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# How do UK companies set prices?

By Simon Hall, Mark Walsh and Tony Yates of the Bank's Structural Economic Analysis Division.

*In the autumn of 1995, the Bank conducted a survey of price-setting behaviour in 654 UK companies that maintain regular contact with the Bank's Agents. The survey was inspired by the work of Alan Blinder in the United States. The survey has made available much new information. For example, companies do not regard the direct costs of changing prices as being particularly important, although prices are typically changed infrequently, on average only twice a year. Preserving customer relationships is very important for firms in making decisions about prices. And there are many differences among firms about which factors influence price changes. These results throw light on how monetary policy—which is focused on the control of inflation—affects the economy. The article describes the survey results and how they compare with other information about UK price setting.<sup>(1)</sup>*

Section 1 of the article explains why price setting is important to a central bank concerned with controlling inflation and section 2 describes how the survey was carried out. Section 3 discusses different theories of price setting, and how the survey results relate to them. The remaining sections look at other questions about price setting: section 4 looks at how often companies review and change prices; section 5 considers what factors influence pricing decisions; and section 6 examines whether prices are more sticky downward than upward. Section 7 discusses what companies say they would do in response to a demand boom. Section 8 draws together the conclusions of the survey.

## 1 Why is price setting important?

Understanding how companies set prices is important for the Bank's advice on controlling inflation, since price-setting behaviour determines how decisions about monetary policy—on interest rates, money and inflation—affect the economy. Early theories about the macroeconomy assumed that monetary variables had no impact on real variables. These theories were based, at least in part, on the idea that price changes were costless and instantaneous. But anyone who has bought or sold something knows that in reality prices are set by buyers and sellers and that it costs time and money to calculate the right price of any product, or how prices should respond to a change in the market. And evidence suggests that changes in money and prices (*nominal* quantities) can and do affect output and employment (*real* quantities), at least in the short run.

It is important to explain how monetary policy affects the economy. An understanding of the monetary transmission

mechanism is central to the efficient execution of monetary policy itself. There are many reasons why monetary policy might affect the economy. Economists have long suspected that at least part of the reason might be that prices are slow to adjust, or 'sticky'. One purpose of the survey was to find out whether this is true. As section 3 reports, there are many reasons why prices might be sticky: interaction between companies, cost conditions, company-customer relations and the costs of changing prices could all lead to prices not changing very much or very frequently. So the survey was intended not only to measure the extent of price stickiness in the United Kingdom, but also to explain it.

## 2 The survey

There have been many attempts to investigate price-setting behaviour using aggregate data.<sup>(2)</sup> But studies using data on individual products and companies are rare. In the United States, Blinder (1992) surveyed 72 companies and asked questions about different pricing theories. Carlton (1986) analysed data collected by Stigler and Kindahl (1970) on individual product prices and looked at the frequency of price changes and the duration of company-customer relationships. Cecchetti (1986) studied the frequency of price adjustment of magazines sold on newsstands. Kayshap (1995) also looked at evidence based on retail catalogues. In the United Kingdom, there seems to be even less company or product-level evidence. An early study by Hall and Hitch (1939) surveyed 38 manufacturing companies in the United Kingdom about their pricing behaviour. More recently, the Workplace Industrial Relations Surveys of 1984 and 1990 asked questions about whether prices would respond to changes in demand;<sup>(3)</sup> and the Lloyds Bank Small Business Research Trust published a

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(1) The authors would like to thank those companies who responded to the survey. They would like to thank Alan Blinder and Alan Kirman for their advice on the questionnaire.

(2) For example, Ball, Mankiw and Romer (1988), and later Yates and Chapple (1996), observe a cross-country correlation between the level of inflation and the output-inflation trade-off, and use this to infer that there are significant costs in changing prices that decline in importance as inflation rises. Ball and Mankiw (1995), Rae (1993) and Cabral, Hall and Yates (1996) all examine the correlation between mean inflation and the skewness of inflation across sub-components of the aggregate price index to make inferences about price stickiness.

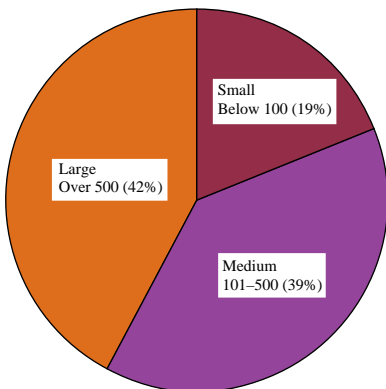
(3) For descriptions of the survey see the source books by Milward and Stevens (1986) and Milward *et al* (1992); for analyses of the questions on price responses see Yates (1994) and Haskel, Kersley and Martin (1995).

survey of price setting in 350 small companies in the United Kingdom.

The Bank of England’s survey was carried out by the Bank’s Agents and its Business Finance Division, who approached some 1,100 industrial contacts across the country. The survey was then carried out by sending a questionnaire to those who agreed to participate. The sample was neither random nor fully representative of all companies in the United Kingdom. In particular, respondents to the survey tended to be established rather than new companies, and this meant that companies in the sample were likely to be larger than average. For example, while large companies (with more than 500 employees) account for 37% of employment in the United Kingdom,<sup>(1)</sup> in the Bank survey they accounted for 96% of total employment of the firms which responded. Chart 1 shows

**Chart 1**  
Company size by number of employees

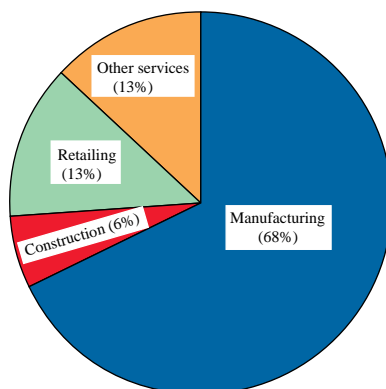
Percentage of companies in each category



Note: Survey respondents were asked to specify numbers of both full and part-time workers. Company size was categorised using numbers of full-time equivalent workers, for which part-time workers have been treated as equivalent to 40% of a full-time worker. This proportion is based on *Labour Force Survey* data on hours worked by part and full-time workers in the economy as a whole.

