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Price adjustment in German manufacturing: evidence from two merged surveys

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Abstract:

This paper presents new evidence on the formation of producer prices. The database combines a one-time survey that was conducted in June 2004 on a sample of 1,200 firms in manufacturing and time-series information on price adjustment of the same firms from a business-tendency survey. The share of time-dependent price setters amounts to 20 per cent. Neither Taylor nor Calvo type price setting describes their price adjustment well. Only a few firms are forward-looking, the majority relies on contemporaneous and past information.

Keywords: Price rigidity, sticky information, survey data

JEL-Classification: E30, D40

Non technical summary

Several theories for explaining price setting have been developed during the last years. They have also found their way into models that seek to explain the monetary transmission process. This paper analyses some questions on price setting and price adjustment behaviour in the German manufacturing sector. We are particularly interested in the following questions:

How do price guarantees and fixed-term contracts affect price setting and lagged price adjustment? How important are long-term relationships between producers and customers generally? Do firms set prices time- or state-dependently? Which firms tend towards the one or the other direction? How forward-looking are firms in their price setting?

We try to answer these questions by using a dataset that combines detailed data from a single cross-section of 1,200 firms on the motives of their price setting with monthly data on actual price changes. This dataset enables us to compare the actual price changes with the self-reported motives. The results show that long-term customer relationships indeed influence price setting and particularly price flexibility. For example, firms with a high share of sales with regular customers change their prices less regularly than other firms but more likely after an increase in demand. This may also explain why they feel generally more hampered in their price flexibility by long-term contracts than other firms do. That forward-looking expectations matter more for firms with a high share of regular customers than for other firms is consistent with this picture. The exception is firms that change their prices at regular intervals, which is the case for fewer than one firm in three. However, since it is important particularly for large firms, the share of sales is higher. More backward-looking are those firms with long-term contracts. These firms state that long-term contracts are the most important reason preventing them from changing prices quickly. This has to be qualified because only every second firm has contracts lasting on average nine months or longer and that, even in such cases, only 60 percent of sales are under these contracts.

Taken together, the empirical results appear to be only partly consistent with prominent theories. Often arguments for and against substantial inflation persistence overlap. A high share of sales with regular customers and under long-term contracts hampers firms' ability to adjust prices. Therefore, customers that are not regular customers and sales under contracts that are not long-term contracts must bear a disproportionately large brunt of price adjustments. This is an argument for a steady monetary policy. However, the survey results do not yield a simple model with clear implications for monetary policy.

Nicht-technische Zusammenfassung

In den letzten Jahren wurde eine Reihe von Theorien zum Preissetzungsverhalten von Firmen entwickelt. Sie haben auch Eingang in Modelle gefunden, die die Wirkungsweise der Geldpolitik erklären wollen. Das vorliegende Papier untersucht nun für Deutschland verschiedene Fragen zur Preissetzung und zur Preisanpassung von Firmen im verarbeitenden Gewerbe und vergleicht die empirischen Ergebnisse mit einigen dieser Theorien. Insbesondere interessieren uns folgende Fragen:

Welche Rolle spielen Preisgarantien und längerfristige Kontrakte für das Preissetzungsverhalten von Firmen und für verzögerte Preisanpassungen? Welche Bedeutung haben generell längerfristige Beziehungen zwischen den Firmen und ihren Kunden? Ist das Preissetzungsverhalten der Unternehmen eher zeit- oder zustandsabhängig und welche Unternehmen tendieren eher in die eine oder die andere Richtung? Wie vorausschauend sind Unternehmen bei ihrer Preissetzung?

Wir versuchen, diese Fragen anhand eines Datensatzes zu beantworten, der detaillierte, einmalig erfragte Daten von 1 200 Firmen über ihre Motive bei der Preissetzung mit monatlich erhobenen Daten zum tatsächlichen Preissetzungsverhalten der Firmen kombiniert. Damit erlaubt dieser Datensatz, die aktuellen Preisänderungen mit den angegebenen Motiven in Beziehung zu setzen.

Die Ergebnisse zeigen, dass längerfristige Geschäftsbeziehungen zwischen Unternehmen und ihren Kunden tatsächlich das Preissetzungsverhalten und insbesondere die Flexibilität beeinflussen. So erhöhen Firmen mit einem hohen Umsatzanteil der Stammkunden im Vergleich zu anderen Unternehmen ihre Preise weniger regelmäßig, dafür aber häufiger bei anziehender Nachfrage. Dies mag auch erklären, warum sie sich durch längerfristige Kontrakte generell stärker in ihrer Preisflexibilität beeinträchtigt fühlen als andere Unternehmen. In dieses Bild passt auch, dass eine vorausschauende und nicht auf die Vergangenheit gerichtete Erwartungsbildung für Firmen mit einem hohen Umsatzanteil der Stammkunden bedeutender ist als für andere Firmen. Ausgenommen sind hierbei Firmen, die ihre Preise in regelmäßigen Abständen ändern. Auf eine regelmäßige zeitliche Abfolge der

Preisänderungen achtet nur jedes dritte Unternehmen. Da aber insbesondere große Unternehmen Wert darauf legen, fällt der Anteil am Umsatz gemessen höher aus. Als eher rückwärts gewandt bei der Erwartungsbildung zeigen sich Unternehmen mit längerfristigen Kontrakten. Längerfristige Kontrakte sind nach Angaben der Unternehmen der wichtigste Grund, warum sie ihre Preise nicht schnell ändern. Allerdings wird dies dadurch relativiert, das nur jedes zweite Unternehmen Kontrakte mit einer durchschnittlichen Laufzeit von neun oder mehr Monaten hat und wenn, dann wiederum nur 60 Prozent der Umsätze davon betroffen sind.

Insgesamt scheinen die empirischen Ergebnisse nur eingeschränkt mit den gängigen theoretischen Erklärungsmodellen übereinzustimmen. Vielfach überlagern sich Gründe, die für und gegen eine ausgeprägte Inflationspersistenz sprechen. Wenn ein hoher Anteil des Umsatzes mit Stammkunden abgewickelt wird und wenn längerfristige Kontakte dominieren, dann beeinträchtigt dies die Anpassungsfähigkeit der Firmen. Notwendige Preisanpassungen müssen dann überproportional auf Nicht-Stammkunden und kurzfristige Verträge überwälzt werden. Dies ist ein Argument für eine stetige Geldpolitik. Ein einfaches Model mit klaren Implikationen für die Geldpolitik lässt sich aus diesen Umfrageergebnissen jedoch nicht ablesen.

Contents

Lists of Tables and Figures

Price adjustment in German manufacturing: evidence from two merged surveys*

1 Introduction

Several Eurosystem national central banks conducted harmonized surveys on price setting during 2003 and 2004 to improve the understanding of the sluggish adjustment of prices. Similar studies are available for the US by Blinder et al. (1998), which inspired the Eurosystem's study, for the UK by Hall et. al (1997, 2000), for Sweden by Apel et al. (2005), and for Canada by Amirault et al. (2004). Fabiani et al. (2005) compare the main results within the euro area and with the aforementioned countries. In Germany, three surveys on price setting in manufacturing were conducted in 1971 and 1983, both by Wied-Nebbeling (1985) and in 1995 by Köhler (1996). The present paper for Germany is unique and allows additional insights because it combines the cross-section data from the harmonized Eurosystem survey on price-setting behaviour of 1,200 manufacturing firms with individual monthly time-series information on price setting from a business tendency survey that is available for the same firms.[1]

Section 2 describes both datasets. Section 3 investigates whether markets are perfectly or imperfectly competitive and how firms set their prices. Furthermore, it inquires whether firms change their prices in anticipation of shocks as predicted by theories of intertemporal optimization. Section 4 focuses on single buyer-seller relations. It takes up Carlton's (1986) criticism that observing the length of written contracts yields higher price durations than observing simple price spells. Although the average duration of contracts is twice the average duration of price spells, we find evidence that firms with an average contract length of one year also often change prices

*) Correspondence: Harald Stahl, Deutsche Bundesbank, Economics Department, Wilhelm-Epstein-Str. 14, 60431 Frankfurt am Main, Germany. Email: Harald.Stahl@bundesbank.de. The opinions expressed in this paper are those of the author and do not necessarily reflect the official position or policy of the Deutsche Bundesbank. I would like to thank the Ifo Institute in Munich for giving me access to its data and J. Döpke, H. Herrmann and J. Hoffmann for their helpful comments. The views expressed in this paper are those of the author and do not necessarily reflect the opinion of the Deutsche Bundesbank.

[1] The gross sample of this business tendency survey also constitutes the gross sample of Köhler's (1996) survey, which therefore overlaps largely with the present sample. An English translation of the questionnaire of the business tendency survey is provided by Stahl (2005).

after one year. However, this holds only if both the actual and the past price changes are an increase. Section 5 is devoted to price spells. It focuses on time-dependent versus state-dependent price adjustment and price reviewing, and the relationship of price setting and price reviewing. Section 6 sets forth the analyses of impediments to price adjustment of an earlier paper by the author (Stahl, 2006). This earlier paper showed, by means of a factor analysis, that the reasons for postponing a price adjustment can be reduced to two factors, and by means of a cluster analysis, that the firms can be allocated to four clusters. One of the two factors is constituted by the answers to the question on time-dependent versus state-dependent price setting, which is dealt with in section 5, and the second factor stems from the remaining reasons for postponing a price change. In contrast to the mechanical decomposition of the factor analysis, section 6 tries to give a more economic interpretation of the correlations between the different reasons for postponing a price change. The results also allow a better understanding of the assignment of the firms to the four clusters. Section 7 summarizes and Annex B documents four face-to-face interviews.

Throughout the paper, we use the time series information to obtain an indication whether a particular variable from the one-time survey has an impact on the duration of a price spell. To this end, we calculate hazard rates for each outcome of the variable and according to the sign of the actual and the past price changes.[2] Since we observe differences in the hazard rates for the distinct values of all the variables investigated only in the case of price increases following price increases, we present results almost exclusively for the latter. The most prominent feature of the hazard functions is a spike after twelve months. Therefore, we will investigate whether a higher (or lower) value of a particular variable from the survey corresponds to a higher probability of a price increase after twelve months or not. This type of analysis is motivated solely by the duration analysis of the business tendency survey (Stahl, 2005), where we found this unexplainable pattern of the baseline hazard function, although many more time-series variables were included. However, we used no cross-section information of the harmonized survey and restricted the analysis to the metal-working industries.

[2] Missing values and length-based sampling complicate duration analysis. To mitigate these problems we ignored left-censored spells and restricted the sample further to price trajectories where at least 15 contiguous months without non-response were available.

Besides hazard rates, we calculate time series for the share of firms with price increases and the share of firms with price reductions, ignoring the sign of the past price change, for the aforementioned groups. Cross-correlations between different outcomes of a variable allow identifying leads and lags. However, we never find any lead or lag. Thus, between groups, prices change contemporaneously. Having established this, we are interested whether, at a given time, the frequency of price changes differs according to the outcome of a particular variable. For this, we calculate the difference of the share of price increases (reductions) from the most distant outcomes of each variable and regress the difference on monthly dummies.

2 The data

A panel of firms report monthly on several issues related to the business cycle in the Ifo Institute's business tendency survey for manufacturing. Firms answer for product groups. Normally, they coincide with plants, since most firms in German manufacturing are single plant firms. Larger plants may answer for several product groups. The sample developed historically and is refreshed from time to time. Large firms and firms in eastern Germany are over-represented.[3] In 2003, the survey covered about 2,450 sample points in western Germany and 650 sample points in eastern Germany. A sample point is a product group of a particular plant. The questionnaire of the business tendency survey includes a monthly question on whether firms had their domestic sales price increased, reduced or kept constant compared with the preceding month. [4]

Since this survey lacks information that we considered to be crucial for understanding price setting, the Bundesbank decided to join a survey by other national central banks of the euro area (Fabiani *et al*., 2005). Hence, in mid-2004 the participants of the business tendency survey were asked to fill in a special questionnaire on producer price setting, consisting of two parts: "General information" and "Information regarding

[3] In 1995, the share of gross value added at factor costs of east German firms accounted for only 6.2% of total gross value added in manufacturing.

[4] The appendix of Stahl (2006) contains an English translation of the questionnaire.

price formation".[5] The first part mainly concerns the market in which the firm operates. The second part investigates how prices are set and, on a four-point scale, whether price setting and price reviewing follows a time-dependent or a state-dependent rule, whether firms behave in a forward-looking or backward-looking manner, what causes price changes and what are likely reasons for a postponement of price changes. According to the information provided for the firms in the questionnaire, the scale ranges from (1)=minor importance to (4)=great importance. In the table and the text of the present paper, we translate the numeric scale as follows: (1) unimportant, (2) minor, (3) important and (4) great. Since previous surveys identified nominal contracts as an important source of price stickiness (e.g. Blinder, 1998, or Köhler, 1996), some additional information on such contracts has been collected.

The questionnaire was send to all participants in the business tendency survey but not to firms that had just started to take part in the survey and not to firms that respond only occasionally. If a plant answers for several product groups, the largest product group was selected. The name of the product group appeared at the beginning of the questionnaire to inform the firm for which group to answer. The final gross sample consisted of roughly 2,500 firms of which 47 per cent answered, a total of 1,200 firms. In the survey on price setting, firms should report the breakdown of sales by type of customer. The biggest share of sales goes to other industrial firms (50%) and to the firm's own group (7%), followed by wholesale (17%) and retail (12%). The government accounts for eight per cent. Included are the answers to the category "others", which seems to refer to public transport, such as railways. Private customers bought only six per cent of sales.

Turning for a moment to the business tendency survey, we see that the dynamics of price changes differ according to the sign of the actual and the past price changes (see Figure A1 and Table A1). During the first 15 months, prices adjust faster downward than upward. After 18 months, this is reversed. The main reason for the reversal is the large hazards around twelve months. Upward price adjustment during the business cycle from April 1994 (trough) to January 2001 (peak) were faster within the first twelve

[5] At the time of the survey, Germany faced a period of weak growth. Total real GDP virtually stagnated and grew in the first two quarters of 2004 by 2.0 per cent. Within industry, it was only 1.5 per cent. The Producer Price Index (PPI) rose by 0.7 per cent.

months than in the business cycle from October 1982 to January 1991 (see Figure A2 and Table A2). After twelve months, differences are negligible. The differences are due to the more frequent price adjustment within one month and the lower hazard rates around twelve months during the more recent cycle.

To decide whether the realised sample can be taken as representative for the gross sample, we apply two informal tests. For the first comparison, we have calculated the unweighted hazard rates for respondents, non-respondents, the firms that were not selected and the firms that stopped reporting before the special survey took place. We do not find substantial differences between the respective hazard rates (Table A3). For the second comparison, we calculate the time series for the share of firms with price increases and price reductions for respondents as well as for non-respondents using the information of the business-tendency survey on price changes.[6] For price increases, differences between respondents and non-respondents are negligible, even going back as far as 1980 (see appendix, Figure A3). A major difference occurs only in January 1982 and at the time of the euro cash changeover, January 2002. At the latter date, respondents showed more price increases and less price reductions than non-respondents (see Figure A4). The share of price reductions of non-respondents is larger than that of respondents, particularly prior to the recession in 1993. However, the price reductions prior to 1993 do not matter much for our analyses. All in all, we see no substantial selection bias invalidating our results.

3 Price setting

All sticky price models have to assume some kind of market imperfection, since sticky prices and perfect competition are incompatible. Most models (e.g. Woodford, 2003, and Rotemberg, 1982) postulate that firms are price setters and that they apply some type of mark-up pricing, at least at times when they set their prices optimally. However, these models do not generate the persistence in inflation that vector autoregressive models predict. One possibility of mitigating this problem is to let a

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[6] To make the series comparable, we have weighted the data with the weights for the year 1995 basket of the German Producer Price Index, aggregated to roughly NACE-3-digit level. In an additional weighting step, differences in the composition of east and west German firms have been taken into account by using figures on gross value added at factor costs for 1995.

fraction of firms index their prices to another price or price index. Another possibility is to assume that a fraction of firms follow a price leader with a lag, a form of strategic complementarity.

3.1 Types of price setting

Most firms (88%) have some price-setting power. This share exceeds 70 per cent even in industries with a relatively low share of price setters: manufacture of textiles (71%), in manufacture of pulp, paper and paper products (76%) and in manufacture of motor vehicles, trailers and semi-trailers (71%) (see annex, Table A4). Price setters reduce their prices less often than price takers. The frequency of price reductions between the two groups differs each month by roughly 3.5 percentage points on average (Table A5), partly because price setters already reduce prices less frequently within one month (Table A6).

Table 1: Types of price setting of firms with price setting power

Type of price setting	Share of firms
Constant mark-up on calculated unit costs	4
Taking calculated unit costs as a reference and varying the mark-up taking into account market and competition conditions	69
Taking the price of the main competitor as reference	17
Tying the price to another price (e.g. wage)	2
In a different manner	7
Total	100

NB Figures are weighted

Mark-up pricing[7] (73%) is the most common form of price setting. Only a few firms apply a constant mark-up on calculated unit costs (4%). The largest share of firms has a time-varying mark-up (69%). They use calculated unit cost as a reference and take market conditions and competition into account. An alternative to mark-up pricing is to

[7] The questionnaire does not specify whether firms apply the mark-up to marginal cost or to average cost. It is not at all clear whether firms calculate marginal cost. After all, if they fix prices for a certain time, the mark-up should be applied to average expected marginal costs. Further, if the mark-up is not constant but related to other factors, the distinction between marginal cost and average cost is probably no longer important.

take the price of the main competitor as a benchmark.[8] This is the case for 17 per cent of price setters[9]. Indexation to another price, as proposed by Yun (1996) or Christiano et al. (2005), is almost non-existent[10].

