PRICE DYNAMICS AND COMPETITION IN FIVE OECD COUNTRIES

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CONTENTS

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I. INTRODUCTION

One feature of the inflationary process in OECD countries during the last twenty years has been that cyclical price movements during the different phases of the business cycles were less pronounced than they had been throughout the first half of the twentieth century. In the earlier period, absolute price falls in downswing phases generally offset the sometimes very steep rises in the price index manifested in upswing phases [see Cagan (1975, 1979), Sachs (1980), Gordon (1980) and Schultze (1981)]. Reduced cyclical price flexibility began to emerge in the late 1960s and continued until 1980, with a dramatic aggravation after the two oil shocks of 1973 and 1979 leading to the stagflation of the 1970s [see Bruno and Sachs (1981)].

This phenomenon, characterised as downward price rigidity, has been observed at an aggregate level as well as at a sectoral level with, of course, differences between countries and industries [for a comparison of the degree of price flexibility between five OECD countries, see Encaoua *et* al., (1983)]. It is thus not surprising that the question of the nature of the price adjustment process has emerged as central to the split of contemporary macroeconomics between two main paradigms. The first, which originates in the Keynesian non-market clearing tradition, emphasizes the importance of fix-price equilibria which correspond to the extreme case where prices remain temporarily fixed in each period. The second paradigm, which corresponds to the "new classical equilibrium macroeconomics", is based on models in which universal auction markets allow prices to adjust instantly to perceived nominal demand changes [see the expository surveys of Gordon (1981) and Tobin (1980)].

What renders the choice between these two paradigms as an "election between two unattractive candidates" (Gordon 1981, p.494) is that on the one hand, the phenomenon of price rigidity has been, until recently, lacking a firm theoretical base; while on the other hand, it has been recognised as a general empirical phenomenon which renders the market-clearing assumption very suspect. However, recent theoretical studies throw new light on this subject. These studies share two common features. First they present price stickiness as a particular case

of a more general price smoothing policy. Second, they argue that in a dynamic framework such a price smoothing policy is an optimal one, particularly compared to a policy of instantaneous price adjustment to demand and supply shocks [see Phlips (1980, 1983), Carlton (1979), Blinder (1982), Amihud and Mendelson (1983), Phlips and Richard (1984)].

The criterion of optimality to which we refer here is that of the maximisation of a discounted sum of profits over a finite or infinite horizon, with the three following assumptions: first, at each point in time, production and sales strategies may differ, the difference being accounted for by inventories; second, firms of an industry have some (perfect or imperfect) knowledge of industry demand functions which provides them with some power to set prices; third, their marginal costs of production are not flat. In such a case, optimal pricing leads to a price policy such that prices at any point in time maintain discounted marginal revenue and discounted marginal cost equal to some constant value independent of time (see Phlips 1980 or Blinder 1982, particularly fig. 2, p.335 for a good exposition of this general principle). This is the essence of a price smoothing policy which must be contrasted with the less profitable policy of equating marginal revenue and marginal cost at each point of time. It may be worthwhile to note that this result prevails whatever the degree of uncertainty about the future: the case of perfect knowledge of future demand and cost functions has been emphasized in Phlips (1980, 1983) while the case of uncertainty affecting future demand and/or cost functions has been investigated by Blinder (1982) and Amihud and Mendelson (1983) among others. The conclusion is the same: "sticky prices will tend to emerge when it is not very costly to vary inventories and when demand shocks are very transitory" [Blinder (1982) p.334].

Having defined a price smoothing policy which is optimal in a dynamic perspective the next question is how firms can implement such a price smoothing policy. Several ways are possible. First, by carrying stocks over and above that required for buffer stocks. This strategy makes sense especially when the rate of interest which serves to discount future profits is lower than the rate of growth of the industry [see Phlips and Richard (1984)]. Second, by offering contracts of relatively long length to their customers, instead of supporting the uncertain variable terms of the market. This strategy is especially relevant when the unit cost borne by the firm on account of the variability of the market price is a function of the second – or higher – moment of the probability distribution of the price [see Carlton (1979)]. Third, firms may implement price smoothing through a discrete price strategy which involves the choice of a period of specified length during which no price variation will occur [see Ross and Wachter (1975)]. Those firms who wish to smooth extensively will select simultaneously a long horizon time and a price

calculated to reflect developments expected to occur within this horizon, while those who wish to be more price-responsive will select a shorter time horizon.

The key implication of a price smoothing strategy, however implemented, is that it provides a rationale for something strongly reminiscent of normal cost (and demand) pricing. Whether it chooses a longer time horizon or offers long-term contracts, a firm which wishes to smooth extensively will calculate a price appropriate to its horizon, and this means that it will smooth out the many transitory fluctuations in costs and demand that occur during the horizon. The extent of such "normalization" depends, ***inter alia,*** on the length of the horizon involved. Those firms using a long horizon will normalize extensively, and the normal costs and demand used to compute price will, ***ceteris paribus,*** be more weakly related to current costs and demand at any time within the horizon, than would be the case if a shorter horizon were used. In the limit, a firm which elects to maximise its instantaneous short-run profits will base its prices exclusively on current costs and demand.

There are many reasons to expect quite a high variation in the extent of price smoothing across different sectors of the economy. In this paper, we propose to concentrate on differences in this respect between industries, and we propose to link these differences to a number of readily-observed features of market structure. The essential feature of the argument is as follows. Industries will be predominantly composed of firms which take a "long view" when the industry is relatively stable, and when the market positions that its constituant members enjoy can be expected to persist over time [see Encaoua, Geroski, Jacquemin (1982)]. This relative insulation from market forces enables these firms to look beyond current period profits, and involves trading off reductions in current profitability for higher profitability in the future. These firms are liable to have a relatively low rate of time preference and *so* can be expected to maximise over a long stream of appropriately discounted future returns.

By contrast, firms in industries characterised by extensive change and unbridled rivalry face a good deal of uncertainty about the security of their future position in the market. This gives stronger incentives to ensure relatively more certain short-run returns, which can be achieved by a higher degree of price responsiveness to current shocks.

The former type of firm is liable to choose a pricing policy which reflects variations in "normal" cost and demand, while the latter will tend to emphasize "current" variations by equating, at each period, marginal revenues and costs.

To summarize, a certain notion of "competition" lies behind these two types of behaviour concerning pricing policy. More competition means less power to ensure persistency of market positions, which leads to a greater emphasis on current

market conditions. Less competition means more power to ensure stability of market positions so that a greater emphasis is placed on long-term returns'.

To identify industries in which competition in this sense is strong or weak requires using a number of more or less imperfect proxies. The three which will feature in the work reported below are concentration ratios, import intensity, and the extent of foreign ownership. Import intensity is a more or less straightforward proxy of foreign entry into domestic markets[2]. The extent of foreign ownership and the level of domestic concentration are more traditional measures reflecting the dominance of large and/or foreign-controlled firms, and these are widely believed to identify industries composed of firms large and secure enough to take a "long view"[3]. As we shall see, the use of these three market structure variables as proxies for the degree of competition makes it possible to capture different and complementary facets of a complex underlying process of change and rivalry in markets.