**Chart 2**  
Sectoral composition of companies in the survey

Percentage of companies in each category



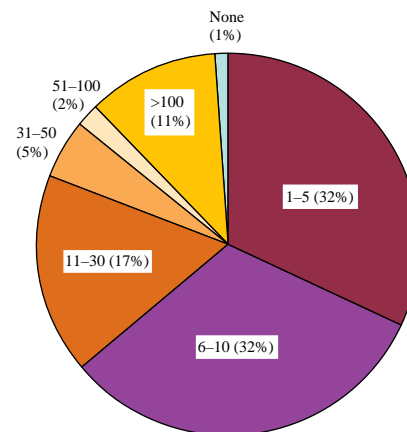
Note: The sectoral allocation is based on the 1992 standard industrial classification: manufacturing (Division D), construction (Division F), retailing (Division G) and other services (Divisions H to Q).

the size of companies in the survey. Partly because of this large-company bias, the sample was dominated by manufacturing companies (see Chart 2): 68% of the sample were manufacturing companies, compared with only 12% for the country as a whole.<sup>(2)</sup>

The survey also asked questions about market structure. As discussed later, the number of competitors in a company’s market (Chart 3), a company’s market share (Chart 4) and

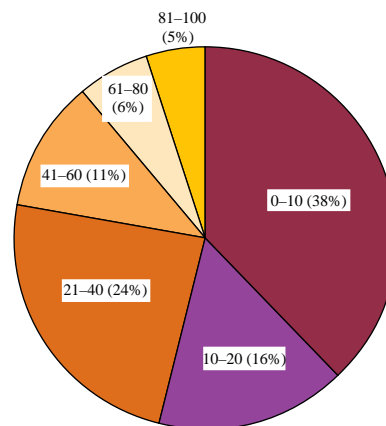
**Chart 3**  
Number of competitors of companies in the survey

Percentage of companies in each category



**Chart 4**  
Market share of companies in survey

Percentage of companies in each category



the length of customer relationships (Chart 5) are all likely to affect pricing decisions.<sup>(3)</sup>

### 3 Why might prices be sticky?

The first part of the survey applied the work of Alan Blinder (1992) to the United Kingdom by asking companies to distinguish between different theories of price setting. The Blinder and Bank surveys outlined a number of these theories and asked companies to assess their importance.

(1) Dale and Kerr (1995) report employment shares by firm size based on data contained in the Inter-Departmental Business Register.  
 (2) The Bank questionnaire may have induced an additional bias in the responses because it asked respondents to focus on the pricing of a specific, main product. This may have been appropriate for manufacturing companies, but was potentially less suitable for service and construction companies, whose ‘product’ may vary with every new transaction. For this kind of company, it might have been more appropriate to ask about the factors determining charges for labour time.  
 (3) The survey also asked companies about organisational structure, trade union arrangements, new product pricing, market location, discounting and customer markets. This information is not used in this discussion but will be considered in subsequent work on the survey results.

**Table A**  
**The recognition and importance of different pricing theories<sup>(a)</sup>**

Percentages in italics

|                         | Bank survey (UK)       |   |           | Blinder's survey (US) |               |
|-------------------------|------------------------|---|-----------|-----------------------|---------------|
|                         | Percentage recognition | Mean rank (b) (ordering among the theories) |           | Mean rank (b)         |               |
| Constant marginal costs | 53.8                   | 3.1   | <i>6</i>  | 2.44                  | <i>10</i>     |
| Cost-based pricing      | 47.1                   | 2.3   | <i>2</i>  | 1.28                  | <i>3</i>      |
| Implicit contracts      | 45.4                   | 2.9   | <i>5</i>  | 1.48                  | <i>4</i>      |
| Explicit contracts      | 43.7                   | 2.2   | <i>1</i>  | 1.71                  | <i>5</i>      |
| Procyclical elasticity  | 35.3                   | 3.3   | <i>9</i>  | 2.03                  | <i>7</i>      |
| Pricing thresholds      | 34.4                   | 2.8   | <i>4</i>  | 2.03                  | <i>8 (c)</i>  |
| Non-price elements      | 24.2                   | 3.3   | <i>8</i>  | 1.14                  | <i>1</i>      |
| Stock adjustment        | 22.9                   | 3.1   | <i>7</i>  | 2.28                  | <i>9</i>      |
| Co-ordination failure   | 22.0                   | 2.5   | <i>3</i>  | 1.15                  | <i>2</i>      |
| Price means quality     | 18.5                   | 3.6   | <i>10</i> | 2.55                  | <i>11 (d)</i> |
| Physical menu costs     | 7.3                    | 3.8   | <i>11</i> | 1.72                  | <i>6</i>      |

- (a) These theories are explained in the text. The bands divide the theories into five groups. Statistical tests show that within each group the proportions recognising each individual theory as important are not significantly different from each other, but are significantly different from the proportions recognising theories from the other groups.
- (b) Low numbers indicate that a theory is important. The Bank survey is on a scale of 1–7, Blinder's on a scale of 1–4.
- (c) Blinder ranks pricing thresholds below procyclical elasticity because a smaller percentage of companies gave this theory a rank of '3' or higher.
- (d) Blinder ranked this 12th below another theory, 'hierarchies', which we did not investigate.

The results of the Bank and the Blinder surveys are summarised in Table A. The Bank survey first asked whether a company recognised a particular pricing theory as being important for its activities. If a theory was recognised, the company then ranked how important it was on a scale of 1 (high) to 7 (low). The 'mean rank' given by those companies which recognised the theory can then be calculated, and is shown in the second column of the table. To make detailed comparisons with Blinder's survey, the third column shows the scores given by Blinder's respondents in the United States. It should be noted that the mean scores for the Bank survey and Blinder's survey are calculated using different scales and cannot be compared directly. In the Bank survey, low numbers are important (on a scale of 1–7). In Blinder's original rankings, high numbers were important (on a scale of 1–4), but to make these rankings more comparable to the Bank numbers, they have been subtracted from four in Table A. Figures in italics show the priority companies gave to the different theories, with 1 being the highest and 11 the lowest priority.

### *Constant marginal costs and cost-based pricing*

Two related theories of price stickiness are constant marginal costs and cost-based pricing. Constant marginal costs means that variable costs per unit of output are more or less constant for a company when production levels change. If a company bases prices on costs, then a company with constant marginal costs has no reason to change prices when production changes. Changes in demand may still influence prices, but as Hall (1986) pointed out, if there was a boom in demand and output increased, prices would increase by less than if variable costs per unit were rising as the company moved towards full capacity. Cost-based pricing, on the other hand, refers to companies which do not take changes in demand into

account when setting prices. Companies operating cost-based pricing will only change prices if charges for raw materials or wage rates or some other costs change. Gordon (1981) and Blanchard (1983) showed how cost-based pricing can lead to considerable inertia in the supply chain as a whole, since one company's rigid final price becomes another's fixed-price, raw material cost.

The results on constant marginal costs offer one of the most marked contrasts between Blinder's survey and the Bank's. The theory of constant marginal costs did not get much support from Blinder's respondents (it came bottom of their list). But in the Bank survey, this theory received the most recognition, cited as important by 54% of respondents, although as Table A shows, those that did recognise the theory as important did not rank it particularly highly (constant marginal costs was ranked sixth out of the eleven theories).