A cross-tabulation of type of price setter with the importance of several reasons for price increases and reductions (Table A7) confirms these results. Firms with a constant mark-up respond to cost changes but rarely to demand changes and they follow price reductions by competitors less often than other firms do. Firms with a variable mark-up take an intermediate position between firms with a constant mark-up and firms that take the price of their main competitor as a reference in their price reactions. The firms that follow their main competitor are more likely than other firms to react to demand changes and, of course, to competitors' price changes. They may take demand changes for otherwise unobservable price changes by their competitors. Another explanation for the larger reaction to demand increases is that these firms follow the price setting of their competitors most of the time but that they have to act sometimes as price leaders to prevent punishment by their competitors. The ensuing loss of market share is least detrimental to their profits at times of exceptional demand. They are less likely than other firms to react to permanent wage increases, and probably increase productivity instead (Table A40). The seasonal pattern of their price changes differs slightly from the other firms, as the time-series information show. They are less likely to raise their prices in January, which is the preferred month for a price increase by other firms, or in September, and they generally show more price reductions than other firms do, but not in January and September (and December). Firms that index their prices do not behave differently from other firms in the event of cost reductions, when almost all firms cut prices, but they raise their prices more frequently in reaction to all

[8] For the majority of firms, 54 per cent, the number of the most important competitors ranges between 5 and 20. More than 20 competitors report 28 per cent of firms and 18 per cent less than 5. This situation has not significantly changed during the last ten years. For 1994, 45 per cent of firms reported between 6 and 15 competitors, 35 per cent more than 15 and 20 per cent less than 6 competitors (Köhler, 1996). However, the impact of the number of the most important competitors on the degree of competition is not quite clear (see Tirole, 1988, chapter 5.5). Competition between three competitors may be tougher than between 25 – for example, because of search costs. These are small in the case of only a few suppliers, i.e. competitors from the viewpoint of the supplier, and large in the case of many suppliers.

[9] Though not asked, two out of three price takers answered this question, too. If it is assumed that those who did not answer question number 8 set their price in a different manner (item 5 of question 8), then 28 per cent follow their main competitor.

[10] Time-dependent price setters use indexing more often (8%) than state-dependent price setters (4%) do.

kinds of cost increases.[11]

Firms change prices in advance if they can anticipate that a price change will occur anyway, as they report in the one-time survey. Thus, they optimize intertemporally. With 61 per cent of firms attaching the highest or second-highest grade of agreement to this item, the agreement is higher than in the Blinder study, where 45 per cent of firms reported raising their prices in anticipation of cost or wage increases. This difference may result from the broader formulation of the question in the present survey. In fact, it is not only firms which react strongly to cost increases that prefer to change their prices in anticipation. The firms which attach great importance to demand changes also do so (Table A8). Price increases by competitors are a welcome opportunity to raise prices, too.

Stylized fact 1: Most firms are price setters, charging a mark-up on costs. Sixty per cent of firms change prices in anticipation of expected cost and demand shocks.

3.2 Price setting and product innovations

Introducing new products on the market may warrant a pricing strategy different from that for established products. Firms may realise a comparatively large mark-up in an early phase because substitutability of product innovations with other goods is initially very low. During the product's life cycle, imitators enter the market and firms have to lower their prices continuously. In order to capture this feature of price setting, firms should report in question 13 whether they reduce their price constantly during the life-cycle of their products. This is indeed the case for 17 per cent of firms. This share is particularly high in the manufacture of office machinery (92%), manufacture of radio, television, communication equipment and apparatus (65%) and manufacture of motor vehicles (38%) (Table A4). These firms generally report a relatively low share of price setters (77%). Even if they are price setters, they are more likely to set their prices by

[11] Indexation does not necessarily imply that firms adjust prices continuously in the way macro-models typically assume. In a face-to-face interview, a manufacturer of parts for cars reported, that one of his customers makes a proposal for a one-off price adjustment if input prices have increased more than expected.

taking the price of their main competitor as a benchmark. These firms probably react with innovations to strong competition and declining mark-ups.

4 The incidence of price guaranties and written contracts

Implicit and explicit, i.e. written, contracts are often mentioned as an important source of price rigidity. They relate to a single buyer-seller relationship. Quite likely, a firm has several contracts with several customers, so that the length of a contract and the duration of a price spell only coincide if all contracts start at the same date and have the same length. If they start at different dates, then the price for new contracts can change, while, for existing contracts, the past price remains in force. Furthermore, not all sales take place under multi-period contracts. Direct identification of contract length by time-series information on price changes is therefore generally impossible. Hence, the survey asks for the share of sales under written contracts with prices set for a stated period, for the average length of this period, and whether the prices are indexed. Additionally, firms report for how long they warrant prices on average.[12] During negotiations, which may take several months, firms warrant prices if nothing completely unexpected happens. Price guaranties are therefore an additional source of price rigidity. Implicit contracts means, in Blinder's (1998, p. 153, question B2(a)) words, that "firms have implicit understandings with their customers – who expect the firms not to take advantage of the situation by raising prices when the market is tight." This survey does not ask directly for implicit contracts. The sales share with regular customers serves as a proxy instead.

The distinction between regular shoppers and random shoppers, together with search costs, is most prominent in Okun's (1981) work. He assumes two types of shopping behaviour: "random shopping" and "shopping based on experience". Random shoppers have an estimate of the distribution of prices in mind and, given that there are costs of searching for the best price, an acceptance price. Once a random shopper has found a seller offering his acceptance price the deal is struck. Equilibrium is achieved mainly by adjusting prices and only to a slight extent by adjusting quantities. In contrast, regular customers compare the actual offer with the preceding price. Since they have already accepted the preceding price, there is no need for the seller to offer a lower

price. The regular customer will even accept a slightly higher price if the price increase is small in comparison with the customer's search costs. Regular customers may be much more sensitive to price increases than random shoppers. The customer's willingness to do regular business with a seller without devoting much effort to searching for a better deal also depends on his trust in the seller's commitment to offer a "fair" price. Prices are stickier with regular shoppers and quantity adjustment is more important for achieving equilibrium.

Price guaranties and written contracts are almost ubiquitous: 92 per cent of firms report that they warrant prices for on average 7.7 months and 87 per cent of firms report that they have written contracts with prices set for a stated period (Table 2). The share of firms with regular customers amounts to 86 per cent. There is probably no firm at all which has neither price guaranties, nor implicit nor explicit contracts.

Table 2: Share of firms with regular customers and written contracts

	Written contracts		Price guaranty		Total
	yes	no	yes	no	
Regular customers	76	10	80	6	86
No regular customers	11	3	12	2	14
Total	87	13	92	8	100

NB Figures are weighted

According to the present survey, regular customers account for 57 per cent of sales on average and vary greatly between industries. The sales share with regular customers is particularly high for manufacturers of motor vehicles (77%) and it is particularly low for the production of refined petroleum products (26%) (Table A9). If firms have written contracts, the average sales share under these contracts amounts to 60 per cent (Table 3). This share is high for manufacturers of motor vehicles (83%) and manufacturers of wearing apparel (80%) and it is low for printing (39%). Assuming a sales share of zero under fixed contracts for firms without fixed contracts yields an aggregate share of 50 per cent. This is substantially smaller than Blinder's (1998) results for manufacturing (69%).[13] Durations of written contracts differ, too. In both

[12] Two face-to-face interviews motivated this question.
[13] According to Blinder (1998), 92 per cent of manufacturing have written contracts and he estimates that 75 per cent of contracts set prices for a stated period.

studies, the median length of a price contracts is twelve months but the mean length of nine months in Germany is just the half of Blinder's mean length of 18 months.

Table 3: Share of firms with price guaranties and written contracts according to contract length

Duration in months	Price guaranty	Written contract	
	Share of firms	Share of firms	Average sales share
0	8	13	0
1<x<=3	31	18	53
3<x<=6	21	19	59
6<x<=9	1	1	53
9<x<=12	36	45	62
12<x	3	3	57
Total (mean)	100	100	51

NB Figures are weighted

How do these firms respond with price changes to changes in their economic environment? Firms with regular customers respond more strongly to increasing demand than other firms. In contrast, firms with price guaranties react less often to demand changes and price changes by competitors than other firms do.[14] They raise their prices more often if wages and the costs of materials increase but, when faced with lower costs of materials, they behave like other firms. The latter contrasts with firms that feel severely hampered by written contracts. They react more strongly to cost reductions than other firms do.

How do fixed contracts correspond to the time-series information of price changes? For the first comparison, we use the micro data underlying the official PPI of the German Federal Statistical Office, which is available for the period from 1997 to 2002 and which is more exhaustive for this period than the business tendency survey. The average monthly frequency of price changes for Germany is 0.23. The implied duration of a price spell is four and a half months and, therefore, half of the mean duration of written contracts. However, we find in these data a very similar shape of the hazard functions, particularly the dependence on the sign of the actual and the past price

[14] Firms that give no price guaranties react strongly to price changes by competitors (Tables A41 and A42).

changes and the spike at twelve months if both the actual and the past price changes are increases. Since the discrepancies between the micro data from the official PPI and the information on the price changes from the business tendency survey are sufficiently small for our purposes, we subsequently analyse the panel information from our merged data set. For firms with non-indexed contracts with an average contract length of twelve months we find quite high hazard rates after twelve months (Table A10). Even after 24 months, their hazard rates are still substantial. The hazard rates for the other contract durations generally do not peak at the average contract length. However, they may if we consider that prices may change only after a multiple of the contract length, say, after twelve months while contract length is six months, because, for example, menu costs prevent more frequent adjustment.[15] Yet, we always observe many short price spells. Hence, the length of a price spell sometimes reflects the length of fixed term contracts – but not always, and one has to focus on price increases. Price reductions are different. Focusing on price increases in the official PPI results in a mean duration of price spells of eight to nine months, too.

If we investigate hazard rates according to the length of the price guaranty, we find that the hazard rates after twelve months are larger than the hazard rates for the comparable fixed-term contract durations (Table A11). However, firms with no price guaranty show very few long price spells. We may conclude that prices are warranted for a certain period by firms which know in advance that they do not change their prices frequently.

Stylized fact 2: 50 per cent of firms have fixed contracts with an average duration of nine months or longer. The average sales share under these contracts is 60 per cent. Average contract length frequently – but not always – coincides with the time span between two price changes if both changes are price increases.

5 Time-dependent vs. state-dependent price setting and price reviewing

There are practical reasons for the question as to whether firms behave in a time- or state-dependent manner. State-dependent models are economically more appealing than time-dependent models are, but their aggregate implications are much harder to

[15] With indexation, hazard rates for short spells are generally higher.

derive. Time-dependent models of price setting postulate that the timing of a price change is exogenous to the firm and that it can only decide on the size of the adjustment, while state-dependent models of price setting postulate that not only the size of the price change but also the timing is the outcome of an intertemporal optimisation by the firm. Taylor (1980) and Calvo (1983) introduced well-known time-dependent models. The original Taylor model is built on contracts. However, its basic ideas can be adapted to price spells, on which we focus on in this section in contrast to the last section. The firm knows the time of the next price change, which means that the length of the price spell is deterministic and finite. In the Calvo model, the firm is completely ignorant about the time of the next price change. Therefore, it determines the size of the price adjustment under the assumption that, during each of the coming months, a price change may occur with equal probability. The hazard function is constant. The duration of price spells is therefore random and exceeds with some positive probability each finite value. The statistical model underlying a prominent state-dependent model, the menu-cost model, enriches the Calvo model by an additional consideration. The duration of price spells is random, but the firm estimates for each point of time the gains and losses a price change would entail. Facing lump-sum price-adjustment costs, the firm changes its price if the opportunity costs from keeping the price constant exceed the price-adjustment costs.

Mankiw and Reis (2002) proposed a competitor model to sticky prices, the sticky information model. It states that "each period a fraction of the population updates itself on the current state of the economy and computes optimal prices based on that information. The rest of the population continues to set prices based on old plans and outdated information." (p. 1296) Recently, Reis (2005) modified the sticky information model of Mankiw and Reis (2002) along the lines of the menu-cost model for sticky prices. Although there is abundant information available, its acquisition and, especially, interpretation are costly. Hence, the firm updates its information set only from time to time and stays inattentive to all new information at all other times. If it updates its information set, it uses all information available. It decides which price to charge and when to update its information set next time. Whereas, in the menu-cost model of sticky prices, the firm continuously observes the state of the economy at no costs and adjusts its price state-contingent because adjustment is costly, in the inattentiveness model,

firms adjust at optimally chosen dates regardless of the state of the economy at those dates because reviewing is costly but not adjustment.[16] Yet, the optimal planning intervals depend on the state at the last adjustment. In the sticky information model of Mankiw and Reis (2002), each firm changes its price every period, but each period only a fraction of firms updates its information about the state of the economy. The other firms continue to set their prices based on old plans and outdated information.

5.1 Time-dependent price setting

The questionnaire includes two questions dealing specifically with deterministic time-dependent price setting. The first two items of question 17 state "We change our price always at a fixed point of time if possible (e.g. beginning of the year)" and "We change our prices always at a fixed time interval if possible (e.g. after 12 months)". The second item tries to capture Taylor type price setting. The first is a bit vaguer. The intention was to capture pure seasonality and to allow for "almost fixed" events like the start of a wage contract that may vary in length from time to time. Firms had to answer on a four-point scale. Based on their answers, we classify firms as "state-dependent" if they attach the lowest grade to both questions, and we classify them as "time-dependent" if they assign the highest grade to at least one of these questions. The remaining firms follow a mixture of time- and state-dependent pricing rules.

Table 4: Share of firms with time-dependent and state-dependent price setting and price reviewing

	Price reviewing	Price setting
Time-dependent only	43	19
State-dependent only	15	41
Time-dependent as well as state-dependent	42	40
Total	100	100

NB Figures are weighted

[16] Sheshinksi's and Weiss' (1977) approach, one of the standard references for menu-cost models, is a mixture of dynamic and comparative static analysis. Given expectations on certain states, for example, the rate of inflation, the firm decides on the future dates of adjustment. In case of unexpected changes of the states of the world, the firm has to reoptimize its bands of inaction. The model does not describe what happens if expectations change at other dates than the times of planned price changes. To achieve the *optimum optimorum*, firms have to review their prices every instant if there are no planning costs.

According to this classification, roughly 20 per cent of firms qualify as time-dependent price setters, 40 per cent as state-dependent price setters and another 40 per cent as firms that sometimes follow a time-dependent price-setting rule and sometimes a state-dependent rule. Purely time-dependent price-setting is frequent in the manufacture of leather and leather products (48%), the manufacture of wearing apparel (43%) and the manufacture of basic metals (42%). State-dependent price setting occurs particularly often in the manufacture of pulp, paper and paper products (66%) (Table A12). In a historical perspective, the share of purely time-dependent price setters is similar to results that Wied-Nebbeling (1985) presents for manufacturing firms in the south-west of Germany for 1971 (13.2%) and 1983 (24.5%), although the questions were a slightly narrower (see annex, Table A13).

The preference for changing price at a fixed point of time increases with the number of employees and the share of sales with the own group and it declines with the share of sales with regular customers and with the share of sales with other industrial firms (Table A14). The preference is smaller for firms with a continuously declining mark-up during the life cycle of their product, for firms that produce only on order and cannot therefore smooth production[17], and for firms that have either short contracts, from one to three months, or contracts exceeding one year. Firms with no fixed contracts at all also show also a greater preference for a fixed point of time for changing price. Firms that do not change prices because of sluggish costs, too, prefer to change prices at a fixed point of time.

A similar picture emerges for the preference of changing price according to a fixed interval of time. This preference is greater for larger firms and smaller for firms with a continuously declining mark-up during the life cycle of their product and firms producing only on order (Table A15). The preference declines with the share of sales with other industrial firms and private customers, as well as for firms that have either short contracts, from one to three months, or contracts exceeding one year. Firms with no fixed contracts at all show also a greater preference for a fixed interval of time for changing price. The more likely a firm is to change its price in reaction to a permanent

[17] At the time of the survey, stockpiling of finished products was customary for 55 per cent of firms, 17 per cent were confronted with unplanned stocks and 28 per cent produced only to order and never had unplanned stocks. The average reach of stocks was 3.1 weeks.

wage increase, the higher is its preference for changing price according to a fixed interval of time. On the other hand, the more important it is for a firm to change its price after a regular time interval, the more likely it is to raise its price after competitor has raised its price. This implies either that these increases are additional price changes at irregular times or that competitors raise their prices after a certain period.[18]

The hazard rates (Table A16) show that twelve months after the past price increase 41 per cent of time-dependent price setters raise their prices but only 14 per cent of state-dependent price setters. For firms following a mixture of both strategies this figure amounts to 28 per cent. However, time-dependent price setters raise 30 per cent of their prices as soon as within a month after their previous price rise.

Unexpectedly, a fixed point of time discriminates the hazards slightly better than a fixed time interval. It is most natural to associate a fixed point of time with seasonality. Price reductions exhibit almost no seasonal pattern (Table A17, panel (a) and panel (b), last column) while price increases are more likely in the first four months of the year (Table A18 panel (a) and panel (b), last column). The degree of seasonality depends on how important firms perceive a fixed point of time to be for changing a price. Price increases do not follow a seasonal pattern if firms perceive a fixed point of time as unimportant (lowest grade). Firms perceiving it as important or very important increase their prices preferably in January.

This reflects the seasonal hazard functions for firms attaching a great importance to price changes at a fixed point of time (Table A19a,b), too. They show high hazard rates after twelve months, independently of the season, i.e. month. However, January is the month with the largest hazard rate after twelve months. From the table, we can also infer the hazards that the next price increase will take place in January, i.e. that January is decisive for the price change but not the length of the price spell. For price spells beginning in May, for example, the hazard rate of a price increase next January, i.e. in eight months, is 18 per cent. The respective hazard rate that the next price increase will take place in December is only five per cent and hence much lower. Overall, the table corroborates that price changes of firms with a major preference for changing price at a

[18] Although the questionnaire provides no answer, it should be kept in mind that collective wage bargaining plays an important role in western Germany. Collective wage contracts refer to industries.

fixed point of time are more likely in January and after twelve months (± one month). Firms with no preference for changing their price at a fixed point of time show many more short price spells and fewer spells with duration of twelve months. Although they show a preference for raising their prices in January rather than in December or February, this effect is only small.

Both the hazard functions according to the perceived importance of a fixed interval between two price increases (Table A20) and according to the perceived importance of a fixed point of time exhibit a substantial amount of very short spells. Thus, although these firms behave time-dependently, neither Calvo nor Taylor price setting describes them well. They seem to increase their prices at times in a lump-sum fashion as menu-cost models would predict and, at other times, in repeated steps as in models of convex adjustment costs. Again, the duration between two price reductions (Table A21) exceeds three months in only a few cases.

Stylized fact 3: Only 20 per cent of firms set their prices mainly time-dependently. Price increases are time-dependent but not price reductions. Time-dependence rises with firm size and with the importance of permanent wage increases for price decisions. Short contracts and production only on order reduce time-dependence. Neither Calvo nor Taylor type price setting describes time-dependent price setters well.