Given that there are differences between industries in the extent of price smoothing, and assuming that these three proxies can be taken as reliable indicators of differences among industries in competitive environments, it remains to ask how differences in the extent of price smoothing might be observed in practice. The essence of a price smoothing strategy is the more or less complete divorce between current market events and current prices. The less highly related are current price changes to current period cost and demand changes, the more extensive is price smoothing. Therefore, the speed with which current period cost and demand changes are transmitted into price changes ought to be inversely associated with the extent to which prices are smoothed. Differences between industries in the speed of transmission can then be associated with differences in the state of competitiveness (in the sense defined above) to empirically examine the various hypotheses. That is, concentration, import intensity and the extent of foreign ownership can be expected to have an effect on pricing (if at all) through their effect on the transmission mechanism linking current price changes to changes in cost and demand.

The hypothesis that the extent of price rigidity varies systematically across industries is a very old one, and has often been the subject of empirical examination. In order to put the procedure outlined above into proper perspective, it is worth briefly dwelling on past empirical work. Three traditions can be distinguished in this rather large literature. The first, and oldest, tradition has focused on the frequency of price change, ignoring changes in costs and demand [see, amongst others, Means (1935, 1972), De Podwin and Selden (1963), Weston, Lustgarten and Grottke (1974), Stigler and Kindahl (1970) and for a critique of the latter, Weiss (1977)]. The difficulty here is manifest. More highly concentrated industries may well exhibit a lower frequency of price change because they have a lower rate of time preference,

but their prices may also change infrequently simply because they experience a lower frequency of cost and demand shocks. The second tradition of work in this area relates price variation to changes in costs and changes in demand, and then adds to such regressions additional terms reflecting market structure [e.g. Weiss (1966), Cagan (1975), Weston and Lustgarten (1974), Aaronovitch and Sawyer (1981), Wilder, Williams and Singh (1977, 1982), de Silva (1971), Phlips (1973), Jones and Laudadio (1973), Sellekaerts and Lesage (1973) and, for a survey, see Dalton and Qualls (1979)]. The problems with this approach are also clear. Such a model posits an additional increment in prices arising from a high level of concentration, which is independent of cost and demand changes. Market structure has no effect on the transmission of cost and demand shocks into prices, but exerts an independent effect on prices in addition to these effects. A great part of the empirical literature which is centered around the test of the much-debated administered price thesis has used a methodology which can be related to this second tradition. In our view, and according to the preceding arguments, it is not surprising that no clear evidence has emerged from this empirical work, since there is no theoretical reason why the vaiue of the rate of change of prices would be directly influenced by market structure variables.

The third and final tradition examines the effect of market structure on the transmission mechanism much in the manner we have suggested here [see Domberger (1979), Winters (1981) and the reply by Domberger (1981), Phlips (1980) and Dixon (1983)]. The difficulty here is that these studies focus only on price inertia and do not examine the full response of prices to changes in costs and demands. As Winters (1981, p. 1027) has remarked, the speed of adjustment measured by these studies captures not the extent to which changes in costs are translated into changes in prices, but how rapidly this occurs. in fact, a firm which pursues a price smoothing policy exhibits two channels of transmission of current cost changes into prices. First, current cost changes are translated into changes in normalized costs, and secondly, changes in normalized costs are translated into changes in prices. The studies in this third tradition invariably measure only the latter, and only test the association between it and market structure. From the point of view of this literature review, the results reported below lie squarely within this third tradition while, at the same time, extending and elaborating the basic framework upon which it rests.

We thus have a basic set of hypotheses and an outline of the method by which they can be examined. The final step is to choose an appropriate data framework within which to conduct the empirical analysis. Obviously, a cross-section analysis is wholly inappropriate. What is needed is a mix of time-series and cross-section data to enable one to measure the various transmission speeds separately for each

industry, and then to compare these across industries. Furthermore, since countries differ markedly in their industrial structure and conduct, a cross-country comparison can be expected to yield useful insights into variations in pricing behaviour. Indeed, since countries do differ noticeably in their overall degree of price flexibility [see Encaoua *et al.* (1983)], it is important to examine whether these differences can be explained by differences in industrial structure and conduct.

This all implies the need for a large-scale data base involving prices, production indices, sales, labour and material costs, inventories, market structure variables and so on, all variables being defined at a disaggregated level. Such a database has been constructed during the realisation of the OECD project "Price Flexibility and Industrial Structure", from which this paper draws.

The data was collected for five countries (Canada, Japan, the United States, the United Kingdom and Sweden) and covers a large number of industries (about 600 four-digit level industries) for between ten and twenty years each. The details and the sources of this data are described in Encaoua *et al.* (1983) and in its Annex[4].

The plan of the paper is as follows. Section II gives a description of the model and estimation strategy. Section III contains a description of the empirical results, organised on a country-by-country basis. The basic conclusions we have derived from the econometric analysis are outlined at the end of Section III. Section IV concludes the paper with a discussion of some broader implications of the results.

II. THE MODEL

It is useful to think of a price smoothing strategy in terms of adjustment to a moving target. At any time *t,* firms have a target price determined by the normalization implicit in their planning horizon, and a current position which may need to be adjusted towards that target. The actual mark-up on prices that firms achieve depends on the target price, and on the amount of adjustment actually effected in the period. Thinking in terms of choice of the rate of change of prices by firms in industry *i* at time *t, $p_i(t)$,* the model then involves two equations[5]:

$$(1)\quad p_i(t) = \lambda_i(t)p_i^*(t) + (1-\lambda_i(t))p_i(t-1) \qquad (1a)$$

$$p_i^*(t) = m_i(t) + k_i(t) \qquad (1b)$$

where $p_i^*(t)$ is the rate of change of the target, $k_i(t)$ is the rate of change of normalized unit costs, $m_i(t)$ is the rate of change of the desired mark-up, and $\lambda_i(t)$ is the speed of adjustment of prices towards the target.

To implement (1), the unobserved variables $m_i(t)$ and $p_i^*(t)$ must be satisfactorily proxied. The former, $m_i(t)$, clearly depends in the first instance on demand conditions (appropriately normalized)[6]. Demand variables are always difficult to construct in these types of studies because they almost invariably involve using variables which are liable to be endogenous. With the exception of Japan (for which we use the rate of growth of sales), the measure used in this study is the negative of the change in inventories divided by the volume of supply, i.e. the sum of production and stocks. Since a slackening off of demand is liable to be accompanied (and, indeed, signalled) by a rise in inventories relative to sales, then this variable (hereafter denoted $DEM_i(t)$) ought to provide reasonably decent information on the larger current period demand shocks that firms face. Writing:

$$(2) \quad m_i(t) = \gamma_i(t)\, DEM_i(t),$$

then, the more extensively demand variations are normalized, the smaller $\gamma_i(t)$ will be. This follows from our earlier argument that price smoothing involves a divorce of current period price changes from current period demand shocks. The second unobserved term in (1) is the rate of change of normalized unit costs, $k_i(t)$. As with the demand term, what is of interest to us here is the response to current period shocks. With this in mind, we write:

$$(3) \quad k_i(t) = \beta_i(t) + \alpha_i(t)\, c_i(t)$$

where $c_i(t)$ is the rate of change of current period unit costs including labour and material costs. Thus, normalized costs contain two components, one reflecting changes in current costs with sensitivity $\alpha_i(t)$, and one representing all other factors[7]. Clearly, the more extensive is normalization, the lower is $\alpha_i(t)$ for reasons already familiar. We expect that $\alpha_i(t)$ is between zero and one. The term $\beta_i(t)$ reflects the expected increase in normalized costs that is independent of the rate of variation of current unit costs and this may also vary systematically across industries, reflecting differences in planned cost increases. It is important to interpret (3) and its associated parameter of interest, $\alpha_i(t)$, carefully. The term $\alpha_i(t)$ reflects the sensitivity of normal costs to current costs and, if it is less than unity, it reflects the essence of a price smoothing strategy: when costs rise, a percentage of these costs are absorbed into margins and this is recouped in the future, when cost decreases are not fully passed on into price decreases. In the long-run stationary state all cost increases are full passed on, whatever the speed of adjustment[8].

