

Price Setting in Austria before and after the Euro Cash Changeover: Has Anything Changed in the Last Five Years?

This study addresses the question of whether the price adjustment process in Austria has changed since the changeover to euro notes and coins at the beginning of 2002. For this purpose, we analyze the frequency and size of price adjustments, sectoral and seasonal differences as well as the structure of prices (notably the share of attractive prices) on the basis of micro price observations underlying the Austrian Consumer Price Index (CPI). A data set spanning the period from 1996 to mid-2006 was used for the analysis. In addition to confirming known results from previous studies – i.e. that price adjustments occur roughly once per year on average, but with strong sectoral differences – our study reveals an unchanged seasonal pattern of price adjustments, with major peaks in January, also after the cash changeover.

At the time of the changeover itself, the observed price changes were more frequent but smaller than usual. As upward and downward price adjustments were also roughly balanced, the cash changeover appears to have had no significant overall inflationary effects, confirming previous studies.

The share of attractive prices (i.e. prices ending in 9 or 90, and even prices), which was over 60% before the cash changeover, plummeted to just over 20% in early 2002. In the course of the ensuing three to four years, however, this share again approached the level observed prior to the transition. From these results we conclude that price-setting habits as well as the structure of Austrian consumer prices has not changed significantly since the cash changeover.

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1 Introduction

In recent years, a number of central banks in the euro area – including the Oesterreichische Nationalbank (OeNB) – have increasingly examined price setting at the micro level, that is, using large data sets on individual prices. In each country, those studies have yielded empirical insights on the price adjustment process in general and on the extent of and reasons for price rigidities in particular.¹ These insights are of great importance to central banks, as the extent of price rigidities determines the strength with which monetary policy affects the real economy, among other things. Due to the lack of more re-

cent data, those studies usually did not focus on the euro cash changeover and the period thereafter. Therefore, this study takes a closer look at that period.

The launch of euro notes and coins in January 2002 changed the reference points against which businesses set their prices and against which consumers compare prices. According to economic theory, after a certain transition period such a change in the numeraire should not have any effects on the price-setting process.

According to an earlier study by the OeNB on price setting in Austria, the euro cash changeover brought about a temporary increase in the fre-

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¹ For a summary of the results of those studies, see Dhyne et al. (2006).

quency of price adjustments.² However, the data set of micro prices used in that study ended in 2003. In this study, we investigate price setting in Austria after the euro cash changeover more closely, using the same data set but extended to mid-2006. In this context, we address the issue of whether the extent and determining factors of price rigidities changed after the launch of euro banknotes and coins – an issue which is certainly relevant to monetary policy.

Specifically, this study examines whether the stylized facts on price-setting in Austria derived from the previous study are still valid, or whether new empirical regularities can be detected. For this purpose, the variables used to characterize the price adjustment process (frequency of price changes, duration of price spells, average size of price changes) are depicted over time.

The euro cash changeover also had an impact on the structure of prices in Austria. We know from previous studies that a large share of prices in the Austrian retail industry is set as attractive prices (psychological, even or fractional prices).³ Upon exact conversion into euro, however, these pricing effects were lost, meaning that a large number of euro prices did not appear “attractive” immediately after the changeover. The second part of our analysis is devoted to the question of whether the price structure prevailing before the changeover has been restored in the last five years, or whether attractive prices

have come to play a less important role after the cash changeover. This question is also interesting from an economic policy perspective, as attractive prices are regarded as a reason for price rigidities.⁴

This study is structured as follows: Chapter 2 summarizes the most important facts on micro-level price setting in Austria from a previous OeNB study. In chapter 3, we use the extended data set to examine price setting in Austria since the euro cash changeover more closely and to establish whether or not the regularities identified in earlier studies have changed over time. Chapter 4 provides an analysis of the new price structure in euro and a comparison of the price structures before and after the cash changeover in Austria. Finally, in chapter 5 we summarize the most important results and draw some conclusions from the evidence compiled.

2 Stylized Facts on Price Setting in Austria: Evidence from Individual Price Data

This analysis is based on monthly prices recorded for nearly all of the goods and services included in the Austrian CPI basket.⁵ The data set used was made available to the OeNB by Statistics Austria for an earlier research project and contains a total of 3.6 million prices recorded for some 700 products in the period from January 1996 to December 2003.⁶ For each price recorded in the data set for a specific product in a given month,

² Kwapil and Rumler (2005), Baumgartner et al. (2005).

³ Fluch and Stix (2005).

⁴ Baumgartner et al. (2005) and Dhyne et al. (2006).

⁵ Several products, such as cigarettes, daily newspapers and automobiles, were excluded from the data set by Statistics Austria for reasons of confidentiality. In total, the available products covered 90% of the overall CPI basket.

⁶ For further information on the data set, please refer to Baumgartner et al. (2005).

