Trade Unions, Market Concentration and Income Distribution in United States Manufacturing Industry

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Introduction

The question of what effect if anu trades unions have on the functional distribution of income is an old one. Conventional production theory suggests that the prescence of a monopoly element on the supply side of a particular labour market may well raise wages but in the long run any factor substitution away from labour would have an ambiguous effect on the factor income distribution depending on the value of the elasticity of substitution. Distributional gains would only accrue to labour under conditions of inelastic factor substitutability (see, for example, Addison & Siebert 1979). A considerable body of econometric research (surveyed in King and Regan 1976) has given general credence to the view that the elasticity of substitution between capital and labour, using cross sectional analysis, is equal to one across a large array of different industries. Adoption of this "stylised" fact leads to the conclusion that a rise in the price of labour would cause such a substitution from labour to capital as to leave the functional distribution unaffected. One might therefore conclude that trades unions can have little or no effect on income distribution. Time series research has tended to conclude (King & Regan 1976) that the elasticity of substitution is, if anything, a little below unity. Under such conditions a monopolistic trade union could increase its income share by raising wages. The descriptive evidence of Levinson (1954), however, suggests that in the long run unions may have very little impact on wage share. Levinson noted that although union membership had increased in the United States by a multiple of five over the period 1929 to 1952 profit share had remained more or less constant and labour share had only risen slightly. Other authors (see King & Regan 1976) suggest that labour share has been constant, if not falling. A recent paper (Kallenberg et. al. 1984) also concludes from a time series model that trades unions have had little or no impact on labour share (variously defined) in the U.S. printing industry over the period 1946 to 1978.

Economists looking at the experience of the United Kingdom in the last sixty years have been less sceptical about the impact of trades unions. Phelps-Brown & Hart (1952) entertained the possibility, though without formal statistical examination, that trades unions might be responsible for the discrete shifts in wage share observable in the U.K. this century. They suggest that trades unions affect income distribution where the markets faced by producers are "hard" in the sense that they will not bear price increases warranted by a particular union-induced wage rise necessary to maintain profit-margins (assuming no immediate factor substitution).

Much more recently there has been a resurgence of interest in the impact of trades unions on wage share, but the question has not been approached from within the orthodox production theory framework, but from a development of Kalecki's degree of monopoly distribution theory (Kalecki 1938, Cowling 1982). Cowling & Molho (1982) found using inter-industry cross sections a tentative positive relationship between production worker share of value added and various measures of unionism. Henley (1984) extended this work to look at the impact on wage share of various types of collective bargaining structure and found that unions are far more likely to have an effect on wageshare where collective bargaining is conducted within a two-tier structure: i.e. a national multi-employer agreement with a supplementary plant or firm specific bargain agreed additionally.

The conclusion that unions in the United States serve to raise wages above their competitive levels does seem to be well established (Parsley 1980). The body of econometric work on the union productivity effect is less voluminous but one might with reasonable confidence suggest that broad agreement exists as to the direction of this effect. Eight out of nine studies to date, covering a broad selection of industries conclude that this direction is positive (Addison 1983). If unions raise wages and are associated with higher monetary productivity then there is little, a priori, we can say about their effect on wage share, except that we would not be at all surprised if the coefficient on our unionisation variable was close to zero and insignificant. A significant coefficient one way or the other would imply that either the wage effect or the productivity effect was more than offsetting the other.

The relationship between wage share and concentration in cross-sections of United States manufacturng has been examined in two previous studies. Moroney & Allen (1969) examinined an inter-regional relationship for thirty seven U.S. manufacturing industries. In some cases their data set was only ten observational units wide. They found no evidence of any impact of regional concentration on production worker share of value added. However, as Cowling & Molho (1982) point out it is unreasonable to assume that in manufacturing industry market power is going to vary regionally across a unified national market such as the United States. A later unpublished study (Barbee 1974) gives much better grounds for believing that a relationship exists. He regressed labour's share of value added on the 4 firm concentration ratio and a capital intensity variable using a sample of 400 4-digit Census of Manufactures industries. The coefficient on concentration was negative and highly significant. Both studies were motivated as tests of Kalecki's theory of distribution.