Putting (2) and (3) into (1b) and thence into (1a) yields[9]:

(4) $p_i(t) = [\ 1 - \lambda_i(t)]\ p_i(t-1) + \lambda_i(t)\ [\beta_i(t) + \alpha_i(t)c_i(t) + \gamma_i(t)DEM_i(t)].$

The two channels of transmission of current period cost and demand changes into current price changes are as follows: $\lambda_i(t)$ measures the speed with which changes in target prices translate into changes in current period prices (the lower $\lambda_i(t)$, the higher is price inertia), whilst $\alpha_i(t)$ and $\gamma_i(t)$ reflect how target prices respond to current cost and demand changes. Hence, the products $\lambda_i(t)\alpha_i(t)$ and $\lambda_i(t)\gamma_i(t)$ reflect the full extent to which current cost and current demand changes translate into current period price changes. The basic hypothesis with which we are concerned predicts that at least three of the four unknown parameters in (4) vary in association with the conditions of competition discussed earlier. Thus, we expect that $\lambda_i(t)$, $\alpha_i(t)$ and $\gamma_i(t)$ will all be lower the more concentrated is industry i, the lower is import penetration, and the higher is the extent of foreign ownership. We have also allowed all four unknown parameters in (4) to take on different values over time and, in particular, to vary with the phases of the trade cycle. In the event, very little time-series variation in these parameters (except perhaps, for $\lambda_i(t)$ and $\gamma_i(t)$) were observed in early experiments. In what follows, we shall generally neglect such trade cycle effects. Parameter stability over time is, however, an important result, for it suggests that a time-series approach is indeed the appropriate vehicle in which to estimate industry-specific values of these parameters.

Thus, our basic estimating equation is (4) with the additional assumption of time-invariant parameters. With this assumption, the time-series equation to be estimated for each industry *i* is the following:

(5a) $p_{it} = d_i^0 + d_i^1 P_{it-1} + d_i^2 c_{it} + d_i^3 DEM_{it} + u_{it} \qquad (t = 1 \ldots T)$

where u_{it} is a random error term. By identification, one obtains from the estimated coefficients of equation (5) the parameters of equation (4) which will be called the parameters of the price dynamics in industry;,:

- speed of adjustment of current prices to the target:

$$\lambda_i = 1 - d_i^0$$

- sensitivity of the target to current cost variations:

$$\alpha_i = \frac{d_i^2}{1 - d_i^1}$$

- sensitivity of the target to current demand pressure:

$$\gamma_i = \frac{d_i^3}{1 - d_i^1}$$

- rate of growth of the target independent of current cost variations:

$$\beta_i = \frac{d_i^0}{1 - d_i^1}$$

The most straightforward implementation procedure is a two-step one in which time-series values of the unknown parameters of equation (5a) are estimated in each industry, and then variation in these across industries is explained using the market structure variables. However, in most cases, the length of the series was insufficient to estimate time-series regressions industry-by-industry and *so* the predominant estimation strategy (with the exception of the United States) involved judicious pooling of time-series and cross-section data. This was done by allocating industries to fairly broad "industry groups" defined according to values for one or more of the variable reflecting competitiveness[10]. Where concentration ratios were used, for instance, industries were grouped into three classes: low, medium, and high concentrations. For each group so defined, we pooled together all the information available over time for each group member. It was thus possible to estimate the parameters expressing the price dynamics in each "industry group" and to compare the values of these parameters between different industry groups defined either by simple or by combined structural criteria.

In general, we elected to work with a relatively small number of industry groups. Another question, related to the time dependency of the parameters, was also investigated. Are the parameters of the price dynamics in a particular industry (or a group of industries) different during the upswings and downswings of the cycle? A downward price rigidity more pronounced that an upward price rigidity would imply that these parameters would differ between expansion and recession. To test such a hypothesis, we have defined dummies, E_t (which takes value 1 if year t is in an expansionary phase of the business manufacturing cycle and value O if not) and we have introduced two new variables in equation (5), $E_t\, p_{it-1}$ and $E_t\, DEM_{it}$, to examine if the speed of price adjustment and the sensitivity of the rate of price variation to demand pressure are different or similar in expansion and recession. The corresponding equation is:

(5b) $$p_{it} = d_i^0 + d_i^1 p_{it-1} + d_i^2 c_{it} + d_i^3 DEM_{it} + d_i^4 E_t\, p_{it-1} + d_i^5 E_t\, DEM_{it} + u_{it}.$$

So, the speed of adjustment in recession becomes: $\lambda_i^{REC} = 1 - d_i^1$ while in expansion it takes the value $\lambda_i^{EXP} = 1 - d_i^1 + d_i^4$).

III. SOME ECONOMETRIC RESULTS FOR FIVE COUNTRIES

The main econometric results which have been obtained for each country are reported in the following tables (more detailed results can be found in Encaoua et al., 1983 and in the companion Annex which also provides a complete account of the statistical sources). The figures in these tables refer to equations (5a) and (5b) while the comments in the text concern the parameters of equation[4].

A. Canada

For Canada, we have complete data for fifty industries (4-digit C.S.I.C.) for the years 1970 to 1980. We first tried to classify industries by the extent of concentration, pooling "high", "medium" and "low" concentration industries together using various criteria. No perceptible differences between groups appeared in these exercises, nor when we used import intensity to classify industries as more or less open to foreign Competition. However, as Table 1 shows, pooling on the basis of the extent of foreign control reveals important systematic differences across industries. In low foreign-controlled sectors [column (1)], $\lambda = 0.96$ on average over the cycle and is not significantly different from unity. This falls to $\lambda = 0.74$ in those sectors dominated by foreign firms [column (3a)]. Adjustment is also apparently more flexible in expansionary phases than in recessions for the sectors more heavily dominated by foreign firms ($\lambda = 0.87$ in expansion and 0.67 in recession [column (3b)]. The values of α implied by these estimates [from columns (1a), (2a) and (3a)] in each industry group are respectively: 0.875, 0.822 and 0.554, which shows a marked decline across groups. *So* the rate at which current cost variations are transmitted into prices declines with the degree of foreign control. This means that price smoothing policy is more developed in industries which are dominated by foreign-controlled firms. Demand effects are evident only in the least dominated sector, and there is only weak evidence to suggest some cyclical variability in these effects. By contrast, values of ß show a noticeable increase as the degree of foreign control increases: these values along the three groups of industries are respectively 2.45, 2.99 and 4.60. *So* the rate of increase of the target which is

Table 1. **Annual growth rate of prices from 1970 to 1986 pooled by class of industry according to the size of foreign direct investment *(FDI)***

