thirdly, I construct a measure of the change in import penetration from the previous year, following the suggestion of Turner (1980) that this may be a better measure of competitive pressure than levels of penetration.

Changes in the five-firm concentration ratio are expected to have a positive influence on the change in margins, proxying changes in potential domestic monopoly power. However, the three year period under investigation may be too short to pick up structural changes in oligopoly groups and the changes in concentration which did occur over this period may be too small to have had a significant effect on oligopoly behaviour. Indeed, the changes in the concentration ratio are distributed around a mean fall of 1 percentage point with a standard deviation of only 4 percentage points; the deviation from the mean exceeds 6 percentage points only in 4 industries. These changes in concentration are very small compared with the dispersion of levels of concentration (a standard deviation of 24 percentage points around a mean of 44%). If there is a threshold below which small fluctuations in concentration do not affect margins, we may find that our analysis of changes in margins and changes in concentration over this period may not pick up any systematic relationship.

The growth of demand is included as an explanatory variable to account for differences across industries in the severity of the recession of the early 1980s. I have argued that demand growth is better proxied by changes in total employment (assuming a constant rate of productivity growth across industries) than the more usual measure of changes in the value of sales, since this latter measure incorporates the changes in relative prices which we are seeking to explain. Here I correct also for import penetration to get a measure of changes in total demand met from both foreign and domestic sources. I assume that the changes in real sales which are proxied by this measure are dominated by demand conditions rather than by supply conditions, a reasonable assumption in the context of this very deep recession which saw demand (as measured) drop by an average of 20% in three years. (While domestic employment fell some 23% on average, import penetration rose from an average of 19% to 21%.) Only in four industries (specialised chemicals, metal doors and windows, fish processing, and jewellery) did demand actually rise over the recession.

Finally, I examine the impact of wage growth on margins in those industries which were facing a high level of import penetration. The import competition hypothesis predicts that in such industries employers will be unable to pass on high wage rises, which will therefore be seen to erode profit margins. This hypothesis is an alternative to the hypothesis advanced in Chapter 4 that it is job-bargaining which restrains employers from passing on high wages into higher prices.

5.4 EXPLAINING CHANGES IN IMPORT PENETRATION

The effect we are most interested in is the interrelationship of margins and import penetration. We would expect rising domestic prices (occasioned by rising domestic margins) to attract greater import penetration if imports are competitive. On the other hand if domestic margins rise in response to an increase in domestic cost competitiveness, we might expect import penetration to decline. The observed negative values of the simple correlation coefficients between margins and imports (Table 5.3) are of course a compound of the simultaneous relationships which the following estimation procedures will attempt to disentangle.

Following Marvel (1980) I have controlled for changes in the sources of comparative advantage (or disadvantage) in trade by including as explanatory variables: the level of investment over the period (capturing relative capital intensity); both the growth of technical and administrative skills and the level of such skills; and the growth of plant size of the leading domestic producers (capturing either changes in capacity utilisation or potential scale economies / diseconomies). To the extent that capital investment and such skills and plant size are sources of comparative advantage (disadvantage) for UK producers, we would expect these variables to have a negative (positive) impact on import penetration.

Finally, I have also followed Marvel's example by including as an explanatory variable the change in domestic concentration. Marvel argues that while current domestic profits provide a short-term incentive for importers, concentration (as a proxy for domestic monopoly power) will provide a longer-term incentive to import. However, it might also be the case that a rise in concentration would better enable domestic producers to effectively collude to repel foreign competition. For instance, Utton and Morgan (1983,p.91) report a tendency for high concentration industries in the UK over the period 1963-75 to experience lower import growth if they are capital-intensive, but to experience relatively high import growth if they are labour intensive. So we must conclude that the expected impact of the concentration change on the the change in import penetration is indeterminate, and also note the preceeding argument that the changes in concentration which did occur over this period may be too small to have had a systematic impact.

5.5 ESTIMATION RESULTS

I first estimate the determination of changes in margins and changes in import penetration by single equation OLS - a procedure used by many of the studies reported earlier. The results are summarised in Table 5.4. Specification a. tests for the impact of imports on margins in concentrated industries as well as for all industries. The first t-statistic reported on the IMPORTS(CONC) variable tests the null hypothesis that the coefficient for concentrated industries is the same as the coefficient for other industries; the second t-statistic reported tests the null hypothesis that the impact of imports on

margins in concentrated industries is zero. Specification b. omits the concentration dummy variable, making no distinction between the effects of imports in concentrated and in less concentrated industries. Each specification is repeated using the four different definitions of the price-cost margin.

These single equation results are of course likely to be biased since they ignore the simultaneous determination of margins and import penetration. But they are of interest in clarifying the results obtained by other researchers. In particular I note that these single equation results appear to support the import competition hypothesis. The coefficient on import penetration in the price-cost margin regression is significantly negative at the 10% level in five out of the eight specifications, although the overall effect in concentrated industries is of uncertain sign and statistically insignificant. Moreover, wage growth does appear to reduce margins in the more concentrated industries; the coefficient is negative in all 8 specifications. However, this effect is statistically significant at the 10% level in only 2 cases, and these are the specifications (PCM3 a and b) which perform least well overall, where the hypothesis that all slope coefficients are zero is not rejected at the 10% level.

TABLE 5.4

REGRESSION COEFFICIENTS FROM SINGLE-EQUATION (OLS) ESTIMATION OF THE DETERMINATION OF CHANGES IN PRICE-COST MARGINS AND IMPORT SHARES.
(t-statistics in brackets)

(Dependent independent variable [1])	PCM1		PCM2		PCM3		PCM4	
	a.	b.	a.	b.	a.	b.	a.	b.

(D.PCM)								
D.IMPORTS (X 0.1)	-1.48 (-1.19)	-0.98 (-0.88)	-2.83 (-2.24)	-2.06 (-1.83)	-3.33 (-2.21)	-2.16 (-1.60)	-6.38 (-2.85)	-4.77 (-2.39)
D.IMPORTS(CONC) (X 0.1)	1.71 (0.87,0.13)		2.64 (1.32,-0.11)		4.02 (1.69,0.32)		5.50 (1.56,-0.27)	
D.CR5 (X 0.001)	-1.12 (-1.18)	-1.26 (-1.34)	-1.26 (-1.30)	-1.47 (-1.54)	-1.38 (-1.20)	-1.71 (-1.50)	-2.21 (-1.29)	-2.66 (-1.57)
D.DEMAND (X 0.1)	1.06 (3.13)	1.06 (3.12)	1.11 (3.22)	1.10 (3.20)	0.32 (0.78)	0.32 (0.76)	1.26 (2.09)	1.26 (2.06)
D.WAGES(IMP) (X 0.01)	-2.50 (-1.43)	-2.31 (-1.33)	-1.39 (-0.78)	-1.11 (-0.63)	-4.03 (-1.91)	-3.60 (-1.70)	-2.70 (-0.86)	-2.10 (-0.67)

R ²	0.1569	0.1491	0.1703	0.1524	0.1196	0.0888	0.1446	0.1185
F [3]	3.05*	3.64**	3.37**	3.73**	2.23	2.02	2.76*	2.79*

(see over for notes)

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TABLE 5.4 (CONTINUED)

(Dependent) independent variable [1]	PCM1		PCM2		PCM3		PCM4	
	a.	b.	a.	b.	a.	b.	a.	b.
<hr/>								
(D.IMPORTS)								
D.PCM (X 0.1)	-0.96 (-0.98)		-1.18 (-1.26)		-2.10 (-2.52)		-1.01 (-1.89)	
D.CR5 (X 0.001)	-1.91 (-2.20)		-1.97 (-2.26)		-2.02 (-2.39)		-2.05 (-2.37)	
D.SKILLS (X 0.1)	4.13 (3.02)		3.83 (2.83)		5.03 (3.64)		3.77 (2.81)	
SKILLDUMMY (X 0.01)	-1.53 (-2.05)		-1.51 (-2.03)		-1.46 (-2.01)		-1.48 (-2.01)	
INVESTMENT (X 0.01)	-0.90 (-0.47)		-0.87 (-0.47)		-1.02 (-0.57)		-1.03 (-0.56)	
D.PLANTSIZE (X 0.01)	-3.23 (-1.76)		-3.15 (-1.72)		-2.71 (-1.51)		-2.87 (-1.58)	
<hr/>								
R ²	0.2541		0.2597		0.3000		0.2772	
F [3]	4.60**		4.73**		5.78**		5.17**	
<hr/>								

[1] The operator D. refers to differences in levels between 1982 and 1979 (or 1980).

[2] The second t-statistic on D.IMPORTS(CONC) tests that this coefficient plus that on D.IMPORTS sum to zero.