There was significant variation in the recognition of constant marginal costs across broad industrial groups. 61% of manufacturing companies recognised constant marginal costs as important, which was statistically significantly different from the proportions in construction (35%), retail (34%) and other services (46%). If the costs of production in manufacturing are less flexible than in other industries—if production is, for example, more capital intensive—then it would make sense that constant marginal costs turn out to be more important, since in capital intensive industries, marginal costs will rise less rapidly with output up to the point of full capacity. But company size does not seem to have any significant impact on the importance of constant marginal costs; and there is only slight evidence that market structure affects the importance of this theory.<sup>(1)</sup> This is surprising, since we might have expected industries consisting of a few large companies, exploiting economies of scale, to be more likely to have relatively constant marginal costs than industries where production is less concentrated.

Cost-based pricing comes second in the Bank's league table of theories, in terms of recognition and rank, with 47% of respondents citing it as important, and assigning it a rank of 2.3. In Blinder's survey, cost-based pricing was also important (third in his league table). The importance of cost-based pricing in the United Kingdom may exacerbate any price rigidity resulting from the prevalence of constant marginal costs, also identified in the survey.

There is some evidence that cost-based pricing is more widespread in small companies: 58% of small companies recognised cost-based pricing as important, compared with 45% of medium-sized companies and 44% of large companies. If there were economies of scale in devising sophisticated systems for monitoring market conditions, then smaller companies might opt for simpler (perhaps cost-based) rules to guide price setting.

(1) Respondents were asked to estimate the number of competitors in the market for their main product or service. 60% of companies with up to five competitors recognised constant marginal costs as important, while 48% of those with more than eleven competitors thought this theory was important. However, these differences were not evident when companies were asked about their market share, nor when mean rankings were compared across market structures.

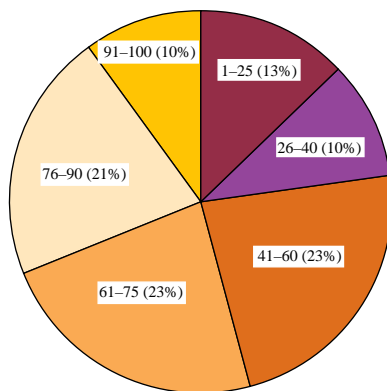
### Explicit or implicit contracts

A third reason for rigidity in prices is that transactions between companies and customers may involve either explicit or implicit contracts (formal or informal understandings). Such contracts deliver stable prices, which provide insurance against uncertainty in market conditions, and allow companies and customers to plan ahead without the threat of sudden changes in costs or prices. Even so prices will not necessarily be rigid under either implicit or explicit contracts, since both can be renegotiated.

Stiglitz (1984) argued that the prevalence of long-term relationships between companies and customers (which the Bank survey confirms) was evidence that these kind of contracts exist. Instead of inferring their existence, the Bank survey asked about such contracts directly (see Chart 5). Both implicit and explicit contracts were

**Chart 5**  
Proportion of companies surveyed with customer relationships lasting over five years

Percentage of companies falling into each category



recognised as important. In rank terms, explicit contracts turned out to be the most important theory. In Blinder's sample, implicit and explicit contracts came fourth and fifth in his league table of theories.

There was also some interesting variation in the importance of contracts across industries. Recognition of explicit contracts was particularly high in the construction sector (at 73%) and particularly low in retailing (25%). This is as expected. Construction projects take a long time to come to fruition, and may be affected by uncertainties like the weather and the price of raw materials. Companies in retailing, by contrast, often sell goods that can be inspected by the buyer before money changes hands, so there is little benefit from the insurance provided by an explicit contract. Perhaps because of the prevalence of explicit contracts, recognition of implicit contracts in construction was correspondingly lower (at 16%) than in the other sectors.<sup>(1)</sup> There is some evidence that companies involved in

longer-term relationships with customers attach greater importance to explicit contracts: companies with over 75% of their customer relationships lasting for longer than five years ranked the theory at 1.8, compared to 2.3 for those with less than 40% of customers in such long-term relationships. This does not accord with the spirit of Carlton's (1986) work, which showed that prices were more rigid when firm-customer relationships were shorter. He suggested that both parties were more prepared to enter into fixed-price contracts early in their relationship, when there had been no time to build up trust, although he did not have any data on whether prices were governed by contracts or not.

### Co-ordination failure

Collusive behaviour between companies, even if it is only implicit, may also make prices sticky. What economists have called co-ordination failure occurs when no company wants to be the first to change prices, even if it is in response to a genuine change in costs or demand. Each company worries that it might spark off a price war and that it might be worse off as a result.<sup>(2)</sup> Blinder's study found this theory to be very important, ranking second in his list. But in the Bank study, the results were less clear: only 22% of respondents recognised co-ordination failure as important, though those that did so ranked it quite highly at an average of 2.5, putting it third in importance among the theories.

Economic theory suggests that companies in very competitive industries take their prices from the market, and cannot engage in price wars with other companies, so there is no co-ordination failure. Companies in very concentrated markets with few competitors may well engage in strategic behaviour, jostling with other companies for market share. But it should be relatively easy for this activity to be co-ordinated, without sparking off a price war. So theory expects co-ordination to be most likely to fail in industries between these two extremes. But, it is unlikely that a relationship as subtle as this would show up in our survey.<sup>(3)</sup>

We did nevertheless find that companies in less competitive markets do not seem to experience more problems with co-ordination failure: only 11% of companies with more than 40% of the market recognised co-ordination failures as important, compared with 30% of those with 5% or less of the market. An explanation might be that market leaders do not have to worry about triggering price wars if they can count on other companies falling into line. Co-ordination failure was less of a problem where there were many customers in long-term relationships.<sup>(4)</sup> This is as expected: price wars between companies are much less likely to succeed if there is a high degree of customer-company loyalty.

(1) Manufacturing: 47%; retailing: 48% and other services 46%.

(2) These ideas were articulated in theory by Stiglitz (1984), Ball and Romer (1987) and Cooper and John (1988).

(3) Especially since we looked only at bivariate correlations. In future, multivariate analysis will be used to test for the links between competition and co-ordination failures more thoroughly.

(4) For example, 14% of companies with more than 75% of customers in relationships longer than five years recognised co-ordination failures as a problem, compared with 27% of companies with up to 40% of customers in these relationships. This difference was significant at the 5% level.