Table 1

Average Frequency and Size of Price Changes

	Frequency of price changes	Average duration of price spells	Frequency of price increases	Frequency of price decreases	Average price increase	Average price decrease
	per month in %	months	per month in %	per month in %	%	%
Main CPI components						
Unprocessed food	24.1	7.5	12.6	11.1	19.6	22.0
Processed food	12.8	7.9	6.8	5.8	14.8	16.1
Energy	40.1	4.8	20.7	19.3	5.1	4.4
Industrial goods (excluding energy)	10.2	11.5	5.4	4.3	13.2	18.6
Services	12.3	18.5	7.5	4.6	8.4	9.3
<i>Market-based services</i>	16.9	15.5	10.0	6.7	7.7	10.1
<i>Services subject to regulation</i>	5.2	22.2	3.6	1.5	9.4	7.8
Total	15.0	11.3	8.2	6.4	11.4	14.1

Source: OeNB, Statistics Austria.

Note: Observation period = January 1996–December 2003.

additional information on the outlet (in anonymized form), the product's characteristics and the unit (number or weight) is also available. Using this information, it is possible to observe the frequency and size of price changes for a specific product (e.g. a certain brand of bananas at a certain shop) over time. The most important results of our analysis are presented below.

2.1 On Average 15% of All Prices Are Adjusted Each Month

The average frequency of price changes (i.e. the average share of price changes per month for a product over the observation period) is used as a measure to describe the price adjustment process. In order to analyze the frequency of price changes in the various sectors of the Austrian economy, we summarize the frequency of price changes for individual products at the level of the five main CPI components defined by the European Central Bank (ECB)⁷ as well as at the aggregate CPI level (table 1).

The last line in table 1 reveals that across all products an average of 15% of all prices are changed each month, which implies that consumer prices in Austria are adjusted every 11 months on average. This frequency of price changes places Austria in the middle range compared with other euro area countries.⁸

2.2 Strong Sectoral Differences in Price Adjustment Frequency

As table 1 also shows, the average frequency of price changes is relatively high in the case of unprocessed food (24%) and energy (40%). This can be explained by the strong influence of supply factors on the prices of these goods, for example due to seasonal fluctuations in the prices of fresh foods or the dependency of energy prices on the volatility of international oil markets. In contrast, the prices of industrial goods and services are adjusted relatively infrequently on average (with price adjustment frequencies of 10% and 12%, respectively). In the case of services, mainly

⁷ *Unprocessed food, processed food, industrial goods (excluding energy), energy, and services.*

⁸ *Cf. Dhyne et al. (2006).*

services subject to price regulation (5%), such as local and regional governments' taxes and fees included in the basket, contribute to this low frequency of price adjustments, while the services traded on markets (e.g. services in the leisure industry and the hotel/restaurant industry) show far more flexible prices with an adjustment frequency of 17%.⁹

2.3 45% of All Price Changes are Decreases

If we examine price increases and decreases separately, it becomes clear that, at the aggregate CPI level, prices were increased (8.2%) somewhat more often on average than they were decreased (6.4%; see table 1). Therefore, 45% of all price changes are reductions, which contradicts the common misconception that prices are generally adjusted upward and hardly ever move downward. The exception to this pattern is the services component (especially services subject to price regulation), where price increases (7.5%) were substantially more common than decreases (4.6%).

2.4 Average Size of Price Changes Exceeds 10%

The last two columns of table 1 show that the size of the observed price changes can be substantial in comparison to the rate of inflation, and that price decreases are somewhat larger than increases: The average size of all price increases came to 11.4%, while price decreases amounted to 14.1% on average. This asymmetry can be explained mainly by the fact that a

large number of price decreases are price cuts in the context of special offers and clearance sales, which are usually more pronounced than regular price decreases.

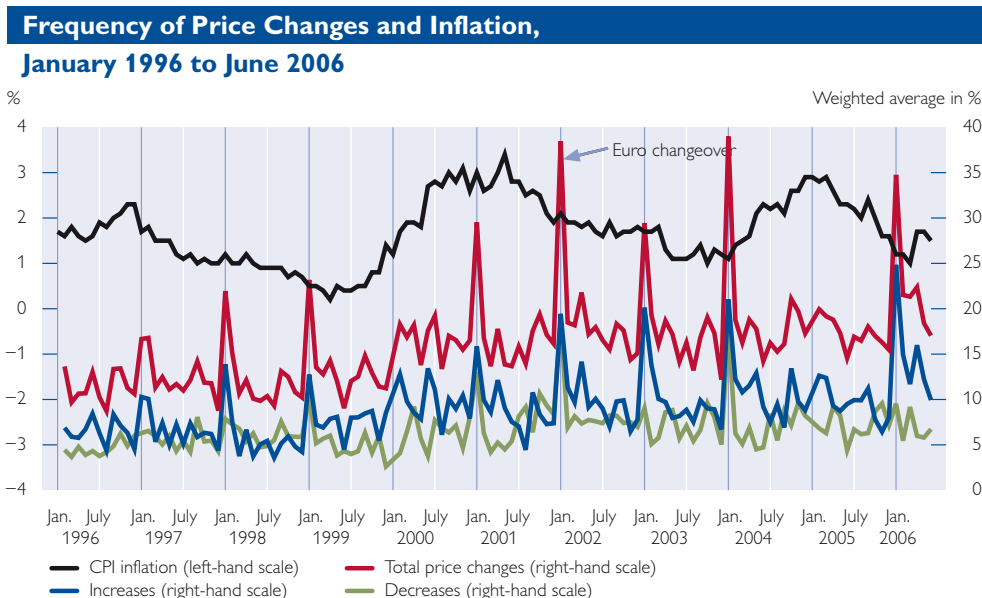
2.5 Pronounced Seasonal Pattern in Frequency and Size of Price Changes