5.2 The correspondence of price reviews and price adjustment

State-dependent price setters should review their prices more often than time-dependent price setters since they need information on the state of the world. They can follow two strategies or a mixture of both: i) review prices regularly and frequently or ii) concentrate on large, exceptional shocks. The former is a prerequisite for the menu-cost model where firms review their price continuously at no cost but change it only occasionally because price adjustment is costly. For time-dependent price setters, however, as long as they do not deviate from their rule or do not intend to do so, reviewing their price at times other than at the time immediately before the scheduled time of the price change would be a waste of resources if reviewing is costly.

Either there is just one contract for western Germany as a whole, or contracts specify the same wage

Table 5: Time-dependent vs. state-dependent price reviewing and price setting

Price reviewing	Price setting			
	State-dependent only	Time-dependent only	Mixture	Total
Time-dependent	58	84	68	66
Daily to quarterly	*44*	*22*	*28*	*33*
Daily	10	4	4	6
Weekly	8	0	2	4
Monthly	12	9	8	10
Quarterly	14	9	14	13
Semi-annual / annual	*14*	*62*	*40*	*33*
Semi-annual	7	23	16	13
Annual	7	39	24	20
Certain events	52	60	53	54

NB 52 per cent of state-dependent price setters review their prices after certain events and 58 per cent of state-dependent price setters review their prices according to a time-dependent rule. These figures add up to more than 100 per cent because some firms follow a mixture of both rules.

According to the survey, 58 per cent of those 41 per cent of firms classified as predominantly state-dependent price setters review their price time-dependently. Yet, not more than 10 per cent of them review it daily. Even if one accepts a monthly review as continuous, this share does not exceed 30 per cent. Thus, an upper bound for the share of firms (with respect to all manufacturing firms) that may set their prices according to the menu-cost model is 12 per cent if one is being generous. If one is less generous, the figure is only 4 per cent.

Is the price review strategy of predominantly time-dependent price setters consistent with their price setting? The last subsection provided some evidence that a large percentage of predominantly time-dependent price setters change their prices after twelve months but it also showed that they deviate from this regularity at times of price reductions. According to Table 5, most of the time-dependent price setters (84%) also review their prices time-dependently. For almost two out of three price setters, the review takes place semi-annually or annually. The hazard rates for time-dependent price setters with an annual review show a large hazard after twelve months and a

increase for all regions but the date the contract starts is different, hence wage contracts are staggered.

comparatively low hazard just after one month. Reviews that are more frequent correspond to higher hazard rates after one month and lower hazard rates after twelve months. Semi-annual (quarterly) reviews display slightly higher hazards after six (three) months. Monthly or even more frequent reviews generally exhibit higher hazards for durations under one year (Table A22).

For firms with a regular price review, whether they set their prices time or state-dependently, there seems to be a relatively close relationship between the median duration of price spell resulting in an increase and the frequency of the regular review. The median duration is somewhat smaller, ranging from ten months for an annual review to two months and one week for a quarterly review. These differences can be reconciled by assuming that the time span between the review and the price change is two months for yearly spells, one month for semi-annual spells, and three weeks for quarterly spells. Thus, there are, on average, two reviews for each realized price increase. Price cuts follow a different pattern, as frequently mentioned in this paper.

Stylized fact 4: Not more than 15 per cent of firms review their prices only state-dependently but 40 per cent review their prices both state-dependently and at regular intervals. For each price increase, there are, on average, two regular price reviews. Reviews are costly but not as costly as price changes.

5.3 Limited information and price reviewing

In Reis' (2005) model of inattentiveness, firms adjust prices (or quantities) at optimally chosen dates in advance regardless of the state of the economy at those dates. Yet, according to the survey, 60 per cent of predominantly time-dependent price setters review their prices after certain events. This is an even higher percentage than for state-dependent price setters (52%), of which 18 per cent review their prices daily or weekly anyway. In other words, predominantly time-dependent price setters are well aware that relying on pure time-dependent strategies is too risky. They monitor their economic environment continuously on a low and cheap level and deviate from their time-dependent rule if necessary, in contrast to Reis' prediction.

In Mankiw and Reis (2002) model of sticky information, each firm changes price in each period and a fraction of firms bases its prices on outdated information. This is

already contradicted by the fact that not every firm changes its price in every period (Table A17 and A18 as well as figure A3 and A4). Second evidence against the model is that, according to the model, firms update their information set following a Poisson process. This condition fulfils non-trivially at most for those firms that review their prices semi-annual or yearly but not at certain instances. However, this behaviour is reported by only 16 per cent of plants.

5.4 The information set

The recurrence to limited information is not restricted to the above-mentioned limited information models. The failure of early models of the New Keynesian Phillips Curve to capture the degree of inflation persistence found in aggregate data, for example, led to the inclusion of some kind of backward-looking behaviour (Galí and Gertler, 1999), in the form of a 'black box'. This section tries to open this black box a little. Question 14 ascertains the importance of different information 'vintages' for the price calculation: the extrapolation of past developments ('past information'), the actual development ('contemporaneous information') and expectations beyond the extrapolation of past values ('expectations'). The wording of the expectations is motivated by the econometrician's inability to discriminate between rational expectations and other forms of expectation-building if the past already contains every piece of useful information. This section is not concerned with the formation of expectations but with the extent to which expectations are taken into account.

A better understanding of the use of the different information vintages in the price calculation can be achieved by regressing the importance of the respective information vintage on several variables (Table 6) using an order probit model. These variables are plant size, the sales share with regular customers, the mean duration of price guaranties, the fact whether a firm has fixed contracts or not, and the importance of the statement "we make a foreseeable price change in advance if possible". Plant size may matter if information gathering is costly, particularly the information relating to future developments, and if the marginal "information" cost for a unit of output is declining, for example, if there are fixed costs. Firms with a larger sales share with regular customers should also be forward-looking since the chosen price will predetermine the future price path. Price guaranties are probably much more likely in a stable

environment. Then, experience should be sufficient as a guideline and expectations should not deliver additional information. Fixed contracts may be based on past cost developments since these are common knowledge. For example., if a large car manufacturer forces its suppliers to cut prices, the price cut may be formulated relative to extrapolated past cost developments. If firms change prices after a fixed time-interval, they should be forward-looking. Finally, firms that change prices in anticipation should by definition look forward.

On average, firms rely largely on contemporary information. That this information is important or very important is reported by 77 per cent of firms. For past information, this share is 49 per cent and for expectations only 39 per cent. Table 6 shows the marginal effects of various variables in an ordered probit regression for the highest category, i.e. very important.

It turns out that the importance of expectations increases with firm size (see also Table A23) while the importance of past information decreases with firm size (see also Table A24). In fact, taking means by size class shows that for firms with 200 or more employees, expectations matter more than past information. Firm size has no impact on the importance of contemporary information (see also Table A25). The importance of expectations increases with the share of sales with regular customers.

Table 6: Marginal effects for the information vintage (for the category "very important")

Variable	Past information	Contemporary information	Expectations
Log number of employees	-0.028	-	0.024
Log share of sales with regular customers	-	-	0.021
Log mean duration of price guaranties	0.032	-0.083	-
No fixed contracts	-0.066	-	-
Regular time interval is for the timing of a price change very important	0.068	-	0.064
Plant makes foreseeable price change in advance (very important)	-	0.132	-
Share of firms reporting that vintage is very important	0.174	0.450	0.134

NB Marginal effects are only shown for those variables that turned out to be significant at the 5% level.

Price guaranties are based on past information. The importance of past information increases with the time horizon of the price guaranty, the importance of contemporary information decreases, and the importance of expectations is uncorrelated with this time horizon. For firms with fixed contracts, past information is more important than for firms without fixed contracts. Firms attaching great importance to past information less frequently raise prices as soon after one month (Table A26). Otherwise, hazard rates do not vary between the different information vintages.

Stylized fact 5: If firms prefer to change prices after a fixed time interval, past information as well as expectations are more important than for the other firms. Finally, firms that attach greatest importance to the statement that they make a foreseeable price change in advance, if possible, assign greater importance to contemporary information than other firms.

6 Why are prices sticky and when are prices likely to change?

The last section offered a somewhat puzzling picture. A substantial percentage of firms does not respond immediately to shocks, at least if they should increase their prices. But why? There are not too few theories explaining sticky prices but too many, as Blinder (1998) mentioned in his book. Unfortunately, the special cross-sectional survey was restricted to two pages in order not to jeopardize participation in the regular business tendency survey. We have therefore been unable to ask more than a few questions since. Therefore, we disregarded theories that seemed *a priori* less important in manufacturing or had turned out to be of minor importance in other studies. Two examples are Blinder's "Psychological Pricing Points" and "Judging Quality by Price" which achieved ranks 22 and 25 out of 27 theories in Köhler's survey. Physical menu-costs did not perform well either, either in the Blinder or in the Köhler study, but since this explanation is so prominent in the literature we included it nonetheless. Although time-dependent price setting leads to the postponement of price changes, too, we exclude it from this section since we have discussed it already in section 4.[19] We accomplish the analysis of reasons for postponing a price change by investigating the occasions of price adjustment given the importance firms attach to the different theories

[19] Moreover, the factor analysis in Stahl (2006) of the reasons for postponing a price change shows that the answers to time-dependent versus state-dependent price setting constitute one out of two factors.

explaining price rigidity. This will show us whether price changes are consistent with the theories of price rigidity and it may indicate circumstances under which firms deviate from their regular behaviour.

Our preferred tool for analyses in this section is the ordered probit approach. Blinder remarks in the footnote to his "Table 5.7 Associations Among the Theories" (Blinder, 1998, p. 117) that the "nonlinearity of the ordered probit model implies that it matters which variable is the dependent variable". Therefore, he presents results for the alternative ordering, too. However, we argue that, for the reasons investigated in our survey, sometimes a point can be made as to why a variable should occur only on the right-hand side, although we do not claim to estimate and to test a theoretical model. From a formal point of view, some regressions may contain simultaneity problems. We nevertheless maintain that we have achieved reasonable economic insights.

6.1 The theories

Nominal contracts. Plants cannot react anymore to unexpected shocks with price changes if prices are fixed in nominal terms for a certain period by contract. An often-cited rational for nominal contracts is reducing risk. Their consequences may also depend on whether they are one-off contracts or whether a contract follows another contract. For example, manufacturers of cars and their suppliers often have a rather general contract governing their relationship during the production of a specific model. They have separate, shorter contracts for prices, which they update once a year. Renegotiating all the contents all the time would be too cumbersome and costly in terms of time and of money. In this situation, the ex post profitability of the whole "package" and not of each individual contract is crucial.

A firm that feels hampered by a fixed contract should be in a comparatively weak position. To account for the strength of the firm, we included the size and the (log) share of sales with different types of customers in an ordered probit regression on the importance of nominal contracts for price rigidity. Furthermore, all other things being equal, nominal contracts should be all the more important for price rigidity, the longer the duration of the contract and the larger the share of sales under fixed nominal contracts. Firms with regular customers may rely more on implicit contracts than on explicit ones.

Physical menu costs. The theory of menu costs (e.g. Sheshinsky and Weiss, 1977) assumes that price adjustment entails fixed costs. A firm will not adjust its price unless the foregone profit ensuing from a fixed price exceeds the adjustment cost. The questionnaire focuses on a narrow definition of menu costs, and therefore mentions printing costs as an example.

Sluggish costs. This "theory" is taken from Apel et al. (2001). In their study, it was ranked second. It states that even if output prices depend on input prices there is no reason to change prices in the period under scrutiny if there are almost no price changes in input costs.

Transitory shock. If firms optimise their prices intertemporally and if there are some fixed costs of price adjustment, then they should not react to transitory shocks. The fixed costs may stem from "antagonizing customers" or from information gathering, for example. In the latter case, it is similar to the sticky information model.

Coordination-failure/Kinked demand curve. According to the theory of coordination failure, firms hesitate to increase prices for fear that competitors will not follow suit and that they will therefore lose customers. For price reductions, there is no symmetric definition. There are two lines of argumentation. The first is that, in case of price reductions, firms are reluctant to reduce prices because they fear competitors will reduce their prices, too, and that this may even trigger a price war. This reasoning is almost the same as for the theory of the kinked demand curve (Wolgrom, 1982). The second is that firms follow the price reductions of competitors for fear of losing market share if they do not reduce their prices. There are several possibilities of overcoming the coordination problem, at least in case of price increases. For example, there may be a price leader with sufficient market power to move first. Another possibility is seasonal price changes or the date of a collectively negotiated wage increase.

Price elasticity of demand. If the price elasticity of demand is smaller than one in absolute terms, a price reduction will lower profits, all other things being equal. Since there are almost no firms without price discrimination, different customers of the same firm may have different price elasticities. A firm may even have some customers with a price elasticity below one and others with elasticity above one.

These explanations deserve some comment, since they are not mutually exclusive (Stahl, 2006). The theory of fixed contracts is a particular case, because it is the only explanation which refers explicitly to a specific contract. While it explains price rigidity for existing contracts, it cannot explain price rigidity for new contracts. Menu costs do not have to be large to be of interest, but some sort of nominal frictions are necessary to create nominal inertia. Sluggish costs alone would imply small price changes, but prices should still change every time costs change. Therefore, an additional nominal friction, such as menu costs, is needed. Sluggish costs cover two aspects. They do not contain a trend and they are not volatile. Transitory shocks do not contain a trend either, but they may be quite volatile. Distinguishing permanent and transitory shocks should be a major factor for the importance of coordination failure. If a firm does not raise its price for fear that competitors will not follow suit, then coordination failure should be much severer if a firm faces a transitory shock than if it faces a permanent shock. Finally, the price elasticity of demand clearly determines the extent to which coordination failure is caused by the demand side.

6.2 The results

The most important reason for price stickiness at the plant level is, on average, explicit *nominal contracts*. Every second firm called it important or very important. One reason for this is that fixed contracts are almost ubiquitous.[20] As expected, the multivariate analysis (Table A27) shows that fixed contracts are all the stronger an impediment, the larger the sales share under fixed contracts and the larger the sales share with other industrial companies. Firms with regular customers and, hence, repeated contracts feel more hindered by fixed contracts. Coordination failure strongly amplifies the importance of written contracts since firms now feel the impact of coordination failure during the whole contract period. Firms that feel hampered by written contracts do not feel hampered by physical menu costs. However, one would

[20] Strikingly, firms feel even more hampered by fixed-term contracts if these contracts are indexed. The difference turns out to be significant in a variant of the multivariate analysis reported in table A27 where we included a dummy variable reflecting indexation. It is not clear whether the answers have to be interpreted as "we feel severely hampered without indexation and have therefore indexed our contracts and no longer feel hampered so much" or "we feel severely hampered although we have indexed our contracts because indexation is only partial".

expect managerial costs rather than physical menu costs to be a reason for engaging in written contracts.

Table 7: Share of firms assigning a great or very great importance to various reasons of price stickiness by cluster

	total	cluster			
Cluster		1	2	3	4
Nominal fixed-term contract	49	6	0	100	84
Coordination failure (+)	55	32	56	59	69
Coordination failure (-)	25	14	23	22	43
Price elasticity of demand (+)	36	15	38	39	47
Price elasticity of demand (-)	35	16	40	39	40
Transitory shock (+)	23	13	29	22	25
Transitory shock (-)	27	15	30	22	40
Sluggish costs	17	3	17	25	20
Menu costs	6	5	6	2	16
Share of firms (%)	100	21	28	28	23

NB Figures are weighted.

Firms with a marked preference for changing prices after a fixed interval of time feel more hampered by fixed contracts than other firms do. This seems contradictory at first sight, but it is not as long as not all contracts are perfectly synchronised within the firm.[21] Firms that feel severely hampered by written contracts are more likely to change their prices in reaction to changes in the cost of materials than other firms are. This gives the impression that customers do not want to smooth their own production but deliver whatever is demanded. In the absence of fixed contracts, they would be vulnerable to price increases by their suppliers at this time. However, to prevent their suppliers from going bankrupt, they have to admit the (partial) pass-through of cost changes. A systematic relationship between the hazard function and the importance of fixed term contracts cannot be observed (Table A39). Fixed term contracts hamper price changes for existing contracts, but they do not restrain firms from charging a different price for new contracts.

[21] However, the significance may be a statistical artefact.

Physical menu costs hamper only six per cent of all firms in changing their prices. The importance of physical menu costs rises with the sales share with private customers and declines with the sales share with other industrial firms (Table A28). Quite likely, physical menu costs rise with the number of potential customers. However, this six per cent is only the direct effect. Since menu costs enhance the importance of sluggish costs and transitory shocks there is also an indirect effect, as we shall see below.

Only 17 per cent of firms say that they do postpone a price change because of *sluggish costs*. The importance of sluggish costs rises with the importance of menu costs (Table A29), and the importance becomes all the greater, the more reluctant the firms are to react to transitory shocks. We understand these transitory shocks as rather volatile unexpected and unsystematic shocks in contrast to more smoothly changing costs without a trend. Smaller firms are less reluctant to change their prices.

Coordination failure causes more upward than downward stickiness. It is important for every second firm that wants to raise its price but only for every fourth firm that wants to cut its price. Firms feel the more hampered in raising their prices, the smaller the firm is (Table A30), and they are more reluctant to lower their prices if their mark-up constantly declines during the life cycle of their product (Table A31). These firms may still be price setters, but are, nonetheless, in a weaker position than other firms are. Firms with coordination problems collude in the event of price increases but they retaliate in the case of price cuts. They are more likely to raise (reduce) their prices in reaction to a price increase (reduction) by competitors than other firms are (Table A41 and Table A42). Not surprisingly, if a firm faces a transitory shock, coordination failure is more severe than when faced with a permanent shock (Table A30 and A31). Written contracts amplify the consequences of coordination failure, too, but this matters more for price increases than for price cuts. The fear that a price cut might trigger a price war increases if costs exhibit no trend and do not vary much. Part of the coordination failure can be attributed to the price elasticity of demand. Strategic interactions among firms may explain the remaining part.

A greater importance of coordination failure coincides with a higher hazard rate for a price increase within one to three months and with a lower hazard rate after twelve months. Hence, firms do not coordinate price increases by raising them reliably after

twelve months. They seem to prefer price increases in several steps, expecting a relatively fast reaction by competitors.

Transitory shocks are important or very important for every fourth firm. Coordination failure and the fear of starting a price war are important reasons why firms do not react to transitory shocks (Table A32 and Table A33). However, if competitors raise their prices first, firms that feel hampered by a transitory shock are more likely to raise their prices than other firms are (Table A41).[22] Firms with inventories of finished products and firms that already feel hampered by menu costs and written contracts are less likely to change prices after transitory shocks. The larger the share of sales with retailers, the easier it is for firms to pass through price increases and the less they are forced to make price reductions. The hazard rates are similar to those for coordination failure. This may be due to the relatively high correlation of the importance attached to both explanations.

