PRICE BEHAVIOR IN THE MANUFACTURING SECTOR FOR SIXTEEN INDUSTRIES CLASSIFIED BY STAGE-OF-PROCESS

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Abstract

One major finding of this paper is that prices in most basic materials producing industries are responsive to demand while prices in most finished goods producing industries are not. If the reverse were true, stabilization policies would have more effect in the short run on prices and less effect on output than is currently the case.

A second finding relates to the 1971-4 period of wage and price controls and the period immediately following their termination. During controls, prices in most manufacturing sectors did rise somewhat slower than their historical relationship to costs would suggest. But after controls ended prices rose relative to costs by considerably more than the amount of their shortfall during controls. This suggests that some fundamental change in price-cost relationships may have taken place in 1974.

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In 1970 at a conference on the econometrics of price determination William Nordhaus [1972a] in his review of recent price behavior analysis concluded, "Most of the specifications and interpretations have proceeded without the benefit of formal theory." Three years later David Laidler and Michael Parkin [1975] in surveying inflation commented that the finding of Nordhaus (and Godley) [1972b] about price behavior in the United Kingdom was based on an incorrect specification: "It is at odds both with the usual theory of price setting and with earlier empirical work . . . ."

These comments are not intended to goad these researchers into further criticisms of each other's work; all three papers are especially valuable contributions to the literature on price behavior. Instead they are cited to point up the difficulty of formulating theoretically sound specifications that can be tested empirically, particularly when the analysis is directed at sectoral price changes rather than the aggregate price level.

The research reported in this paper is a further attempt to wed theory and practice, particularly with respect to the existence and effect on price behavior of snort-run disequilibria between production and demand. In this paper attention is given to the roles of the level and change in capacity utilization and to a previously untested excess demand variable -- the ratio of new orders to output. But before the reader focuses too intently on the success of this endeavor, it should be pointed out that the research has a second objective. It is to examine price behavior in the manufacturing sector for a disaggregation of sixteen industries classified by where they are located in the stages-of-process by which raw materials are transformed into finished goods. The empirical results of this analysis are price equations which are imbedded in an integrated model of final and intermediate demand by stage of process. (For a description of this model see Popkin [1977].)

Typically, price behavior analysis for the manufacturing sector is directed at the twenty 2-digit industries that comprise it. But such analysis requires treatment of such industries as pulp, paper and allied products and chemicals and allied products, both of which consist of industries that convert raw materials to basic industrial materials which are then transformed into semi-manufactures and finished goods in those 2-digit industries and in others. On the demand side the sources of derived demand for the basic materials are lost and the pattern of lagged adjustment processes clouded. On the supply side possible differences in substitution possibilities, say for iron ore in steel plants vis-a-vis those for steel-based versus aluminum-based car parts, are not reflected. Such problems can be alleviated if manufacturing industries are viewed by stage-of-process rather than the aggregative SIC categories to which they have been assigned.

The sixteen stage-of-process industries on which this research focuses fall into three groups. The first consists of six industries that produce largely finished goods. They are automotive, consumer home goods (primarily nonauto durables), food, beverage and tobacco manufactures, other consumer staples (nonedible nondurables excluding fuels), machinery and equipment other than ordnance and transportation equipment, and an industry composed of shipbuilding, ordnance, aircraft and railroad equipment. The second group consists of one industry that produces intermediate, or semi-manufactures. Finally, there are nine primary industries defined wherever possible as the first processors of raw materials. They are textiles, lumber, paper, chemicals, fertilizers, stone, clay and glass, steel, nonferrous metals and petroleum refining.

The behavioral hypothesis

The strategy used to analyze price behavior in these sixteen industries consisted of testing the hypothesis that each consists of competitive firms but that prices may be in disequilibrium. It was assumed that the firms produce output subject to a Cobb-Douglas production function with constant returns to scale (see Nadiri [1977] and Popkin [1978] for use of similar assumptions):

(1) $$X = AK^{\alpha 1} L^{\alpha 2} M^{\alpha 3} e^{ht} \qquad \text{where } \alpha_1 + \alpha_2 + \alpha_3 = 1$$

and X is output,
K, capital,
L, labor,
M, materials and
t, a term representing Hick's-neutral technological change.