### *Procyclical elasticity*

Rotemberg and Saloner (1986) and Shapiro (1988) put forward a theory suggesting that strategic interactions between companies could depend on the state of the business cycle. When demand falls, some companies may go out of business. If the number of companies falls significantly, this may increase companies' ability to co-ordinate their prices as well as reducing price competition. This theory is known as procyclical elasticity, since it explains why the responsiveness (elasticity) of prices to changes in demand may dampen in a cyclical downturn. Procyclical elasticity was recognised as important by 35% of the sample, but was not scored highly by those that did. Blinder did not find that procyclical elasticity was rated highly either: it came seventh in his list of theories.

### *Pricing thresholds*

Pricing thresholds may also inhibit companies from changing prices. For example, many companies price at £4.99 or £9.99 instead of £5 or £10. Companies might do this if they believe that increasing prices above these thresholds would lead to falls in demand that are out of proportion to the price increase. Pricing thresholds ought to mean that prices are more sticky upwards than downwards. Kayshap (1995) tested the importance of this phenomenon in the United States. He found some weak evidence that pricing thresholds were important. He observed that price changes tended to be slightly smaller when they crossed over 50-cent thresholds. In the Bank survey, pricing thresholds were recognised by 34% of companies, with a mean rank of 2.8. This places it fourth in the list of theories—more important than in Blinder's survey, where pricing thresholds ranked eighth.

Pricing thresholds were recognised much more widely in retailing (69%) than in all the other industry groupings, where recognition was recorded at 29% for manufacturing, 38% for construction and 30% for other services. In retailing, most transactions are conducted with final consumers. Elsewhere, buyers tend to work for companies, so they might be less responsive to psychological factors like pricing thresholds. Pricing thresholds might also be less important as customer loyalty increases, but the survey found no evidence of this.

### *Non-price elements*

Another possibility is that although observed prices are sticky, the real underlying price varies as companies instead change quality, or delivery times, or the amount of after-sales service. These non-price elements were thought important by Carlton (1990), and Blinder's survey found them to be the most important factor for his respondents. The Bank survey is much less supportive, recording a 22% recognition of non-price elements and a mean rank of 3.3, which puts it eighth in the list of theories.

Non-price elements were much less widely recognised by construction companies (11%) than by companies in manufacturing (29%). As discussed above, explicit contracts were much more important for construction companies than for the other industrial groupings: if prices are more rigid because of this, delivery, after-sales service and quality might be the dominant mechanism through which companies compete and adjust to demand conditions. And if these other elements are not flexible either (perhaps because explicit contracts rule this out), then changes in market conditions are more likely to result in construction companies experiencing larger swings in output and employment than other companies. This scenario accords with the above-average variability of construction employment and output in the whole economy.

### *Stock adjustment*

Companies could respond to changes in market conditions not by changing prices but by adjusting stock. This idea is usually attributed to a paper by Blinder (1982). In some ways, stock adjustment encompasses the other theories: companies can react to a change in market conditions in a number of ways, including leaving the market, changing prices or, in the short run, adjusting stocks. 23% of respondents recognised this as an important factor in their price setting and as in Blinder's survey, stock adjustment did not rank highly relative to the other theories. This is slightly perplexing, given the high levels of support for other price-stickiness theories, since stock adjustment is probably a symptom of other forms of price stickiness, rather than a cause in its own right.

### *Price means quality*

If companies think customers buy on the basis that price means quality, they may be unwilling to cut prices for fear that buyers will think the product has declined in quality.<sup>(1)</sup> Quality signalling might well be relevant for the luxury car market, or perhaps certain niche markets for clothes or food, but is unlikely to be of widespread importance for most products. Blinder's survey and the Bank's confirmed this: quality signalling was recognised by 18.5% of Bank respondents, ranking it tenth in the list of theories. In Blinder's survey, this theory was the least important of all.

### *Physical menu costs*

Menu costs theories derived originally from the idea that restaurants might be reluctant to change prices in response to a change in supply or demand because of the cost of re-printing menus. These costs could be called physical menu costs, as they refer to the resources needed to implement price changes.<sup>(2)</sup> Menu costs were found to be of little importance in Blinder's sample, and were even less so in the Bank's, with only 7% of companies citing them as important. Part of the reason may be that there are other information costs that companies have to bear: for example,

(1) This idea was put forward in a paper by Stiglitz (1987).

(2) They were first discussed explicitly by Sheshinski and Weiss (1977), and then developed by Mankiw (1985) and Akerlof and Yellen (1985a).

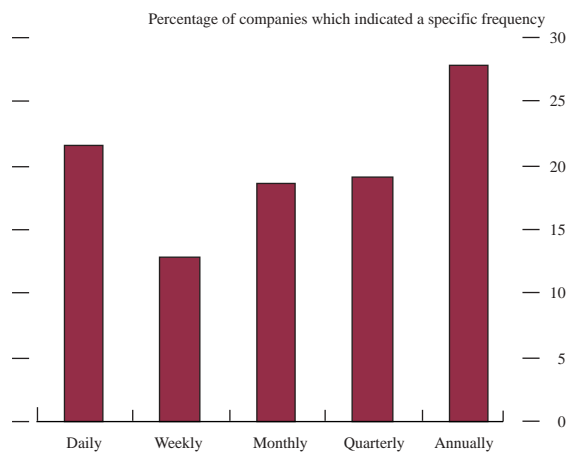
the costs of being sufficiently aware of prices in the market and of anticipating consumer and competitor reaction to pricing policies. The survey did not ask about these directly, but they are described in the next section.<sup>(1)</sup> The survey showed that physical menu costs were much more widely recognised in retailing than in other sectors; 22% of retailers thought they were important, compared with 5% for manufacturing, 3% for construction and 9% for other services. Since, as discussed below, retailers tend to change prices most frequently, this result is not surprising.

The survey's questions on pricing theories, which were designed to match those asked by Blinder (1992), gave some interesting results. In the Bank survey, constant marginal costs were important for respondents, while non-price elements were not. Blinder found the opposite. The Bank survey also found that, except in retailing, physical menu costs did not seem to be important.

#### 4 How often are prices reviewed and changed?

Other questions in the survey asked more directly about price setting: about the frequency of price reviews and price changes. On price reviews, the survey asked 'How frequently are pricing decisions actively reviewed?' On price changes, it asked 'In the last twelve months, how many times have you actually changed the price of your main product?' Charts 6 and 7 compare the frequency of price reviews and price changes.