Approximately two-thirds of the respondents declared that the *price elasticity of demand* does not hamper price changes. Only 10 per cent have highly price-sensitive customers. In particular, regular customers are price sensitive. As argued by Okun (1981), regular customers remember the past price and are therefore more sensitive to price increases as "shoppers". However, they are not less sensitive to price reductions. Private customers are more sensitive and other industrial firms less sensitive to price changes. Non-price elements in contracts may be more important in doing business with other industrial firms than with other customers. Firms that produce only on order cut their prices even if the quantity reaction does not compensate for the price reduction. Since they have no inventories, their only alternative would be to interrupt production. Owing to fixed costs, however, their losses would then be even higher. Other variables quite likely reflect the producers' reaction to the high price elasticity of their customers. For example, firms introduce innovative products on the market to make them less substitutable by others (i.e. reduce the price elasticity of demand) (Table A34 and Table A35). The more price sensitive customers are, the greater is the likelihood that a firm will raise its price if raw materials become more expensive. However, they are not more reluctant than other firms to change their prices in reaction to demand changes. On the

[22] Firms that do not feel hampered by a transitory shock are less likely to raise their prices in reaction to a price increase by competitors than other firms are.

contrary, those firms reduce their prices more often in reaction to a demand decrease, reporting that the larger quantity sold does not compensate for the lower price. There is also a positive correlation between the length of fixed contracts and the price elasticity of demand.

In the light of these findings, we can reinterpret the four clusters of firms slightly compared with Stahl (2006). The first cluster presents firms that do not feel much hampered at all. That is partly due to a low price elasticity of demand and low menu costs. Transitory shocks and price elastic demand contribute to the sluggish price adjustment in the second cluster. Smoothly changing costs without a trend and fixed contracts prevent the firms of the third cluster from adjusting prices. The firms of the fourth cluster face relatively high menu costs and their customers react quite strongly to price increases. Furthermore, strategic interactions contribute substantially to coordination failure.

Stylized fact 6: Fixed contracts and coordination failure, aggravated by transitory shocks, are the main reasons for postponing a price adjustment. The importance attached to the various reasons for postponing a price change in the one-off survey does not correspond to the hazard rates for changing a price from the time series.

7 Summary

The survey of 1,200 German manufacturing firms, which was conducted in 2004, reveals that almost all manufacturing firms (88%) have a certain margin for price setting and that most of them apply mark-up pricing. This confirms the basic assumptions of widespread sticky price models. The second most likely price-setting behaviour of firms is to follow a price leader. Indexation to another price is negligible.

Price changes in anticipation of cost and demand changes, if possible, are reported by 61 per cent of firms. However, these firms change prices faster than other firms do, and they appreciate contemporaneous information even more than the other firms do. Generally, firms rely mostly on contemporaneous information for calculating their prices. Past information does not matter much and expectations further in the future even less. Thus, firms are not as forward-looking as theory assumes, which implies that

price stickiness may have real effects. At least, firms with many employees and firms with a large share of sales with regular customers are more forward-looking than other firms are. Firms with fixed-term contracts that explicitly prohibit a price change and firms that warrant prices for a certain time behave instead in a more backward-looking manner. Time-dependent price setting increases the importance of both forward and backward looking approaches.

The percentage of predominantly time-dependent price setters is relatively small. It amounts to not more than 20 per cent and seems to be rather stable. There are indications from previous surveys that this share has not changed much during the past 30 years. While setting their prices predominantly time-dependently, 60 per cent of these firms nonetheless review their prices after certain events, so that only 8 per cent of firms set and review their prices time-dependently. Thus, contrary to the assumptions of time-dependent models, firms do have an estimate of the distance between their optimal price and their prevailing price, and they are willing to react to shocks by changing prices. Therefore, purely time-dependent models should overestimate price rigidity.

In accordance with mark-up pricing, firms are most likely to change prices in reaction to changes in the costs of materials. Their impact is larger for price increases than for price reductions. Labour costs matter only in the case of permanent wage increases. The impact of transitory wage increases as well as reductions of labour costs is modest. Firms also react strongly to price reductions by competitors but to a lesser extent to price increases. Asked for the reasons why they postpone a price adjustment, firms attached the greatest importance, on average, to fixed nominal contracts, followed by coordination failure as the second most likely source of price rigidity. The latter results in more upward than downward stickiness and intensifies the effects of fixed contracts.

Regular customers are more price-sensitive than random shoppers are. Therefore, the larger the share of sales with regular customers is, the more forward looking firms are, the more likely they are to raise prices when demand increases. Firms with regular customers feel more hindered by fixed contracts than do firms with no regular customers.

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Annex A

Figure A1:

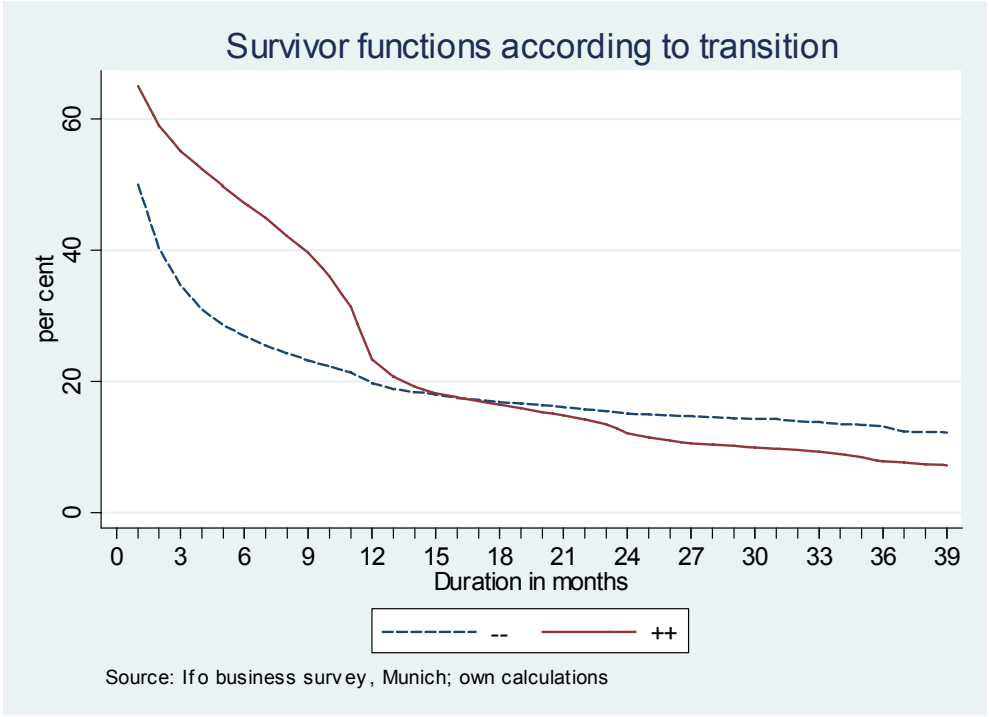

Figure A2:

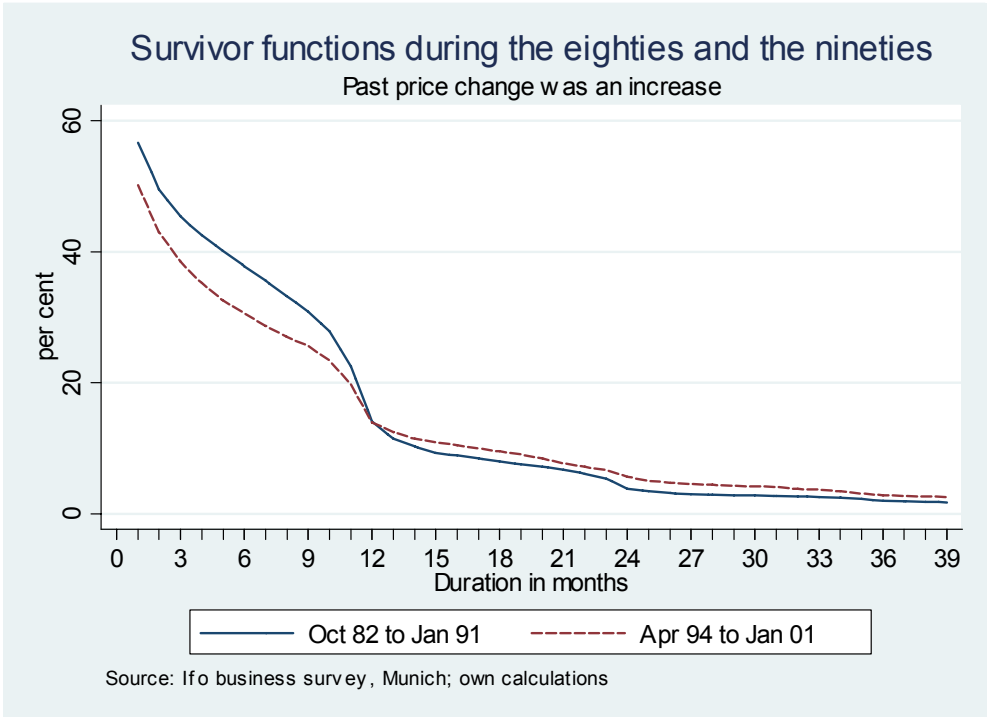

Figure A3:

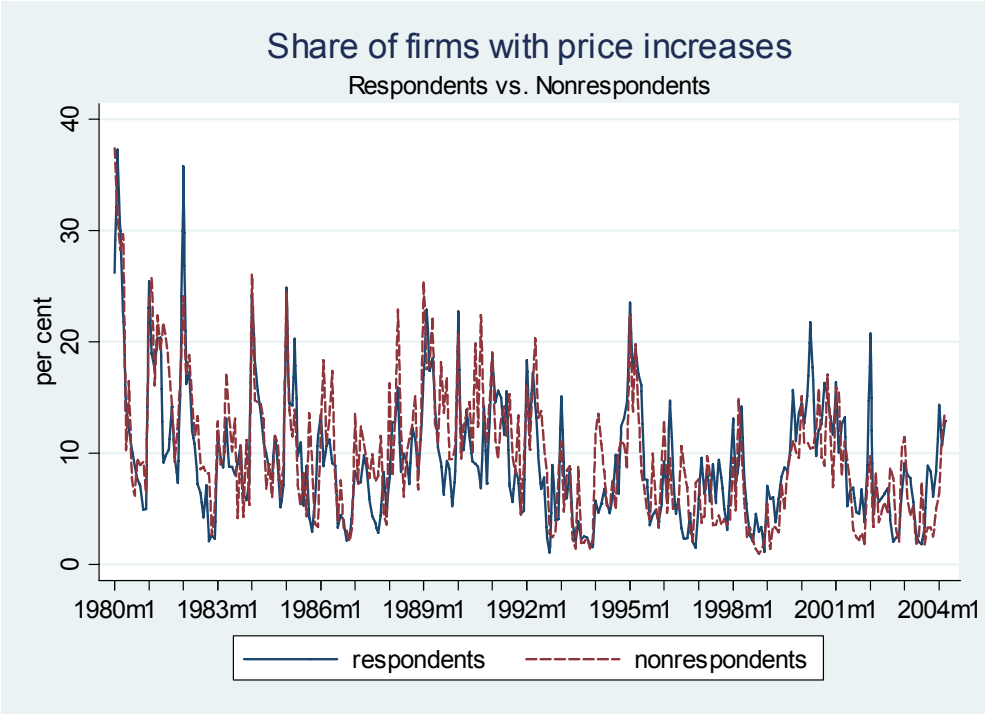

Figure A4:

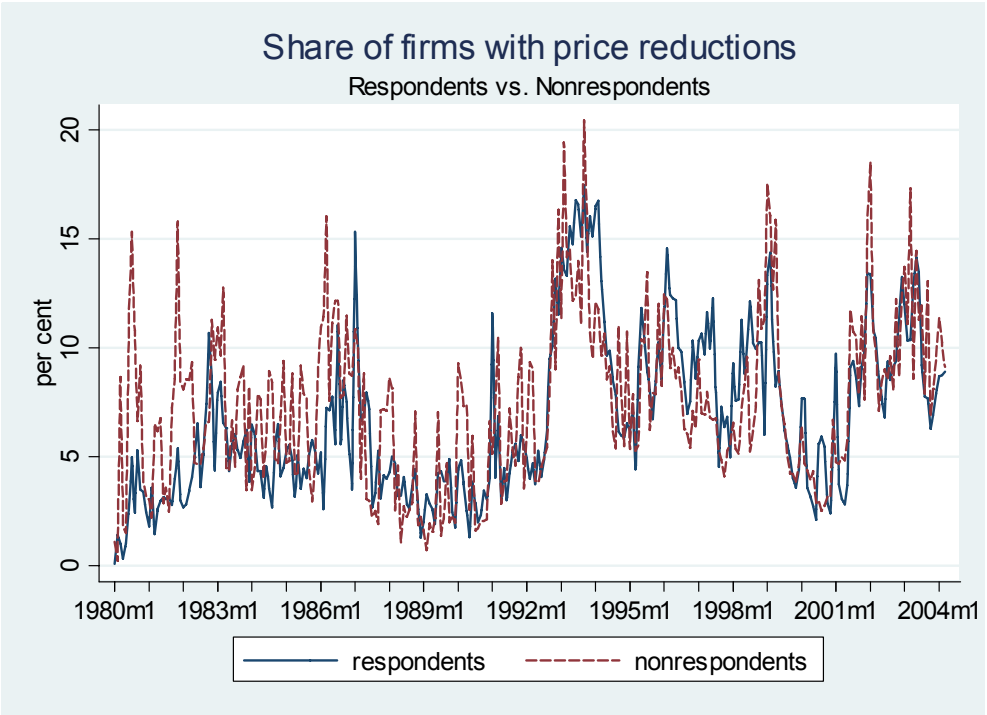

Table A1: Hazard rates according to transition

Duration	Transition				Duration	Transition			
	--	-+	++	+-		--	-+	++	+-
1	50	3	35	2	14	3	4	7	2
2	20	4	10	4	15	2	5	6	1
3	14	5	8	3	16	4	4	3	1
4	11	5	6	2	17	2	3	4	2
5	8	6	5	3	18	2	7	3	1
6	6	6	5	3	19	2	2	4	2
7	6	4	5	2	20	2	2	5	2
8	5	4	6	2	21	3	3	3	1
9	5	3	6	1	22	3	1	4	1
10	5	5	10	1	23	2	3	5	1
11	5	4	12	1	24	4	7	10	1
12	7	5	23	2	25	1	2	5	1
13	5	4	11	2	26	1	2	4	2

Table A2: Hazard rates according to different business cycle

	Hazard rates after … months in per cent											nobs
Duration	1	2	3	4	6	9	11	12	13	15	24	
Period	Price increase following a price increase											
Oct 82 to Jan 91	43	11	7	6	5	7	18	36	17	8	26	4579
Apr 94 to Jan 01	49	12	8	6	5	4	13	26	8	4	15	3102
	Price reduction following a price increase											
Oct 82 to Jan 91	1	1	1	1	1	1	1	2	2	2	3	325
Apr 94 to Jan 01	1	2	2	3	1	2	3	3	2	1	0	398
	Price reduction following a price reduction											
Oct 82 to Jan 91	50	19	11	12	9	4	7	6	5	1	2	1390
Apr 94 to Jan 01	55	22	15	11	8	7	5	9	5	3	2	2411
	Price increase following a price reduction											
Oct 82 to Jan 91	2	4	5	5	5	7	5	5	3	6	2	332
Apr 94 to Jan 01	1	3	4	4	5	6	3	5	3	2	3	354

Table A3: Hazard rates according to participation: hazard rates of a price increase following a price increase

Duration	Respondents	Non-respondents	Not selected	Drop-outs	Total
1	35	35	33	33	35
2	12	9	9	9	10
3	7	8	6	7	8
4	5	7	6	5	6
5	5	6	4	5	5
6	6	7	7	5	5
7	4	3	5	4	5
8	6	5	6	6	6
9	6	5	7	6	6
10	9	10	7	9	10
11	14	17	10	11	12
12	21	23	21	22	23
13	12	8	9	11	11
14	9	6	6	6	7
15	6	3	6	5	6
16	5	3	6	2	3
17	2	3	5	3	4
18	4	6	3	3	3
19	6	1	5	2	4
20	3	5	1	6	5
21	4	3	5	2	3
22	11	3	3	4	4
23	5	5	4	5	5
24	9	10	8	10	10
25	6	7	3	4	5
26	4	5	3	3	4
27	1	4	3	4	4

Table A4: Share of firms with certain characteristics of price setting and importance of different vintages of information according to Nace-2-digit industries

Industry	Price setters	Price is constantly reduced during the life cycle	Price calculation is based on			Firms
			past information	present information	expectations	
	Share of firms		*Mean score*			*Number*
15 Food and beverages	85	13	2.1	3.3	2.2	84
16 Tobacco	65	-	2.9	3.1	2.9	4
17 Textiles	71	28	2.2	2.9	2.0	39
18 Wearing apparel	96	17	2.3	3.1	2.4	38
19 Leather and leather products	90	3	2.9	3.2	2.0	19
20 Wood and wood products	85	14	2.3	3.1	2.0	49
21 Pulp, paper and paper products	76	21	2.0	3.2	2.3	60
22 Printing	90	18	2.3	3.1	2.0	86
23 Refined petroleum products	-	-	1.9	3.2	1.8	4
24 Chemicals	94	26	2.3	3.3	2.3	85
25 Rubber and plastic products	86	23	2.1	3.2	2.1	69
26 Other non-metallic mineral products	93	4	2.4	3.4	2.2	81
27 Basic metals	85	30	2.8	3.3	2.3	25
28 Fabricated metal products	88	14	2.8	3.1	2.4	146
29 Machinery	93	10	2.6	3.2	2.2	196
30 Office machinery	86	92	2.0	3.5	2.3	6
31 Electrical machinery	92	22	2.8	2.8	2.0	61
32 Radio, tv, communication equipment and apparatus	97	65	2.6	2.8	2.3	33
33 Precision instruments	85	26	2.5	3.0	2.3	50
34 Motor vehicles	71	38	2.0	2.8	2.7	29
35 Other transport equipment	-	4	2.5	3.0	2.7	8
36 Furniture, toys, jewellery	81	16	2.7	3.0	2.4	56
Total	88	17	2.5	3.2	2.2	1228

Table A5: Difference of the frequency of price changes between price takers and price setters (as a percentage)

Month	Price increases	Price reductions
January	-0.5	3.3
February	-1.7	3.7
March	-0.6	3.6
April	-0.3	3.4
May	0.1	4.2
June	-1.3	2.6
July	-1.1	3.7
August	-1.3	3.3
September	-1.3	3.5
October	-0.6	4.5
November	0.2	3.7
December	-1.1	3.6
Average	-0.8	3.6

NB: Price takers reduce their prices more often than price setters. Differences of price increases are statistically not significant different from zero.