Maximizing short-run profits with respect to this production function yields the following price equation which can be viewed as describing short-run equilibrium by holding capital constant:

(2) $$p^e = C\left(1 - \frac{1}{b}\right)^{-1} w^{(\alpha 2/1-\alpha_1)} m^{(\alpha 3/1-\alpha_1)} X/K^{(\alpha_1/1-\alpha_1)} e^{-(ht/1-\alpha_1)}$$

where p^e is the equilibrium price,
b, the price elasticity of demand,
w, the wage rate and
m, the price of materials.

In the short run, the cost of capital does not enter the price equation because capital stock is assumed fixed, only its utilization may vary. A bridge between short run pricing behavior and the long-run pricing rule can be established by relying on the first-order profit maximizing conditions with respect to capital input:

(3) $$\frac{r}{pe} = \alpha_1\left(1 - \frac{1}{b}\right)\frac{X}{K} ,$$

where r is the rental price of capital.

Substituting (3) into (2) for r yields Nordhaus' [1972a] derivation of the long-run competitive pricing rule:

$$(4) \qquad p^e = C'\left(1 - \frac{1}{b}\right) r^{\alpha_1} w^{\alpha_2} m^{\alpha_3} e^{-ht}$$

In words, in the short run, equilibrium price depends positively on wage rates and materials prices, each weighted by their proportion to the sum of both, and on movements in output vis-a-vis capital stock which may be assumed fixed. In the long run price depends on, aside from wage rates and materials prices, the rate at which capital grows relative to output. Their relative growth mirrors what is happening to the cost of capital under the assumption of a Cobb-Douglas production function with constant returns to scale.

Equation (2) depicts the movement of both short run and long run equilibrium prices. The change in equilibrium price may be expressed by transforming (2) into:

$$(5) \qquad \frac{p^e_t}{p^e_{t-1}} = -e^{\left(\frac{-h}{1-\alpha_1}\right)} \left(\frac{w_t}{w_{t-1}}\right)^{\left(\frac{\alpha_2}{1-\alpha_1}\right)} \left(\frac{m_t}{m_{t-1}}\right)^{\left(\frac{\alpha_3}{1-\alpha_1}\right)} \left[\frac{(X/K_t)}{(X/K_{t-1})}\right]^{\left(\frac{\alpha_1}{1-\alpha_1}\right)}$$

But prices may not always be in equilibrium so that actual price change may differ from equilibrium price change. Actual price change is given by:

$$(6) \qquad \frac{p_t}{p_{t-1}} = \lambda_t\left(\frac{p^e_t}{p^e_{t-1}}\right)$$

That is prices in any time period are assumed to change by some changing fraction (λ_t) of the change in equilibrium price. As long as prices are in dynamic equilibrium, λ_t will equal unity. But, for a number of well-known reasons, prices need not always be in equilibrium. Therefore λ_t is a measure of disequilibrium:

(7)
$$\lambda_t = \frac{P^e_{t-1}}{P_{t-1}} = \left(\frac{NO}{X}\right)_{t-1}^{\delta(X/K)_{t-1}}$$

where NO is new orders.

The rationale for (7) is that the demand curve is a schedule of the demand for orders at various prices, the supply curve, a schedule of output. If price is not in equilibrium new orders differ from output, implying that unfilled orders and/or finished goods inventories are changing.[1/] Unfilled orders and

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1/

This can be demonstrated as follows:

$$\left(\frac{NO}{X}\right)_t = \frac{UO_t - UO_{t-1} + S_t}{IFG_t - IFG_{t-1} + S_t}$$

, where UO is unfilled orders, IFG, finished goods inventories and S, shipments.