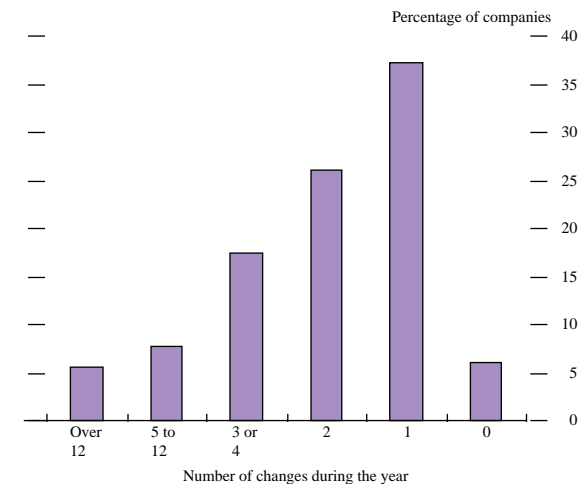
**Chart 6**  
Frequency of price reviews



##### Informational menu costs

The frequency of price reviews reveals something about informational menu costs—the costs of collecting the data needed to decide whether the current price is right or not—as distinct from physical menu costs—the costs of implementing the outcome of a price review—discussed

**Chart 7**  
Price changes



earlier. For example, if price reviews were entirely costless, companies would conduct them continuously, to pick up every change in market conditions as it occurred. For the 80% of companies in our sample which review prices less than once a day, price changes are probably not costless; the expected gains from reviewing prices continuously are not large enough to justify the costs. Indeed, these costs are such that 28% of companies said that they reviewed prices only once a year.

##### Time and state-dependent pricing

Companies were asked whether they normally reviewed prices at a particular frequency and/or whether prices were reviewed 'in response to particular events'. These questions can help distinguish between two different theories of price setting—time-dependent and state-dependent pricing rules.

In time-dependent pricing models<sup>(2)</sup> because price changes are costly, companies choose to review prices at discrete time intervals. The length of this interval tends to depend on the rate of inflation, since this determines how quickly the company's own relative price falls. When inflation is high, and a company's relative price is falling rapidly, profits fall quickly and it will review prices more frequently to compensate. State-dependent pricing models,<sup>(3)</sup> however, are based on the assumption there is no routine price reviewing. Instead, prices will be fixed until there is a sufficiently large shift in market conditions to warrant a change.

Both theories predict that prices will remain unchanged for periods of time and then move in discrete jumps. But they may have different implications for macroeconomic policy. Under time-dependent pricing rules, the interval between price changes rises as inflation falls. As Ball, Mankiw and

(1) The theoretical literature on menu costs stresses that quite small menu costs can have large effects on economic welfare. Mankiw (1985) and Akerlof and Yellen (1985b) were the first to make this point. If a firm faces small menu costs, and prices are slightly more sticky than otherwise, the costs to the firm are incurred by changing output back and forth as demand changes. But the costs to the economy also include those incurred by a firm's customers, who cannot fully satisfy their demand for the firm's good because the price is rigid. So although menu costs do not seem to be important in the Bank sample, menu costs could still explain some of the observed real effects of monetary policy in the United Kingdom.  
 (2) The early time-dependent pricing models (such as Fisher 1977) were generally applied to the labour markets but subsequent models (such as Ball and Romer 1989) have extended the principle to product markets.  
 (3) State-dependent pricing rules were first articulated by Barro (1972) and developed in a series of papers by Sheshinski and Weiss (1977, 1983), Caplin and Sheshinski (1987), Caplin and Spulber (1987) and Caballero and Engel (1991).

Romer's (1988) menu-cost model shows, the effects of a monetary shock on real activity may therefore be larger and persist for longer at lower rates of inflation. With state-dependent pricing rules, any effects from nominal variables—interest rates, prices and money—on the real side of the economy are less likely to vary with the rate of inflation.<sup>(1)</sup> If this is the case, then all other things being equal, a higher incidence of companies operating time-dependent price reviews could mean that the real effects of nominal shocks would increase at lower rates of inflation. But all other things are not equal, and set against these possible effects of disinflation, are the substantial costs of inflation.<sup>(2)</sup> In particular, at higher rates of inflation the variance of (and hence the size of shocks to) the price level may be higher. If this higher variance implies greater uncertainty and more difficulty for companies in assessing market conditions, then higher rates of inflation could imply greater real effects of monetary policy shocks. And, with higher rates of inflation, there will tend to be more changes in the price level and companies will have to incur more frequently the menu costs of price changes.

The survey suggested that time-dependent pricing was more common than state-dependent pricing, with 79% of the respondents reporting that they reviewed their prices at a specific frequency. 11% of companies said that they reviewed prices 'in response to a particular event', placing them in the state-dependent camp. 10% of companies implied that they operated both time and state-dependent pricing. This was not unexpected since the theories are not mutually exclusive; it is plausible to think of companies reviewing prices annually, but conducting additional reviews in response to extraordinary events. Kayshap (1995) found more support for state-dependent, rather than time-dependent rules in the United States. But the findings of Carlton (1986) and Cecchetti (1986) for the United States were consistent with either type of price setting.

### Price reviews versus price changes

Charts 6 and 7 show that, in the year to September 1995, price changes were much less frequent than price reviews. The median number of times that prices were changed was twice a year, while the median company reviewed prices every month. So companies often reviewed prices but decided not to change them. Prices were possibly left unchanged because market conditions were unchanged. But perhaps prices were unchanged because, even once companies had decided to incur the informational costs of reviewing prices, they thought there were extra costs of changing price lists (physical menu costs), or risks of sparking off a price war, or of breaching implicit or explicit contracts with loyal customers. So comparing the frequency of price reviews with price changes suggests that informational costs are not the only

significant cost of changing prices: other theories are important too.

The results make interesting reading when compared with previous research on the frequency of price changes. Respondents to the Bank survey changed prices on average at around twice the frequency of respondents to previous surveys, which were mostly conducted for the United States. A rough calculation from Cecchetti's (1986) data reveals that, on average, magazine prices over the period 1953–79 remained fixed for about five years. Carlton's (1986) study of Stigler and Kindahl's (1970) data implies an average period of price rigidity of around ten months. Blinder (1992) found that the typical firm changed prices once a year. Kayshap's (1995) study of retail mail order catalogues found that, on average, prices remained fixed for fifteen months. Dahlby (1992) found that the mean length of pricing period in Canadian insurance premiums was about 13 months. Table B summarises their results.<sup>(3)</sup>

**Table B**  
The frequency of price changes

| Author      | Period  | Prices               | Frequency (implied number of changes every five years) (a) |
|-------------|---------|----------------------|--|
| Carlton     | 1957–66 | US industrial        | 6  |
| Cecchetti   | 1959–73 | US newsstands        | 1  |
| Blinder     | 1991    | 72 US companies      | 5  |
| Kayshap     | 1953–87 | US retail catalogues | 4  |
| Dahlby      | 1974–82 | Canadian insurance   | 4  |
| This survey | 1995    | 654 UK companies     | 10   |

(a) Bank calculations from the other authors' published articles.