[3] F-test significant at 1% level ** ; at 5% level *

TABLE 5.5

REGRESSION COEFFICIENTS FROM SIMULTANEOUS ESTIMATION [1] OF THE
DETERMINATION OF CHANGES IN PRICE-COST MARGINS AND IMPORT SHARES
(t-statistics in brackets)

(Dependent) independent variable [2]	PCM1		PCM2		PCM3		PCM4	
	c.	d.	c.	d.	c.	d.	c.	d.
(D.PCM)								
D.IMPORTS (X 0.1)	2.43 (0.71)	2.62 (1.04)	-2.12 (-0.65)	-1.17 (-0.48)	3.16 (0.72)	2.54 (0.82)	-5.83 (-1.03)	-4.55 (-1.06)
D.IMPORTS(CONC) (X 0.1)	2.91 (1.08,2.93)		4.63 (1.73,1.39)		4.48 (1.25,3.26)		8.95 (1.92,0.99)	
D.CR5 (X 0.001)	0.07 (0.06)	-0.35 (-0.30)	-0.78 (-0.74)	-1.28 (-1.15)	0.34 (0.23)	-0.37 (-0.26)	-1.59 (-0.85)	-2.65 (-1.36)
D.DEMAND (X 0.1)	1.07 (3.00)	1.15 (3.29)	1.07 (3.19)	1.19 (3.49)	0.55 (1.43)	0 (0)	1.23 (2.25)	1.43 (2.39)
D.WAGES(IMP) (X 0.01)	-0.69 (-0.45)	-0.76 (-0.47)	0.07 (0.05)	0.10 (0.06)	-1.93 (-0.85)	-4.89 (-2.17)	0.52 (0.20)	-0.83 (-0.27)

(see over for notes)

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TABLE 5.5 (CONTINUED)

(Dependent) independent variable [2]	PCM1		PCM2		PCM3		PCM4	
	c.	d.	c.	d.	c.	d.	c.	d.
(D.IMPORTS)								
D.PCM (X 0.1)	3.10 (0.96)	2.11 (0.67)	5.56 (1.47)	3.13 (0.91)	1.10 (2.17)	-4.89 (-0.90)	5.26 (1.29)	1.11 (0.35)
D.CR5 (X 0.001)	-1.74 (-1.86)	-1.72 (-1.90)	-1.49 (-1.32)	-1.59 (-1.60)	-1.85 (-1.89)	-2.25 (-2.32)	-1.21 (-0.77)	-1.68 (-1.55)
D.SKILLS (X 0.1)	3.77 (2.76)	4.16 (3.01)	4.09 (2.61)	4.26 (2.93)	4.79 (1.70)	5.93 (1.94)	4.51 (2.22)	4.22 (2.80)
SKILLDUMMY (X 0.01)	-1.51 (-2.20)	-1.56 (-2.28)	-2.08 (-2.47)	-1.89 (-2.43)	-1.21 (-1.70)	-1.44 (-1.80)	-2.33 (-2.20)	-1.77 (-2.13)
INVESTMENT (X 0.01)	-1.21 (-0.63)	-0.85 (-0.44)	-0.75 (-0.33)	-0.21 (-0.10)	-1.26 (-0.65)	-1.57 (-0.70)	-1.25 (-0.41)	-0.32 (-0.13)
D.PLANTSIZE (X 0.01)	-2.17 (-1.42)	-2.63 (-1.63)	-2.97 (-1.51)	-3.34 (-1.78)	-1.27 (-0.61)	-2.54 (-1.09)	-3.16 (-1.10)	-3.43 (-1.51)
R ² [3]	0.4935 **	0.4476 **	0.2843 **	0.3166 **	0.4260 **	0.1841	0.0078	0.2419 **

[1] Estimated by iterative three-stage least squares with convergence in 3,4 or 5 iterations in all cases (convergence tolerance = 0.1).

[2] The operator D. refers to differences in levels between 1982 and 1979 (or 1980).

[3] This is the system R². Asterisks indicate that the chi-square test that all slope coefficients are equal to zero is rejected at the 1% level.

However, when we estimate the relationships between margins and imports as a simultaneous system, the results (Table 5.5) no longer support the import competition hypothesis.

There are striking differences between the single equation and system estimations of the coefficients measuring the interaction of margins and imports. These differences indicate the importance of estimating the interactions simultaneously. Whereas single equation analysis suggests that import penetration reduces margins, the simultaneous estimation finds no consistent or statistically significant impact of imports on margins.

Under the simultaneous estimation, we find that the sign of the estimated coefficient on import penetration is either positive or negative according to whether the definition of the dependent variable (margins over variable costs) treats salaries as fixed costs (PCM1&3) or as variable costs (PCM2&4). (There is a similar pattern in the single equation estimates where the coefficients are all negative, but substantially lower when salaries are treated as variable costs). These findings are compatible with the hypothesis that some part, but not all, of salaries are properly treated as overhead costs. To illustrate this point, suppose that the fixed component of salaries is S^* which is less than the full salary bill S . The PCM2 definition of margins treats all of salaries as variable costs. If we define the actual margin over variable costs to be m^* , revenue to be R , and import penetration to be I , then we can write the observed margin and its

differential with respect to imports as follows:

$$PCM2 = m^* - S^*/R$$

$$d(PCM2)/dI = dm^*/dI + (S^*/R).(1/R).(dR/dI)$$

We expect the value of (dR/dI) to be negative, as imports replace domestic revenue, so the PCM2 measure will estimate the coefficient on import penetration to be lower than its actual value (dm^*/dI) . The larger the fixed component of salaries, the larger the underestimation of the import coefficient. Equally, we might expect those measures of margins which treat salaries as fixed costs (PCM1&3) to overestimate the import coefficient to the extent that some part of salaries are actually variable costs. This hypothesis, in tandem with the hypothesis that the effect of imports on margins is actually zero, would explain the observed pattern of positive and negative coefficients. Since the coefficients are all statistically insignificant anyway, the import competition hypothesis is clearly not supported under simultaneous estimation.

Both methods of estimation find that import penetration has less of a depressant effect (or a stronger positive effect) on margins in the more concentrated industries; this differential effect is statistically significant at the 10% level in two out of the four

systems specifications. Indeed, the total impact of import penetration on margins in concentrated industries is estimated to be positive in all four of the systems specifications, and is statistically significant at the 1% level in 2 of these cases. (In tests not reported here, these effects persist if alternative cut-off points are used for the concentration dummy, e.g. at 40% or 60% instead of 50%.) There is substantial evidence here that imports are generally not competitive and that in fact they tend to bolster margins in concentrated industries - evidence which supports the hypothesis that leading producers in concentrated industries bolster their market dominance and profits by means of overseas sourcing.

If we follow the suggestion of Turner (1980) in measuring import pressure by the annual rate of growth of imports, rather than by levels, we also find that the import competition hypothesis is rejected. Table 5.6 summarises the estimated coefficients obtained by substituting the variable IMPORT GROWTH for the variable IMPORTS in both the single equation and system estimations.

TABLE 5.6
COEFFICIENTS ON THE IMPORT GROWTH VARIABLE

<u>SPECIFICATION</u>	<u>D.IMPORTGROWTH</u>	<u>D.IMPORTGROWTH(CONC)</u>
SINGLE EQUATION		
PCM1a.	0.051 (0.70)	0.111 (0.42,0.64)
2a.	0.123 (1.65)	0.034 (0.12,0.60)
3a.	0.294 (3.49)	-0.082 (-0.26,0.72)
4a.	0.438 (3.45)	-0.117 (-0.25,0.72)
SYSTEM		
PCM1c.	-0.133 (-0.39)	0.156 (0.34,0.09)
2c.	-0.016 (-0.05)	0.046 (0.10,0.12)
3c.	0.382 (1.00)	0.184 (0.43,4.12)
4c.	0.486 (0.82)	0.516 (0.69,2.81)

t-statistics in brackets; the second statistic on the second variable tests the hypothesis that the sum of the coefficients on the two variables is zero. Specifications a. and c. are as in Tables 4.4 and 4.5 .

Finally, we observe from Tables 5.4 and 5.5 that wage growth in high import industries appears to erode margins when the relationship is estimated by a single equation . The coefficient on the variable which measures wage growth in industries where import penetration is high is negative in all 8 specifications, and statistically significant at the 10% level in two specifications. But in the system estimation, the coefficient is generally much smaller, and it is positive in three specifications. It is statistically significant at the 10% level in only one specification (PCM3d) - and that is a specification which is unsatisfactory in that the hypothesis that all slope coefficients are zero is not rejected at the 5% level. (Note that choosing a different cut-off point for the import dummy variable, e.g. at 10% or 30% instead of the reported 20%, does not affect these results.) Again we are led to conclude that single equation estimation is liable to lead to a mistaken inference that imports are competitive. When the relationships between margins and imports are tested as a simultaneous interaction, there is no support for the import competition hypothesis.

While the import variables perform very differently according to whether we estimate by single equation or by systems methods, it is interesting to note that the exogenous variables perform very similarly whichever procedure is used.

The demand variable has a consistently positive impact on margins, significant at the 1% level in all specifications (except PCM3), with almost identical coefficients . It is apparent that

industries hit hardest by the recession lowered their margins in relation to other industries. (This captures, of course, only the differential effect of the recession across different industries. Despite the severity of the recession, aggregate manufacturing margins actually rose between 1979 and 1982 - see Table 1.4).

The concentration variable has an unexpected negative sign in the price-cost margin regressions when estimated as a single equation, but it is statistically insignificant even at the 10% level. In the simultaneous estimation, the coefficient is smaller or positive and shows even less statistical significance. I infer support for the hypothesis that the changes in concentration which did occur over this period were too small to have had a systematic effect on margins.

Turning to the explanation of changes in import penetration, we again find that the endogenous variable (changes in margins) performs very differently when the estimation is simultaneous compared with single equation estimation, whereas the performance of the exogenous variables varies very little.

Under single equation estimation, a rise in price-cost margins appears to discourage imports - an unexpected result. However, when we estimate the interactions simultaneously, the coefficient on changes in margins is positive in seven out of eight specifications, although significant at the 5% level in only one case.

The concentration variable has a consistently negative coefficient in the import regression under both single and system estimation, with coefficients very similar in either case and usually significant at the 5% level in the single equation estimation and at the 10% level in the system estimation. Rather than attracting imports, increases in domestic concentration appear to enable domestic oligopolies to deter imports more effectively.

In the import regressions, the coefficient on the variable measuring growth in technical and administrative skills is consistently positive and significant (at the 1% level in most specifications) in both single equation and system estimations. This indicates that those domestic industries where skills are increasing at the fastest rate are at a comparative disadvantage in trade in relation to industries where skill levels are stable. In contrast, the skill level dummy attracts a negative coefficient (significant at the 5% level in most specifications), implying that those industries which already have a high skill level are at a comparative advantage. The implication is that comparative advantage for UK manufacturing lies in the accumulated stock of older skills rather than in the acquisition of new skills. For instance, the largest growth in the skill variable is found in industry 347, manufacture of office machinery and data processing equipment, where the skill ratio grew by 15 percentage points between 1979 and 1982, presumably as the industry was forced to recruit and train staff with skills in the new technologies of communications and micro-computers. On the other hand, the various chemical industries (251-9) already had a high ratio of non-operative staff in 1979,

presumably already trained in relatively older skills. The chemical industries increased their skill ratio by only 3 percentage points between 1979 and 1982. The implication of these regression results is that the chemical industry is likely to have a comparative advantage in trade, based on older skills, in relation to computer manufacturers who are likely to be fighting a losing battle with importers in the acquisition and development of new skills.