$$\left(\frac{NO}{X}\right)_t - 1 = \frac{UO_t - UO_{t-1} + S_t}{IFG_t - IFG_{t-1} + S_t} - \frac{IFG_t - IFG_{t-1} + S_t}{IFG_t - IFG_{t-1} + S_t} .$$

$$\left(\frac{NO}{X}\right)_t = 1 + \frac{(UO_t - UO_{t-1}) - (IFG_t - IFG_{t-1})}{X}$$

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finished goods inventories change in opposite directions in adjusting to a gap of a given algebraic sign. It can be demonstrated that the parameter δ is equal to the reciprocal of the sum of the absolute values of the elasticities of supply and demand. If these elasticities are not constant, then the ratio p^e/p for any given value of NO/X may vary. For example, if supply becomes more inelastic at higher output levels, the same gap at higher output levels will imply a larger gap between equilibrium and actual price. This nonlinearity may be represented by specifying the output-capital ratio as an exponent of the ratio of new orders to output. Hence, the degree of price disequilibrium is represented by (7).

Substituting (5) and (7) into (6), combining labor and materials prices into one variable, and expressing the relationships in logs yields:

$$(8)\qquad \Delta \ln p_t = \ln \beta_0 + \beta_1 \Delta \ln \sum_{t}^{t-i} \omega_i \left[\left(\frac{\alpha_2}{1-\alpha_1}\right)^{w} + \left(\frac{\alpha_3}{1-\alpha_1}\right)^{m}\right] +$$

$$\beta_2 \Delta \ln \sum_{t}^{t-i} \omega_i \left[\frac{X}{K}\right] + \beta_3 \left(\frac{X}{K}\right)_{t-1} \ln \left(\frac{NO}{X}\right)_{t-1} + u_t .$$

This equation is estimated by ordinary least squares for each of two sample periods 1960:I-1971:II and 1960:I-1975:IV, the former period ending with the institution of price and wage controls. For the longer sample period a dummy variable for post-controls effects is specified alternatively in some sectors.

Equation 8 makes explicit the role of the level and change in excess demand, as reflected in the output-capital ratio which is a measure of capacity utilization. The level is appropriate only when there is short-run disequilibrium and then only if supply and demand elasticities are not constant. The constant term, β_0 , includes the technical progress term from (5) which has an expected negative algebraic sign. Other factors might obscure this, however, including changes in monopoly power. If the data fit the Cobb-Douglas constant returns to scale assumptions, β_1 should equal unity and β_2 should equal the capital share divided by the noncapital share $\frac{\alpha_1}{1-\alpha_1}$. The algebraic sign of β_3 represents the positive constant in the exponent of NO/X.

If both β_2 and β_3 turn out to be positive competitive behavior is implicit.[1/] If they are negative, noncompetitive behavior is implied. However since the results depend importantly on the appropriateness of the underlying assumptions, it would be more prudent to interpret the algebraic signs of the estimates of β_2 and β_3 merely as indicators of whether margins behave procyclicly, anticyclicly or are cyclicly neutral.

1/ Laden has shown [1972] that in industries using average-cost pricing β_2 would be positive above the point of minimum average cost, but negative in the large range below it.

The data and estimation

The data are taken from five primary sources: Censuses and Annual Surveys of Manufactures (Census Bureau), monthly series on manufacturers' inventories, shipments, new and unfilled orders (Census Bureau), component series of the monthly wholesale price index (Bureau of Labor Statistics), monthly series on employment, hours and earnings (Bureau of Labor Statistics) and components of the monthly industrial production index (Federal Reserve Board). Capital stock estimates were prepared using perpetual inventory techniques by extrapolating BLS benchmarks by census annual investment data interpolated quarterly by data from BEA. Data at the three and four digit SIC level (six and eight digit wholesale price index categories) are combined to form aggregates for each of the sixteen manufacturing sectors. The four-digit composition of each of the sectors is available on request. All variables are measured quarterly. For flow variables, the monthly series are seasonally adjusted and quarterly averages formed. The various series have been constructed for 1958-1975 and most are available monthly.