Table A6: Price setters versus price takers

	Hazard rates after … months in per cent										nobs
Duration	1	2	3	4	6	9	11	12	13	15	
	Price increase following a price increase										
Price setter	42	11	7	5	5	6	15	29	13	6	10541
Price taker	50	13	8	6	5	5	12	32	9	5	1656
	Price reduction following a price reduction										
Price setter	56	23	15	12	9	6	5	7	5	2	8207
Price taker	59	24	19	12	9	11	9	9	3	2	2019

Table A7: Type of price-setting according to reason for a price change

Reason for a price change	Type of price-setting									
	Constant mark-up		Variable mark-up		Competitor		Indexation		Total	
	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
	mean score									
Increase/decrease in costs of materials	3.5	2.5	3.4	2.9	3.3	2.8	3.8	2.9	3.4	2.9
Labour costs										
permanent increase (e.g. negotiated wage)	2.7	-	2.7	-	2.4	-	3.2	-	2.7	-
transitory increase (e.g. overtime hours)	1.3	-	1.5	-	1.5	-	1.5	-	1.5	-
decrease (e.g. bonuses, lay offs)	-	1.7	-	1.9	-	1.8	-	1.8	-	1.9
Increase / decrease in financing costs	1.8	1.6	1.9	1.6	1.9	1.7	2.2	1.7	1.9	1.6
Demand increase / reduction	1.4	1.3	2.2	1.9	2.4	2.1	1.9	1.9	2.2	1.9
Demand reduction / increase	1.5	1.8	2.1	2.4	2.4	2.6	1.8	2.1	2.2	2.4
Product improvement	2.0	-	2.3	-	2.4	-	2.6	-	2.3	-
Increase of productivity	-	2.1	-	2.4	-	2.5	-	2.6	-	2.4
Price increase / decrease by a competitor	2.0	2.0	2.0	2.5	2.6	3.1	2.0	2.4	2.1	2.6
Other	1.2	1.0	1.8	1.9	1.6	1.5	1.0	2.2	1.7	1.8
Total	1.9	1.8	2.2	1.9	2.3	2.3	2.2	2.2	2.2	2.2

Table A8: Importance of an anticipatory price change

	Coefficient		Marginal effects	
			not important	very important
Regular customers				
Log share of sales	0.0466	(0.0401)	-0.0122	0.0131
No regular customers	-0.0018	(0.1575)	0.0005	-0.0005
Log number of employees	-0.0035	(0.0259)	0.0009	-0.0010
Continuously declining mark-up during life-cycle	0.0366	(0.0868)	-0.0095	0.0104
Stocks of finished products				
Never	0.0555	(0.0895)	-0.0144	0.0158
Sometimes	0.1896	(0.1131)*	-0.0464	0.0565
Log share of sales with				
own group	0.0303	(0.0287)	-0.0079	0.0085
other industrial firms	0.0971	(0.0277)***	-0.0254	0.0273
Wholesale	0.0204	(0.0239)	-0.0053	0.0057
Retail	0.0012	(0.0268)	-0.0003	0.0003
private customers	0.0810	(0.0378)**	-0.0212	0.0228
Fixed contracts				
Log mean duration of contracts	-0.0669	(0.0555)	0.0175	-0.0189
Log share of sales	-0.0848	(0.0429)**	0.0222	-0.0239
No fixed contracts	-0.5648	(0.2303)**	0.1760	-0.1289
dummy missing share of sales	-0.4853	(0.3208)	0.1525	-0.1095
Postponement of price increase for fear that competitors will not increase their prices too				
moderately important	0.0194	(0.1120)	-0.0051	0.0055
Important	0.0295	(0.1062)	-0.0077	0.0083
very important	0.2586	(0.1265)*	-0.0627	0.0776
Postponement of price change because of sluggish costs				
moderately important	0.0604	(0.0829)	-0.0157	0.0171
Important	0.2218	(0.1128)**	-0.0537	0.0666
very important	0.4944	(0.2769)*	-0.1015	0.1641
Price increase because of demand increase				
moderately important	0.0591	(0.0945)	-0.0154	0.0168
Important	0.2080	(0.1068)*	-0.0518	0.0611
very important	0.2881	(0.1333)**	-0.0676	0.0884
Price increase because of increase in the cost of material				
moderately important	0.3364	(0.2368)	-0.0762	0.1057
Important	0.3931	(0.2035)*	-0.0963	0.1168
very important	0.5210	(0.1976)***	-0.1406	0.1419
Price increase because of price increase by competitor				
moderately important	0.2214	(0.1008)**	-0.0561	0.0641
Important	0.2909	(0.1111)***	-0.0717	0.0861
very important	0.5120	(0.1609)***	-0.1082	0.1672
Price reduction because of price reduction by competitor				
moderately important	0.0563	(0.1250)	-0.0145	0.0161
Important	-0.0409	(0.1202)	0.0108	-0.0115

very important	0.0386	(0.1348)	-0.0100	0.0110
Thresholds	-0.0883	(0.3509)		
	0.5882	(0.3516)		
	1.6633	(0.3532)		
Share of firms reporting that an anticipatory price change is not/ is very important			0.179	0.202
Number of observations	975			
Pseudo R-squared	0.0491			
Log-Likelihood	-1253.0			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A9: Regular customers, price guaranty and written contracts according to Nace-2-digit industries

Industry	Regular customers	Price guaranty	Written contracts		
	Sales share	Mean duration	Mean duration	Sales share	Share indexation
15 Food and beverages	41	9.0	10.4	63	7
16 Tobacco	0	8.4	8.4	75	22
17 Textiles	65	8.6	8.4	76	6
18 Wearing apparel	54	7.7	7.0	80	8
19 Leather and leather products	58	7.7	8.2	67	3
20 Wood and wood products	56	5.0	6.0	58	6
21 Pulp, paper and paper products	67	5.7	7.3	50	31
22 Printing	68	5.7	9.6	39	13
23 Refined petroleum products	26	1.8	5.5	70	0
24 Chemicals	42	9.7	10.8	65	4
25 Rubber and plastic products	60	6.0	8.7	55	10
26 Other non-metallic mineral products	58	6.7	8.8	55	17
27 Basic metals	69	11.3	10.7	68	19
28 Fabricated metal products	64	7.8	8.4	59	20
29 Machinery	60	6.3	6.9	59	7
30 Office machinery	69	3.5	9.3	52	0
31 Electrical machinery	44	8.1	9.1	71	8
32 Radio, tv, communication equipment and apparatus	64	9.0	11.1	68	4
33 Precision instruments	54	10.2	11.6	66	7
34 Motor vehicles	77	10.1	10.9	83	2
35 Other transport equipment	35	9.7	11.6	70	4
36 Furniture, toys, jewellery	48	10.7	12.4	57	3
Total	57	7.7	9.0	60	11

Table A10: Hazard rates according to fixed term contracts with and without indexation

	Hazard rates after … months in per cent											nobs
Duration	1	2	3	4	6	9	11	12	13	15	24	
	Price increase following a price increase											
Length	contracts without indexation											
24	31	5	4	0	0	4	20	20	26	0	7	123
12	34	8	4	3	3	5	16	34	15	5	20	2918
6<x<12	24	14	6	3	5	9	14	10	0	5	22	90
6	52	15	9	8	10	3	14	18	10	3	22	1196
4	59	22	23	18	21	25	0	25	0	0	0	129
3	48	16	11	7	7	7	15	17	6	3	14	740
2	37	12	4	5	5	5	24	18	12	25	0	129
1	66	22	16	15	9	16	0	11	0	0	0	343
	contracts with indexation											
24	66	13	10	0	0	0	11	38	0	0	25	59
12	44	9	8	6	3	6	18	44	12	11	19	459
6<x<12	-	-	-	-	-	-	-	-	-	-	-	-
6	60	21	13	7	4	3	19	10	3	7	14	387
4	43	29	22	22	44	25	0	0	0	0	0	56
3	63	25	12	11	3	9	15	13	0	13	8	427
2	80	38	0	0	0	0	0	0	0	0	0	137
1	38	7	13	6	8	0	50	0	50	0	0	35
	no contracts											
0	39	9	3	6	6	5	12	25	14	7	17	1120
	Price reduction following a price reduction											
	contracts without indexation											
24	46	21	9	25	19	10	0	13	0	0	0	65
12	52	20	15	12	9	8	5	8	4	4	5	1930
6<x<12	65	26	20	9	13	12	12	33	0	0	0	287
6	61	23	15	12	6	4	5	6	4	0	5	961
4	58	15	11	19	24	20	17	0	0	50	0	132
3	57	28	17	11	9	7	12	11	7	0	5	914
2	62	24	18	13	10	8	19	0	0	0	0	322
1	53	19	11	14	5	20	0	0	14	0	0	144
	contracts with indexation											
24	75	31	44	33	0	0	0	0	0	0	0	61
12	55	26	20	12	9	4	7	5	8	8	0	477
6	63	31	18	6	6	0	4	9	0	0	0	269
4	71	30	33	25	0	0	0	0	0	0	0	34
3	64	26	23	17	11	11	9	0	0	0	0	309
2	59	24	14	19	20	0	0	0	17	0	0	137
1	54	11	8	30	17	0	33	0	0	0	0	34
	no contracts											
0	58	23	13	11	8	6	5	2	8	3	3	1117

Table A11: Hazard rates according to the length of price guaranties

	Hazard rates after … months in per cent																nobs
Duration	1	2	3	4	6	7	8	9	10	11	12	13	14	15	16	24	
	Price increase following a price increase																
24	30	5	4	1	1	1	2	3	3	10	8	14	6	0	0	4	121
12	33	7	4	2	3	3	4	6	8	16	36	16	8	5	2	21	4195
6	43	12	8	7	9	5	6	4	7	14	27	11	5	5	3	20	2246
4	52	15	10	12	15	2	9	14	17	18	30	13	9	0	0	20	295
3	50	15	11	6	5	5	5	6	8	13	20	9	3	7	3	16	2291
2	46	17	5	7	5	7	7	3	11	11	13	13	7	10	0	7	427
1	59	18	12	11	5	5	6	8	14	8	15	5	6	5	3	18	943
No guaranty	41	16	13	8	0	15	6	0	0	0	0	0	0	11	13	0	68
	Price reduction following a price reduction																
24	52	17	5	23	13	0	4	5	5	0	13	0	0	0	8	0	129
12	52	19	16	11	9	6	5	8	8	6	6	4	2	1	2	4	2363
6	57	22	15	12	8	5	8	3	8	6	8	3	3	3	5	2	2010
4	55	28	19	9	15	0	9	15	18	8	9	0	25	17	0	33	255
3	58	26	16	10	8	7	6	6	8	7	11	5	6	4	1	5	2251
2	61	25	14	16	11	12	5	6	7	9	0	7	3	0	6	0	815
1	63	25	16	18	11	8	9	10	11	4	8	11	0	0	0	0	1124
No guaranty	73	40	12	10	8	18	11	0	0	0	17	0	0	0	25	0	212

Table A12: Share of firms with time-dependent vs. state-dependent price reviewing and price setting according to Nace-2-digit industries

Industry	Price reviewing			Price setting		
	time-dependent only	state-dependent only	both	time-dependent only	state-dependent only	both
15 Food and beverages	43	11	46	20	43	36
16 Tobacco	0	43	57	0	66	34
17 Textiles	26	27	47	21	44	34
18 Wearing apparel	69	3	28	43	17	41
19 Leather and leather products	65	10	25	48	17	35
20 Wood and wood products	48	14	37	6	55	38
21 Pulp, paper and paper products	26	19	54	21	67	12
22 Printing	61	9	31	11	48	41
23 Refined petroleum products	36	0	64	0	48	52
24 Chemicals	39	14	47	32	33	35
25 Rubber and plastic products	50	13	37	15	54	31
26 Other non-metallic mineral products	58	15	27	9	34	57
27 Basic metals	33	34	33	42	15	43
28 Fabricated metal products	35	16	49	16	51	33
29 Machinery	37	14	49	17	40	43
30 Office machinery	86	0	14	9	54	37
31 Electrical machinery	64	11	26	19	44	37
32 Radio, tv, communication equipment and apparatus	40	26	34	24	28	48
33 Precision instruments	35	9	55	30	10	60
34 Motor vehicles	58	9	33	39	2	59
35 Other transport equipment	31	16	53	21	54	25
36 Furniture, toys, jewellery	30	16	54	32	28	39
Total	43	14	42	19	41	40

Table A13: When do you change your sales prices?

	1971	1983
Only at the beginning of a new business year/a new season	13.2†	24.5
Following the collective wage bargaining round†	-	43.7
Only, if cost increases are too large given prevailing prices	72.3	50.7
Always, if costs change	22.2	16.4
If demand changes significantly	14.0	15.0
Always, if demand changes	1.7	1.0
Always, if your main competitors change their prices	20.0	17.8
No response	0.2	1.0

Source: Wied-Nebbeling (1985); † "a new season" was not included in the 1971 questionnaire.

Table A14: Importance of a fixed point of time for a price change

	Coefficient		Marginal effects	
			not important	very important
Regular customers				
log share of sales	-0.1181	(0.0420)***	0.0471	-0.0286
no regular customers	0.2399	(0.1627)	-0.0946	0.0641
Log number of employees	0.1139	(0.0280)***	-0.0454	0.0276
Continuously declining mark-up during life-cycle	-0.2139	(0.0940)**	0.0851	-0.0488
Stocks of finished products				
Never	-0.2636	(0.0978)***	0.1048	-0.0597
Sometimes	-0.2136	(0.1246)*	0.0849	-0.0476
Log share of sales with				
own group	0.0653	(0.0306)**	-0.0260	0.0158
other industrial firms	-0.0856	(0.0289)***	0.0341	-0.0207
Wholesale	-0.0038	(0.0251)	0.0015	-0.0009
Retail	-0.0165	(0.0283)	0.0066	-0.0040
private customers	-0.0373	(0.0412)	0.0149	-0.0090
Fixed contracts				
no contracts	0.7169	(0.2262)***	-0.2676	0.2182
1-3 months	-	-	-	-
4-6 months	0.4525	(0.1374)***	-0.1762	0.1255
7-9 months	0.7409	(0.2990)**	-0.2689	0.2375
10-12 months	0.6577	(0.1156)***	-0.2576	0.1593
longer than 12 months	0.1054	(0.2467)	-0.0419	0.0268
log share of sales	0.1368	(0.0461)***	-0.0545	0.0331
dummy missing share of sales	0.8140	(0.3535)**	-0.2904	0.2655
dummy missing duration	-0.2312	(0.0866)***	0.0920	-0.0535
Postponement of price change because of sluggish costs				
moderately important	0.1118	(0.0867)	-0.0445	0.0275
Important	0.2316	(0.1186)*	-0.0916	0.0608
very important	0.5649	(0.2823)**	-0.2128	0.1718
Thresholds	1.2019	(0.2937)		
	1.6100	(0.2952)		
	2.2312	(0.2973)		
Share of firms reporting that fixed point of time is not/is very important			0.488	0.159
Number of observations	945			
Pseudo R-squared	0.0659			
Log-Likelihood	-1104.9			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A15: Importance of a fixed interval of time for a price change

	Coefficient		Marginal effects	
			not important	very important
Regular customers				
log share of sales	-0.0483	(0.0425)	0.0192	-0.0104
no regular customers	0.0783	(0.1668)	-0.0311	0.0175
Log number of employees	0.0845	(0.0276)***	-0.0336	0.0181
Continuously declining mark-up during life-cycle	-0.2490	(0.0932)***	0.0991	-0.0496
Stocks of finished products				
Never	-0.2507	(0.0957)***	0.0998	-0.0502
Sometimes	-0.1198	(0.1244)	0.0477	-0.0244
Log share of sales with				
own group	0.0228	(0.0301)	-0.0091	0.0049
other industrial firms	-0.0726	(0.0287)**	0.0289	-0.0156
Wholesale	0.0214	(0.0251)	-0.0085	0.0046
Retail	-0.0241	(0.0283)	0.0096	-0.0052
private customers	-0.0962	(0.0428)**	0.0383	-0.0206
Fixed contracts				
no contracts	0.7081	(0.2286)***	-0.2610	0.1983
1-3 months	-	-	-	-
4-6 months	0.4185	(0.1399)***	-0.1623	0.1038
7-9 months	0.7408	(0.2978)**	-0.2649	0.2200
10-12 months	0.8068	(0.1162)***	-0.3127	0.1736
longer than 12 months	0.2936	(0.2298)	-0.1143	0.0726
log share of sales	0.1772	(0.0465)***	-0.0705	0.0380
dummy missing share of sales	0.9841	(0.3601)***	-0.3291	0.3128
dummy missing duration	-0.2985	(0.0870)***	0.1186	-0.0560
Price increase because of permanent wage increase				
moderately important	-0.0683	(0.1267)	0.0272	-0.0144
Important	0.3290	(0.1199)***	-0.1298	0.0747
very important	0.3839	(0.1270)***	-0.1501	0.0917
Thresholds	1.2684	(0.3040)		
	1.7153	(0.3054)		
	2.4503	(0.3085)		
Share of firms reporting that fixed interval of time is not/is very important			0.473	0.133
Number of observations	943			
Pseudo R-squared	0.0789			
Log-Likelihood	-1098.9			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A16: Hazard rates according to time dependent vs. state dependent price setting

	Hazard rates after … months in per cent										nobs
Duration	1	2	3	4	6	9	11	12	13	15	
	Price increase following a price increase										
Time dep.	30	7	5	4	5	6	16	41	15	7	2879
Both	35	10	6	3	4	5	17	28	12	5	3714
State dep.	56	16	10	8	6	6	11	14	10	4	4532
	Price reduction following a price increase										
Time dep.	1	2	1	1	1	0	1	2	2	1	284
Both	1	1	1	2	1	1	1	1	1	1	416
State dep.	1	4	4	4	3	2	4	4	3	4	654
	Price reduction following a price reduction										
Time dep.	55	22	13	10	9	6	4	7	2	3	1690
Both	54	21	16	12	9	7	6	9	5	2	2853
State dep.	58	25	16	13	9	7	7	5	6	4	4612
	Price increase following a price reduction										
Time dep.	1	2	5	4	4	7	6	6	4	3	253
Both	1	4	2	3	4	4	5	3	2	4	374
State dep.	2	3	5	4	6	5	4	3	4	3	602

Table A17: Monthly distribution of price reductions according to the importance of a fixed point of time for a price change (as a percentage)

Importance	Not important	slightly important	moderately important	very important	Average
Month	*a) price reduction following a price increase*				
Jan	11	12	11	11	11
Feb	7	9	8	8	8
Mar	8	6	6	11	8
Apr	7	5	5	6	6
May	9	12	7	9	9
June	11	6	6	14	10
July	7	6	10	10	8
Aug	7	8	10	6	8
Sep	8	7	12	8	9
Oct	9	10	9	5	8
Nov	10	9	7	7	9
Dec	7	8	9	5	7
Total	100	100	100	100	100
Importance	Not important	slightly important	moderately important	very important	Average
Month	*b) price reduction following a price reduction*				
Jan	9	11	11	9	10
Feb	10	11	10	8	10
Mar	9	10	9	9	9
Apr	8	8	9	7	8
May	8	8	9	8	8
June	8	7	7	8	8
July	7	6	6	8	7
Aug	7	6	7	8	7
Sep	8	8	8	9	8
Oct	8	8	8	9	8
Nov	9	8	9	9	9
Dec	8	9	9	8	8
Total	100	100	100	100	100

NB If a price reduction follows a price reduction, 9 per cent of all price reductions of those plants that perceive a fixed point of time as very important for a price change take place in January. No preference for a particular month can be observed.