### How do companies' circumstances and characteristics affect price reviews and price changes?

Table C shows how the frequency of price reviews varied by sector. As expected, the average frequency of price reviews was much higher in retailing than in manufacturing. But in construction and other services, where many products take time to deliver, the high frequency of reviews was surprising. One explanation might be that the 'product' tends to vary with each new transaction and that respondents are interpreting this as a price review.<sup>(4)</sup> Statistical significance tests<sup>(5)</sup> found that the median price review frequency for construction and retailing was weekly, and significantly different from manufacturing (quarterly) and other services (monthly). Differences also occurred in the average number of price changes in industries: for example, the average for manufacturing was two changes a year, while for retailing it was three. Differences between industries are broadly consistent with the survey of small companies published by the Lloyds Bank Small Business Research Trust.

Table C also shows that large companies reviewed prices more often than small companies: this difference was

(1) Although, if firms operate a form of state-dependent pricing called an Ss rule, where there are upper and lower bounds within which they make no adjustment to prices, lower inflation could reduce the likelihood that the upper bound is breached when there is, for example a positive shock to money supply. This method of pricing may therefore also imply that the real effects of any nominal shock may be higher at lower rates of inflation.

(2) For an overview, see Briault (1995).

(3) As we have already discussed, the frequency of price changes could well be affected by the prevailing rate of inflation, as well as by factors specific to the different industries examined in each study. As a consequence, these results are not strictly comparable.

(4) For the construction and services sectors, a question about charging out of particular factors, like labour time to clients, may have been more appropriate.

(5) Based on a Wilcoxon rank-sum test for differences between medians.

**Table C**  
**Factors influencing the frequency of pricing reviews**

|  | Frequency of:             |                               |
|--|---------------------------|-------------------------------|
|  | Price reviews<br>(median) | Price changes<br>(median) (a) |
| Whole sample                                 | Monthly                   | 2                             |
| <b>Industry</b>                              |                           |                               |
| Manufacturing                                | Quarterly                 | 2                             |
| Construction                                 | Weekly                    | 3 or 4                        |
| Retail                                       | Weekly                    | 3 or 4                        |
| Other services                               | Monthly                   | 1                             |
| <b>Company size</b>                          |                           |                               |
| Small  | Quarterly                 | 1                             |
| Medium                                       | Quarterly                 | 2                             |
| Large  | Monthly                   | 2                             |
| <b>Number of competitors</b>                 |                           |                               |
| 0–5  | Quarterly                 | 1                             |
| 6–10   | Monthly                   | 2                             |
| > 11   | Monthly                   | 2                             |
| <b>Market share</b>                          |                           |                               |
| Up to 5%                                     | Monthly                   | 2                             |
| 5%–20%                                       | Quarterly                 | 2                             |
| 20%–40%                                      | Quarterly                 | 2                             |
| > 40%  | Quarterly                 | 1                             |
| <b>Percentage of long-term relationships</b> |                           |                               |
| <40% (b)                                     | Monthly                   | 2                             |
| 40%–60%                                      | Monthly                   | 2                             |
| 61%–75%                                      | Monthly                   | 2                             |
| > 75%  | Quarterly                 | 1                             |

Note: As before, small companies are defined as those with less than 100 full-time equivalent employees, medium between 100–500 and large companies with more than 500 such employees.

- (a) Number of changes during the previous twelve months.  
(b) Includes those companies responding 'not applicable'.

statistically significant, although there was no significant difference in the average number of price changes. The findings confirm those of Blinder (1992), who reported very little support for a pricing theory that he called 'hierarchies', which suggested that large companies' prices would be more rigid because of bureaucratic sluggishness. The observation that small companies review prices less frequently is interesting. At face value, it reveals something about the balance between two forces that economic theory predicts influence small companies. One theory says that small companies may be prevalent in an industry because the technology is such that their costs rise more steeply with output. So the penalty for not changing prices in response to a change in costs is large. In these circumstances, prices would be more sensitive and reviewed more frequently than in larger companies. A second theory says that monitoring market conditions and devising pricing policies is something done more efficiently by large companies, which can spread the cost over many units of production. The finding that small companies review prices less frequently is supported by our earlier finding that cost-based pricing is important for small companies: cost-based pricing implies that companies ignore fluctuations in demand, which should mean that prices are reviewed less frequently.

Companies operating in more competitive markets reviewed and changed prices more often: this held when looking at the number of competitors, or at market share.<sup>(1)</sup> A possible explanation is that the consequences of charging the wrong price are more serious in a competitive industry—since

demand is more sensitive to price—and so companies have a greater incentive to check the appropriateness of their current price and are more sensitive to changes in market conditions. This finding is consistent with the work of Carlton (1986), who observed that US industrial prices were more rigid in concentrated industries. But other studies—using more aggregated data to look at the speed, rather than the frequency, of price adjustment—give conflicting results. For example, Weiss's (1993) study of Austrian manufacturing found that more concentrated industries adjusted prices more slowly in response to changes in costs, but more quickly in response to changes in demand. Kraft (1995) examined data on German manufacturing prices and found that prices in more concentrated industries adjusted more quickly to changes in costs or demand. Geroski (1992), using UK data, found the opposite.<sup>(2)</sup>

The results also showed that companies with a greater proportion of customers involved in long-term relationships reviewed and changed prices less frequently than the others: these differences were statistically significant. This ran counter to the work of Carlton (1986), who found that prices tended to be more flexible the longer the buyer-seller association. Carlton argued that customers involved in shorter relationships with suppliers were more likely to use fixed-price contracts because of the fear that companies may exploit them by price changes. The Bank survey found the opposite: as discussed above, explicit contracts tended to be more important for companies with a greater proportion of long-term customers.

There were several key results from the questions on the frequency of price reviews and price changes. First, although physical menu costs were thought to be unimportant by respondents, companies changed prices only about twice a year on average, suggesting there were some costs associated with pricing decisions. Second, time-dependent pricing rules predominated. Third, in line with Carlton (1986), greater competition increased the number of price changes: but, counter to his work, companies with a greater proportion of long-term customers changed prices less frequently than other companies.

## 5 How are prices determined?

The survey also asked what factors influenced companies' pricing decisions. This gave a useful cross-check on earlier questions. The first set of questions asked companies to rank only theories of price stickiness: subsequent questions, as described below, allowed companies to express their views on how prices are determined.

Companies were asked to rank alternative methods of pricing of their main product. Table D summarises the results. The most popular response was that prices were set

(1) With respect to the number of competitors, all differences between price review frequencies were significant at the 5% level, while for price changes, companies with 0–5 competitors changed prices significantly less than the others at the 5% level. For market share, there is a statistically significant difference between price reviews of companies with less than 5% of the market and those with more than 40%, and we found that those companies with more than 40% market share also changed prices less than all other categories, with these differences significant at the 5% level.  
(2) For a summary of other studies, see Weiss (1993) and Kraft (1995).