In addition there is also the Kallenberg et.al.(1984) study, who use an annual time series for the United States printing industry during the period 1946-1978 and conclude that for various different measures of labour share that a higher share may be associated with increased union activity and is associated with lower employer market power. Their underlying model is a sociological "power" theory where functional income distribution is seen as the outcome of the balance of employer power (in product and labour markets) and collective employee power. They found some evidence of a positive relationship between unionism and labour share. Three measures of employer power are used. Negative relationships are found between labour share and asset size, and labour share and capital intensity. Asset concentration performs less well though they admit that this may be due to deficiencies in their concentration measure.

One further very recent study looks at the impact on unions and of market concentration on price-cost margins (Freeman 1983), although the author's approach to his analysis is that he is testing the relationship between unionism and profitability rather than income distribution theory. His dependent variable is net profits divided by revenue and although this is not directly analogous to Kalecki's production workers wages share his results do serve to establish a relationship between profit share and unionism. Two longitudinal data sets are used - one for 3 digit Census of Manufactures industries and the other from Internal Revenue Service balance sheet data. The author summarises his findings as follows:

> "the major finding is that unionism has a statistically quantitatively important depressant impact upon the relevant profit indicators that holds up under various specifications and is as or more robust than the widely studied impact of concentration on industrial profitability. In addition the analysis shows that the negative effect of unionism on industry profits is limited to more concentrated industries." (Freeman 1983 p.1)

As already stated two U.K. studies exist on the question of the impact of unionism on wage share within the context of Kaleckian distribution theory. This approach entails regressing wage share on unionism and on proxies of the determinants of the price-cost margin. In both studies these proxies are a measure of concentration and the advertising-sales ratio. The link between the price-cost margin (or degree of monopoly) and wage share requires an assumption that unit variable costs are constant - but this may well be a reasonable assumption to make as a description of oligopolistic industries where excess capacity is the norm (see Cowling 1982). Kalecki himself never formulated an explicit determination of the degree of monopoly but clearly saw this quantity as related to the size structure of firms within an industry and the degree of collusion those firms employ over price setting. This explicit determination is provided by Cowling (1982), who obtains the result that in a profit-maximising oligopoly the average price-cost margin is a function of the Herfindahl index of industrial concentration, the price elasticity of demand, and a conjectural variation term which measures the average conjectured output response of rivals to a change in output of a particular member of the oligopoly (the correspondence of output behaviour is likely to be fuller as the number of firms in the oligopoly decreases) (2). This serves to demonstrate that income distribution in an industry is determined by the structure and market conduct of that industry. The presence of the advertising-sales ratio in the estimating equation is to capture the fact that firms in an oligopoly may have some control over the demand curve for their product through their advertising behaviour.

In order to test the proposition that income distribution in oligopolistic industries is determined by the interaction of product market structure and conduct, and the power of organised labour for United States manufacturing industry we shall adopt the following estimating equation:

LSi = F(CRi, ADi, CAPi, UNi)

where LSi is a measure of the income share of labour

CRi is a measure of industrial concentration

ADi is a measure of advertising intensity

CAPi is a measure of capital intensity, and

UNi is a measure of unionisation.

This model is essentially the same as that of Cowling & Molho (1982) and given the relationship that exists between income distribution and the price cost margin (3) it is a very similar model to that of Freeman (1983). However at this point it is important to point out one important difference between Cowling & Molho and Freeman concerning whose income share is being determined in their models. Cowling & Molho since they are testing a Kaleckian model use as their dependent variable the income share of production workers - the implication is that direct costs comprise raw materials and only the production labour input. This comes from Kalecki's opinion that salaries can be considered a component of overheads and so invariant to output. Any redistribution from salaries to profits that may result from a change in product or labour market structure can be simply considered as a internal redistribution between two components of what Kalecki terms "gross capitalist income". The implication of applying a distribution theory interpretation to Freeman's model is that variable costs comprise raw materials and both blue and white collar labour inputs. We shall examine both cases in our empirical analysis. Furthermore the Kaleckians would predict that in using Freeman's definition of the price-cost margin the relationship between the degree of monopoly becomes a much more complex one since his definition of variable costs contains an element of overheads whose average would not remain invariant to changes in product price.