A more detailed description of sources of data and methods of construction of particular series is available from the author on request.

Lag Structure.— The lag structure for the materials and labor input price variable had been determined by fitting Almon lags using a second degree polynomial and a lag distribution running from t to t-7. The results were used to construct single variables incorporating the relevant information obtained by using the Almon technique. Insignificant or negative lag coefficients were eliminated; those terms remaining were combined using approximate values of the Almon weights. Separate weights were so derived for each sample period. Upon analysis, it appeared that where they differed it was due to the fact that materials prices affect output prices with a lag structure different from that of labor prices. Accordingly, separate lags were estimated for materials and labor prices, again based on Almon techniques, with the result that the same lag structure seemed applicable to both time periods.

The same general strategy was used to develop distributed lag weights for the other two variables, the change in the log of the output-capital ratio and the output-capital ratio times the log of the orders-output ratio. (The latter measure of disequilibrium is assumed to operate only with a lag.) For these two variables first degree polynomials were fitted running from t to t-3 and t-1 to t-4 respectively. The technique described above was used to select the distributed lag weight for these variables as well, except that significant negative weights for the disequilibrium variable were accepted because there could be "overshooting." It turned out to be necessary to use different lag structures for each sample period for these two variables. The lags and their weights are given in Appendix A.

Results

The results are found in Table 1. For the shorter time period more than half of the price variation is explained in only eight of the sixteen industries. Results are particularly poor for lumber, chemicals, fertilizers, nonferrous metals and petroleum. In virtually every industry, the amount of explained price variation increases when the sample is extended through 1975. But in a number of cases the improvement is associated with the emergence of significant serial correlation, a sharp rise in the standard error and some unacceptably large shifts in the estimates of some parameters. In those cases a dummy variable was incorporated to test for post-control bulges in 1973 and 1974. (In some sectors decontrol began in the second half of 1973, preceeding the general decontrol that took place in April 1974.) The result is more rational parameter estimates and the virutal elimination of significant serial correlation; this suggests that the serial correlation present before the inclusion of the dummy variable was due to a missing variable during the 1972-1975 period, and that variable seems to be one reflecting post-controls developments.

The analysis of the results can best be accomplished by looking at the estimates for the longer sample period, including those that incorporate the dummy variable where specified. In all but one of the equations, the adjusted R^2 exceeds 60 percent; in eleven sectors it is greater than 80 percent. The only disappointing result is in the highly volatile lumber sector, although most of the parameter estimates are significant and relatively stable when

Table 1. -- Regression results for periods beginning in 1960:1 and ending 1971:2 and 1975:4