Investment attracts negative, but statistically insignificant, coefficients in both single equation and system estimations, giving only very weak evidence of systematic comparative advantage in capital intensive industries. Growth in plant size attracts a consistently negative coefficient, statistically significant at the 10% level in 3 of the 12 specifications reported. The plant size variable measures changes in the average level of employment in the plants of an industry's leading five producers. During the recession this measure of plant size fell by an average of nearly 8% while total employment fell by an average of 22%, indicating that capacity utilisation fell in those plants which were retained at the same time as many plants were closed down. The plant size variable may well be picking up a comparative advantage for those industries where the leading producers were better able to reorganise and close down plants during the recession in order to concentrate production in their most efficient plants.

5.6 CONCLUSIONS

When the interaction between changes in domestic price-cost margins and changes in import penetration over the period 1979-82 is examined as a simultaneous relationship, there is no evidence to support the import competition hypothesis. Rather, variations in the changes in margins across industries appear to be most strongly influenced by the relative severity of the impact of the recession. The study shows that the bias inherent in the single equation estimation procedure could lend misleading support to the import competition hypothesis.

It appears then that the importing of manufactured goods into the UK has not been systematically competitive with domestic production, at least not over the period covered by this study. We may surmise that imports are in large part coming from overseas producers who act collusively rather than competitively in relation to domestic producers, behaving as trans-national oligopolies; or, alternatively, a substantial proportion of imports might be controlled by leading domestic producers. Indeed, the evidence that imports tend to actually raise rather than depress margins in concentrated industries lends support to the latter hypothesis.

There are, however, other possible interpretations of these results. It might be argued that the changes in import penetration which occurred over the period 1979-82 may have been too small to have

had a measureable impact on margins, or that the period is too short for the effects to have worked through; if this were the case, the evidence here would neither prove nor disprove the import competition hypothesis. Moreover, it might be argued that the period was unusual in that the real exchange rate reached an unprecedented peak in 1980 (see footnote 1.3 for movements in the real exchange rate vis-a-vis the US dollar).

The period 1979-82 is the longest for which industry production data is currently available on the 1980 Standard Industrial Classification, so this is the longest period over which we can study the impact of import competition on recent movements in margins and income distribution. This four-year period is not necessarily too short or unusual for significant results to emerge in cross-section analysis. Changes in the real exchange rate may have been one of the underlying factors influencing the overall upward drift in import penetration over the period, from a 1979 level (averaged across the sample) of 18.9% to a level of 20.9% in 1982. We would expect exchange rate movements to influence primarily the overall level of domestic margins, however, rather than the inter-industry differences which are studied here. Moreover, any industry-specific effects of exchange rate movements or of other factors (e.g. productivity movements relative to foreign producers) should be picked up by the measured changes in import penetration. There is indeed substantial variation in the amount by which import penetration increased (or in some cases decreased) across industries between 1979 and 1982; the sample standard deviation is some 3.75 percentage points, nearly one fifth of

the 1979 average level of import penetration. This variation in the growth of import penetration does appear to be substantial enough to have had a (potentially) measureable impact on margins - hence the apparently significant effect of import penetration reported from single-equation estimation in Table 5.4 . So the four-year time period does not appear to be too short for us to test the import competition hypothesis. Indeed, use of a much longer period would strain severely the underlying assumption that no change occurred in the unobservable variables such as the degree of intra-firm or intra-oligopoly trade.

There are two sources of delay which might affect the timing of the impact of foreign competition on domestic pricing: the lag with which foreign producers react to changes in underlying conditions of comparative advantage, and the lag with which domestic producers respond to changes in actual or threatened behaviour by foreign producers. The former lags are subsumed when we use a direct measure of import penetration to explain domestic margins. With regard to the latter, there is little work to indicate the length of time we should expect for the adjustment of oligopoly pricing to changes in either internal or external competition. Indeed, if domestic producers react in the same way, and with the same delays, as do foreign producers to changes in the underlying sources of comparative advantage, then changes in import penetration and domestic pricing would occur simultaneously. The assumption implicit in this study, and in most of the other studies to which reference is made, is that most of the adjustment takes place within the one-year data period. Even if lags are longer than one year, we might nevertheless expect that the impact

of import competition will still be picked up in this study if the measured changes in import penetration reflect longer term trends in industries' comparative advantage.

An interesting implication of this study is that where previous research has found imports to have a significant competitive effect, the results may have been biased by the use of single equation estimation which ignores the simultaneous impact of margins on import behaviour. Of course, firm conclusions cannot be drawn without further study of the earlier periods which these studies cover. Further studies should also attempt to deal with the problem of inter-industry differences in international oligopoly structure and intra-firm (or intra-oligopoly) trade, either by examining changes rather than levels of import penetration (the technique used here) or by estimating these inter-industry differences directly.

The other general conclusion which we can draw from this study is that, in the early 1980s, improvements in the comparative trade advantage of UK manufacturing appear to have occurred in the following areas : a) those industries with an established stock of skills, rather than those which are being forced to acquire new skills; b) the more concentrated industries; and c) those industries which were best able to rationalise plant utilisation over the period of the recession.

CONCLUSIONS

The empirical study reported in chapter four suggests strongly that workers' strength, as measured by their ability to push wage levels above the alternative wage, does reduce price-cost margins in UK manufacturing, thus affecting the aggregate distribution of income. There is also support for the hypothesis that unemployment plays an important role in influencing the relative bargaining strengths of workers and employers. Though the statistical significance of the unemployment effect is weak, the estimates correspond surprisingly closely to the estimates derived from other research using the very different techniques of aggregate time-series analysis. Taking the evidence of chapter four together with such time-series studies and with the evidence presented in chapter one on recent changes in UK income distribution, I find substantial support for the reserve army hypothesis. In chapter two I have emphasised that this involves two complementary hypotheses, first that unemployment undermines workers' bargaining power and secondly that the balance of bargaining strength is reflected in price-cost margins so that changes in labour strength affect, in aggregate, the division of income as well as the rate of cost and price inflation.

Unfortunately, the measure of the pressure of unemployment which I have used is not able to distinguish between the effects of the level of unemployment and its rate of change. The number of registered unemployed attributed to an industry measures the pressure of unemployment on that industry only to the extent that workers look for jobs in the industry in which they were previously employed; otherwise this measure is more

likely to be picking up the rate of loss of jobs in the industry. The important question of whether or not the reserve army effect is diminished when unemployment levels off is left unanswered. Moreover, many other factors will have affected workers' bargaining strength over the period studied (often factors which cannot be distinguished in cross-section studies) such as the political climate, industrial relations legislation and state intervention in industrial disputes. It could well be argued that these factors have been largely instrumental in the weakening of unions' bargaining position in the UK since the late 1970s, though it may also be the case that such institutional attacks on unions as have occurred have only been feasible given the contemporaneous rise of mass unemployment. A more detailed study of the reserve army effect on bargaining power should look not only at the direct and immediate effects of the level and rate of change of unemployment but also at the lagged effects of past developments which may well affect current bargaining through their embodiment in institutional, legal and political forms.

If the evidence presented in chapter four is fairly clear that manufacturing industries' price-cost margins are eroded by workers' success in bargaining up wages, the reason why this should occur is not so clear. An obvious explanation, that firms are price-takers (taking for instance the prices set competitively in world markets) is discounted by the voluminous evidence from cross-sectional studies that prices are set above marginal costs and that such margins are affected systematically by industry structure and conduct variables, and the similar evidence from time-series studies which show, in addition, that cost changes tend to be marked up in full albeit with a time lag. The hypothesis that it is the slow adjustment of prices to cost changes which affects income distribution suggests that unanticipated wage growth should erode margins. But this hypothesis fails to explain changes in

aggregate margins when inflation rates are steady, and the cross-sectional evidence presented here does not support the hypothesis when it is applied to inter-industry variations. The evidence here is that it is a high level of wages (above the alternative wage) rather than a high rate of growth of wages which erodes profit margins.

The evidence is compatible with the hypothesis that workers and employers bargain over employment as well as over wages, and I cannot reject the hypothesis of efficient bargaining between profit-maximising employers and rent-maximising unions. This last conclusion fits with the findings of recent research in the US which investigates the relationship over time between firms' profits, employment and wages. The study here reaches similar conclusions through cross-sectional analysis at the industry level. I find the hypothesis of job-bargaining plausible for the UK in 1975 and even in 1979, years when unions were both fairly strong and (presumably) concerned about the effects of unemployment both on their members and on the unions as organisations in their own right. However, the analysis (chapter three) of bargaining models suggests that when employers are particularly strong they should be able to, and find it in their interests to, refuse to bargain over employment. My expectation that this situation would have prevailed in 1982, when unions were feeling the impact of mass unemployment and attacks on their organisation, is not borne out by the evidence that wage premia continued to erode manufacturing margins. Of course, employers too were only just recovering from the depths of recession by 1982 and it is possible that any effects on the scope of bargaining would not come through until later years.

An alternative hypothesis is that margins over marginal costs are stable but that margins over average costs are affected by scale economies. However, I have cited evidence that most of UK manufacturing

industry exhibits constant returns to scale when operating under conditions of excess capacity; moreover, the industry growth variable which proxies variations in demand conditions in estimating the determination of margins would also pick up any systematic scale effects.

The alternative hypothesis which is not discounted by the evidence in chapter four is that it might be the threat of foreign competition which restrains employers from passing on high wages into high prices; although I have noted that several studies of UK industrial pricing do specifically reject the hypothesis that import penetration and/or price competition depress domestic margins. Nevertheless, even if one rejects the hypothesis of a competitive world price, we should recognize the growing internationalisation of production and marketing and the openness of national economies to exports and imports. These developments suggest that industrial oligopolies should be analysed as international phenomena. Simple equilibrium models of rivalrous collusion do suggest that (transnational) oligopolies would adjust industry output in the face of relative cost changes to give larger shares to the relatively lower cost producers, so that domestic producers facing high rises in costs (relative to inflation rates and currency movements) could expect to lose some share of the transnational market. The expected effect on margins of a loss of international competitiveness is not so obvious, depending partly on the degree of product differentiation.