CANADA

Independent variables	(1) $0 \leqslant FDI < 30\%$		(2) $30\% \leqslant FDI < 70\%$		(3) $70\% \leqslant FDI < 100\%$	
	(a)	(b)	(a)	(b)	(a)	(b)
Constant	**2.35** (3.3)	2.06 (2.8)	**2.87** (4.6)	**3.37** (5.3)	**3.28** (5.0)	**3.55** (5.5)
p_{it-1}	0.04 (0.9)	**0.03** (0.8)	0.04 **(1.1)**	**0.06** **(1.6)**	**0.26** (4.2)	**0.33** (4.9)
c_{it}	**0.84** **(25.1**	0.84 **(25.3)**	**0.79** **(20.6)**	**0.76** (19.7)	**0.41** (8.7)	**0.37** (7.3)
DEM_{it}	**1.32** (2.8)	**1.87** **(3.1)**	**0.73** (1.5)	**0.1** (0.2)	**0.37** **(1.2)**	**-0.07** **(-0.1**
$E_t \cdot p_{it-1}$		0.08 (1.0)		**-0.13** **(2.0)**		–0.2 **(-2.3)**
$E_t \cdot DEM_{it}$		**-1.02** (1.2)		**1.24** (1.8)		0.63 (1.2)
R^2	**0.83**	**0.83**	**0.74**	**0.76**	0.48	0.50
SEE	**5.9**	**5.8**	**4.7**	**4.6**	**4.9**	**4.9**
D.W.	**2.3**	**2.3**	**2.2**	**2.2**	1.9	**1.9**

Note: The dependent variable is $p_i t$. c_{it} is the rate of change of current period unit cost, DEM_{it} is the current value of the demand pressure variable, FDI is the percentage of domestic sales controlled by foreign firms, $E_t = 7$ if t is an expansionary year, and *D.W.* is the Durbin-Watson statistic. There are 16, 18 and 16 industries pooled over nine years in columns (1)-(3) respectively, so $N = 144, 162$ and 144; t values are in parentheses.

independent of current cost variations is the highest in the foreign-controlled industries.

In summary, Canadian industries dominated by foreign firms have much slower price adjustment to normalized costs and demand (in undominated sectors, adjustment is virtually instantaneous), and a much slower conversion of current costs into normalized costs (in undominated sectors, current and normal cost changes are highly correlated) [see column (1)]. These two sets of results together combine to suggest a clear sluggishness in the response of current prices to current costs and demand shocks in industries more heavily dominated by foreign firms. As a background to these findings, two specific features of foreign investment in Canada should be noted. The first is that multinational firms in many cases occupy dominant positions in their respective industries. They are the more often among the

eight biggest firms in each 4-digit level industry. Secondly, in 1978 multinational firms controlled over 70 per cent of Canada's total imports[11], *so* that imports do not exert the same competitive pressure as in other countries.

B. Japan

For Japan, we have complete data for sixty-seven industries (4-digit J.S.I.C.) for eight years (1971 to 1979). The only proxy for Competitiveness that yielded significant results is the four-firm concentration ratio. Table 2 shows the results for four industry groups defined using this variable. It is evident that there is a particularly noticeable difference between the most concentrated sectors [four-firm concentration ratio greater than or equal to 80 per cent, see column (4)] and the rest. The value of λ, the speed of adjustment in this sector, is about 0.89 and appears to be independent of the state of the trade cycle. The value of a, the sensitivity of the target to current cost variations is 0.618 in the most Concentrated sector and 0.86 elsewhere. Demand effects appear to be important in the less competitive sectors, and are either close to zero or perversely signed in the more concentrated sectors. As before, the value of ß rises from 0 to 1.87 as we move towards more heavily concentrated groups.

Thus, the results are qualitatively similar to the Canadian ease, except in two respects. First, there is an interesting difference in the type of competitiveness which appears to affect pricing. While in Canada, foreign direct investment served to discriminate industries according to their price adjustment policy, in Japan it is the concentration measure which plays this role. It is worth noting that concentration is generally higher in Japan than in Canada (the mean value of CR4 in Japan is 65 per cent compared to the related figure of 49 per cent in Canada (see Encaoua et al., 1983, p.66), while foreign-controlled firms account only for a small share of manufacturing activity in Japan.

Second, Japanese industries are, in general, more price flexible than industries of other countries. The rate of change of their prices is exceedingly sensitive to cyclical fluctuations. It is only in the very highly concentrated industries (CR4 80 per cent) that this price flexibility to market forces is less pronounced).

C. United Kingdom

For the United Kingdom, we have between fifty and fifty-six industries (M.L.H. level) for the period 1970 to 1979. It proved possible to observe substantive differences when these industries were pooled by the five-firm concentration ratio,

Table 2. Growth rate of prices from 1971 to 1979. Pooled analysis by class of industry according to degree of concentration (CR_4)

JAPAN

Independent variables	(1) $0 \leqslant CR_4 < 40\%$		(2) $40\% \leqslant CR_4 < 60\%$		(3) $60\% \leqslant CR_4 < 80\%$		(4) $CR_4 \leqslant 80\%$	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Constant	0.10 (0.1)	0.25 (0.38)	0.88 (1.6)	0.69 (1.2)	1.88 (3.1)	1.77 (2.7)	1.87 (2.5)	2.00 (2.7)
P_{it-1}	-0.005 (0.2)	-0.02 (0.5)	-0.01 (0.5)	-0.03 (1.0)	-0.07 (2.3)	-0.06 (1.8)	0.11 (2.2)	0.12 (2.4)
c_{it}	0.86 (30.4)	0.88 (29.5)	0.86 (38.3)	0.85 (35.2)	0.81 (31.5)	0.81 (30.4)	0.55 (15.9)	0.52 (14.9)
q_{it}	0.15 (3.9)	0.25 (3.5)	-0.01 (0.4)	-0.07 (1.1)	-0.003 (0.1)	-0.02 (0.6)	-0.06 (2.8)	-0.16 (3.9)
$E_{tP_{it-1}}$		0.07 (0.9)		0.09 (1.1)		0.006 (0.0)		-0.24 (1.5)
$E_t q_{it}$		-0.13 (1.7)		0.08 (1.2)		0.03 (0.6)		0.14 (2.9)
R^2	0.89	0.89	0.93	0.93	0.89	0.88	0.70	0.72
SEE	5.7	5.7	4.8	4.8	5.9	5.9	6.8	6.6
D.W.	2.6	2.7	2.2	2.2	2.5	2.5	2.1	2.0

Note: All definitions are as in Table 1, except that CR4 is the four-firm concentrationratio and q_{it} is a demand variable defined as the rate of growth of sales. The number of industries in the four groups are 17, 16, 18 and 16, pooled over eight years, so $N = 136$, 128, 144 and 128 respectively.