Nevertheless we can interpret this model as a development of Kalecki's theory of distribution or more generally as an ad hoc formulation of an hypothesised link between income distribution and market structure and conduct. As a formulation of Cowling's development of Kalecki the estimating equation is an approximation to a precisely defined theoretical functional form and so we must be very careful in our interpretation of the explanatory variables. The concentration ratio serves as a proxy for the Herfindahl index since the latter are not available, and also as a proxy for the conjectural variation term, since we believe that that the degree of collusion rises as the number of firms in an oligopoly falls. The advertising intensity variable serves as a proxy for the elasticity of demand for the reason outlined above that we might expect a monopolistic firm to seek to render demand inelastic and advertising would be one way to achieving this. The presence of a capital intensity variable is to allow for the possibility that more concentrated industries are associated with a lower labour share in the trivial sense that more concentrated industries tend to be more capital intensive due to considerations of minimum efficient scale.

Data

Our principal data source is the 1972 United States Census of Manufactures, and the observational unit is the 3 digit industry. 1972 is a fortunate choice of year since it gives us a cross-section just prior to the O.P.E.C. oil price increase that played havoc with the materials cost structure of western manufacturing industries. However this choice was constrained by the availability of data on union density. This constraint also imposes on our choice of observational unit, since our unionisation series are only available at the 3-digit level rather than the preferable 4-digit level.

In order to examine the robustness of the model three different definitions of labour share are used and results are reported for each in turn. In all three cases the denominator is value added in manufacture (i.e. gross output net of materials costs). Production worker wage share of value added is the narrowest measure and corresponds to that used by Cowling & Molho (1982) and Henley (1984). It is the most appropriate to a Kaleckian model since production worker payroll accounts for only the labour costs that Kalecki regarded as variable. Employee payroll share includes as well in the numerator the salaries of administrative and clerical staff. The broadest measure uses "total labour cost" as numerator and in addition to wages and salaries includes a quantity which the Census of Manufactures terms "supplemental labour cost" and includes pension and unemployment benefits paid to former employees, and therefore income generated in the production process that accrues to the employed class. These three measures are used to cater for differing opinions of who constitutes the employed class - from the post Kaleckian who would argue that salaried staffs tend to identify with the managerial interest and that their share relative to profits is an ex post distribution assue between ownership interests and managerial interests to the orthodox viewpoint interested in the distinction between "property income" and "remunerative income". Table 1 summarises the three measures used.

Table 1: Definitions of Labour Share

1.	Production Worker Payroll / Value Added	(WS1)
2.	Employee's Payroll (wages & salaries) / Value Added	(WS2)
3.	Total Labour Cost (wages,salaries & supplemental labour cost) / Value Added	(WS3)

The concentration measure used is a 4-firm concentration ratio in the absence of the theoretically preferable Herfindahl index. It is that of Weiss & Pascoe (1981) and relates to the year 1972. It has considerable advantages over other concentration ratio available in that it makes precise adjustments (rather than "guesstimates") for four common deficiencies in published concentration series. Firstly it adjusts for the closeness of product groups within each industry, secondly for the geographical fragmentation of markets. The third adjustment is for where two products in separate industries are in close competition (for example, beet sugar and cane sugar) and finally an adjustment is made to reflect import penetration and export intensity. The Weiss-Pascoe series is at the 4-digit industry level so to match it to our 3-digit database 4-digit ratios were aggregated up using the proportion of shipments accounted for by each 4-digit industry in the corresponding 3-digit industry as weights.

Advertising intensity is measured by the advertising sales ratio, derived in a similar fashion from the 4-digit ratios of Ornstein (1977). Ornstein's data in fact refers to 1967 but is the only available at a sufficient degree of disaggregation. Furthermore it does not cover the full sample of industries. As a result our potential sample is reduced by around 30.

Two capital intensity variables are used alternately - both employing the 1972 Book Value of Assets as numerator. The capital/labour ratio uses production man-hours as denominator , the capital/output ratio uses value-added.

The unionisation series used are those of Freeman & Medoff (1979) and measure the percentage of production workers or precentage of all workers, depending on which dependent variable is being used, covered by a collective bargaining agreement. They refer to an average for the period 1967 to 1972.