Further study is clearly required to investigate industrial structure and performance in an international context. Unfortunately, the rate of progress of labour and industrial economics is slow in addressing the necessary theoretical and data requirements for transnational studies; such work is beyond the scope of this study. Nevertheless, although the finding, described in chapter four, that high wage premia are not passed on into prices might be explicable through

examination of international oligopoly adjustments, such an explanation would be difficult to reconcile with the cited evidence that, in general, UK manufacturing cost rises in the 1970s were marked up in full and that there has been little discernable effect of import competition on industry margins. Moreover, to the extent that international competition does restrain domestic pricing, we would expect manufacturing margins to be affected by movements in the real exchange rate; but in chapter one I have described the evidence that there has been a secular rise in manufacturing margins which has not been accompanied by a corresponding relaxation in foreign price competition as measured by the real exchange rate. Moreover, the study reported in Chapter 5 presents evidence supporting the conclusion that any apparent competitive effect of imports on margins which emerges in cross-section single-equation analysis is a biased result which disappears when the relationship between imports and margins is estimated simultaneously.

I conclude that the balance of evidence tends not to support the hypothesis that it is foreign competition which has prevented domestic producers from marking up high wages. On the other hand, the hypothesis of job-bargaining does provide a generally plausible explanation both for the evidence that wage-premia are not marked up in the same way as other costs and for the observed secular rise in UK manufacturing profit margins at the expense of manual workers' earnings.

A theoretical position running through this study has been to emphasize the importance of analysing conflict over the creation and distribution of economic surplus. Recognising the evidence from both labour and industrial economics that surplus is not competed away implies that we need to investigate bargaining over surplus as the interface between labour and product markets. It is not sufficient for labour economists to simply insert a few variables representing concentration or profitability into wage equations, nor for industrial economists to add measures of unionisation into structure-performance equations. We need to model bargaining as a process with simultaneous repercussions on both labour and product markets.

I have argued that the asymmetric Nash bargaining model allows us to distinguish and investigate important aspects of bargaining: each side's opportunity costs, their preferences, the scope of bargaining, and bargaining power. I have used the model to analyse whether or not workers and employers might choose to bargain over employment as well as wages; I have examined the implications of job-bargaining for price-cost margins; and I have discussed briefly the possibility that employers might manipulate the minimum profit constraint in order to withdraw surplus from the bargaining arena. Several further developments of the bargaining model suggest themselves: to investigate bargaining over other decision variables besides wages and jobs, including levels of work-effort and supervision, and the question of whether these are decided cooperatively or otherwise; to analyse the development of multi-divisional and transnational corporations in terms of strategies to bypass workers' bargaining power by capitalising surplus through transfer pricing and artificially high profit constraints, or strategies to directly reduce workers' bargaining strength by setting up alternate sources of supply from both within and without the corporation; to extend the bargaining problem to include managers and other non-manual staff as well as employers and production workers.

The particular empirical study which I have reported here suggests a number of lines of development. We need a fuller analysis of the determinants of bargaining power, including institutional features, and we need to investigate appropriate specifications for empirical estimation. The fall-back positions, or minimum wage and profit constraints, need clearer definition particularly with regard to capital mobility and financial leverage. Empirical studies of bargaining also need to develop a dynamic framework in which bargaining power and wage levels are not independent of previous periods (viz partial adjustment models) and where information on profitability and inflation may lag behind current agreements.

All these latter points are implicit criticisms of aspects of the study presented here, pointing out omissions in the theoretical and empirical framework which future work could attempt to remedy. Nevertheless, appropriately qualified conclusions can be and have been drawn from the descriptive and econometric evidence presented and from the theoretical and empirical evidence cited. At a more general level, it does appear that conflict and bargaining over surplus is an important feature of contemporary capitalist economies and a fruitful area for further theoretical and empirical investigation.

FOOTNOTES

CHAPTER 1

- 1.1 The rise of non-oil profitability during the recession is first noted in the Bank of England Quarterly Bulletin of June 1983 (p.168): "Employment income took over 81 per cent of total income generated in the manufacturing sector in 1981; though later figures are not yet available, they will probably show a fall, reflecting the improvement in real profitability in the sector in 1982. This gain in profitability is unusual in that it occurred without any increase in manufacturing production". Then, in the September 1983 edition, the Bank notes that: "Companies' profit margins appear to have widened despite continued competitive pressure on domestic and export selling prices" (p.334). In March 1984 they report on the profitability of industrial and commercial companies in the third quarter of 1983: "the real pre-tax rate of return to non-North Sea companies was then close to 7%, more than double its level in early 1981" (p.16), and in September, the Bank reports (p.353) that: "by the first quarter of 1984 it is estimated to have reached 8.5% - above its last peak in 1978 but still lower than throughout the 1960s". In the same issue they analyse movements in the post-tax rate of return through the 1970s and early 1980s, observing that: "the post-tax rate of return has fluctuated around a level similar to that seen in the late 1960s despite the marked decline in pre-tax profitability" (p.358).
- 1.2 The Bank of England Quarterly Bulletin (September 1984, p.353) notes the significant rise in price-cost margins: "Profitability in

2.2 An alternative treatment of the evolution of concentration is provided by Davies and Lyons (1982) who combine a model of technological factors, which set a minimum level of concentration as a result of economies of scale, with a model of random growth and entry into the market. However, taking technology as given ignores firms' incentive to invest in research and development (and product differentiation) precisely in order to gain scale economies. An assumption of random growth is essentially anti-theoretic; and the model's feature of random entry into the market is based upon an assumption that entrants will be able to join the collusive oligopoly, ignoring the incentive for incumbents to deter entry by threatening and carrying out retaliatory responses to entry.

2.3 So, for instance, even such a critical assessor of Marx as Schumpeter (1954, p.686-687) "cannot but be impressed by both the analytic and realistic virtues of this conception of capitalist evolution". This conception he characterises as follows: "in Marx's general schema, social evolution is propelled by a force that is immanent or necessarily inherent in the profit economy. This force is Accumulation: under pressure of competition the individual concern is compelled to invest as much of its profits as possible in its own productive apparatusrushing down on declining average-cost curves and annihilating ('expropriating') the weaker ones in the process, capitalist concerns, individually growing in size, build up vast powers of production....".

2.4 We can see from equation 2.5 the obvious point that this last result does not hold in the extreme case of a zero mark-up, when $W/VA=1$; for then it is by definition impossible to increase wage share.

2.5 Employers have an interest both in reducing wages and in increasing workers' effort and productivity. As a convenient simplification I shall treat effort and productivity as given, and consider only conflict over wages and the level of employment. Alternatively, one can consider the level of employment to refer to the total effort/productive work performed by labour rather than just the number of worker-hours or weeks - so the wage w is the wage paid per unit of effort. Of course, productivity changes alter capital-output ratios and the real size of aggregate income for a given level of employment. Subsuming conflict over productivity under the notion of efficiency wages does leave the picture incomplete; but it allows a clearer presentation of conflict over distribution.

2.6 Lags in the reaction of price to wage rises, and in the reaction of wages to price rises, have important implications not only for the distribution of income, but for the relationship between unemployment and inflation. For instance, Layard and Nickell (1985) model a pricing equation where prices are reduced by unexpected wage rises and a wage equation where real wages are reduced by unexpected price rises. If the latter effect is more significant than the former, i.e. if unanticipated inflation tends to erode wages more than profit margins, then inflation can reconcile in favour of employers the contradictions between the level of real wages which workers try to win in the labour market and the actual level of real wages which results from the employers' pricing decisions. This notion lies behind the model of inflation as a resolution of conflict, as developed by Rowthorn (1980). But if inflation is anticipated in the longer run (eg. if we impose a condition of steady, anticipated inflation as a long-run equilibrium condition,

viz. Sawyer, 1982) then an increased tendency towards conflict (eg. a rise in the underlying strength of labour) will have to be balanced by some tendency (eg. a rise in unemployment) which produces an offsetting reduction in the tendency towards conflict. This treatment of inflation as the reconciling factor when real wages and prices are overdetermined is used also by Marglin (1984).

2.7 See also the analysis by Sugden (1983) of the relationship between transnational corporations and the degree of monopoly.

2.8 Such an efficient bargain may offer, or appear to offer, an individual employer higher profits than bargaining over the wage alone - but I have argued that aggregate real profitability will tend to fall if margins are squeezed. Even in the micro-economic context, I argue later that employers may wish to resist "efficient bargaining".

2.9 Hahnel and Sherman's (1982) reworking of Weisskopf's model shows that US real hourly wages move pro-cyclically, supporting the reserve army hypothesis.

2.10 See, for example, the survey by Ashworth (1981).

CHAPTER 3

3.1 For example, Roth and Schoumaker (1983) report on actual game experiments and conclude that predetermined expectations do affect bargaining outcomes.

- 3.2 It is the model of bargaining favoured by Aoki (1983) in his discussion of bargaining theories in relation to the firm, and it is the most commonly used model in the growing literature on union employer bargaining.
- 3.3 There is an implicit assumption here that capital stock and productivity are fixed, so this should be seen as a short-term profit function, though the assumption of constant capital stock can be relaxed when there is efficient bargaining with a rent-maximising union.
- 3.4 For instance, Mulvey (1978) looks at union-employer bargaining in terms of monopoly/monopsony power and makes the point that unions will get a better trade-off between wages and jobs the more 'essential' is the labour they supply and the smaller their contribution to total costs.
- 3.5 Levinson (1967) makes a similar point with respect to industry concentration, deducing a generalisation that: "given a similarly high degree of union organisational strength, employers in a more concentrated industry will be able to resist union pressures more effectively than employers in a more competitive industry" and also that "the greater the degree of concentration in an industry, the greater will be the union's ability to maintain a high degree of organisational strength". Taken together these arguments explain "the positive correlation found in manufacturing between union strength and concentration and the negative coefficient associated with the interaction of unionism and concentration" (p.204-5).