Table 3. Growth rate of prices from 1970 to 1979 pooled analysis by class of industry according to concentration (CR_5)

UNITED KINGDOM

	Independent variables	Constant	p_{it-1}	$c_i t$	DEM_{it}	$E_{t.Pit-1}$	$E_t.DEM_{it}$	R^2	SEE	D.W.
(1)	$CR_5 \leqslant 40\%$	1.41	0.19	0.78	−0.01	−0.11	−0.26	0.83	3.1	2.5
		(1.7)	(4.6)	(19.8)	(−0.05)	(2.2)	(0.7)			
(2)	$40\% < CR_5 \leqslant 50\%$	1.83	0.14	0.73	−0.66	−0.05	0.44	0.80	3.7	2.3
		(1.8)	(2.6)	(14.7)	(2.0)	(0.7)	(0.9)			
(3)	$50\% < CR_5 \leqslant 70\%$	1.75	0.41	0.44	−1.39	−0.14	0.84	0.69	5.0	2.2
		(1.5)	(6.2)	(11.2)	(3.6)	(1.8)	(1.7)			
(4)	$CR_5 > 70\%$	5.0	0.31	0.09	−3.61	−0.006	2.4	0.45	8.0	2.3
		(2.6)	(3.91)	(4.0)	(6.9)	(0.05)	(3.4)			

Note: All variables are defined as in Table 1, CR_5 is the five-firm concentration ratio. The four groups contain 16, 11, 14 and 15 industries respectively, with eight years' data. This implies that N = 128, 88, 112 and 120 in rows (1)-(4) respectively.

and also when they were pooled by both the concentration ratio and the extent of import penetration. The two sets of results are contained in Tables 3 and 4. Table 3 reveals a relatively high degree of price inflexibility for the United Kingdom. In the *most* competitive sector (row 1), $\lambda = 0.81$ and $a = 0.962$. This suggests a very high transmission of current into normal costs coupled with a far from complete translation of the latter into price changes. λ changes from 0.81 to 0.86, 0.59 and 0.69, and a falls from 0.962 to 0.848, 0.746 and 0.130 as one moves towards the more highly concentrated sectors. The parameter ß rises throughout, taking the respective values 1.74, 2.12, 2.97 and 7.25. All of this is consistent with the basic hypothesis that price responsiveness to current shocks is weaker in less competitive sectors, given a generally much slower price response to changes in costs and demands in virtually all U.K. industries, relative to Japan and Canada. Demand effects appear "perverse" (prices rise when demand falls) and, contrary to earlier results, more substantive in impact in less competitive sectors[12]. There is some slight suggestion of cyclical variation in the impact of demand and in price inertia.

It also proved possible to observe interesting differences between industries when they were grouped by both concentration and import penetration in the United Kingdom (Table 4). One of the results suggested by Table 4 is that openness to import competition increases price flexibility. Indeed, inside the population of highly concentrated industries (rows 3 and 4), the speed of adjustment of prices (λ) takes on significantly different values according to whether import penetration is low (row 3) or high (row 4): the corresponding figures are 0.63 and 0.95. However, the rates of transmission of current cost variations into target (a) are not significantly different between the two groups of industries since they take the respective values of 0.62 (row 3) and 0.74 (row 4).

The demand pressure variable (γ) exerts a perverse influence on prices except in those industries which are characterized both by low concentration and relative immunity against import competition. The downward inflexibility of prices during downswings is the more pronounced in those highly concentrated industries where the rate of import is low. These results suggest that the degree of import penetration has an important impact on price adjustment in highly concentrated industries. However, the United Kingdom seems clearly a very price inflexible economy in general, although this result is chiefly manifest in highly concentrated closed industries'[13].

The second result suggested by Table 4 is more general. It amounts to saying that the response of current period prices to current changes in costs and demand is generally lower in less competitive environments. This is particularly clear from the inspection of the figures of rows (2) and (3), if one admits that industries grouped in

Table 4. **Growth of rate of prices from 1970 to 1979. Pooled analysis by class of concentration according to two criteria combined: concentration (C_5) and import penetration (*IMP*)**

UNITED KINGDOM

	Independent variables	Constant	ρ_{it-1}	$c_i t$	DEM_{it}	$E_t P_{it-1}$	$E_t.DEM_{it}$	R^2	*SEE*	*D.W.*
(1)	CR_5 "low"	0.39	0.20	0.85	0.49	−0.15	−1.12	0.86	2.8	2.6
	IMP "low"	(0.4)	(4.0)	(15.7)	(1.1)	(2.3)	(2.1)			
(2)	*CR5* "low"	2.12	0.19	0.64	−0.84	−0.05	0.61	0.78	3.4	2.3
	IMP "high"	(2.2)	(3.3)	(12.8)	(3.2)	(0.7)	(1.7)			
(3)	CR_5 "high"	1.83	0.37	0.39	−3.17	−0.12	2.1	0.73	5.2	2.1
	IMP "low"	(1.5)	(6.1)	(8.3)	(4.7)	(1.6)	(2.8)			
(4)	CR_5 "high"	1.91	0.05	0.70	−0.64	0.1	0.59	0.84	4.4	2.4
	IMP "high"	(1.7)	(0.9)	(15.2)	(1.8)	(1.3)	11.3)			

Note: All variables are as in Table 3, $IMP_{,,}$ is the level of imports divided by total industry sales and $E_t = 7$ in expansion. The number of industries in the four groups is 9, 16, 16 and 9 respectively, so $N = 72.104, 104, 72.$ CR_5 "high" is defined as CR_5 [0.5, 1] and *IMP* "high" is defined as *IMP* [0.25, 1].

row (2) are more competitive than those grouped in row (3). So, price movements in the less competitive industries (those of row 3) seem far more bound up with the trend of normalized costs, which are apparently not very closely linked with current costs in the United Kingdom, and this is in conformity with the results obtained by Coutts, Godley and Nordhaus (1978). However, it should be mentioned that the level of sectoral disaggregation they used was not detailed enough to bring out the role played in their results by the structural market variables.

D. United States

For the United States we have time-series data for each of 430 industries (4-digit S.I.C.) covering the period 1958 to 1980. This enables us to use the two-step econometric procedure described above. The first step involves a time-series estimate of the parameters of equations (5a) and (5b) for each industry i, based on twenty-two yearly observations (from 1958 to 1980) for each industry. In the second step, the estimated parameters for each industry are regressed against the market structure variables of the corresponding industry, namely the concentration ratio[14] and the average level of import penetration during the period. We have also included the variance of the demand pressure variable as a proxy for the variability of demand during the period.

Naturally, it is out of the question to present the results of each of the 430 time-series regressions. For the second stage regressions, we kept only those industries where the estimated value of the speed of price adjustment (λ) is between 0 and 1 at the 95 per cent level of confidence. This restriction maintained 385 industries in the sample. The results of the second-step procedure are presented in Table 5. Concentration has a negative and significant impact on the speed of price adjustment and on the parameters measuring the transmission of current costs and demand variations into target prices. These results confirm the fact that, as in Canada and Japan, concentrated U.S. sectors are marked by a greater price stability or price smoothing than other sectors. The rate of imports, however, has no significant influence either on the speed of adjustment or on the transmission mechanism. It is worthwhile to note here that the rate of import penetration is low in U.S. industries compared to those in other countries (except Japan) (see Encaoua et al., 1983). So it is not too surprising that this variable has no significant influence, except perhaps on the parameter a, measuring the sensitivity of the target to current cost variations. The last variable, the variance of demand, has a very slight effect on the price mechanism.