**Table D**  
**How are prices determined?**

Percentages in italics

|                                   | 1st |           | 2nd |           | 3rd |           |
|-----------------------------------|-----|-----------|-----|-----------|-----|-----------|
| Market level                      | 257 | <i>39</i> | 140 | <i>21</i> | 78  | <i>12</i> |
| Competitors' prices               | 161 | <i>25</i> | 229 | <i>35</i> | 100 | <i>15</i> |
| Direct cost plus variable mark-up | 131 | <i>20</i> | 115 | <i>18</i> | 88  | <i>14</i> |
| Direct cost plus fixed mark-up    | 108 | <i>17</i> | 49  | <i>8</i>  | 42  | <i>6</i>  |
| Customer set                      | 33  | <i>5</i>  | 52  | <i>8</i>  | 47  | <i>7</i>  |
| Regulatory agency                 | 11  | <i>2</i>  | 3   | <i>1</i>  | 5   | <i>1</i>  |

with respect to market conditions. The top preference<sup>(1)</sup> for almost 40% of respondents was that prices were set at the highest level that the market could bear. An additional 25% of respondents stated that they set prices in relation to their competitors—this was the second choice most popular among companies. The popularity of market-led pricing might seem to contradict our earlier findings on cost-based pricing strategies, and on the frequency of price changes. But it is possible to reconcile the findings by recognising that market and cost-based strategies co-exist. For example, we found earlier that some companies appeared to operate both time and state-dependent pricing rules. It could be that periodic (time-dependent) price reviews take both demand and cost conditions into account, but that actual price changes are particularly dependent on market conditions (ie are state-dependent).

Retailing and manufacturing companies were particularly conscious of rival prices, which may explain the high ranking of co-ordination failure as a cause of price rigidity in these sectors. Companies in more concentrated markets were more likely to look to their competitors' prices when determining their own. The importance of competitors' prices in the decision to change price was confirmed elsewhere in the survey (see below). Construction companies suggested that the market level was by far the most important factor in price determination but, surprisingly, gave less weight to competitors' prices.

The survey also confirmed the importance of company-specific factors. The first preference of about 20% of respondents was that the price was made up of a direct cost per unit plus a variable percentage mark-up. This was consistent with the importance which companies placed on cost-pricing theories of sticky prices and on the importance of material costs in price changes (see below). A further 17% of companies, particularly retailing companies, stated that they priced on the basis of costs plus a fixed percentage mark-up.

Cost plus mark-ups tended to be more important for small companies, and market conditions much less so. This may suggest that the cost mark-up 'rule of thumb' for pricing is more suitable for small companies, which cannot afford expensive market research. This is consistent with the

finding that small companies were also likely to review prices less frequently than large companies, and with the result in section 3 that small companies were more likely to recognise cost-based pricing as an important factor in their own price setting.

Only 5% of companies reported that their prices were set by their customers; this was more a feature of manufacturing and services than other sectors. This method of pricing was more important for companies with a larger proportion of long customer relationships. It was also more prevalent in companies operating in more concentrated markets. This is puzzling, since companies with fewer competitors ought to have more power over their consumers, who have fewer alternative suppliers if they are dissatisfied.<sup>(2)</sup>

## 6 What factors drive prices up and down ?

A key question is whether, faced with upward or downward shocks of similar magnitude, companies are more reluctant to cut prices than to raise them. If prices are more sticky downward than upward, then this would mean that a tightening in monetary policy could have a larger, short-run impact on unemployment than a loosening of policy of the same size.<sup>(3)</sup>

Previous work on price asymmetries used mostly aggregated data and produced conflicting results. For example, DeLong and Summers (1988) inferred from their results in the United States that prices were more sticky downwards than upwards. Cover (1992) confirmed this using the same US data. But Ravn and Sola (1995) found no evidence of asymmetry for the United Kingdom. Other international work showed that it took larger output losses to eliminate each extra unit of inflation. This is consistent with asymmetries in the response of prices to upward and downward shocks.<sup>(4)</sup>

Evidence using data on individual prices is also conflicting. Carlton (1986) found no evidence of excessive downward stickiness in the US price data collected by Stigler and Kindahl (1970). Blinder (1992) found that the speed of adjustment to positive and negative demand and cost shocks was no different. Using New Zealand data, Rae (1993) found no evidence of downward stickiness in product prices. Cabral *et al* (1996) and Yates (1995) supported this for prices and wages (respectively) in the United Kingdom. One of the few studies that showed evidence of downward rigidities was a survey of employees in the United States by Kahneman, Knetsch and Thaler (1986) which reported that respondents preferred money wage increases of 5% with 12% inflation, to money wage cuts of 7% with no inflation.

The Bank survey asked companies to rank those factors most likely to push prices up or down. It found that there were substantial differences between the factors that

(1) Companies were able to choose more than one response as their top preference. This means the total percentage of companies expressing first preferences for all of the explanations of price determination exceeds 100%.

(2) However, firms with fewer competitors might also have fewer buyers, in which case the buyers could exercise more power. The survey did not include questions that would reveal this.

(3) Downward stickiness may itself be generated by periods of prolonged inflation: if prices always tend to go up, then price cuts may be hard to interpret or accept. If this is the case then the best cure for downward stickiness is price stability.

(4) See Ball, Mankiw and Romer (1988); Yates and Chapple (1996) and Laxton, Meredith and Rose (1995).

influenced price increases and those that influenced price decreases (Table E). First, many more companies said that cost rises were likely to push prices up than said that cost reductions were likely to push prices down. Second, a rise in demand seemed less likely to lead to a price increase than

**Table E**  
**Factors leading to a rise or fall in price**

Percentages in italics

| Rise                       | Number (a) |           | Fall                       | Number (a) |           |
|----------------------------|------------|-----------|----------------------------|------------|-----------|
| Increase in material costs | 421        | <i>64</i> | Decrease in material costs | 186        | <i>28</i> |
| Rival price rise           | 105        | <i>16</i> | Rival price fall           | 235        | <i>36</i> |
| Rise in demand             | 101        | <i>15</i> | Fall in demand             | 146        | <i>22</i> |
| Prices never rise          | 26         | <i>4</i>  | Prices never fall          | 75         | <i>12</i> |
| Increase in interest rates | 18         | <i>3</i>  | Decrease in interest rates | 8          | <i>1</i>  |
| Higher market share        | 14         | <i>2</i>  | Lower market share         | 69         | <i>11</i> |
| Fall in productivity       | 5          | <i>1</i>  | Rise in productivity       | 22         | <i>3</i>  |

Note: Top preferences only.