3.6 Abraham and Medoff (1984) find considerable protection against lay-off for long-service workers, especially amongst unionised workers, in their survey of US non-agricultural and non-construction firms. However, as I go on to argue, this does not necessarily imply that the median union voter is indifferent to the level of employment. Indeed, two recent US studies conclude that unions are concerned about job levels. Svejnar (1984) tests a model which assumes efficient bargaining over wages and jobs and finds that unions bargaining with twelve major US companies between 1954 and the late 1970s exhibit "risk-neutral" or even "risk-averse" preferences with regard to the trade-off between jobs and wages. Pencavel (1984) makes a contrary assumption, namely that unions choose their preferred point on the labour demand curve, in his study of union wages and employment in composition rooms in the newspaper industry in ten US cities between 1946 and 1965. He concludes that: "the elasticity of substitution between wages and employment in the union's objective function tends to lie between zero and unitythe larger ITU [International Typographical Union] locals possess objectives that approximate the rents from unionisation".

3.7 There is a further argument why even non-altruistic workers should be concerned about the threat of job losses to fellow workers - an argument put forward by Jesus Seade at a Warwick University seminar - namely that the median union voter is short-sighted if she presses for pay rises irrespective of the threat of job losses to others; for if jobs are lost in this round of bargaining, she will lose her position as median voter and may be overruled in future bargaining rounds.

- 3.8 Discounting the trivial case where workers have no bargaining power at all, $b=0$.
- 3.9 We can see that in the limiting-case of risk-loving, as r approaches minus infinity, the division of surplus is the same on the labour demand curve as on the contract curve. This indeed is the case analysed by Oswald (1984) where workers are indifferent to the level of employment and the contract curve is the labour demand curve. Note that, in this case, it is easy to show that the division of surplus equals the ratio of bargaining strengths.
- 3.10 Bargaining over employment levels is of course a quite separate issue from employers' power to discipline and hire and fire individual workers.
- 3.11 A case in point is quoted by Ford (1964, p.59): "In its dispute with Bournemouth Corporation, the Musician's Union claimed before the Industrial Court that 'a proper object of a trade union is to establish by agreement with an employer the number of workers to be employed'" but the managers claimed that this was "'solely within the discretion of the individual managers concerned'". The court ruled against the union.
- 3.12 There is some empirical support for this hypothesis from Neumann, Bobel and Haid (1983) who report a significant positive effect of financial leverage on price-cost margins in their study of 283 West German manufacturing companies between 1965 and 1977. This result appears to support my hypothesis, though it may be biased by their definition of margins in relation to equity capital plus reserves. They do not explain why they include leverage in their estimation.

CHAPTER 4

- 4.1 In practice, this assumption of the independence of the vector X from the level of the bargained wage may not be necessary because I use proxies for elements of X , to represent collusion and demand conditions, which are more likely to be fully independent of the wage.
- 4.2 I make an assumption here that the parameter d is the same across all industries. This implies that the relative importance of jobs in bargaining is the same in each industry, as determined by unions' preferences over wages and jobs and by employers' preparedness to bargain over jobs. This is not unreasonable given that several large unions represent a large proportion of total union membership, and we can expect their preferences over wages and jobs to be similar in different industries - though bargained outcomes will differ as labour demand and bargaining strength conditions may differ widely across industries.
- 4.3 An alternative explanation for the impact of unionism on wage-share is that pushing up wages can alter the composition of costs rather than price-cost margins. However, this explanation is at variance with Cowling's (1982, p.124, fn.18) observation that the composition of costs has been stable since 1945.
- 4.4 This approach bypasses the problem of specifying the bargaining equation and allows us to investigate directly the impact of wage premia on price-cost margins. In place of the specification

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- 4.4 This approach bypasses the problem of specifying the bargaining equation and allows us to investigate directly the impact of wage premia on price-cost margins. In place of the specification

problem, we now face a possible econometric difficulty in that the wage premium is not necessarily independent of the margin. However, we do not expect wage premia to be directly influenced by margins, but by the level of surplus per worker. So we can expect any simultaneous equation bias to be small. Data availability forces me to use 1983 wage data in the 1982 price-cost margin equation, so avoiding even this small potential bias.

4.5 I discuss later the estimation of the average wage premium.

4.6 I note that this is also the specification implied if workers are indifferent to job levels and bargain over the wage alone. In other cases, the employers' share of total surplus will be affected by workers' risk- or inequality-aversion, represented by the parameter r in equation 3.5. However, if we assume this parameter to be constant across industries - see footnote 4.2 - then this estimating equation does measure the determinants of bargaining power as specified. Alternatively, we can interpret this equation as estimating the combined effects of the exogenous variables on bargaining power and risk-aversion.

4.7 These arguments apply equally as reasons for not estimating the bargaining equation and the price-cost margin equation simultaneously, an exercise which would be yet more problematic in that it would require specification of industry revenue and cost functions in order to relate profit margins to profit levels.

4.8 These measures may well be collinear with the measures of further education and training.

4.9 Similar to the 1975 and 1979 estimates.

4.10 I describe this specification as 'standard' in the sense that many wage equations use some or other of the variables which I have described as 'bargaining variables' without relating them to the size of the employers' surplus.

4.11 The unemployment variable measures the number of registered unemployed whose last employment was in that industry. This is not necessarily a good measure of the number of people currently seeking work in that industry, and we can expect it to be correlated with the rate of growth/loss of employment in that industry. Despite these problems, it is a useful measure of the extent to which unemployment affects different industries and it is to be regretted that the series has not been published since May 1982.

4.12 See footnote 5 to chapter 3.

4.13 Or perhaps we need to separate out the different levels of union coverage, as in Henley (1984).

4.14 Indeed, on a small random sample of industries, the ranking of estimated wage premia using the coefficients from the bargaining specification c was found to be the same as that using coefficient estimates from specification a.

4.15 I have not corrected for differences in (expected) risk across industries, viz. Neumann et al. (1983) and Harris (1984). However, the notion of a risk-adjusted return to capital is more relevant to their estimation of rates of return on capital, implying a theory of

entry barriers, rather than to estimation of margins, based on a theory of oligopolistic behaviour.

4.16 The result that wage premia are deducted directly from margins rather than being passed on into price implies that margins are set by employers with reference to the alternative wage, rather than to the actual wage. Indeed, if we calculate margins on the basis of the alternative wage and estimate equation 4.5 with these revised margins, we find that the coefficient on the wage surplus term becomes insignificant (as we would expect); if we drop this term we get a better fit (as measured by the residual sum of squares) when we use the revised definition of margins rather than actual margins. We can see that this is an expected corollary of the primary result if we write the estimating equation as:

$$\frac{A - L\bar{w} - L(w - \bar{w})}{R} = m(x) + d \frac{L(w - \bar{w})}{R}$$

where A is net revenue (less salaries in some definitions), and R is gross or net revenue. Estimating the coefficient d to be equal to -1 is equivalent to finding that margins are better explained when defined on the alternative wage than on the actual wage. Even when R=A (ie. on the definition of PCM3) an estimate of d=-1 is not a necessary result due to an identity, but an indication that the decomposition of the wage into the alternative wage plus a wage premium is economically significant. For if we chose some arbitrary vector to replace \bar{w} , we clearly would not expect to find a statistically significant estimate of the coefficient d.

4.17 The measure of profits includes the opportunity cost of capital, which should strictly be deducted before arriving at a definition of economic surplus. However, I correct for the opportunity cost by

including estimates of capital stock as an explanatory variable
(having to ignore differences in capital mobility and gearing
through lack of data).

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APPENDIX

STACKELBERG AND COURNOT DUOPOLY :
choosing roles and variables

CONTENTS

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1. INTRODUCTION

The Stackelberg and Cournot solutions to one-period duopoly each rely on two particular restrictions which I want to question : i) the roles of follower and leader are assigned to the firms rather than chosen; other roles are not considered; ii) the "reaction variable", usually either price or quantity, is assigned, not chosen.

It is clear that, if its rival acts as a follower, a firm will always prefer to be a Stackelberg leader rather than accept the Cournot solution. But under what circumstances is a Stackelberg solution viable ? I want to show that there will often be cases where both firms might prefer to be leaders, or both prefer that the other be leader; and then to consider the implications both of deeper strategic interplay and of the choice of reaction variable.

First let us ask why one firm might act as a leader, the other as follower. Imposing an informational or psychological asymmetry would be highly arbitrary. It seems more natural to regard asymmetry in duopoly as the result of either a history or a threat of dominance by one firm, where one firm is seen to be in a position to dictate the play - viz. Dixit's (1979) incumbent who could prevent entry but prefers to act as a Stackelberg leader. But it is not necessarily the case that a dominant firm will choose to be a leader; nor that the subordinate firm must choose to play its allotted role of follower. So it is important to examine the circumstances in which firms might prefer to be the leader or might prefer that the other be leader.

I shall assume throughout : i) that at any Stackelberg point both firms choose to sell strictly positive outputs at strictly positive prices, i.e. I am not considering blockaded entry; ii) goods are strict substitutes as long as prices and quantities are strictly positive; iii) I refer only to Cournot reaction functions, where conjectural variation is zero; iv) reaction functions are continuous when profits are positive; v) firms are profit maximisers with profit function for firm i :

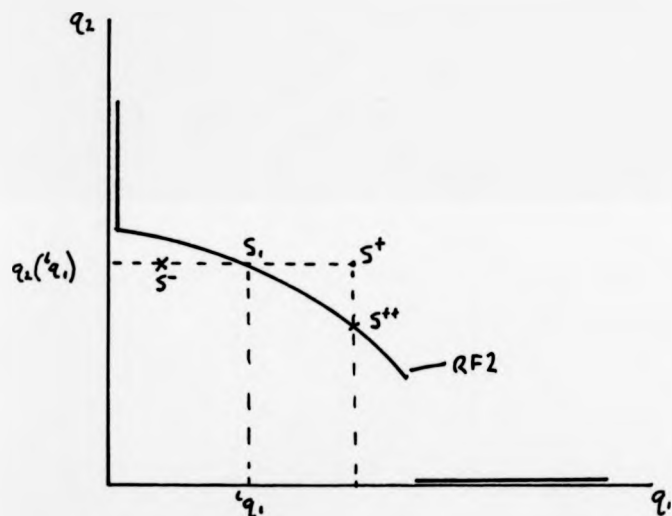
$$\begin{aligned}\pi_i(q) &= q_i \cdot p_i(q) - c_i(q_i) \\ \text{or } \pi_i(p) &= q_i(p) \cdot p_i - c_i[q_i(p)]\end{aligned}$$

depending on whether firms' decision variables are the vector of quantities q or the vector of prices p .