In order to specify the preceding results in more detail, Table 6 presents the mean of each of the three pertinent parameters of price dynamics in six different

Table 5. **Inter-industry disparities in the parameters of the price equation (5a) estimated for each industry by a time-series analysis**

UNITED STATES

Independent variables	Dependent variables [estimated parameters of equation (5a)]		
	Speed of price adjustment $\lambda_i = 1-d_i^1$	Sensitivity of the target to current costs $\alpha' = d_i^2/1-d_i^1$	Price responsiveness to demand pressure d_i^3
Constant	0.905 (2.6)	0.949 (24.9)	1.47 (11.3)
Concentration CR_{4i}	-0.219 (3.1)	-0.168 (2.3)	-0.876 (3.5)
Average rate of import penetration IMP,	0.006 (0.4)	-0.031 (2.3)	-0.025 (0.5)
Variance of demand pressure	-0.052 (3.8)	-0.089 (6.2)	-0.147 (3.0)
SEE	0.21	0.20	0.69
R^2	0.13	0.27	0.13

Table 6. **Means of the parameters measuring the speed of price adjustment, the price responsiveness to cost variations, and the price sensitivity to demand pressure in industry groups distinguished according to the concentration ratio CR_4**

UNITED STATES

Classes of concentration CR_4%	Number of industries	Mean of the speed of price adjustment $\lambda_i = 1-d_i^1$	Mean of the sensitivity of the target to current costs $\alpha_i = d_i^2/1-d_i^1$	Mean of the price sensitivity to demand pressure d_i^3
0 - 20	90	0.800	0.708	0.992
20 - 30	82	0.768	0.733	0.948
30 - 40	71	0.762	0.691	0.977
40 - 50	46	0.780	0.702	0.684
50 - 60	44	0.649	0.638	0.796
60 - 100	52	0.688	0.618	0.355
Total 0 - 100	385	0.732	0.694	0.846

groups of industries, ranked according to their concentration ratio. The results in Table 6 clearly confirm the relationship obtained in econometric analysis. The parameters λ and α fall in general as one moves into less competitive sectors. Similarly, demand changes exert much more substantial effects on price changes in competitive industries, with more highly concentrated industries apparently much less sensitive to shifts in demand. All these results confirm the conclusion that in the U.S., the adjustment of prices to current demand and cost changes takes longer in concentrated industries where the leading firms have some ability to set their own prices, than in other industries. This is what makes these prices more stable or sticky.

E. Sweden

For Sweden, we have data for thirty-six industries for the period 1970 to 1980. The only variables reflecting competitiveness that we were able to obtain were those measuring openness. Table 7 shows two sets of groupings reflecting more or less openness to exports [columns (1) and (2)] and to imports [columns (3) and (4)]. Comparing first more and less export-intensive sectors, we find small differences in λ (0.85 and 0.93 respectively) and α (0.53 and 0.63). Low export sectors do, however, appear to be much more susceptible to cyclical effects, while high export sectors are more sensitive to demand. Similarly, very small differences appear between low and high import penetration sectors, with pairs of (λ, a) observed as (0.94, 0.659) and (0.90, 0.522) as between columns (3) and (4). Low import penetration sectors are much more susceptible to cyclical forces, whilst high penetration sectors show a heightened sensitivity to demand. There is some evidence in these results consistent with the view that open sectors are, in fact, somewhat less sluggish than closed sectors but the interesting feature of Sweden is that what sluggishness exists in price adjustment occurs only via the channel measured by a, and not via that measured by λ.

F. Summary

There are four broad conclusions that we wish to draw from these results. First, on the whole, price adjustment through both channels (the conversion of current shocks into targets, and the adjustment towards these targets) is slower in less competitive sectors. It appears that firms in less competitive industries are both slower to incorporate new information into their plans, and slower to adjust to whatever plans are made on the basis of this information. Second, there appear to

Table 7. Annual growth rate of prices (1970-1980) in industry classes pooled according to levels of the rate of export *(EXP)* and import *(IMP)*

SWEDEN

Independent variables	Industry classes according to the rate of exports *(EXP)*				Industry classes according to the rate of imports *(IMP)*			
	(1) *EXP* low (<30%)		(2) *EXP* high (>30%)		(3) *IMP* low (<41%)		*IMP* high (>41%)	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Constant	4.52 (5.8)	4.24 (5.2)	2.80 (3.3)	3.06 (3.3)	4.25 (5.4)	4.24 (5.3)	3.3 (3.8)	3.2 (3.3)
Pit_{-1}	0.07 (1.8)	0.13 (2.8)	0.15 (2.7)	0.14 (2.5)	0.06 (1.3)	0.11 (2.3)	0.10 (1.8)	0.10 (1.7)
c_{it}	0.59 (16.2)	0.58 (16.3)	0.45 (12.6)	0.45 12.1)	0.62 (16.8)	0.61 (16.7)	0.47 (13.0)	0.47 (12.8)
DEM_{it}	0.06 (0.9)	−0.10 (1.1)	0.33 (6.8)	0.38 (5.8)	0.17 (3.0)	0.09 (1.1)	0.29 (5.5)	0.28 (4.0)
$E_t.p_{it-1}$		−0.17 (2.3)		0.01 (0.1)		−0.19 (2.6)		0.05 (0.5)
$E_t.DEM_{it}$		0.31 (2.9)		−0.09 (1.1)		0.16 (1.7)		0.002 (0.03)
R^2	0.68	0.69	0.48	0.48	0.68	0.69	0.48	0.47
SEE	6.2	6.0	6.7	6.7	5.8	5.7	7.2	7.3

Note: All variables are defined as in Table 1; *EXP* is exports divided by sales, and IMP is imports divided by sales + exports − imports. There are eighteen industries in each group, so N = 180.

be important cross-country differences in both the speed of adjustment to costs and demand changes, and in the type of competitive environment which affects pricing. Broadly speaking, Japan appears to be very price flexible, and the United Kingdom very price inflexible, with the United States, Canada and Sweden occupying intermediate positions. Further, Japan, the United States and the United Kingdom all exhibit inflexibility in more concentrated sectors, Sweden seems slightly more flexible in open sectors, the United Kingdom is more inflexible in closed sectors, and in Canada the important characteristic of inflexible sectors is that they are dominated by foreign-owned firms. Third, the effects observed are generally not continuous, and inflexibility appears mainly in the most concentrated or closed sectors. This points to some sort of "critical threshold effect", with inflexibility emerging only above certain critical levels of concentration, or below a certain degree of openness. Finally, unlike some studies (e.g. Godley and Nordhaus, 1972) we do observe significant demand effects on prices. For Canada, Japan and the United States, demand has an impact mainly on prices in competitive sectors, while in the United Kingdom demand has an apparently "perverse" effect, but only on competitive sectors. Demand effects in Sweden are important and, in relatively closed sectors, are cyclically sensitive.

IV. CONCLUDING REMARKS

The aim of this study has been to investigate the proposition that the degree of price inflexibility is not uniform across industries, and that it is affected in important ways by the state of industry structure and conduct[15]. It has long been accepted that the level of prices in an industry depends, inter *alia,* on industry structure and conduct, but the proposition that this is also true of their rate of variation has long been the object of intensive, though inconclusive, debate. Things began to improve when it became possible to demonstrate theoretically that, under certain conditions, a certain degree of price rigidity is compatible with optimising behaviour when the optimisation is done in an intertemporal framework. The empirical work which has been presented in this paper rests on these theoretical foundations. It is only by identifying the two transmission mechanisms of current cost and demand changes on prices that it proved possible to observe the links between market structure variables and price variations, as we did in this paper.