Table 2: O.L.S. Regressions of Estimating Equation

71 observations   t-statistics in brackets

Levels:

	WS1	WS1	WS2	WS2	WS3	WS3
Const	0.368 (12.37)	0.378 (11.72)	0.539 (18.30)	0.557 (16.90)	0.592 (17.40)	0.612 (16.08)
CR	-0.165 (-3.329)	-0.194 (-3.667)	-0.100 (-2.061)	-0.150 (-2.821)	-0.083 (-1.470)	-0.137 (-2.235)
A/S	-1.430 (-4.312)	-1.499 (-4.123)	-2.122 (-6.394)	-2.325 (-6.219)	-2.448 (-6.378)	-2.661 (-6.168)
K/L	-0.002 (-3.650)		-0.004 (-5.883)		-0.004 (-5.555)	
K/Y		-0.019 (-1.407)		-0.055 (-3.911)		-0.057 (-3.559)
UN	0.085 (2.284)	0.070 (1.677)	0.069 (1.586)	0.077 (1.543)	0.098 (1.943)	0.104 (1.800)
F	14.64	10.18	24.52	16.65	22.51	15.19
R2	0.438	0.344	0.598	0.472	0.551	0.448

Logarithms:

	WS1	WS1	WS2	WS2	WS3	WS3
Const	-1.404 (-8.650)	-2.074 (-12.26)	-0.922 (-7.644)	-1.575 (-12.57)	-0.774 (-6.360)	-1.394 (-11.13)
CR	-0.093 (-1.418)	-0.215 (-2.865)	-0.012 (-0.257)	-0.103 (-1.955)	0.008 (0.179)	-0.080 (-1.511)
A/S	-0.138 (-5.645)	-0.133 (-4.213)	-0.124 (-7.049)	-0.135 (-6.068)	-0.124 (-6.988)	-0.134 (-6.013)
K/L	-0.229 (-6.045)		-0.204 (-7.570)		-0.194 (-7.163)	
K/Y		-0.107 (-1.674)		-0.201 (-4.444)		-0.187 (-4.141)
UN	0.172 (2.410)	0.121 (1.370)	0.077 (1.686)	0.101 (1.789)	0.092 (1.978)	0.113 (1.993)
F	22.39	9.595	29.51	15.50	27.10	14.40
R2	0.550	0.329	0.620	0.453	0.599	0.434
Sargan	0.291	0.228	0.368	0.317	0.421	0.367

CR: 4-firm concentration ratio, A/S advertising sales ratio,
K/L: Capital-labour ratio, K/Y: capital/output ratio, UN: collective agreement coverage

Results

Table 2 presents ordinary least squares regression results for both logarithmic and levels specifications of the estimating equation for all three definition of the dependent variable. In fact the Sargan criterion tests show that the levels specification is preferred in all cases (4).

First of all we should note the general level of significance of the coefficients on our two product market structure and conduct variables - the concentration ratio and the advertising sales ratio. From the logarithmic estimations we can note that a 10% proportional rise in the advertising sales ratio is associated with between a 1.2 and a 1.4 percent proportional fall in labour share. If we can assume that an increase in advertising intensity is indicative of the strengthening of the power of firms in a monopolistic industry then we can see that this effect would have a clear impact on income distribution in that industry. The result for concentration is not as robust in terms of the levels of significance of its coefficients but nevertheless a negative association with labour share is established. We should note one point concerning the size of the coefficient on concentration: that it decreases in size in all cases as the measure of labour income in labour share broadens. We can conclude from this that there is a much stronger inverse relationship between concentration and production worker payroll share than between concentration and the income share of salaried staffs. This is further supported by the following two regressions with salary share of value added as the dependent variable (unionisation here is administrative and clerical collective agreement coverage).

~~Levels~~

$$SS = 0.135 + 0.019CR - 0.007A/S - 0.002K/L + 0.241UN$$
$$(8.093)\ (0.513)\ (-2.860)\ (-4.016)\ (3.258)$$
F:7.26 Adjusted R-squared:0.263

Logarithms

$$SS = -1.315 + 0.057CR - 0.075A/S - 0.244K/L + 0.288UN$$
$$(-4.227)\ (0.528)\ (-1.912)\ (-3.814)\ (2.729)$$
F:4.97 Adjusted R-squared:0.185

Here we have a positive but not statistically significant relationship between salary share and concentration. Cowling & Molho (1982) observed this for the U.K. Their explanation was:

> "...in a world of managerial capitalism we would expect the size and expense of the salariat to grow with concentration as the managerial hierachy skim off for themselves at least a fraction of the increment in profits and thus we would expect to observe a positive association with concentration." (Cowling & Molho 1982 p.101)

The strongest results for unionisation are obtained with production worker payroll share as the dependent variable. The logarithmic results indicate that a 10% increase in the collective agreement coverage of production workers is associated with a 1.2 to 1.7 percent increase in labour share. Although not as robust in terms of statistical significance as for advertising intensity, we can note that a positive relationship is established for all three definitions of labour share. We can conclude from that the impact of unionism is to mitigate against the power of monopolistic elements in the product market in the determination of income distribution.