DIAGRAM 1

A down-sloping (negative) reaction function in quantity space

- RF2 = firm 2's reaction function, or $q_2(q_1)$.
- S_1 = firm 1's Stackelberg point on RF2.
- 1q_1 = firm 1's Stackelberg output.



2. CHOOSING ROLES

PROPOSITION 1 If a firm's reaction function slopes downwards, it will always prefer being a Stackelberg leader to being a Stackelberg follower. This applies unreservedly to quantity reaction functions, and to price reaction functions if the rival does not face a capacity constraint.

The following proof makes no assumptions about the firm's profit function other than those implied by the specifications above. However the proposition can easily be demonstrated in the case of a quasi-concave profit function simply by sketching the relevant iso-profit lines.

The reaction function in quantity space is illustrated in Diagram 1, showing firm 2's optimal (Cournot) reaction to outputs of firm 1. Firm two's reaction function is referred to both as RF2 and as $q_2(q_1)$.

By assumption firm 1 chooses some non-zero leadership output 1q_1 to give the leadership point $S_1 = [{}^1q_1, q_2({}^1q_1)]$. We can show that S_1 must lie to the right of the leader's own reaction function (RF1). i.e. :

$$q_2'(q_1) < 0 \quad + \quad q_1[q_2({}^1q_1)] < {}^1q_1 \quad \underline{1}$$

For if this inequality is reversed, i.e. if RF1 passes through some point S^+ , then we can construct S^{++} as shown. [See Diagram 1]

Now $\Pi_1(S^+) \geq \Pi_1(S_1)$ from the definition of the reaction function.
 But $\Pi_1(S^{++}) > \Pi_1(S_1^+)$ from the assumption of strict substitutes,
 which implies that S_1 would not have been firm 1's Stackelberg choice.
 We also know that RF1 cannot pass through S_1 , since by assumption the
 slope of RF2 is strictly negative. So equation 1 must be true.

So RF1 must pass through some point S^- .

But $\Pi_2(S^-) > \Pi_2(S_1)$ from the assumption of substitutes.

If firm 2 acts as a Stackelberg leader, S^- is just one of the set of
 points which it can choose. So firm 2 must prefer to be a Stackelberg
 leader. QED.

If firms consider that their rivals are making decisions in terms of
 prices rather than quantities we have to analyse reaction functions in
 price space. The analysis is not so simple as in quantity space
 because although a firm may hold its price constant, as its rival's
 price changes so does the quantity demanded and the effect on the
 firm's profit is ambiguous, depending on whether price exceeds or lies
 below marginal cost.

However, at any set of prices p (at which quantities demanded are
 strictly positive), if a firm's profit is not increasing in its
 rival's price, it must be increasing in its own price; and vice versa.
 For the first derivatives of firm i 's profit function are :

$$\Pi_{i,j}(p) = [p_i - c_i'()] \cdot q_{i,j}(p)$$

$$\Pi_{i,i}(p) = [p_i - c_i'()] \cdot q_{i,i}(p) + q_i(p)$$

DIAGRAM 2

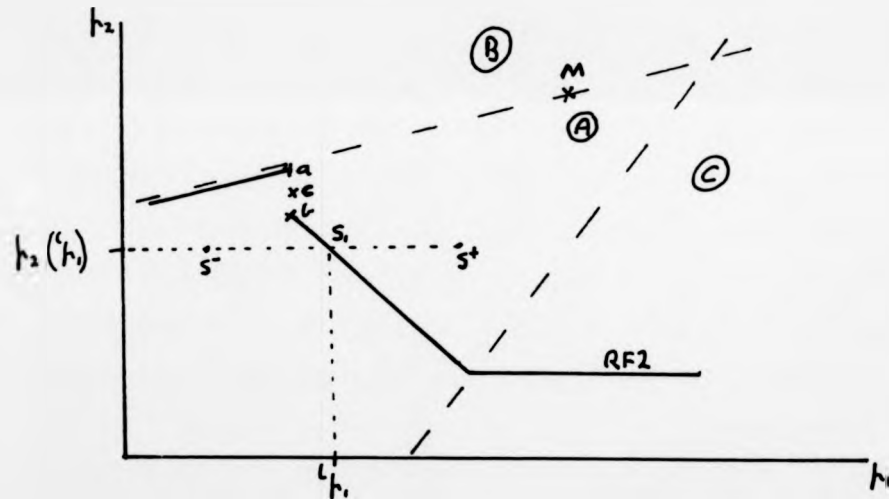
A negative reaction function (RF2) in price space

region A : $q_1 > 0, q_2 > 0.$

region B : $q_2 = 0.$

region C : $q_1 = 0.$

ab = discontinuity in RF2.



where $\Pi_{1,j}(p)$ represents the partial derivative with respect to p_j of firm 1's profit function; $c_1'()$ represents firm 1's marginal cost function.

Substitutability implies that $q_{1,j} > 0$ as long as p_j is not so high that $q_j = 0$. I shall assume that $q_{1,1}(p) < 0$ if $q_1 > 0$. So

$$p_1 > c_1'() \rightarrow \Pi_{1,j}(p) > 0$$

$$p_1 \leq c_1'() \rightarrow \Pi_{1,1}(p) > 0$$

if $q_1, q_j > 0$

2

i.e. within the region of price space where quantities are strictly positive,, there will always be a price path for a firm along which profit rises as one or other price rises.

Diagram 2 shows a downward-sloping price reaction function $p_2(p_1)$. Note that the price space is divided into four regions, corresponding to zero or strictly positive values of output. When p_1 exceeds some limit firm 1's sales fall to zero and firm 2 can set a monopoly price. From the first order condition which characterises firm 2's reaction function we know that, on the reaction function with positive outputs, price exceeds marginal cost. Equation 2 and the envelope theorem tell us that along the reaction function firm 2's profit is an increasing function of its rival's price (as long as quantities are strictly positive). There may, therefore, be some value of p_1 which is so low that firm 2 cannot make positive operating profits, so it chooses to

produce zero output. I represent this possibility by a discontinuity ab in the reaction function, where it jumps to the zero-output price line.

Let firm 1 choose some leadership price 1p_1 which gives the Stackelberg point S_1 on firm 2's reaction function in the region A where both firms sell strictly positive quantities. First I want to show that firm 1's reaction function cannot pass through or to the left of S_1 . i.e. :

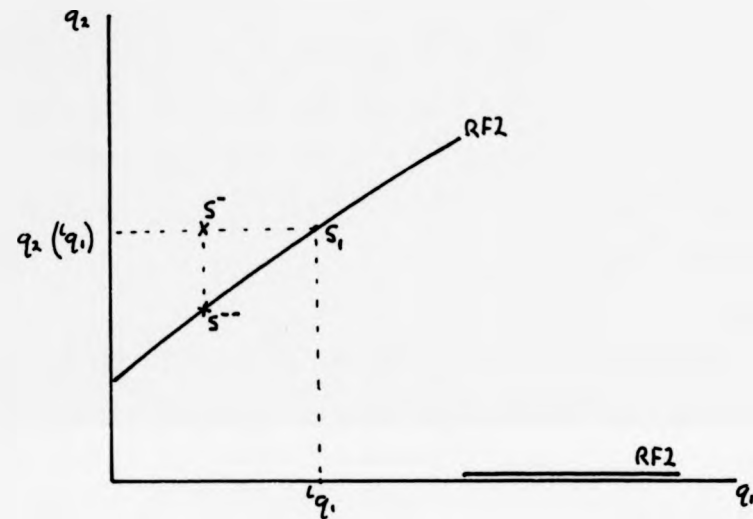
$$p_j'(p_1) < 0 \quad \rightarrow \quad p_1[p_j({}^1p_1)] > {}^1p_1 \quad \underline{3}$$

for, if not, RF1 must pass through some point S^- where $\Pi_1(S^-) > \Pi_1(S_1)$. We can construct an arbitrary reaction function for firm 1 upwards from S^- remembering that profits must be strictly increasing. If RF1 meets RF2 at any point above S^- then this point must dominate S_1 which cannot then be the leadership point. If however RF1 passes through the gap ab in RF2, e.g. at some point c, then we know that $\Pi_1(c) > \Pi_1(a)$. But at c firm 1's price must exceed marginal cost and its profit is increasing in its rival's price; so a rise in p_2 to point a can decrease firm one's profit only if marginal costs rise sufficiently steeply, perhaps through a capacity constraint. If we rule out this possibility, then 3 above must be true.

So RF1 passes through some point S^+ . Now RF1 can be constructed arbitrarily upwards from S^+ until it reaches the region B in the diagram at point M where firm 1 is a monopolist.

DIAGRAM 3

A positive reaction function in quantity space



We can also construct some line north-east from S_1 , along which Π_2 must be strictly increasing (see 2). This line cannot reach region B where firm 2's output and profit both fall to zero. So this constructed line must meet firm 1's reaction function (RF1) at a point which firm 1 must strictly prefer to S_1 . So firm 1 must prefer being a Stackelberg leader to being a Stackelberg follower. QED.

PROPOSITION 2 If both firms have upward-sloping reaction functions, then if one prefers to be leader the other must prefer to be the Stackelberg follower.¹

This proposition holds both for price and quantity space. It can be seen to be true for quasi-concave profit functions simply by sketching iso-profit lines, but I want to show that it is true more generally.