Not only are inter-industry variations in price flexibility important, but an important part of these variations is related to the structure of industry and the characteristics of the production process. Furthermore, both the extent of flexibility

and its determinants vary in important and interesting ways across countries. While interesting in these terms, we think that our results can also be put into a somewhat wider perspective, and we should like to close with two sets of speculations.

A feature of price smoothing in an environment in which costs rise over a fairly long period of time is that actual price mark-ups are revealed to be consistently less than desired mark-ups. If prices are sufficiently insensitive to cost changes and if the latter rise rapidly, this situation can appear very much like a profits squeeze. If indeed price smoothing does lie beneath apparent squeezes on profits, as this speculative interpretation suggests, the explanation lies in the price inertia of firms and in their unwillingness to respond quickly to new market developments. This interpretation raises the difficult question of a possibility of reconciling an economic policy oriented towards more price flexibility on the one hand and individual behaviour of firms whose long-term view leads them to prefer more price stability on the other hand. The more general question behind this interpretation is therefore the following: does price flexibility constitute a desirable and achievable policy goal?

The second speculative remark we wish to make follows from the observation that a concomitant of a price smoothing policy is a production smoothing policy. That is, it is by no means clear that price and quantity adjustments are substitutes. We have emphasized in the introduction the empirical fact that price flexibility has declined in most Western economies since the Second World War. If this has been matched by a decline in quantity flexibility through the adoption of the kinds of intertemporal profit-maximising policies which give rise to price smoothing, then much of current thinking about market dynamics may not be correct. In particular, relative quantity inflexibility in the face of a decline in demand is liable to generate excess capacity'[6] simultaneously with an apparent profits crisis. What lies behind these twin outcomes, on this view, is a fundamental weakness in competitive forces which ,allows firms to respond only partially to current events.

NOTES

1. Note the difference between this type of argument and those which link price rigidity to collusion possibilities [e.g. Domberger (1979), Ross and Wachter (1975) and others who argue in terms of a kinked demand curve in the tradition originated by Sweezy (1939)]. The problem with collusion arguments is that it is hard to reconcile price smoothing (which involves in general some sacrifice in current profits) with joint monopoly pricing without introducing *ad hoc* and more or less unobservable costs such as the risk of a price retaliation or a price war.
2. This is not true if most imports are controlled by large domestic firms. For the conventional case and this caveat, see Geroski and Jacquemin (1982) and Cowling and Murfin (1982).
3. Following the discussion of note 1, concentration ratios and (to a lesser extent) the importance of foreign ownership, are generally interpreted as reflecting conditions which may facilitate collusion [(see Geroski (1983) and Caves (1982)]. In the context of our argument, they are taken to reflect conditions liable to involve stability of market shares and/or specific technical conditions of production, involving high fixed costs and commitment to excess capacity, which may serve as barriers to entry [see Encaoua and Jacquemin (1980)]. Either type of situation is liable to lead to firms taking a "long view".
4. It has been decided that this database would be made available to academic researchers, by request, from the OECD, Economics and Statistics Department, General Economics Division, 2 rue Andre-Pascal, 75775 Paris Cedex 16, France.
5. The adjustment rule (1a) is appropriate when the target does not move too much. While not strictly accurate, this is much more liable to be true for a target written in terms of the rate of change of prices rather than in their levels.
6. Adopting the assumption of profit maximisation and supposing that goods are homogenous, the level of mark-up is $m_i = (1 + v_i/n_i)^{-1}$ where n_i is the elasticity of demand and v_i is a conjectural variation term [see Geroski (1983) and Phlips (1980)]. We suppose in the text that the rate of change of v_i is zero.
7. One can think of (3) in the following terms. Suppose that firms expect unit costs to rise at the rate $m_i^0(t)$. If, however, current unit costs rise faster or slower than this, then firms adjust their current period expected rate of change of normal costs by a factor $m_i^1(t)$. Thus $k_i(t) = m_i^0(t) + m_i^1(t)(c_i(t) - m_i^0(t)) = m_i^0(t)(1-m_i^1(t)) + m_i^1(t)c_i(t)$ and the parameters in (3) are defined as $\beta_i(t) = m_i^0(t)(1-m_i^1(t))$ and $\alpha_i(t) = m_i^1(t)$.
8. Neglecting $m_i(t)$, (1a) becomes $p_i(t) = (1-\lambda_i(t))p_i(t-1) + \lambda_i(t)k_i(t)$. At the long-run stationary state (for which $p_i(t) = p_i(t-1)$) we have $p_i(t) = k_i(t)$, whatever the value of the speed of adjustment $\lambda_i(t)$.

9. The constant term and the β_i which enter Domberger's (1979, p.97) estimating equation without explanation can be explained in the terms developed in the text. He allows them to take industry-specific values but does not examine their association with market structure.

10. We imposed group boundaries exogenously on the data. Even if they are not equal to maximum likelihood estimates of the boundaries, experimentation suggested that the results are not very sensitive to the precise value of these boundaries. In Encaoua et al., 1983 and its companion Annex, an extensive set of cross-section and time-series estimates is included.

11. This information came from the two following official publications:
    - Structural Aspects of Domestic and Foreign Control in the Manufacturing, Mining and Forestry Industries 1970-1972. Catalogue 31-523, Occasional, Statistics Canada, 1978, pp.13 and 55.
    - Canadian Imports by Domestic and Foreign-controlled Enterprises, 1978. Catalogue 67-509, Occasional, Statistics Canada, 1981, p.vii.

12. This result is liable to reflect very high costs of carrying inventories using short-term credit. It is our view that this result reflects the very different financial links between industry and financial institutions characteristic of the United Kingdom, but we were not able to verify this.

13. Domberger, 1979 found that his estimated λ's rose with increases in concentration. The principal cause of the difference, we suspect, lies in his relatively small non-random sample (only twenty-one industries) and, quite possibly, with problems arising from his generation of unit labour cost data. His work is on quarterly data, but it is hard to see how this would make a difference except to perhaps produce lower estimates of all round. There is also a difference in dating (his study covers 1963 to 1974), but it is also hard to see how this could produce a different association between concentration and λ. For further discussion of Domberger's study, see Winters (1981) and Domberger (1981).

14. The trend of concentration from 1958 to 1977, measured on a sample of either 430 (4-digit level) or 1000 (5-digit level) industries showed great stability over the period (see Encaoua et al., 1983 and Shepherd 1982). So, the choice of the date at which concentration is measured did not matter too much in the following results.

15. Other potentially important determinants include the degree of product durability, product perishability, the length of the production process, etc.

16. Recent theoretical work on the effect of excess capacity on entry (e.g. Spence, 1977, Dixit, 1980, and others) suggests that such increases in excess capacity may, in fact, weaken competitive forces.

BIBLIOGRAPHY

Aaronovitch, S. and Sawyer, M.C., "Price Change and Oligopoly", The Journal of Industrial Economics, Vol. XXX, No. 2, December 1981.

Amihud, Y. and Mendelson, H., "Price Smoothing and Inventory", Review of Economic Studies, Vol. 50, January 1983.

Beals, R., "Concentrated Industries, Administered Prices and Inflation: A Survey of Empirical Research", Council on Wage and Price Stability, Washington, 1975.

Blair, J.M., "Inflation in the United States: A short-run Target Return Model", in The Roots of Inflation, ed. Gardiner C. Means, et al., Burt Franklin & Co., Inc., New York, 1975.