Table A18: Monthly distribution of price increases according to the importance of a fixed point of time for a price change (as a percentage)

Importance	Not important	slightly important	moderately important	very important	Average
Month	*a) price increase following a price reduction*				
Jan	9	15	22	26	15
Feb	9	9	9	11	9
Mar	11	8	12	10	10
Apr	9	16	13	7	10
May	10	11	7	7	9
June	9	6	4	6	7
July	8	6	6	3	7
Aug	9	5	6	4	7
Sep	9	6	4	4	7
Oct	8	6	5	5	7
Nov	5	6	5	4	5
Dec	5	6	6	11	7
Total	100	100	100	100	100
Importance	Not important	slightly important	moderately important	very important	Average
Month	*b) price increase following a price increase*				
Jan	9	12	18	22	15
Feb	9	10	15	14	12
Mar	10	12	14	12	12
Apr	11	13	14	12	12
May	10	10	9	8	9
June	9	8	7	5	7
July	8	7	5	5	6
Aug	7	5	2	3	4
Sep	7	6	3	4	5
Oct	8	6	3	5	6
Nov	6	5	4	3	5
Dec	6	6	6	7	6
Total	100	100	100	100	100

NB If a price increase follows a price increase, 22 per cent of all price increases of those plants that perceive a fixed point of time as very important for a price change take place in January. January is the preferred month for a price change.

Table A19a: Seasonal hazard rates for a price increase following a price increase; month of start of the price spell

	Hazard rates after … months in per cent																	nobs
Duration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18	24	
Month	Fixed point of time for a price change very important																	
Jan	23	4	2	2	2	3	1	1	4	2	10	55	12	4	7	3	27	437
Feb	33	7	3	2	3	2	2	1	4	6	31	42	22	14	6	0	32	285
Mar	30	11	3	1	1	2	2	0	5	17	17	32	23	3	7	0	28	216
Apr	25	4	3	1	3	2	1	4	12	11	16	41	11	7	7	0	33	232
May	30	6	3	2	4	0	5	18	13	15	24	23	15	10	11	0	30	151
June	34	5	4	6	3	9	13	11	9	24	21	18	0	0	17	0	17	118
July	15	10	1	1	9	22	15	4	6	12	14	31	5	11	0	14	0	103
Aug	36	13	3	13	12	12	4	10	11	24	8	25	0	0	0	17	0	63
Sep	34	4	9	18	12	12	19	16	0	5	20	31	18	11	14	0	0	96
Oct	21	7	16	7	7	10	5	2	2	4	8	43	8	9	10	0	22	114
Nov	31	16	8	9	16	8	9	6	6	0	13	0	0	23	10	14	0	59
Dec	55	10	6	8	4	0	9	5	3	6	10	36	24	27	0	0	25	150
	Fixed point of time for a price change not important																	
Jan	46	15	8	6	3	8	2	4	6	2	9	22	9	10	9	0	21	484
Feb	56	14	12	7	3	3	4	8	1	6	14	15	9	7	0	3	24	499
Mar	52	12	7	4	5	5	6	1	4	12	11	17	11	5	10	0	5	573
Apr	50	12	8	7	4	3	2	1	8	7	15	27	13	11	4	9	23	609
May	48	12	7	7	7	2	3	9	7	8	19	15	14	12	7	0	17	510
June	50	12	7	9	4	3	6	10	5	15	13	14	12	2	7	6	13	454
July	47	12	6	6	4	9	5	14	7	5	13	7	8	5	2	7	10	410
Aug	60	14	8	3	14	10	8	12	7	13	10	9	18	10	0	0	0	378
Sep	59	13	6	8	9	16	11	8	10	9	11	3	12	5	0	0	11	384
Oct	50	15	19	10	12	11	7	7	3	8	4	26	0	7	0	15	13	421
Nov	53	24	13	12	11	10	7	3	7	10	5	22	7	13	6	0	13	349
Dec	61	21	18	8	8	4	3	3	4	8	7	6	17	9	0	0	0	331

NB The shaded diagonal marks price changes in January, i.e. at fixed point of time, and the shaded vertical price changes after twelve months.

Table A19b: Seasonal hazard rates for a price reduction following a price reduction; month of start of the price spell

	Hazard rates after … months in per cent																nobs
Duration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18	24	
	Fixed point of time for a price change very important																	
Jan	51	29	9	6	0	6	7	7	8	9	6	0	0	22	14	0	0	116
Feb	57	10	7	24	5	0	12	0	7	8	9	0	0	0	0	0	0	98
Mar	51	33	6	13	11	5	0	5	16	13	9	22	0	0	0	0	0	116
Apr	59	21	16	15	13	11	12	7	15	10	0	13	0	0	0	0	0	100
May	57	22	7	24	4	11	0	0	5	6	0	9	0	11	0	0	0	109
June	55	22	13	11	16	7	13	15	0	7	0	9	10	0	0	0	0	119
July	51	27	16	6	13	19	5	17	0	11	14	0	0	0	25	0	0	112
Aug	58	29	18	0	8	6	14	0	25	0	0	0	0	0	0	0	0	97
Sep	55	17	6	13	7	12	0	0	0	6	0	6	7	0	0	0	0	104
Oct	61	19	27	8	10	6	15	9	0	10	0	0	0	0	13	0	0	108
Nov	53	29	9	3	19	26	0	0	0	13	0	0	17	0	0	0	0	106
Dec	60	26	10	0	11	13	21	18	11	0	0	20	0	0	0	0	0	97
	Fixed point of time for a price change not important																	
Jan	57	21	16	12	9	6	4	1	6	6	4	8	0	8	3	0	13	497
Feb	56	20	17	10	11	11	9	3	7	6	17	9	7	0	0	0	10	469
Mar	54	24	13	18	8	12	5	14	4	11	16	7	4	0	5	6	0	442
Apr	58	25	17	16	11	9	8	11	8	9	8	3	14	5	0	0	0	436
May	55	18	14	14	9	11	3	3	8	6	5	5	3	0	0	0	7	408
June	49	25	19	9	13	7	12	7	7	8	2	8	6	0	0	0	6	410
July	53	28	22	13	8	14	7	4	2	6	0	10	11	6	0	8	0	377
Aug	56	27	13	9	18	8	11	10	11	3	0	7	9	0	0	0	0	388
Sep	61	25	10	17	10	4	3	9	13	13	0	0	8	5	16	0	0	419
Oct	62	20	18	8	16	11	4	4	5	11	10	8	4	0	19	0	0	449
Nov	57	24	16	19	9	8	3	6	0	2	10	6	0	7	0	6	0	461
Dec	61	32	20	15	5	15	2	0	8	10	4	0	4	5	0	0	0	417

NB The shaded diagonal marks price changes in January, i.e. at fixed point of time, and the shaded vertical price changes after twelve months.

Table A20: Hazard rates according to reasons for postponing a price change and their importance (price increase following a price increase)

	Hazard rates after … months in per cent										nobs
Duration	1	2	3	4	6	9	11	12	13	15	
Importance					Fixed point of time						
Unimportant	52	14	9	7	6	6	12	17	11	5	5402
Minor	39	12	8	4	3	6	16	25	13	5	1241
Important	34	8	4	3	3	5	18	34	14	6	1933
Great	30	7	4	3	5	6	17	41	13	8	2024
					Fixed time interval						
Unimportant	52	14	9	7	5	5	13	22	10	5	5297
Minor	37	9	6	3	4	5	14	28	10	4	1192
Important	36	10	6	3	4	5	17	32	14	5	2106
Great	30	7	5	4	4	6	16	39	17	9	2070
					Anticipatory price adjustment						
Unimportant	35	9	4	3	4	5	19	37	14	6	1865
Minor	39	11	7	5	5	6	15	32	12	6	2578
Important	43	10	7	5	5	6	13	25	13	5	3472
Great	54	16	10	7	5	6	13	22	11	4	3154

Table A21: Hazard rates according to reasons for postponing a price change and their importance (price reduction following a price reduction)

	Hazard rates after … months in per cent										nobs
Duration	1	2	3	4	6	9	11	12	13	15	
Importance					Fixed point of time						
Unimportant	56	24	12	11	10	7	3	6	3	4	1282
Minor	52	18	16	11	8	6	5	6	5	1	1086
Important	56	24	17	12	7	7	8	13	5	1	1367
Great	57	24	16	13	9	7	7	6	5	3	5173
					Fixed time interval						
Unimportant	54	22	14	12	7	7	4	7	2	2	1160
Minor	54	18	16	12	9	5	6	6	3	1	1185
Important	54	22	15	10	10	7	6	12	8	3	1239
Great	57	25	16	13	9	6	7	6	5	3	5162
					Anticipatory price adjustment						
Unimportant	57	25	17	13	9	7	8	9	8	7	1829
Minor	55	21	15	11	10	7	5	4	4	2	1953
Important	53	23	15	12	11	6	5	7	5	2	2958
Great	60	24	15	13	8	9	6	11	3	1	2572

Table A22: Hazard rates of purely time-dependent price setters according to the frequency of regular price reviews

	Hazard rates after … months in per cent										nobs
Duration	1	2	3	4	6	9	11	12	13	15	
	Price increase following a price increase										
Annually	22	5	4	2	3	5	14	36	16	7	823
Semi-annually	36	7	4	5	9	3	15	24	14	2	664
Quarterly	36	15	12	7	6	3	13	20	6	5	274
Monthly	53	18	9	9	7	10	9	14	8	8	1704
Missing	44	12	10	8	4	4	18	26	10	2	822
	Price reduction following a price reduction										
Annually	41	19	13	9	10	9	4	8	2	2	384
Semi-annually	58	20	17	12	10	9	4	18	3	0	492
Quarterly	55	25	9	12	9	2	3	8	5	0	296
Monthly	62	26	18	12	6	8	7	8	6	3	2359
Missing	55	25	16	13	11	6	5	10	5	0	787

Table A23: Importance of expectations for the price calculation

	Coefficient		Marginal effects	
			not important	very important
Log number of employees	0.1104	(0.0254)***	-0.0336	0.0238
Regular customers				
log share of sales	0.0948	(0.0406)***	-0.0289	0.0205
no regular customers	0.1032	(0.1537)	-0.0304	0.0234
Regular time interval is for price change very important	0.2691	(0.0996)**	-0.0763	0.0640
Thresholds	-0.2489	(0.1294)		
	0.6663	(0.1304)		
	1.5937	(0.1367)		
Share of firms reporting that expectations are not/ are very important			0.231	0.134
Number of observations	857			
Pseudo R-squared	0.0163			
Log-Likelihood	-1130.9			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A24: Importance of past information for the price calculation

	Coefficient		Marginal effects	
			not important	very important
Log number of employees	-0.1104	(0.0246)***	0.0335	-0.0283
Guaranteed prices				
log share of sales	0.1255	(0.0478)***	-0.0380	0.0322
no guaranteed prices	0.1319	(0.4427)	-0.0380	0.0359
Regular time interval is for price change very important	0.2484	(0.0950)***	-0.0707	0.0684
No fixed contracts	-0.2895	(0.1146)**	0.0945	-0.0665
	-1.1582	(0.1256)		
Thresholds	-0.3708	(0.1220)		
	0.5131	(0.1234)		
Share of firms reporting that past information is very important			0.174	0.450
Number of observations	927			
Pseudo R-squared	0.0255			
Log-Likelihood	-1236.6			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A25: Importance of present information for the price calculation

	Coefficient		Marginal effects	
			not important	very important
Guaranteed prices				
log share of sales	-0. 2104	(0.0475)***	0.0272	-0.0833
no guaranteed prices	-0. 2876	(0.3927)	0.0456	-0.1104
Plant makes foreseeable price change in advance if possible				
very important	0. 3329	(0.0908)***	-0.0374	0.1321
	-1.8127	(0.1120)		
Thresholds	-1.1333	(0.1034)		
	-0.1858	(0.0992)		
Share of firms reporting that present information is not/ is very important			.067	0.450
Number of observations	979			
Pseudo R-squared	0.0158			
Log-Likelihood	-1146.8			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A26: Hazard rates according to the information vintage

	Hazard rates after … months in per cent										nobs
Duration	1	2	3	4	6	9	11	12	13	15	
					Past information						
					Price increase following a price increase						
Unimportant	47	12	8	7	6	7	16	32	12	6	3168
Minor	42	12	7	5	6	5	15	27	13	7	3166
Important	42	9	7	4	4	6	13	30	12	6	3158
Great	34	9	5	3	3	5	14	31	15	5	1554
					Price reduction following a price reduction						
Unimportant	55	24	15	11	10	6	7	13	7	4	2474
Minor	56	23	16	11	9	7	6	9	4	3	2912
Important	55	23	16	15	7	6	5	5	4	2	2165
Great	52	20	13	11	9	6	5	5	7	2	1189
					Present information						
					Price increase following a price increase						
Unimportant	42	10	6	3	3	4	14	37	16	5	854
Minor	36	7	4	3	4	5	16	28	14	5	1477
Important	38	11	8	4	5	6	14	28	13	6	3754
Great	48	12	7	6	5	6	15	29	11	6	5796
					Price reduction following a price reduction						
Unimportant	64	26	17	12	8	10	8	11	5	3	870
Minor	52	19	17	11	8	7	6	8	2	1	962
Important	53	20	14	12	9	5	4	9	7	3	2701
Great	58	25	16	13	9	7	7	6	4	3	5348
					Future information						
					Price increase following a price increase						
Unimportant	44	11	8	6	5	6	14	28	11	6	2875
Minor	42	10	6	4	6	6	16	30	14	6	3212
Important	41	10	6	6	5	6	13	32	11	7	2980
Great	41	9	6	3	2	5	16	32	16	3	1592
					Price reduction following a price reduction						
Unimportant	55	23	13	12	9	7	6	5	5	4	2170
Minor	55	22	17	11	9	7	7	9	3	1	2653
Important	58	24	17	13	9	5	5	9	7	2	2689
Great	54	20	14	12	9	7	5	8	6	3	1140

Table A27: Importance of nominal contracts for postponing a price change

	Coefficient	Marginal effects	
		not important	very important
Regular customers			
log share of sales	0.0090 (0.0412)	-0.0030	0.0025
no regular customers	-0.4467 (0.1710)***	0.1627	-0.1048
Log number of employees	-0.0031 (0.0260)	0.0010	-0.0009
Continuously declining mark-up during life-cycle	0.0730 (0.0876)	-0.0239	0.0209
Stocks of finished products			
Never	-0.1405 (0.0917)	0.0476	-0.0384
Sometimes	-0.1375 (0.1135)	0.0470	-0.0371
Log share of sales with			
own group	0.0330 (0.0291)	-0.0110	0.0093
other industrial firms	0.1155 (0.0282)***	-0.0383	0.0325
Wholesale	-0.0418 (0.0244)	0.0139	-0.0118
Retail	0.0116 (0.0276)	-0.0038	0.0033
private customers	-0.0454 (0.0400)	0.0151	-0.0128
Fixed contracts			
log mean duration of contracts	0.2251 (0.0563)***	-0.0747	0.0634
log share of sales	0.1526 (0.0441)***	-0.0506	0.0430
no fixed contracts	-0.6146 (0.2578)**	0.2270	-0.1366
dummy missing share of sales	1.5679 (0.3342)***	-0.2655	0.5655
dummy missing duration	-0.0953 (0.0815)	0.0320	-0.0264
Postponement of price increase for fear that competitors will not increase their prices too			
moderately important	0.2742 (0.1131)**	-0.0866	0.0819
Important	0.4996 (0.1036)***	-0.1574	0.1485
very important	0.8253 (0.1195)***	-0.2259	0.2729
Postponement of a price change because of menu costs			
moderately important	0.0308 (0.0964)	-0.0102	0.0876
Important	-0.1052 (0.1036)	-0.2271	-0.0285
very important	-0.2710 (0.1195)	-0.0963	-0.0678
Price change preferably after fixed period of time			
moderately important	-0.0725 (0.1028)	0.0244	-0.0200
Important	0.0239 (0.1540)	-0.0079	0.0068
very important	0.2925 (0.1157)**	-0.0906	0.0891
Thresholds	0.9579 (0.2945) 1.5900 (0.2966) 2.3990 (0.2997)		
Share of firms reporting that nominal contracts are not/are very important		0.272	0.202
Number of observations	993		
Pseudo R-squared	0.1191		
Log-Likelihood	-1202.3		

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A28: Importance of menu costs for postponing a price change