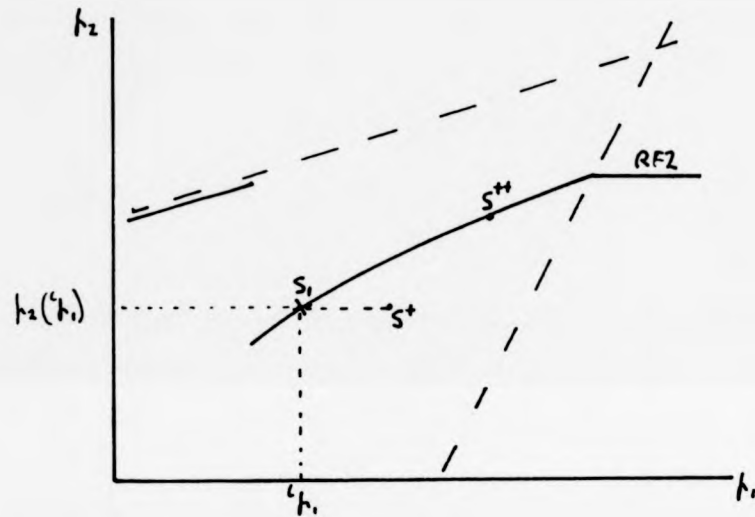
First I need to show that, in quantity space, if a firm's reaction function slopes up, its rival's reaction function must pass "to the right" of any non-zero Stackelberg point. i.e. :

$$q_2'(q_1) > 0 \quad \rightarrow \quad q_1[q_2(lq_1)] > lq_1 \quad \underline{4}$$

If not, i.e. if RF1 passes through S^- in diagram 3, then we can construct S^{--} where $\Pi_1(S^{--}) > \Pi_1(S_1)$ which contradicts the assumption that S_1 is chosen by firm 1 as its leadership point.

DIAGRAM 4

A positive reaction function in price space



Similarly in price space, if a firm has an upward-sloping reaction function its rival's reaction function must pass "to the left" of its leadership point. i.e. :

$$p_2'(p_1) > 0 \quad + \quad p_1[p_2(l_{p_1})] < l_{p_1} \quad \underline{5}$$

Referring to Diagram 4, if firm 1 has chosen some leadership point S_1 (where both quantities are strictly positive) and if RF1 passed through some point S^+ as shown, then we could construct a line north-east along which profits of firm 1 must be strictly increasing (see 2). This constructed line cannot meet the region where firm 1's output and profit fall to zero, so it must meet RF2 at some point S^{++} . But then S_1 could not have been the optimal leadership point. So 5 must be true.

Now we can consider the case where both reaction functions slope up and where one firm prefers to lead. In quantity space we can draw the reaction functions as in diagram 5a where the leadership position chosen by firm 1 is to the left of RF1 and S_2 is below RF2.

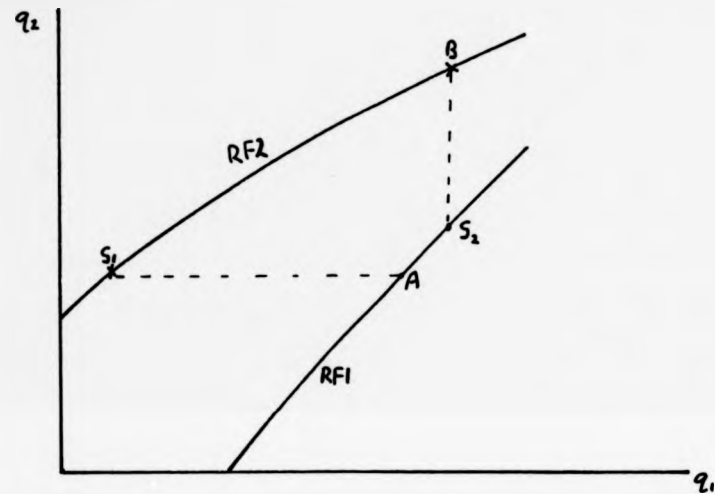
If firm one prefers to lead, i.e. $\pi_1(S_1) > \pi_1(S_2)$, then S_2 must lie "above" S_1 (as in diagram 6a) since if we construct point A :

$$\begin{aligned} \pi_1(A) &\geq \pi_1(S_1) && \text{since A is on RF1} \\ + \quad \pi_1(A) &> \pi_1(S_2) \end{aligned}$$

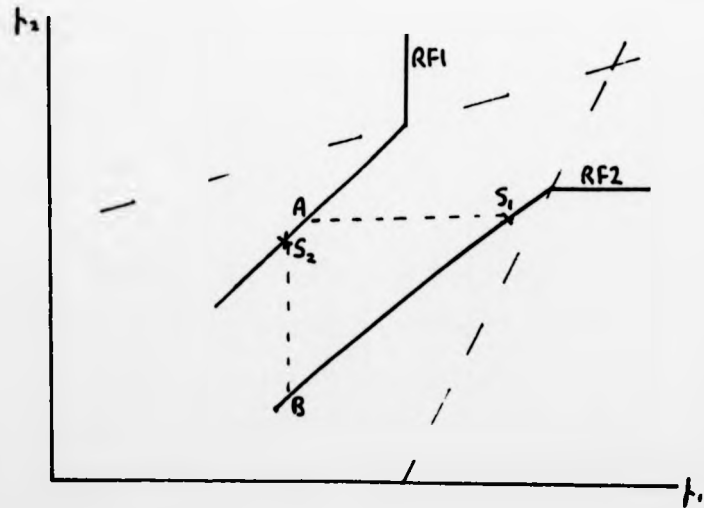
DIAGRAM 5

Both reaction functions slope up; one firm prefers to lead

a) quantity space



b) price space



But firm 1's profit is a declining function of its rival's output along firm 1's reaction function (since substitutability implies that a decrease in q_2 will raise Π_1 if q_1 is held constant; a fortiori if q_1 can be optimally adjusted). So S_2 must lie above A.

If we construct point B as shown on RF2 (which we know lies above S_2)

$$\Pi_2(B) > \Pi_2(S_2) \quad \text{since B is on RF2}$$

But B must lie above S_1 since RF1 and RF2 are positively sloped

$$\begin{aligned} \rightarrow \Pi_2(B) &< \Pi_2(S_1) \\ \rightarrow \Pi_2(S_1) &> \Pi_2(S_2) \quad \text{QED} \end{aligned}$$

The same argument holds in price space - see diagram 5b.

PROPOSITION 3 If two firms face similar cost and demand structures which give positive sloping reaction functions, then each must prefer being the Stackelberg follower to being the Stackelberg leader.

The proof is simple if firms' costs and demands are identical. For if one preferred to lead, symmetry implies that the other must prefer to lead as well. Proposition 2 rules out this possibility. We may go on

to suppose that firms with positive-sloping reaction functions with similar but not necessarily identical costs and demands will also each prefer that the other lead.

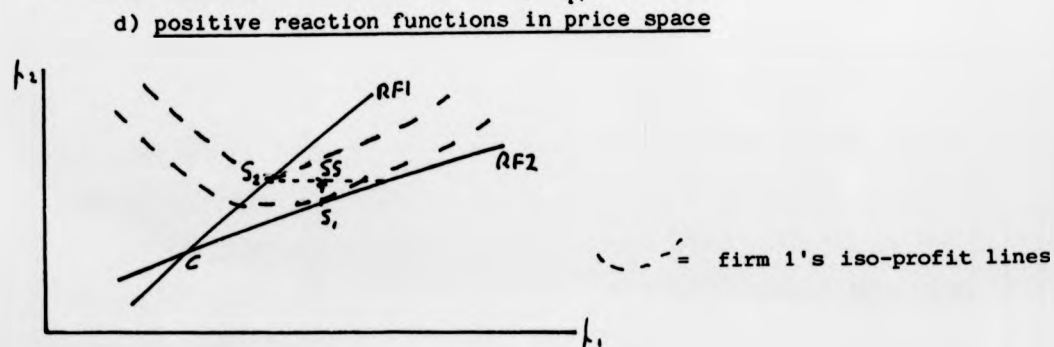
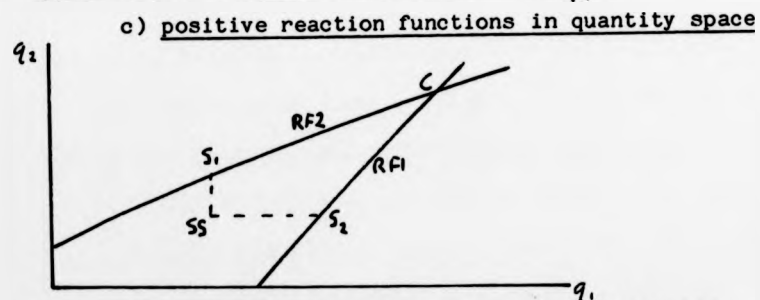
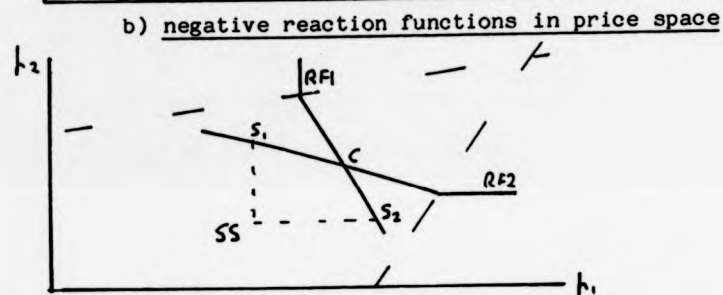
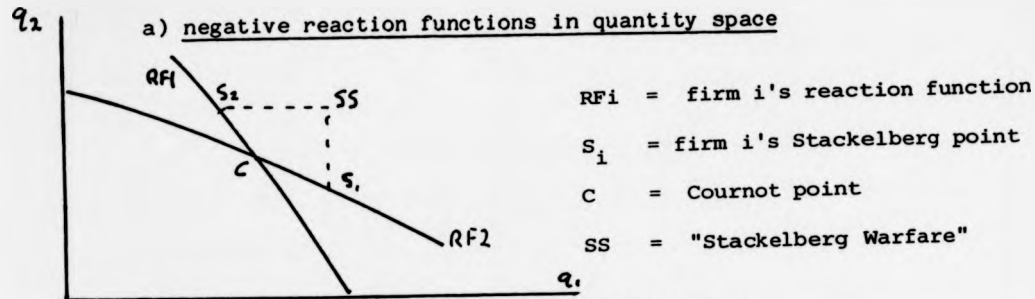
Why might firms prefer to follow ? The intuitive answer is that generally each firm's profit increases if its rival raises price or decreases output. If a firm is known to have a positive reaction function the rival will be deterred from lowering price or raising output by the threat of retaliation. But this "threat" is only operative if the firm is expected to act as a follower. So a firm may sometimes choose to be a follower in preference to being a leader.