Blinder, A.S., "Inventories and Sticky Prices: More on the Micro-foundations of Macroeconomics", American Economic Review, Vol. 72, 1982.

Bruno, M. and Sachs, J., "Supply Versus Demand Approaches to the Problem of Stagflation", in Giersch, H. (ed.) Macroeconomic Policies for Growth and Stability, Kiel, Institüt fur Weltwirtschaft, 1981.

Cagan, P., "Inflation and Market Structure, 1967-1973", Explorations in Economic Research, No. 2, Winter 1975.

Cagan, P., Persistent inflation, Columbia University Press, New York, 1979.

Carlton, D.W., "Contracts, Price Rigidity and Equilibrium", Journal of Political Economy, Vol. 87, No. 5, October 1979.

Caves, R.E., Multinational Enterprise and Economic Analysis, Cambridge University Press, Cambridge, 1982.

Coutts, K., Godley, W. and Nordhaus, W., Industrial Pricing in the United Kingdom, Cambridge University Press, Cambridge, 1978.

Cowling, K. and Murfin, A., "Price Formation and Import Penetration in U.K. Manufacturing Industry", Recherches Economiques de Louvain, Vol. 47, No. 3-4, September 1981.

Dalton, J.A. and Qualls, P.O., "Market Structure and Inflation", The Antitrust Bultetin, Vol. XXIV, No. 1, Spring 1979.

Depodwin, H.J. and Selden, R.T., "Business Pricing Policies and Inflation", Journal of Political *Economy,* Vol. LXXI, No. 2, April 1963.

De Silva, K.E.A., "Industrial Concentration and Price Changes in Canadian Manufacturing Industry, 1961-67", Quarterly Review of Economic Business, Spring 1971.

Dixon, R., "Industry Structure and the Speed of Price Adjustment", The Journal of Industrial Economics, Vol. XXXII, September 1983.

Domberger, S., "Price Adjustment and Market Structure", The Economic Journal, Vol. 89, March 1979.

Domberger, S., "Price Adjustment and Market Structure: A Reply", ***The Economic Journal,*** Vol. 91, December 1981.

Encaoua, D. and Jacquemin, A., "Degree of Monopoly, Indices of Concentration and Threat of Entry", ***International Economic Review,*** Vol. XII, No. 1, February 1980.

Encaoua, D., Geroski, P. and Miller, R., "Price Dynamics and Industrial Structure: A Theoretical and Econometric Analysis", OECD Economics and Statistics Department Working Paper No. 10, July 1983.

Encaoua, D., Jacquemin, A. and Geroski, P., "Strategic Competition and the Persistence of Dominant Firms: A Survey", to appear in ***New Developments in the Analysis of Market Structure,*** ed. F. Matthewson and J. Stiglitz, M.I.T. Press, 1984.

Geroski, P. and Jacquemin, A., "Imports as a Competitive Discipline", ***Recherches Economiques de Louvain,*** Vol. 47, September 1982.

Geroski, P., "Some Reflections on the Theory and Application of Concentration Indices", ***International Journal*** of ***Industrial Organization,*** Vol. 1, March 1983.

Godley, W. and Nordhaus, W., "Pricing in the Trade Cycle", ***Economic Journal,*** Vol. 82, 1972.

Gordon, R.J., "A Consistent Characterization of a Near Century of Price Behavior", ***American Economic Review,*** Vol. 70, No. 2, May 1980.

Gordon, R.J., "Output Fluctuations and Gradual Price Adjustment", ***Journal of Economic Literature,*** Vol. XIX, June 1981.

Jones, J.C.H. and Laudadio, L., "Concentration, Relative Price Flexibility and "Administered Prices": Some Canadian Experience", ***The Antitrust Bulletin,*** Vol. XXII, No. 2, Winter 1977.

Means, G.C., "Industrial Prices and Their Relative Inflexibility", Senate Document 13, 74th Congress, 1st Session, Washington, D.C., U.S. Government Printing Office, 1935.

Means, G.C., "The Administered Price Thesis Reconfirmed", ***American Economic Review,*** Vol. LXII, No. 3, June 1972.

Phlips, L., "Business Pricing Policies and Inflation – Some Evidence from EEC Countries", ***Journal of Industrial Economics,*** Vol. 18, November 1969.

Phlips, L., "Inter-temporal Price Discrimination and Sticky Prices", ***Quarterly Journal of Economics,*** Vol. 94, May 1980.

Phlips, L., ***The Economics of Price Discrimination,*** Cambridge University Press, London and New York, 1983.

Phlips, L. and Richard, J.F., "An Oligopoly Model with Demand Inertia and Inventories", C.O.R.E. Discussion Paper, July 1984.

Ross, S.A. and Wachter, M.L., "Pricing and Timing Decisions in Oligopoly Industries", ***Quarterly Journal of Economics,*** Vol. 89, February 1975.

Sachs, J., "The Changing cyclical Behaviour of Wages and Prices: 1890-1976", ***American Economic Review,*** Vol. 70, No. 1, March 1980.

Schultze, C.L., "Some Macro-Foundations for Micro Theory", ***Brookings Papers on Economic Activity,*** No. 2, 1981.

Sellekaerts, W. and Lesage, R., "A Reformation and Empirical Verification of the Administered Price Inflation Hypothesis: the Canadian Case", ***Southern Economic Journal,*** Vol. 39, January 1973.

Shepherd, W.G., "Causes of Increased Competition in the U.S. Economy 1939-1980", ***Review of Economics and Statistics,*** Vol. 64, November 1982.

Spence, M., "Entry, Capacity, Investment and Oligopolistic Pricing", ***Bell Journal of Economics,*** Vol. ***8,*** Autumn 1977.

Stigler, G.J. and Kindahl, J.K., ***The Behavior of Industrial Prices,*** National Bureau of Economic Research, No. 90, General Series, Columbia University Press, New York and London, 1970.

Tobin, J., ***Asset Accumulation and Economic Activity: Reflections on Contemporary Macroeconomic Activity,*** Yrjo Jahnsson lectures, University of Chicago Press, 1980.

Weiss, L., "Business Pricing Policies and Inflation Reconsidered", ***Journal of Political Economy,*** Vol. LXXIV, No. 2, April 1966.

Weiss, L., "Stigler, Kindahl and Means on Administered Prices", ***American Economic Review,*** Vol. 67, No. 4, September 1977.

Weston, J.F., Lustgarten, S. and Grottke, N., "The Administered Price Thesis Denied: Note", ***American Economic Review,*** Vol. 64, No. 1, March 1974.

Weston, J.F., Lustgarten, S., "Concentration and Wage-Price Changes", in ***Industrial Concentration: the New Learning,*** (eds.) Goldschmid, H.J., Mann, H.M. and Weston, J.F., Little, Brown and Company, Boston, 1974.

Wilder, R.P., Williams, C.G. and Singh, D., "The Price Equation: A Cross Sectional Approach", ***American Economic Review,*** Vol. 67, No. 4, September 1977.

Wilder, R.P., Williams, C.G. and Singh, D., "The Cross Sectional Price Equation: A Reply", ***American Economic Review,*** Vol. 72, No. 4, September 1982.

Williamson, O.E., ***Markets and Hierarchies,*** Free Press, New York, 1975.

Winters, L.A., "Price Adjustment and Market Structure: A Comment", ***The Economic Journal,*** Vol. 91, December 1981.