Stage-of-Process Sector	End of Period	ln materials & labor prices		ln output/capital		ln (order/production) x output/capital 2/		Constant term		Post Controls Dummy		$\bar{R}^2$	D.W	$\overline{SEE}$
		Regression coefficients and "t" statistics 1/										Other statistics		
FINISHED MANUFACTURES														
AUTOS	71:2	.955	(4.3)					-.004	(2.4)			.278	1.89	.007
	75:4	.773	(7.5)					-.004	(2.2			.465	2.13	.009
	75:4	.761	(8.9)					-.004	(2.7)	.018 3/	(5.5)	.636	2.09	.008
CONSUMER HOME GOODS	71:2	.085	(0.6	-.042	(2.6)	.039	(3.4)	.002	(1.6)			.635	1.60	.002
	75:4	1.126	(15.0)	-.034	(2.2)	-.041	(4.0)	-.009	(8.3)			.868	1.24	.003
FOOD	71:2	.888	(7.0)	-.310	(1.0)	.090	(2.2)	.001	(0.6)			.558	1.94	.007
	75:4	.807	(9.5)	.643	(2.5)	-.057	(1.6)	-.001	(0.4)			.602	1.32	.013
	75:4	.846	(15.8)	-.082	(0.5)	.052	(2.1)	-.0001	(o.1)	.055	(9.7)	.844	2.34	.008
OTHER CONSUMER STAPLES	71:2	.293	(2.8)	.001	(0.0)	.079	(3.1)	.003	(2.5)			.648	1.32	.002
	75:4	1.026	(13.3)	-.234	(5.1)	-.113	(4.9)	-.007	(5.8)			.805	0.86	.003
	75:4	.660	(9.0)	-.154	(4.1)	-.050	(2.5)	-.003	(2.5)	.014	(6.5)	.883	1.62	.003
MACHINERY AND EQUIPMENT	71:2	.970	(7.3)			.012	(1.0)	-.004	(2.4)			.629	0.98	.003
	75:4	1.532	(20.1)			.041	(3.3)	-.011	(8.8)			.872	0.76	.005
	75:4	1.192	(12.()			.022	(2.0)	-.007	(5.1)	.019	(5.1)	.910	1.37	.004
ORDNANCE, SHIPBUILDING, AIRCRAFT AND RAILROAD EQUIPMENT	71:2	1.187	(3.4)	-.117	(2.0)	.034	(2.0)	-.009	(2.1)			.428	2.30	.005
	75:4	2.255	(17.1)	-.191	(3.6)	.083	(5.9)	-.023	(9.4)			.828	2.28	.007
	75:4	1.878	(12.0)	-.155	(3.2)	.061	(4.4)	-.018	(6.6)	.023	(3.8)	.859	2.35	.007
SEMI-FINISHED MANUFACTURES	71:2	.796	(8.7)			.046	(2.6)	-.003	(3.4)			.621	1.13	.003
	75:4	1.562	(20.9)			.152	(7.3)	-.008	(7.7)			.874	1.27	.006
	75.4	1.180	(12.5)			.106	(5.6)	-.005	(5.1)	.023	(5.4)	.914	1.21	.005

Table 1. -- Regression results for periods beginning in 1960:1 and ending 1971:2 and 1975:4 (Continued)

Stage-of-Process Sector	End of Period	Regression coefficients and "t" statistics 1/										Other statistics		
		ln materials & labor prices		ln output/capital		ln (order/production) x output/capital 2/		Constant term		Post Controls Dummy		$\bar{R}^2$	D.W	$\overline{SEE}$
PRIMARY MANUFACTURES														
TEXTILES	71:2	.986	(3.9)	.311	(4.9)	.028	(1.4)	-.005	(1.6)			.643	1.11	.007
	75:4	.932	(9.0)	.506	(10.8)	.052	(3.7)	-.001	(0.3			.861	1.41	.009
LUMBER	71:2	1.956	(2.1)	.424	(1.7)	.395	(1.9)	-.006	(0.6)			.185	1.75	.029
	75:4	1.352	(2.2)	.568	(2.6)	.364	(2.6)	.004	(0.4)			.225	1.52	.032
PAPER	71:2	.388	(3.3)	.149	(3.0)	-.073	(3.1)	.0002	(0.1)			.361	1.90	.006
	75:4	1.146	(5.1)	.168	(2.1)	.060	(1.5)	-.004	(1.3)			.283	0.60	.016
	75:4	.537	(4.0)	.092	(2.0)	-.008	(0.4)	-.001	(0.7)	.057	(11.8)	.783	2.28	.009
CHEMICALS	71:2	-.037	(0.2)	-.149	(3.6)	-.010	(0.7)	.001	(0.4)			.261	1.91	.004
	75:4	2.971	(16.3)	.096	(1.2)	.193	(6.4)	-.040	(11.1)			.810	0.86	.015
	75:4	1.646	(9.1)	.076	(1.5)	.085	(3.9)	-.021	(6.9)	.083	(9.6)	.924	1.78	.009
FERTILIZERS	71:2	-.569	(1.2)			.043	(2.0)	-.004	(0.9)			.064	1.37	.014
	75:4	.988	(12.4)			.121	(5.3)	-.020	(4.7)			.714	1.57	.023
	75:4	.978	(12.9)			.116	(5.3)	-.020	(5.0)	.062	(2.8)	.743	1.56	.022
STONE, CLAY & GLASS	71:2	1.123	(8.9)			.009	(0.4)	-.005	(3.5)			.630	1.28	.004
	75:4	1.445	(13.6)			.062	(2.3)	-.006	(3.7)			.746	1.17	.006
	75:4	1.001	(10.0)			.031	(1.5)	-.004	(2.8)	.022	(7.2)	.860	1.90	.005
IRON & STEEL	71:2	.909	(7.9)					-.002	(2.0)			.579	1.37	.006
	75:4	1.511	(12.0)					-.009	(3.6)			.694	1.23	.014
	75:4	.907	(7.7)					-.003	(1.5)	.075	(7.9)	.846	1.61	.010
NONFERROUS METALS	71:2	1.467	(1.7)	.106	(1.3)	.117	(1.4)	-.005	(0.8)			.055	0.85	.017
	75:4	2.892	(5.7)	.332	(3.1)	.252	(3.8)	-.014	(2.5)			.361	0.70	.024
	75:4	0.800	(1.6)	.240	(2.9)	.100	(1.8)	.0001	(0.0)	.081	(6.4)	.616	1.10	.019
REFINED PETROLEUM PRODUCTS	71:2	.646	(1.6)	.262	(1.0)	.223	(2.6)	.001	(0.3)			.117	1.51	.015
	75:4	1.464	(15.2)	.862	(3.0)	.120	(4.2)	-.003	(1.1)			.841	1.24	.018