(a) Numbers citing a scenario as most important.

a fall in demand was to lead to a price cut. These asymmetries may, to an extent, provide information about the relative incidence of changes in costs and demand. For example, if a company has not recently experienced cost decreases, it might be less likely to suggest that cost decreases could lead to a fall in prices.

The asymmetries also point to the importance companies place on strategic interaction with competitors and on their desire to preserve market share.

The importance of strategic interaction with competitors suggests that when contemplating a price cut, companies need to consider the chance of sparking off a price war. If changes in costs are either specific to each company and/or harder to monitor by other companies in the market, then a price reduction prompted by a fall in costs is more likely to be interpreted as an aggressive act to gain market share by competitor companies, and a price war might be more likely to result. So companies might be more reluctant to cut prices. On the other hand, demand changes may be more common to all companies and/or easier to monitor, so price cuts in response to a fall in demand might be easier to implement without threatening a price war. The finding that companies were much more likely to match rival price falls than they are to follow rival price rises appears to support the importance of strategic behaviour.<sup>(1)</sup>

The importance of preserving market share suggests that when contemplating a price increase, companies focus on the effect on their customer base. If there are significant company-customer relationships, then companies might find it easier to bargain for price increases that result from cost increases, which the company cannot do anything about, than from demand increases, which are to do with the tastes and incomes of its customers. Companies are also more likely to cut prices in response to a fall in market share, than they are to raise prices to exploit a higher market share.

Two other asymmetries emerge from the survey. First, there is weak evidence from Table E that interest rate rises are more likely to lead to price rises than interest rate falls are to lead to price reductions.<sup>(2)</sup> And finally, three times as many companies stated that prices never fall as stated that they never rise. This could indicate that prices are sticky downward, but more probably it reflects the fact that because inflation has been positive throughout recent history, price falls are less likely.

This question not only permitted us to assess the extent of asymmetry in the response of prices to shocks, but also provided information on how prices were set more generally, and a cross-check on earlier questions about pricing theories. The most striking feature of Table E is that four times as many respondents cited cost increases as most likely to provoke a price rise, as cited the next most popular scenario: an increase in the rival price. This result confirms the popularity of cost-based pricing observed earlier, which came second in the league table of pricing theories. It also accords with other work which found that prices were more sensitive to cost than demand conditions.<sup>(3)</sup> The survey result might not be indicative of the sensitivity of prices to costs or demand, but may instead reflect the relative variability of costs and demand at the time the survey was conducted. But the result is still very striking.

## 7 How do companies respond to demand booms?

Section 3 observed that 24% of companies recognised non-price elements as an important factor in price setting: that is, rather than change prices, they might change delivery times, for example. The survey asked about these factors more directly by posing the question: ‘What action do you take when a boom in demand occurs and this demand cannot be met from stocks?’ Table F summarises the results.

**Table F**  
**Response to demand booms<sup>(a)</sup>**

Percentages in italics

|                     | 1st |           | 2nd |           | 3rd |           |
|---------------------|-----|-----------|-----|-----------|-----|-----------|
| More overtime       | 408 | <i>62</i> | 69  | <i>11</i> | 15  | <i>2</i>  |
| More workers        | 80  | <i>12</i> | 206 | <i>32</i> | 90  | <i>14</i> |
| Increase price      | 75  | <i>12</i> | 38  | <i>6</i>  | 47  | <i>7</i>  |
| More capacity       | 51  | <i>8</i>  | 90  | <i>14</i> | 88  | <i>14</i> |
| More subcontractors | 44  | <i>7</i>  | 81  | <i>12</i> | 74  | <i>11</i> |
| Longer delivery     | 44  | <i>7</i>  | 71  | <i>11</i> | 83  | <i>13</i> |
| Other               | 28  | <i>4</i>  | 7   | <i>1</i>  | 5   | <i>1</i>  |

(a) Number of companies assigning a particular rank.

By far the most popular response was to increase overtime working. Only 75 companies (12%) said that increasing prices would be their most important response. This concurs with the responses to the Workplace Industrial Relations Survey (WIRS) question (on which the Bank’s question was based): Haskel, Martin and Kersley (1996) reported that 8% of WIRS respondents would change prices in response to an increase in demand. 51 respondents (8%)

(1) We might have expected these effects to increase as firms experienced less competition, where strategic interaction between firms becomes more important, but there was no evidence of this.

(2) The direct effects of interest rates on company costs may be a more immediate influence on individual company prices than the more general effects of monetary policy on economic activity.

(3) Sweezy (1939); Neild (1963); Coutts, Godley and Nordhaus (1978); and more recently Geroski (1992).

said that increasing capacity would be their most likely response to a shift in demand. Perhaps companies interpreted the term ‘demand boom’ as a permanent increase in demand rather than a temporary one, which would mean that, in the long run, we might expect some combination of price, capacity and employment increases, depending on the cost conditions in each industry.

This question makes a very broad statement about the extent of price stickiness in general, but it can also be used in the discussion of why prices might be sticky. Table F shows that there is as much (if not more) flexibility in overtime, employment or capacity as there is in prices, even though the short-term costs of changing overtime, employment or capacity are probably greater than the menu costs—physical and informational—of changing prices. The fact that prices still seem to be rigid means that other factors, perhaps related to competition with other companies or implicit/explicit contracts with customers, must also be more important than menu costs.

## 8 Conclusions

The Bank survey found that implicit and explicit contracts were thought to be very important for companies and that cost-based rather than market-led pricing was widespread. Although physical menu costs did not seem to be important, the more general costs of changing prices were important, because companies seemed to change prices, on average, only twice a year. In contrast to Blinder’s survey, constant marginal costs were very important for Bank respondents’ pricing decisions, but non-price elements were not.

Companies typically reviewed prices regularly rather than responding to particular events. The survey showed that competition increased the frequency of price reviews, as did Carlton (1986), but that long-term relationships with customers might reduce price flexibility. The survey found substantial differences between the factors that pushed prices up and those that pushed prices down: price setting was asymmetric, although the degree of flexibility up or down was unclear. Most companies seemed likely to increase overtime and capacity in response to a boom in demand, rather than change prices, which suggests that factors other than direct physical menu costs are important to companies’ decisions to change prices or quantities.

The combined effect of company and market characteristics on price setting will be reviewed in future research. There are also responses to other questions in the survey that we have yet to consider: about wage-bargaining arrangements, about discounting policies and about the procedures for pricing new products. But the material presented so far helps demonstrate that the economy does not behave as though markets were costlessly and instantaneously cleared, and that taking account of short-run price frictions could be important in explaining macroeconomic performance. The value of a survey of individual companies is that it can help resolve some of the theoretical disputes between economists, particularly when these theories generate similar predictions for aggregate data. If these theories imply different macroeconomic and microeconomic policy responses, then surveys of this kind are even more important.

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