PROPOSITION 4 If firms can choose to act either as follower or leader, the Cournot solution is not a Nash equilibrium. The Stackelberg solutions are Nash equilibria in choice of roles; but firms will conflict between the two Stackelberg solutions if they have similar profit functions or if both their reaction functions are down-sloping.

At the Cournot solution each firm acts as a follower. Given that its rival is following, either firm could do better by acting as leader (unless reaction functions have zero slopes). Given that one firm is acting as leader, the other's optimal choice is to follow; and vice versa. But I have shown previously that if the Stackelberg solutions

DIAGRAM 6

ranking Cournot and Stackelberg outcomes



have non-zero outputs then, in either of the two cases referred to here, the firms will necessarily prefer different solutions. If reaction functions are negative, each will want to lead. If firms are similar and reaction functions are positive, each will want the other to lead.

In the case where both reaction functions slope down and intersect at a unique, stable Cournot position, we can rank four possible outcomes as follows (see diagram 6).

In quantity space (6a) the two Stackelberg solutions S_1 and S_2 must be as shown. We know that (for firm 1) $S_1 >_1 S_j$ (where $>$ denotes strict preference) from Proposition 1. The choice of the Cournot point C is feasible but rejected when firm 1 leads, so $S_1 >_1 C$. But S_j is beyond C on 1's reaction function, so $C >_1 S_j$. If both firms produce at their leadership levels, the outcome SS (Stackelberg Warfare) is clearly worse than accepting the rival's leadership. So we can conclude :

$$S_1 >_1 C >_1 S_j >_1 SS$$

6

The same result holds for negative reaction functions in prices (6b).

If quantity reaction functions slope up and the profit functions are similar enough for each firm to prefer the other to lead, and if there is a unique Cournot equilibrium, the rankings can be deduced from diagram 6c. The same result holds in price space for quasi-concave profit functions (see 6d).

$$S_j >_i SS >_i S_i >_i C$$

7

We get here the perhaps surprising result that with upward sloping reaction functions a (unique) Cournot solution is worse for a firm than either Stackelberg solution or leadership warfare.

In fact equations 6 and 7 tell the same story if we translate firms' roles from the categories of 'leader' or 'follower' into the categories of 'strong' and 'weak'. With negative reaction functions each prefers leadership if the other will comply, so in this case I label leadership the 'strong' role. If firms are similar and reaction functions are positive I call the follower role strong. Denoting an outcome where firm i is strong and its rival weak by "SW", etc, equations 6 and 7 translate into these rankings :

$$SW >_i WW >_i WS >_i SS$$

8

It appears that there is no obvious solution here, where firms can choose their roles. In a repeated game setting each firm will have an incentive to convince its rival that it is going to stick to its preferred role, for if a firm is known to act strongly, its rival's best response is to comply. It may well be firms' perceived abilities to withstand a period of Stackelberg warfare which determines the outcome.

It is apparent that a particular solution concept, the Nash equilibrium, leads to widely different results depending on whether firms' decisions are over price/quantity or over roles of follower and leader. These can be regarded as alternative levels of strategic conjecture and behaviour, each implying a particular context of information and expectations. An obvious extension of strategic play for a firm would be to present to a self-styled leader a pattern of behaviour - a putative reaction function - which will induce the leader to make a favourable decision. For instance, if a firm thinks that its rival is observing its behaviour in order to deduce its reaction function, it may choose to present a positive-sloped "reaction function" with the intention that its rival should choose to be a leader. This would constitute a strategy of threats and inducements : "If you hurt me by raising your output / lowering your price, I will retaliate in kind." Price wars and predatory pricing can be understood as firms presenting and testing out eachothers' reaction functions and eachothers' ability to stick to their preferred role despite temporary losses.

3. PRICES OR QUANTITIES

So far I have not questioned whether firms set prices or quantities, nor in what circumstances their reaction functions slope up or down. It is common to present quantity reaction functions sloping down and price reaction functions sloping up, although the opposite situations are feasible.

The duopoly game as I have considered it is played in prices or quantities not according to how each firm makes decisions, but according to how it conjectures its rival makes decisions. For example, if one firm conjectures that its rival will hold price constant, it makes no difference (at least if the firm is certain about cost and demand conditions) whether it considers a range of possible prices and estimates the demand and profit that will ensue, or whether it considers a range of outputs and estimates the ensuing prices and profit. In either case the firm will settle on the profit-maximising price/output configuration. Whether it proceeds to announce a fixed price or to auction a fixed quantity is not relevant. What is relevant is whether it expects that its rival will hold price or quantity constant (in the case where the firm is acting as a follower).

If technology and conditions in factor markets dictate a high cost to changing output, then a follower might reasonably expect its rival to hold output constant. Constant price might be a reasonable conjecture when selling strategies require price stability. But in many cases

there may be a substantial degree of arbitrariness in such conjectures. Indeed one firm might be conjecturing in prices whilst its rival conjectures in quantities !

Price and quantity games usually yield a different outcome to a given solution concept, e.g. to the Cournot solution. Moreover, the slope of a firm's reaction function may often be negative in quantities but positive in prices π and I have argued earlier that negative reaction functions make the Stackelberg solution concept particularly questionable.

The slope of firm i 's reaction function at a point (in price or quantity space) is given by the negative of the ratio of the second derivatives : $-\pi_{ij} / \pi_{ii}$. Since π_{ii} is required to be negative to satisfy the second order conditions for profit maximisation, the slope of the reaction function has the same sign as the cross partial. Of course the sign of the slope may vary. For simplicity I have only considered monotonic reaction functions.

In the case of quantities, $\pi_{i,j}(q) = q_i \cdot p_{i,j}(q) + p_{i,j}(q)$. Substitutability implies that the second term is negative, so the quantity reaction function has a positive slope iff $p_{i,j} > -p_{i,j}/q_i > 0$ and it has an unambiguously negative slope if the cross partial of the demand term is zero.

In the case of prices :

$$\pi_{i,j}(q) = (p_i - c_i') \cdot q_{i,j} + q_{i,j}(1 - c_i'' \cdot q_{i,i}).$$

where $c_i''()$ is the second derivative of firm i 's cost function. If the cross partial derivative of the demand function - $q_{i,j}(p)$ - is non-negative, the price reaction function slopes up unless marginal costs are falling sufficiently rapidly.

Why should price and quantity reaction functions tend to have opposite slopes? Intuitively we can see that a follower alters its decision variable to get an optimal trade-off between price (or profit-margin) and quantity. If the leader's decision variable is quantity, a rise in that variable causes the follower's dependent variable (price) to fall. To redress the fall in price, the follower will have to lower quantity - i.e. the follower in a quantity game usually moves in the opposite direction to the leader. On the other hand, if the leader raises price, the follower's dependent variable (quantity) rises. To redress the rise in quantity, the follower has to change price in the same direction as the leader's move; so price reaction functions usually slope upwards.

4. CONCLUSIONS

If firms have similar histories and face similar costs and demands, there is little reason to expect either a Cournot or a Stackelberg solution to be generally viable.

Although the Cournot solution is a Nash equilibrium in choices over output (price), it is not so if firms make choices over roles. For if a firm is going to act as a follower, it must benefit its rival to act as leader.

If firms have negative reaction functions and/or similar profit functions, I have argued that the Stackelberg solution is not generally satisfactory. Without predetermined asymmetry each firm has an incentive to act 'strongly', to take its preferred role and force its rival to accept the non-preferred role. Of course if both firms take the preferred role they inflict mutual damage (see equation 8). It can be argued that they may settle for each taking the non-preferred role in order to minimise mutual damage. This would mean the Cournot solution with negative reaction functions; the "leadership warfare" solution with similar positive reaction functions. But since the Cournot solution is not a Nash equilibrium in choice of roles, it would obtain only as a compromise or collusive solution. In which case firms might be expected to seek some more profitable solution through implicit or explicit collusion. The Cournot solution might be a lower bound to feasible arrangements; the threat of price war would provide the incentive to collude.

In some specific market situations, however, the Stackelberg solution does seem reasonable. If both firms have positive reaction functions (most likely to occur if they view each other as making price rather than quantity decisions) and if there is sufficient asymmetry in costs or demand for one firm to prefer to lead, then one Stackelberg solution will not only be a Nash equilibrium in choice of roles, it will be strictly preferred by both firms to the other Stackelberg solution and to the Cournot solution.

Alternatively, Stackelberg seems a plausible solution to a situation where one firm believes that its rival expects and is able to win a price war. For if so, the firm expects that its rival will act strongly come what may; in which case the firm will prefer to comply by accepting the weak role (which might be leader or follower depending on the slopes of the reaction functions). Such a situation may pertain where a firm has a history of market dominance which gives it incentive to fight price wars, expecting them to be short-lived as in the past; or where a firm is seen to have a greater capacity than its rival both to inflict and to endure short-term losses, due perhaps to conglomerate- or government-backed financial support.

FOOTNOTE

1. Ono (1980) proves this result in the case of an upward-sloping price reaction function and a concave profit function. The proof presented here is more general in that it refers to both price and quantity reaction functions and does not assume concavity.

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