1/ The absolute value of "t" statistics is shown in parentheses.

2/ The output/capital ratio is here expressed as a deviation from its mean.

3/ Dummy reflects only changes in the timing of introduction of price increases on new model cars from the fall to early winter as a result of proceedures followed during the controls period.

viewed over both sample periods.

With respect to parameter estimates, the coefficient of the labor and materials price variable is significant in fifteen of the sixteen sectoral equations based on the longer sample period (all but five for the shorter period). In seven of the fifteen sectors the coefficient is not significantly different from one. The sectors in which such coefficients exceed unity are largely primary industries while those less than unity are finished goods industries.

The output-capital ratio is significant in eight of the sixteeen industries. But the coefficient has a negative sign in sectors other than primary manufacturing.

The disequilibrium variable is significant in eleven industry sectors. In two of these -- consumer home goods and staples -- the coefficient has a negative sign. Further tests in which X/K was deleted from the disequilibrium variable produced results that precluded rejecting the hypothesis that supply and demand elasticities are not constant. In general inclusion of X/K resulted in a slight improvement in the fit of the equations.

The hypothesis put forward that price behavior reflects competitive behavior among firms in an industry in which the production function is Cobb-Douglas with constant returns to scale cannot be rejected in two sectors -- textiles and lumber. But the existence of perfect competition may be obscured in some of the other industries because the production function assumption is too restrictive. The results show that in eight other industries the behavior of margins, as reflected by the output-capital ratio and the disequilibrium variable, is procyclical, a pattern not inconsistent with competitive behavior. Procyclical margin behavior requires that one or both of the two margin-related variables must be significant, and when so, the sign must be positive. The eight industries are consumer food, machinery and equipment, paper, chemicals, fertilizers, nonferrous metals, refined petroleum products and semi-manufactures, only two of which are finished goods industries.

In three industries the sign of neither margin-related variable is significant, suggesting constant mark-up or cyclically neutral margin behavior; the three are autos, steel and stone, clay and glass.

Anti-cyclical margin behavior is indicated in two sectors -- consumer home goods and staples -- where both variables are negative and significant. However, the effect of import competition in these sectors should be examined before accepting the competitive implications of the results presented here.

Margin behavior in the ordnance, et al industry cannot be determined because the two variables have coefficients of opposite sign.