	Coefficient (standard error)		Marginal effects not important	very important
Regular customers				
log share of sales	-0.0286	(0.0472)	0.0092	-0.0009
no regular customers	-0.0217	(0.1833)	0.0070	-0.0006
Log number of employees	0.0162	(0.0298)	-0.0052	0.0005
Continuously declining mark-up during life-cycle	0.0323	(0.1020)	-0.0105	0.0010
Stocks of finished products				
Never	-0.1929	(0.1095)*	0.0603	-0.0053
Sometimes	-0.1316	(0.1344)	0.0412	-0.0036
Log share of sales with				
own group	0.0444	(0.0334)	-0.0144	0.0013
other industrial firms	-0.0748	(0.0303)**	0.0242	-0.0023
Wholesale	0.0511	(0.0272)*	-0.0165	0.0015
Retail	-0.0201	(0.0299)	0.0065	-0.0006
private customers	0.1427	(0.0412)***	-0.0462	0.0043
Fixed contracts				
log mean duration of contracts	0.1301	(0.0675)*	-0.0421	0.0039
log share of sales	-0.0596	(0.0490)	0.0193	-0.0018
no fixed contracts	-0.2677	(0.2727)	0.0801	-0.0064
dummy missing share of sales	0.3068	(0.3517)	-0.1077	0.0131
Thresholds	0.5854	(0.3197)		
	1.3770	(0.3218)		
	2.2073	(0.3341)		
Share of firms reporting that menu costs are not/are very important			0.742	0.012
Number of observations	988			
Pseudo R-squared	0.0373			
Log-Likelihood	-750.3			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A29: Importance of sluggish costs for postponing a price change

	Coefficient (standard error)		Marginal effects not important	very important
Regular customers				
log share of sales	0.0154	(0.0421)	-0.0061	0.0006
no regular customers	-0.1002	(0.1702)	0.0398	-0.0033
Log number of employees	-0.0985	(0.0269)***	0.0389	-0.0036
Continuously declining mark-up during life-cycle	-0.1043	(0.0903)	0.0413	-0.0036
Stocks of finished products				
Never	0.0374	(0.0932)	-0.0147	0.0014
Sometimes	0.1378	(0.1158)	-0.0540	0.0056
Log share of sales with				
own group	0.0434	(0.0301)	-0.0172	0.0016
other industrial firms	0.0014	(0.0284)	0.0006	0.0001
Wholesale	-0.0144	(0.0246)	0.0057	-0.0005
Retail	-0.0110	(0.0281)	0.0043	-0.0004
private customers	-0.0166	(0.0392)	0.0066	-0.0006
Fixed contracts				
log mean duration of contracts	0.0630	(0.0574)	-0.0249	0.0023
log share of sales	0.0667	(0.0453)	-0.0264	0.0024
no fixed contracts	0.1136	(0.2442)	-0.0446	0.0046
dummy missing share of sales	0.1681	(0.3404)	-0.0654	0.0073
Postponement of price increase because after short while a price cut would be necessary				
moderately important	0.3398	(0.0912)***	-0.1319	0.0148
Important	0.3958	(0.1060)***	-0.1515	0.0194
very important	0.5729	(0.1662)***	-0.2093	0.0365
Postponement of a price change because of menu costs				
moderately important	0.6080	(0.0984)***	-0.2265	0.0348
Important	0.7154	(0.1479)***	-0.2538	0.0516
very important	1.2861	(0.3100)***	-0.3725	0.1652
Thresholds	0.1664	(0.2963)		
	1.3985	(0.2988)		
	2.4915	(0.3092)		
Share of firms reporting that sluggish costs are not/are very important			0.446	0.014
Number of observations	971			
Pseudo R-squared	0.0731			
Log-Likelihood	-976.4			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A30: Importance of coordination failure for postponing a price increase

	Coefficient		Marginal effects	
			not important	very important
Regular customers				
log share of sales	0.0198	(0.0394)	-0.0048	0.0048
no regular customers	-0.0023	(0.1555)	0.0006	-0.0006
Log number of employees	-0.0746	(0.0250)***	0.0183	-0.0183
Continuously declining mark-up during life-cycle	0.0813	(0.0859)	-0.0195	0.0204
Stocks of finished products				
Never	0.1185	(0.0878)	-0.0282	0.0300
Sometimes	-0.0395	(0.1121)	0.0098	-0.0096
Log share of sales with				
own group	0.0141	(0.0284)	-0.0035	0.0035
other industrial firms	0.0535	(0.0274)*	-0.0131	0.0132
Wholesale	0.0698	(0.0233)***	-0.0171	0.0172
Retail	0.0677	(0.0263)***	-0.0166	0.0167
private customers	-0.0266	(0.0369)	0.0065	-0.0065
Fixed contracts				
log mean duration of contracts	-0.0879	(0.0545)	0.0215	-0.0216
log share of sales	-0.0375	(0.0423)	0.0092	-0.0095
no fixed contracts	-0.1295	(0.2250)	0.0333	-0.0302
dummy missing share of sales	0.0308	(0.3151)	-0.0074	0.0077
Postponement of price change since after short while a price cut would be necessary				
moderately important	0.2323	(0.0882)***	-0.0540	0.0600
Important	0.4871	(0.1079)***	-0.1006	0.1382
very important	0.8962	(0.1812)***	-0.1405	0.2949
Postponement of price change because of written contracts				
moderately important	0.0748	(0.1069)	-0.0179	0.0188
Important	0.3017	(0.1043)***	-0.0682	0.0798
very important	0.5474	(0.1075)***	-0.1156	0.1528
Postponement of price increase because of the price elasticity of demand				
moderately important	0.4767	(0.0962)***	-0.1059	0.1279
Important	0.6385	(0.1047)***	-0.1323	0.1805
very important	1.3733	(0.1434)***	-0.1853	0.4677
Thresholds	-0.3208	(0.2803)		
	0.4810	(0.2803)		
	1.6512	(0.2825)		
Share of firms reporting that coordination failure is not/is very important			0.162	0.163
Number of observations	1011			
Pseudo R-squared	0.1023			
Log-Likelihood	-1219.7			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A31: Importance of coordination failure for postponing a price reduction

	Coefficient (standard error)		Marginal effects not important	Marginal effects very important
Regular customers				
log share of sales	0.0379	(0.0436)	-0.0147	0.0033
no regular customers	-0.1218	(0.1726)	0.0479	-0.0096
Log number of employees	-0.0335	(0.0268)	0.0130	-0.0029
Continuously declining mark-up during life-cycle	0.2424	(0.0889)***	-0.0926	0.0234
Stocks of finished products				
Never	-0.0295	(0.0949)	0.0115	-0.0025
Sometimes	0.0825	(0.1167)	-0.0319	0.0075
Log share of sales with				
own group	0.0212	(0.0301)	-0.0082	0.0018
other industrial firms	-0.0360	(0.0289)	0.0140	-0.0031
Wholesale	0.0510	(0.0247)**	-0.0199	0.0044
Retail	-0.1000	(0.0284)***	0.0389	-0.0086
private customers	-0.0164	(0.0394)	0.0064	-0.0014
Fixed contracts				
log mean duration of contracts	-0.0248	(0.0585)	0.0096	-0.0021
log share of sales	0.0110	(0.0460)	-0.0043	0.0010
no fixed contracts	-0.0947	(0.2479)	0.0371	-0.0076
dummy missing share of sales	0.4095	(0.3240)	-0.1487	0.0494
Postponement of price change because of sluggish costs				
moderately important	0.0722	(0.0909)	-0.0280	0.0063
Important	0.2035	(0.1183)*	-0.0776	0.0200
very important	0.6923	(0.2708)**	-0.2335	0.1031
Postponement of price change since after short while a price reduction would be necessary				
moderately important	0.7359	(0.1076)***	-0.2694	0.0834
Important	0.8920	(0.1189)***	-0.3071	0.1239
very important	1.3039	(0.1626)***	-0.3740	0.2608
Postponement of price change because of written contracts				
moderately important	0.0707	(0.1166)	-0.0274	0.0063
Important	0.2697	(0.1128)**	-0.1028	0.0263
very important	0.2983	(0.1154)***	-0.1134	0.0296
Postponement of price increase because of the price elasticity of demand				
moderately important	0.4967	(0.1131)***	-0.1863	0.0518
Important	0.5459	(0.1193)***	-0.2013	0.0614
very important	0.6168	(0.1535)***	-0.2173	0.0815
Thresholds	0.6019	(0.3100)		
	1.6320	(0.3120)		
	2.5743	(0.3158)		
Share of firms reporting that coordination failure is not/is very important			0.412	0.040
Number of observations	981			
Pseudo R-squared	0.1541			
Log-Likelihood	-1030.4			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A32: Importance of a transitory shock for postponing a price increase

	Coefficient	Marginal effects	
		not important	very important
Regular customers			
log share of sales	0.0355 (0.0427)	-0.0142	0.0027
no regular customers	-0.1446 (0.1751)	0.0576	-0.0099
Log number of employees	-0.0201 (0.0270)	0.0080	-0.0015
Continuously declining mark-up during life-cycle	0.1736 (0.0902)	-0.0689	0.0145
Stocks of finished products			
Never	-0.1564 (0.0954)	0.0623	-0.0112
Sometimes	0.0151 (0.1184)	-0.0060	0.0012
Log share of sales with			
own group	0.0202 (0.0305)	-0.0081	0.0015
other industrial firms	-0.0111 (0.0291)	0.0044	-0.0009
Wholesale	0.0288 (0.0249)	-0.0115	0.0022
Retail	-0.0632 (0.0283)**	0.0252	-0.0048
private customers	0.0981 (0.0396)**	-0.0391	0.0075
Fixed contracts			
log mean duration of contracts	-0.1250 (0.0581)**	0.0498	-0.0096
log share of sales	-0.0257 (0.0460)	0.0102	-0.0020
no fixed contracts	-0.0534 (0.2419)	0.0213	-0.0039
dummy missing share of sales	-0.5443 (0.3540)	0.2094	-0.0260
Postponement of a price increase for fear that competitors will not increase their prices too			
moderately important	0.8951 (0.1349)***	-0.3332	0.1076
Important	1.0632 (0.1291)***	-0.3983	0.1142
very important	1.3929 (0.1362)***	-0.4683	0.2255
Postponement of a price change because of menu costs			
moderately important	0.3953 (0.0977)***	-0.1545	0.0383
Important	0.4932 (0.1463)***	-0.1887	0.0554
very important	1.1206 (0.3080)***	-0.3640	0.2048
Postponement of price change because of written contracts			
moderately important	0.2250 (0.1156)***	-0.0890	0.0196
Important	0.3180 (0.1127)***	-0.1254	0.0284
very important	0.3239 (0.1169)**	-0.1276	0.0291
Thresholds	0.6979 (0.3133) 1.6038 (0.3149) 2.5557 (0.3187)		
Share of firms reporting: transitory shock not/very important		0.484	0.035
Number of observations	981		
Pseudo R-squared	0.1053		
Log-Likelihood	-1039.3		

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A33: Importance of a transitory shock for postponing a price reduction

	Coefficient	Marginal effects	
		not important	very important
Regular customers			
log share of sales	0.0413 (0.0426)	-0.0159	0.0041
no regular customers	-0.2771 (0.1737)	0.1091	-0.0226
Log number of employees	-0.0375 (0.0263)	0.0144	-0.0037
Continuously declining mark-up during life-cycle	-0.0557 (0.0894)	0.0215	-0.0054
Stocks of finished products			
Never	-0.1972 (0.0930)**	0.0768	-0.0182
Sometimes	-0.1386 (0.1167)	0.0540	-0.0127
Log share of sales with			
own group	0.0110 (0.0297)	-0.0042	0.0011
other industrial firms	0.0215 (0.0286)	-0.0083	0.0021
Wholesale	0.0103 (0.0244)	-0.0040	0.0010
Retail	0.0548 (0.0277)**	-0.0211	0.0055
private customers	0.0323 (0.0395)	-0.0124	0.0032
Fixed contracts			
log mean duration of contracts	-0.0535 (0.0574)	0.0206	-0.0053
log share of sales	-0.0705 (0.0442)	0.0271	-0.0070
no fixed contracts	-0.3055 (0.2405)*	0.1202	-0.0248
dummy missing share of sales	-0.3395 (0.3249)	0.1341	-0.0257
Postponement of price reduction for fear that competitors will reduce their prices too			
moderately important	0.8747 (0.0911)***	-0.3098	0.1179
Important	1.0130 (0.1069)***	-0.3303	0.1698
very important	1.7587 (0.1550)***	-0.4152	0.4510
Postponement of a price change because of menu costs			
moderately important	0.2012 (0.0980)**	-0.0759	0.0224
Important	0.3249 (0.1476)**	-0.1189	0.0408
very important	0.6888 (0.2950)**	-0.2267	0.1150
Postponement of price change because of written contracts			
moderately important	0.2493 (0.1134)**	-0.0936	0.0283
Important	0.2298 (0.1094)**	-0.0868	0.0253
very important	0.3375 (0.1134)***	-0.1259	0.0392
Thresholds	0.0966 (0.2939) 1.0805 (0.2955) 2.0268 (0.2986)		
Share of firms reporting that a transitory shock is not/is very important		0.395	0.048
Number of observations	974		
Pseudo R-squared	0.1181		
Log-Likelihood	-1074.0		

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A34: Importance of the price elasticity of demand for postponing a price increase

	Coefficient		Marginal effects	
			not important	very important
Regular customers				
log share of sales	0.0880	(0.0398)**	-0.0311	0.0156
no regular customers	-0.3091	(0.1560)**	0.1153	-0.0460
Log number of employees	-0.0401	(0.0250)	0.0142	-0.0071
Continuously declining mark-up during life-cycle	0.3439	(0.0840)***	-0.1153	0.0684
Stocks of finished products				
Never	-0.1363	(0.0886)	0.0489	-0.0232
Sometimes	0.1735	(0.1105)	-0.0592	0.0335
Log share of sales with				
own group	0.0075	(0.0284)	-0.0027	0.0013
other industrial firms	-0.0717	(0.0265)***	0.0253	-0.0127
Wholesale	0.0360	(0.0230)	-0.0127	0.0064
Retail	-0.0219	(0.0261)	0.0077	-0.0039
private customers	0.0861	(0.0367)**	-0.0304	0.0153
Fixed contracts				
log mean duration of contracts	0.1253	(0.0543)**	-0.0443	0.0223
log share of sales	-0.0326	(0.0418)	0.0115	-0.0058
no fixed contracts	-0.1215	(0.2266)	0.0439	-0.0203
dummy missing share of sales	-0.3353	(0.3069)	0.1261	-0.0481
Thresholds	-0.7382	(0.2722)		
	0.1010	(0.2715)		
	1.0264	(0.2730)		
Share of firms reporting that price elasticity of demand is not/very important			0.311	0.102
Number of observations	981			
Pseudo R-squared	0.0270			
Log-Likelihood	-1261.6			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A35: Importance of the price elasticity of demand for postponing a price reduction

	Coefficient		Marginal effects	
			not important	very important
Regular customers				
log share of sales	0.1216	(0.0406)***	-0.0448	0.0207
no regular customers	-0.2902	(0.1562)*	0.1113	-0.0417
Log number of employees	-0.0443	(0.0252)*	0.0163	-0.0075
Continuously declining mark-up during life-cycle	0.1903	(0.0845)**	-0.0686	0.0346
Stocks of finished products				
Never	-0.2610	(0.0898)***	0.0984	-0.0408
Sometimes	0.0563	(0.1106)	-0.0206	0.0099
Log share of sales with				
own group	-0.0179	(0.0288)	0.0066	-0.0030
other industrial firms	-0.0452	(0.0268)*	0.0167	-0.0077
Wholesale	0.0193	(0.0231)	-0.0071	0.0033
Retail	-0.0128	(0.0262)	0.0047	-0.0022
private customers	0.0616	(0.0368)*	-0.0227	0.0105
Fixed contracts				
log mean duration of contracts	0.1220	(0.0545)**	-0.0450	0.0208
log share of sales	-0.0645	(0.0426)	0.0238	-0.0110
no fixed contracts	-0.1432	(0.2296)	0.0539	-0.0226
dummy missing share of sales	-0.1430	(0.3368)	0.0540	-0.0222
Thresholds	-0.8308	(0.2756)		
	-0.0246	(0.2749)		
	0.8708	(0.2762)		
Share of firms reporting that price elasticity of demand is not/very important			0.346	0.096
Number of observations	966			
Pseudo R-squared	0.0190			
Log-Likelihood	-1238.5			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A36: Importance of increase of material costs for a price increase

	Coefficient		Marginal effects	
			not important	very important
Guaranteed prices				
log share of sales	-0.2917	(0.0502)***	0.0219	-0.1143
no guaranteed prices	-0.4290	(0.3566)	0.0468	-0.1698
Log share of sales with				
own group	-0.0521	(0.0268)**	0.0039	-0.0204
Wholesale	0.0462	(0.0215)**	-0.0035	0.0181
private customers	-0.0765	(0.0332)**	0.0057	-0.0300
Price set by competitor†	-0.4937	(0.0888)***	0.0491	-0.1949
Postponement of price increase because impact of price elasticity of demand is				
moderately important	-0.0071	(0.0956)	0.0005	-0.0028
Important	0.1308	(0.1019)	-0.0092	0.0509
very important	0.3321	(0.1377)**	-0.0197	0.1254
Postponement of price increase because of written contracts				
moderately important	0.0763	(0.1074)	-0.0055	0.0298
Important	0.1780	(0.1035)*	-0.0123	0.0690
very important	0.3097	(0.1063)***	-0.0200	0.1186
Thresholds	-2.2965	(0.1436)		
	-1.8003	(0.1364)		
	-0.6562	(0.1290)		
Share of firms reporting that increase of material costs is not/is very important			0.034	0.574
Number of observations	1095			
Pseudo R-squared	0.0407			
Log-Likelihood	-1041.8			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

† Question 8: price set by taking the price of our main competitor as a reference

Table A37: Importance of reduction of material costs for a price reductions

	Coefficient		Marginal effects not important	Marginal effects very important
No price discrimination	-0.3439	(0.1251)***	0.0940	-0.1157
Price set by competitor†	-0.2602	(0.0813)***	0.0668	-0.0910
Postponement of price change because of written contracts				
not important	-0.2967	(0.0722)***	0.0748	-0.1047
Thresholds	-1.1850	(0.0559)		
	-0.5144	(0.0485)		
	0.2624	(0.0476)		
Share of firms reporting that material costs are not/are very important			0.155	0.333
Number of observations	1100			
Pseudo R-squared	0.0127			
Log-Likelihood	-1461.8			

Standard errors in parentheses.