Both capital intensity variables are significantly negatively related to labour share. This is of course as we might expect since as labour forms a smaller factor input in one industry compared with another we might expect its proportional remuneration to be smaller. However, when capital/labour ratio is the variable used the impact of concentration on labour share (in terms os the size of the coefficient on concentration) is smaller than when capital/output is used. This suggests that the capital/labour ratio is endogeneous in this model, both determining wage share and being determined by it. A possible explanation for this may be found in orthodox production theory i.e. that the factor proportionality decided upon by firms in an industry will depend upon the extent to which trades unions succeed in adjusting the wage level above it competitive level. To test this we report results in which the capital/labour ratio is determined by an instrumental variable - the instrumental variable chosen being the other measure of capital intensity. We use the capital/output ratio as an instrument because it does seem to have less of an undermining effect on concentration, perhaps because the presence of a trade union not only alters the factor proportionality but also raises output per man (see Addison 1983). Results are shown for production worker payroll share as dependent variable:

levels:

$$WS = \underset{(12.11)}{0.371} - \underset{(-3.515)}{0.180CR} - \underset{(-4.158)}{1.420A/S} - \underset{(-1.476)}{0.0100K/L^*} + \underset{(1.689)}{0.065UN}$$

logarithms:

$$WS = \underset{(-9.362)}{-1.758} - \underset{(-2.471)}{0.181CR} - \underset{(-4.570)}{0.124A/S} - \underset{(-1.860)}{0.089K/L^*} + \underset{(1.489)}{0.117UN}$$

* instrumented variable

A comparison of these results with the equivalent ordinary least squares estimations shows that the size of the coefficient on concentration is now much nearer that in the ordinary least squares estimations that use the capital/output ratio. This confirms that the capital/labour ratio is endogeneous and consequently undermining the impact of concentration on labour share.

Conclusion

This paper has addressed the question of what influence, if any, does monopolistic power in both product markets and labour markets of manufacturing industry have on income distribution, in the context of a cross-section of 3-digit U.S. industries. We have found convincing evidence to support the view that the structure and market conduct of firms within an industry bears an important relationship to the functional distribution of income within that industry. Both concentration and advertising intensity have been observed to be negatively related to labour share and especially to the share of value added going to production workers' wages. We would argue that this indicates that any theory of income distribution must take serious account of the important influence of product market power.

In addition we have found a distinct positive relationship between labour share and the proportion of the appropriate workforce within an industry who are covered by a collective bargaining agreement. This suggests that the power of monopolistic firms to determine income distribution is at least partially offset by the impact of trades unions and collective employee organisation.

We would therefore suggest that the evidence we have found lends strong support for a Kaleckian theory of income distribution in which the power of monopoly influence in the product market and the countervailing influence of labour market monopoly are seen as important determinants of the way in which the division of income is made between labour and profit shares.

Footnotes

(1) As Addison (1983) points out, the literature on this question is still a long way from identifying the precise means by which unions are associated with higher productivity.

(2) The precise statement of this relationship is as follows (Cowling 1982 p.34):

$$(P - c'(X))/P = a/e + (1 - a)H/e$$

where P is market price, c'(X) the industries variable cost function, a the conjectural variation term, dXj/dXi.Xi/Xj, strictly constant for all i and j firms but could be viewed as loosely the average output response of rivals, H the Herfindahl index and e the industry own price elasticity of demand.

(3) The following relationship can be shown to exist between the average industry price-cost margin and wage share:

$$W/Y = 1 - (p - c'(X))/P\ (R/Y)$$

and follows from the identity $R = \pi + W + M + F$ with the assumption that marginal costs are constant

where: $R = p \cdot X$ equals total revenue

π is profits, M is materials expenditure, and F is overheads expenditure.

$c'(X)X = W + M$, assuming constant marginal costs.

(4) see Sargan (1964). The test statistic is: S = s(lev)/g.s(log) where g is the geometric mean of the dependent variable, s(lev) is the residual variance of the level specification and s(log) is the residual variance of the logarithmic specification. If S > 1 then we prefer the logarithmic specification. This requires the assumption that both residuals have the same distribution which is of course not true, but Godfrey & Wickens (1981) have shown that in many cases the effect of this will be negligible.

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