The general picture that emerges from this analysis is that price behavior in primary industries is consistent with the competitive model while that in finished goods industries is not. It is interesting however that post-controls dummies are significant in many of both kinds of industries, not just competitive industries where controls may have suppressed the response of prices to rising demand. 1/

Post-controls dummy variables are significant in eleven of the sixteen sectors. Two of the sectors in which they are not significant are those with cyclically neutral or anticyclical margin behavior -- autos and consumer home goods. Such variables are also not significant in three industries that fit the competitive pattern -- textiles, lumber and petroleum. In the first two, demand began to decline in early 1973 when new housing and apparel expenditures weakened at the final demand level: and petroleum prices have never been fully decontrolled.

1/ That such dummies are not significant in textiles and lumber -- the two industries which appear to fit best the competitive hypothesis tested here -- is understandable in the fact that demand for the output of these sectors began to decline early in 1973 when new housing and apparel expenditures weakened at the final demand level.

The extent of the post-controls price rise -- the coefficient of the dummy variable times the number of quarters its value was one -- is shown in the first column of table 2 for each sector in which the effect is significant. In most of these sectors price behavior is consistent with the competitive hypothesis, but there are several exceptions -- steel, stone, clay and glass, consumer staples and (possibly) ordnance et al. That most of the sectors in which the dummy variable is significant are those that fit the competitive hypothesis is to be expected since the controls program tended to impose cost pass-through behavior in most sectors.

The second column of table 2 contains the sum of the residuals during controls. In all but two instances they are negative, suggesting controls held prices down. But the price rise explained by the post controls dummy exceeds substantially the measure in column 2 of the downward impact of controls during the period in which they were in place.

These results with respect to the effect of controls fall somewhere in between the polar findings of R.J. Gordon [1975] that the post-controls bulge in margins over materials and labor costs about offset their contraction during controls and the finding of Al-Samarrie, Kraft and Roberts [1977] that controls had little effect in manufacturing. The conclusion here is that while controls had some effect in holding down margins in many manufacturing sectors, their termination does not explain even half of the post-controls bulge.

The general picture of price behavior duing 1960-75 that emerges from this analysis is that price behavior in primary industries is consistent with the competitive hypothesis while that in finished goods industries is not. Regardless of the reason for the finding, it suggests a reason for what is regarded as insensitivity or considerable delay in the response of prices to a change in aggregate demand policies, particularly a restrictive change. According to this analysis,

Table 2. -- Analysis of effect of controls on margin behavior

Stage-of-process sector	Price increase associated with dummy	Sum of residuals during controls period
Food	16.5%	-1.2%
Other consumer staples	4.2	-1.7
Machinery and equipment	5.7	-3.6
Ordnance, et al	4.6	-1.8
Semi-finished manufactures	6.9	2.9
Paper	22.8	-0.5
Chemicals	24.9	-4.3
Fertilizers	6.2	-0.3
Stone, clay & glass	8.8	-2.2
Steel	15.0	-4.2
Nonferrous metals	32.8	4.0

the initial response to a restrictive change on the part of most finished goods manufacturers is a reduction in output, not in the ratio of output to input prices. This reduction in the volume is greater than would be the case if the output-input price ratio behaved procyclicly. As a result there are larger cutbacks in orders placed by finished goods producers for materials and supplies than would occur otherwise. When these cutbacks in orders impact on those semifinished and primary manufacturing industries in which the output-input price ratio does behave procyclicly, prices in these industries weaken. Such weakness then feeds forward to final demand prices, but of course with a lag, affecting prices in all finished manufacturing and distribution sectors, whether or not the output-input price ratio in those industries behaves procyclicly. It would appear that if the findings reported here were reversed -- that procyclical margin behavior were more characteristic of finished goods producers than of primary producers, aggregative demand policies would be more efficient.