*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

† Question 8: price set by taking the price of our main competitor as a reference

Table A38: Importance of demand increase for a price increase

	Coefficient		Marginal effects	
			not important	very important
Log number of employees	0.0427	(0.0253)*	-0.0134	0.0071
Regular customers				
log share of sales	0.1231	(0.0406)***	-0.0384	0.0205
no regular customers	-0.3339	(0.1559)**	0.1139	-0.0456
Guaranteed prices				
log share of sales	-0.2738	(0.0476)***	0.0855	-0.0456
no guaranteed prices	0.0317	(0.3531)	-0.0098	0.0054
Log share of sales with				
private customers	0.0674	(0.0339)**	-0.0211	0.0112
Price discrimination				
no discrimination	-0.6328	(0.1518)***	0.2275	-0.0724
according to quantity only	-0.2039	(0.0790)***	0.0654	-0.0321
Postponement of price increase because impact of price elasticity of demand is				
moderately important	0.0561	(0.0927)	-0.0174	0.0095
important	0.2308	(0.0961)**	-0.0690	0.0415
very important	0.3375	(0.1296)***	-0.0949	0.0666
Plant makes foreseeable price change in advance if possible				
minor important	0.1888	(0.1146)	-0.0566	0.0338
important	0.2880	(0.1040)***	-0.0869	0.0510
very important	0.4075	(0.1165)***	-0.1156	0.0795
Thresholds	-0.8594	(0.1797)		
	0.2594	(0.1783)		
	1.1686	(0.1807)		
Share of firms reporting that demand increase is not/is very important			0.242	0.093
Number of observations	960			
Pseudo R-squared	0.0535			
Log-Likelihood	-1185.2			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A39: Importance of demand decrease for a price reduction

	Coefficient	Marginal effects	
		not important	very important
Log number of employees	0.0287 (0.0235)	-0.0085	0.0065
Continuously declining mark-up during life-cycle	0.2591 (0.0824)***	-0.0728	0.0629
Guaranteed prices			
log share of sales	-0.2322 (0.0640)***	0.0691	-0.0524
no guaranteed prices	-0.5987 (0.3435)*	0.2112	-0.0958
Fixed contracts			
log duration	-0.1099 (0.0717)	0.0327	-0.0248
log share of sales	-0.0875 (0.0348)**	0.0261	-0.0197
no fixed contracts	-0.3724 (0.2263)	0.1225	-0.0710
Log share of sales with			
other industrial firms	0.0265 (0.0206)	-0.0079	0.0060
Wholesale	0.0652 (0.0212)***	-0.0194	0.0147
private customers	0.0247 (0.0348)	-0.0074	0.0056
Postponement of price reduction because impact of price elasticity of demand is			
moderately important	0.2784 (0.0868)***	-0.0790	0.0668
Important	0.4461 (0.0942)***	-0.1196	0.1139
very important	0.4760 (0.1302)***	-0.1197	0.1294
Plant makes foreseeable price change in advance if possible			
moderately important	0.2038 (0.1089)*	-0.0579	0.0488
Important	0.2429 (0.1013)**	-0.0700	0.0571
very important	0.3370 (0.1142)***	-0.0921	0.0844
Thresholds	-0.9185 (0.2340) 0.0539 (0.2331) 0.9145 (0.2342)		
Share of firms reporting that a demand increase is not/is very important		0.222	0.143
Number of observations	1045		
Pseudo R-squared	0.0468		
Log-Likelihood	-1347.9		

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A40: Importance of permanent wage increase for a price increase

	Coefficient		Marginal effects	
			not important	very important
No guaranteed prices	-0.2296	(0.1205)*	0.0590	-0.0652
Fixed contracts				
log duration	0.0726	(0.0500)	-0.0170	0.0219
log share of sales	-0.0866	(0.0394)**	0.0202	-0.0261
no fixed contracts	0.0451	(0.2048)	-0.0103	0.0138
Log share of sales with				
other industrial firms	-0.0204	(0.0186)	0.0048	-0.0062
Wholesale	-0.0510	(0.0200)**	0.0119	-0.0154
Price discrimination				
no discrimination	0.0238	(0.1252)	-0.0055	0.0072
according to quantity only	0.1556	(0.0715)**	-0.0352	0.0480
Price set by competitor†	-0.3500	(0.0799)***	0.0906	-0.0971
Regular time interval is for price change				
Important	0.1935	(0.0877)**	-0.0424	0.0610
very important	0.3389	(0.0959)***	-0.0698	0.1105
Thresholds	-1.2266	(0.2052)		
	-0.4301	(0.2031)		
	0.5544	(0.2035)		
Share of firms reporting that a permanent wage increase is not/is very important			0.150	0.228
Number of observations	1162			
Pseudo R-squared	0.0199			
Log-Likelihood	-1533.3			

† Question 8: price set by taking the price of our main competitor as a reference

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A41: Importance of price increase by competitor for a price increase

	Coefficient		Marginal effects not important	Marginal effects very important
Log number of employees	0.1050	(0.0247)***	-0.0330	0.0122
Guaranteed prices				
log share of sales	-0.0645	(0.0492)	0.0203	-0.0075
no guaranteed prices	0.9809	(0.3529)***	-0.1996	0.2176
Stocks of finished products				
Never	-0.3614	(0.0910)***	0.1201	-0.0366
Sometimes	-0.1387	(0.1104)	0.0450	-0.0149
Number of main competitors				
between 5 and 20	-0.1214	(0.0915)	0.0379	-0.0143
more than 20	-0.3001	(0.1088)***	0.0989	-0.0310
Log share of sales with				
other industrial firms	-0.0339	(0.0257)	0.0107	-0.0040
Wholesale	0.0548	(0.0229)**	-0.0172	0.0064
Retail	-0.0230	(0.0261)	0.0072	-0.0027
private customers	0.0443	(0.0377)	-0.0139	0.0052
Postponement of price increase for fear that competitors will increase their prices too				
Important	0.3264	(0.0840)***	-0.0990	0.0411
very important	0.5946	(0.1055)***	-0.1606	0.0926
Postponement of price reduction for fear that competitors will not reduce their prices too				
moderately important	0.1716	(0.0913)**	-0.0526	0.0211
Important	0.4844	(0.1107)***	-0.1346	0.0719
very important	0.6388	(0.1614)***	-0.1591	0.1119
Postponement of price increase in case of transitory shock				
Unimportant	-0.2964	(0.0798)***	0.0933	-0.0344
Regular time interval is for price change				
Important	0.1369	(0.0949)	-0.0417	0.0170
very important	0.2593	(0.1036)**	-0.0764	0.0346
Plant makes foreseeable price change in advance if possible				
moderately important	0.3019	(0.1127)***	-0.0890	0.0402
Important	0.4046	(0.1062)***	-0.1205	0.0528
very important	0.5571	(0.1204)***	-0.1524	0.0849
Thresholds	0.0785	(0.2386)		
	1.1940	(0.2405)		
	2.3392	(0.2462)		
Share of firms reporting that a price increase by competitors is not/is very important			0.244	0.058
Number of observations	996			
Pseudo R-squared	0.1014			
Log-Likelihood	-1157.4			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A42: Importance of price reduction by competitors for a price reduction

	Coefficient		Marginal effects	
			not important	very important
Log number of employees	0.0880	(0.0245)***	-0.0330	0.0252
Continuously declining mark-up during life-cycle	0.2525	(0.0840)***	0.0203	0.0641
Guaranteed prices				
log share of sales	-0.0428	(0.0464)	0.0129	-0.0149
no guaranteed prices	0.8140	(0.3504)**	-0.1244	0.2963
Stocks of finished products				
never	-0.1681	(0.0871)*	0.0417	-0.0443
sometimes	0.0056	(0.1075)	-0.0012	0.0014
Log share of sales with				
own group	-0.0175	(0.0271)	0.0049	-0.0057
other industrial firms	0.0497	(0.0265)*	-0.0114	0.0131
wholesale	0.0706	(0.0228)***	-0.0167	0.0192
retail	0.0062	(0.0262)	-0.0028	0.0032
private customers	-0.0374	(0.0363)	0.0078	-0.0090
Price discrimination				
no discrimination	-0.4342	(0.1410)***	0.1506	-0.1147
according to quantity only	-0.0847	(0.0773)	0.0293	-0.0322
Postponement of price increase for fear that competitors will increase their prices too				
moderately important	0.1790	(0.1119)	-0.0329	0.0406
important	0.5770	(0.1075)***	-0.1284	0.1704
very important	1.0558	(0.1287)***	-0.1729	0.3439
Postponement of price reduction for fear that competitors will not reduce their prices too				
moderately important	0.0769	(0.0893)	-0.0279	0.0336
important	0.3915	(0.1054)***	-0.0843	0.1231
very important	0.4964	(0.1615)***	-0.1022	0.1835
Thresholds	0.1190	(0.2127)		
	0.9157	(0.2146)		
	1.9754	(0.2175)		
Share of firms reporting that a price reductions by competitors are not/ are very important			0.155	0.200
Number of observations	1055			
Pseudo R-squared	0.0982			
Log-Likelihood	-1298.3			

Standard errors in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A43: Events allowing firms to change prices

Variable	Price increase				Price reduction		
	Demand	Material	Wage	Competitor	Demand	Material	Competitor
Foreseeable price change in advance	+			+	+		
Time dependence							
fixed point of time							
regular time interval			+	+			
State dependence							
fixed contracts		+				+	
menu costs							
sluggish costs							
coordination failure			+	+			+
transitory shock	+			+			
Price elasticity of demand	+	+			+		+
Regular customers	+						
Price guaranty	-	-	+	-	-		-
Price discrimination							
no discrimination	-					-	-
according to quantity	-		+				
Type of customer							
own group		-					
other industrial firms							+
wholesale		+	-	+	+		+
retail							
private customers	+	-					

NB The table should be read as follows: firms that feel severely hampered by fixed contracts are more likely to reduce their price in response to a decrease in material costs than other firms are.

Table A44: Hazard rates according to reasons for postponing a price change and their importance (price increase following a price increase)

	Hazard rates after … months in per cent										nobs
Duration	1	2	3	4	6	9	11	12	13	15	
					Fixed term contract						
Unimportant	36	9	5	5	5	6	15	32	15	8	2952
Minor	42	11	7	5	4	5	13	28	10	6	2023
Important	47	13	9	5	5	5	14	23	12	5	3035
Great	46	11	6	5	4	6	16	34	14	4	3277
					Menu costs						
Unimportant	45	11	7	5	5	6	15	30	13	5	8548
Minor	36	9	5	4	4	5	14	33	12	7	1771
Important	29	7	3	3	2	4	14	28	17	6	634
Great	49	14	7	4	4	3	12	12	16	8	239
					Sluggish costs						
Unimportant	42	11	6	5	4	5	15	31	13	6	5081
Minor	44	10	7	4	5	6	15	31	14	5	4390
Important	42	10	6	4	4	6	14	25	14	7	1205
Great	49	22	13	14	9	4	2	3	6	7	328
					Coordination failure, increase						
Unimportant	39	9	7	4	4	5	14	35	13	5	2008
Minor	39	10	6	4	5	6	17	30	14	7	2820
Important	45	12	7	5	5	6	14	27	13	5	4707
Great	46	13	8	5	4	6	14	26	11	4	2054
					Coordination failure, decrease						
Unimportant	43	10	6	4	4	5	15	30	12	5	4642
Minor	40	11	7	5	6	6	14	32	13	5	3048
Important	46	12	7	6	5	6	16	26	15	7	2737
Great	40	13	9	5	3	7	17	27	10	7	630
					Transitory shock, increase						
Unimportant	39	9	5	4	4	6	16	31	13	6	4858
Minor	43	12	8	5	6	5	15	29	15	5	3433
Important	50	13	8	6	4	6	15	25	10	5	2408
Great	50	18	9	3	7	7	7	21	10	7	489
					Elasticity of demand, increase						
Unimportant	43	9	7	5	3	5	15	33	11	6	3718
Minor	45	11	7	4	6	7	16	29	13	5	3973
Important	39	11	6	5	5	4	13	27	14	7	2569
Great	41	9	7	2	3	5	15	26	11	4	749

Table A45: Price reduction following a price reduction

	Hazard rates after … months in per cent										nobs
Duration	1	2	3	4	6	9	11	12	13	15	
					Fixed term contracts						
Unimportant	56	24	14	12	7	5	5	3	7	2	2558
Minor	56	23	13	11	9	8	8	12	6	2	1772
Important	55	22	18	13	11	6	6	9	3	5	2804
Great	55	23	14	12	8	7	5	7	5	1	2080
					Menu costs						
Unimportant	56	23	15	12	9	6	6	7	6	2	7368
Minor	51	26	15	13	11	7	8	9	1	3	1287
Important	48	21	19	9	6	5	7	9	5	5	235
Great	72	29	22	13	8	13	0	20	0	0	300
					Sluggish costs						
Unimportant	58	22	15	12	8	6	7	6	6	3	4519
Minor	53	23	15	12	9	6	5	9	4	3	3080
Important	58	26	17	12	14	9	7	7	3	0	1191
Great	60	30	16	12	14	10	5	11	6	0	341
					Coordination failure, increase						
Unimportant	57	22	16	10	10	8	7	9	5	3	1792
Minor	53	26	13	12	7	5	6	5	5	1	1901
Important	57	23	16	12	10	7	5	9	5	4	3727
Great	56	22	16	13	9	6	6	6	5	1	2117
					Coordination failure, decrease						
Unimportant	53	22	14	12	8	7	7	5	4	4	3377
Minor	55	24	15	12	10	5	4	11	5	1	2625
Important	62	23	20	11	11	9	4	8	5	2	2522
Great	52	24	13	15	9	5	8	7	5	2	727
					Transitory shock, decrease						
Unimportant	56	23	14	10	8	7	8	8	6	2	3473
Minor	56	24	17	12	10	5	2	7	4	2	3188
Important	56	22	15	15	10	6	5	8	3	5	1928
Great	52	22	14	11	9	11	8	6	2	0	556
					Elasticity of demand, decrease						
Unimportant	57	23	15	12	8	9	8	7	6	3	3156
Minor	58	24	16	11	9	6	4	9	5	2	3013
Important	49	24	15	14	12	4	4	7	5	3	1785
Great	56	22	16	10	8	6	8	7	1	2	944

Table A46: Time dependent versus state dependent price reviews

	Hazard rates after … months in per cent										nobs
Duration	1	2	3	4	6	9	11	12	13	15	
	Price increase following a price increase										
State dep.	45	10	7	5	4	5	13	24	12	6	1482
Both	44	11	7	4	4	6	16	33	13	6	5928
Time dep.	41	12	7	6	5	5	14	27	12	6	4287
Missing	32	7	6	5	8	7	19	29	18	2	500
	Price reduction following a price reduction										
State dep.	54	24	13	16	9	6	7	12	4	6	1185
Both	56	23	15	12	9	6	6	4	6	3	4368
Time dep.	58	24	16	12	9	7	6	10	4	1	4318
Missing	56	14	11	12	8	7	6	4	0	0	355

Annex B: Four case studies on the formation of prices

Firm A is a medium-sized manufacturer of special purpose machinery, producing 15 to 20 machines every year. Its main market is East Asia and its export-share is 80 per cent. Thus, it sells every year three or four machines in Germany on average. It has between five and 20 competitors. It decides in every single case about the price. Every January it updates its supply price by taking the most recent sales price of the respective machine as a base and adding the actual cost development since then. On top of that, it adds expected costs. The firm explained the price review in January by the large number of different inputs and their relatively low variations, so that in the aggregate updating the supply price more often would be too costly. However, in the event of larger fluctuations or a larger positive trend in costs it would update its supply price more frequently. This may happen, for example, if the steel price increases even more. The firm builds its expectations using all internal and external information available in January. At that time it has balanced it books and knows the overhead costs. The main external source for information is the VDMA, the employers' federation to which the firm belongs. If the actual price development differs substantially from that which is expected, the firm updates its supply price during the year. Time for construction amounts to up to one year. During negotiations with customers that are ongoing for several months the firm gets an impression of the price of its main competitors. The interview partner said that it is nowadays common for customers to ask three different firms for a tender. Obviously, in the past that was not the case. Delivery time takes up to 12 months.

Firm B is another medium-sized manufacturer of special purpose machinery. Its main market is the United States. It regrets that it knows no sales representatives for the euro area. Its price is slightly higher on foreign markets than at home, since on foreign markets it needs sales representatives, whereas, on the domestic market, the company itself conducts the negotiations. Last year, it sold just one machine in Germany. Normally, it sells at least one machine per month to customers in Germany. It has between five and 20 competitors and it decides each price on a case-by-case basis. Like firm A, it takes the most recent sales price of the respective machine as a base and adds the actual cost development since then. However, it does not perform the calculation in

January but every time a new contract is negotiated for comparable machines. Obviously, the machines are quite different. The share of sales that results with customers with a long-term relationship is 45 per cent. New tenders depend on the price of the last contract. If necessary, the firm offers discounts to regular customers to maintain the relationship.

Firm C is a manufacturer of parts for cars. It has less than five competitors and 99 per cent of sales take place on a regular basis. Prices are closely related to the product life cycle of the car. With each new model of a car, a new model of the specific part is developed. There is a skeleton agreement that does not specify the price explicitly but that can be seen as an implicit contract for about four to five years. The price is calculated for three different lot sizes. The product innovation allows firm C to charge a high mark-up at the beginning. Every following year there are new negotiations with the car manufacturer. Since the competitors have already started to improve their products, too, and the car producer threatens to change the supplier the profit margin for firm C decreases. Yet, the profit margin is quite volatile and there is no correlation with the business cycle since the situation differs from year to year and from product line to product line. Eighty per cent of sales are regulated by written contracts. The price is always valid for one year from January onwards even if the agreement is not reached before April. The sales price does not depend on the region but on the car manufacturer. There is one customer that applies some kind of price indexation. He informs firm C every six month of the amount by which the price should change owing to changes in the price of aluminium. Firm C always accepts. The contract contains a provision that allows adjustment of prices if costs change a lot. It is possible to adjust them, too, if the lot size is significantly smaller than in the skeleton agreement specified.

Firm D is a manufacturer of chemical products for construction. It has the second biggest market share in Germany. Labour amounts to 15 per cent of costs and materials - mainly oil – for another 70 per cent. Its business shows a strong seasonality and during winter no production takes place at all. The firm then renews its machines instead. The market is declining. Its own supplies of material come from a monopolist. Firm D compares its actual price on a monthly basis with a price index for raw materials. If both diverge, it recalculates its list prices. Prices are always decreasing.

Firms A, B and D stated that capacity utilization is crucial for their price setting. For firms A and B the main problem is the personnel. To reduce this dependence they try to outsource as much as possible or move production to low-cost countries. If firms should raise their price, they try to force their suppliers to reduce their prices.

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