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Appendix A. Distributed lag weights for the demand variables

	Period Ending	Δ ln $\left(\frac{\text{output}}{\text{capital}}\right)$				$\left(\frac{\text{output}}{\text{capital}}\right)$ x ln$\left(\frac{\text{orders}}{\text{production}}\right)$			
		t	t-1	t-2	t-3	t-1	t-2	t-3	t-4
:XTILES	71:2	.308	.269	.231	.192	.344	.281	.219	.156
	75:4	.333	.277	.223	.167	–	.265	.333	.402
JMBER	71:2	.472	.325	.175	.028	.277	.259	.241	.223
	75:4	.310	.271	.230	.188	.303	.267	.231	.198
.PER	71:2	–	–	.333	.667	–	.333	.667	–
	75:4	–	–	.375	.625	.741	.259	–	–
IEMICALS	71:2	.667	.333	–	–	–	.167	.333	.500
	75:4	–	–	.250	.750	.199	.231	.269	.301
:RTILIZER	71:2	–	–	–	–	–	–	.333	.667
	75:4	–	–	–	–	.400	.333	.267	–
:ONE, CLAY, GLASS	71:2	–	–	–	–	.667	.333	–	–
	75:4	–	–	–	–	.667	.333	–	–
:EEL	71:2	–	–	–	–	–	–	–	–
	75:4	–	–	–	–	–	–	–	–
)NFERROUS METALS	71:2	–	–		.6	.477	.333	.190	–
	75:4	.256	.253	.247	.244	.510	.333	.156	–
JTOMOTIVE	71:2	–	–	–	–	–	–	–	–
	75:4	–	–	–	–	–	–	–	–
NSUMER FOOD	71:2	.250	.250	.250	.250	.667	.333	–	–
	75:4	–	–	.368	.632	–	1.0	–	–
)NSUMER HOME	71:2	.206	.235	.265	.294	.167	.222	.278	.333
	75:4	–	.194	.333	.472	–	.256	.333	.410
)NSUMER STAPLES	71:2	–	–	.700	.300	.182	.227	.273	.318
	75:4	–	.200	.333	.467	.500	.333	.167	–
:DNANCE	71:2	.290	.260	.240	.210	.111	.222	.296	.371
	75:4	–	.247	.333	.420	.202	.238	.262	.298
.CHINERY & EQUIP-	71:2	–	–	–	–	–	–	.333	.667
MENT	75:4	–	–	–	–	–	.222	.333	.444
:TROLEUM REFINING	71:2	.600	.400	–	–	.667	.333	–	–
	75:4	.187	.229	.271	.314	1.865	.791	-.291	-1.365
:MI-FINISHED	71:2	–	–	–	–	–	.250	.333	.417
.NUFACTURES	75:4	–	–	–	–	.533	.333	.133	–

Appendix A (continued)

Distributed lag weights for materials prices and wages

	Relative Weight	t	t-1	t-2	t-3	t-4	t-5	t-6	t-7
tomotive									
Wages	.356	–	–	.200	.300	.300	.200	–	–
Materials' Prices	.644	.400	.300	.200	.100	–	–	–	–
nsumer Foods									
Wages	.275	.588	.294	.118	–	–	–	–	–
Materials' Prices	.725	.588	.294	.118	–	–	–	–	–
nsumer Homegoods									
Wages	.528	.400	.300	.200	.100	–	–	–	–
Materials' Prices	.472	.400	.300	.200	.100	–	–	–	–
nsumer Staples									
Wages	.552	.538	.308	.154	–	–	–	–	–
Materials' Prices	.448	.538	.308	.154	–	–	–	–	–
dnance									
Wages	.727	.438	.312	.188	.062	–	–	–	–
Materials' Prices	.273	.438	.312	.188	.062	–	–	–	–
chinery & Equipment									
Wages	.726	.400	.300	.200	.100	–	–	–	–
Materials' Prices	.274	.400	.300	.200	.100	–	–	–	–
termediate									
Wages	.590	.500	.333	.167	–	–	–	–	–
Materials' Prices	.410	.500	.333	.167	–	–	–	–	–
troleum Refining									
Wages	.107	.500	.333	.167	–	–	–	–	–
Materials' Prices	.893	.500	.333	.167	–	–	–	–	–