Chart 1 shows the frequency of price changes for each individual month and reveals a clear seasonal pattern with annual peaks each January. This provides an indication that many companies adjust their prices at the turn of the year. Regarding the trend development, chart 1 moreover reveals that the frequency of price changes began increasing in 2000, which (at least graphically) coincides with the rise in the aggregate rate of inflation that year. Moreover, the two lower lines in chart 1 show that price increases and decreases demonstrate roughly similar seasonal patterns (with peaks in January) as well as the same trend development – also with an increase in 2000.

Chart 2 illustrates the average size of all price changes for each individual month, both in absolute terms of overall price changes and separately for price increases and decreases. Here it becomes visible that the size of price changes also shows seasonal fluctuations. If we consider price increases and decreases separately, it becomes clear that the peaks can be attributed to especially large price reductions in July and in part also in August. This mainly reflects the substantial price reductions in the clothing sector during the summer sales.

⁹ A comparison of the price adjustment frequencies in the first column of table 1 with the average price spells derived from those frequencies in the second column reveals a high degree of heterogeneity, even among individual products within each component. For example, the far longer average price spells for services (18 months) compared to industrial goods excluding energy (13 months) – despite their similar average frequencies – can be attributed to several products with extremely long price durations within the services component.

Chart 1



Source: OeNB, Statistics Austria.

A similar effect can be observed in January during the winter sales. However, as price increases are below average each January, the winter sales do not have as strong an effect on the (red) line depicting the overall size of price changes.

3 Price Setting after the Euro Cash Changeover: Empirical Regularities over Time

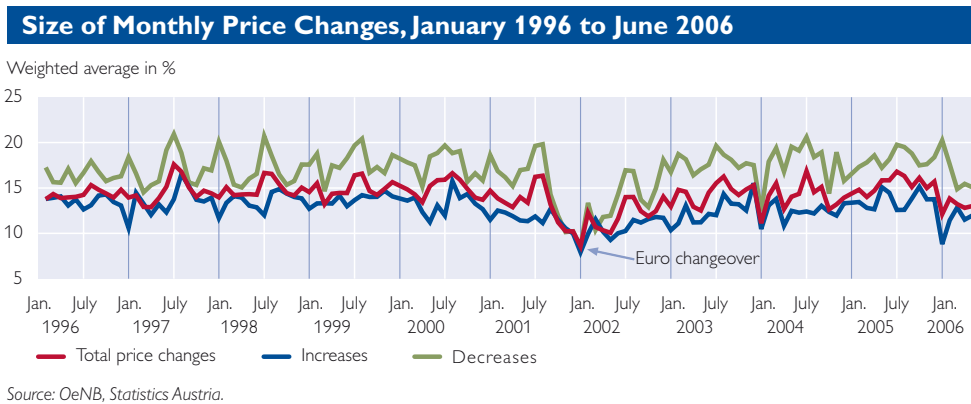
The data set used in the previous study (1996 to 2003) did include the time of the changeover to euro cash, but the period was too short for an in-depth assessment of whether the empirical characteristics of price setting (i.e. frequency and size of price changes, seasonal patterns) differed before and after the changeover. For this reason, the old data set was updated by acquiring also the monthly price data for the Austrian CPI for the

period from January 2004 to June 2006 from Statistics Austria. Given that the new data set contains exactly the same information (prices, quantities, outlet codes, etc.) as the previous set, the former can be merged smoothly with the latter.

Chart 1 shows the average frequency of price changes per month for all of the products included in the CPI for the extended data set, which spans the period from January 1996 to June 2006. Chart 2 shows the average size of all price changes and for price increases and decreases separately, likewise based on the extended data set. In both charts, the depiction until the end of 2003 is based on calculations from the old data set; after that point, the calculations are based on the new data.¹⁰ Based on the two charts, we can now examine the characteristics of price setting during the cash changeover

¹⁰ The weights used in the calculation of weighted averages are the CPI weights applicable to the respective baskets of goods and services. Specifically, this means that the weights differ slightly between the periods 1996 to 1999, 2000 to 2005, and 2006 but remain constant within those periods.

Chart 2



period and also compare these characteristics in the periods before and after the changeover.

3.1 More Frequent but Smaller Price Changes during the Euro Cash Changeover

In January 2002, a sharp increase in the monthly frequency of price changes to nearly 40% can be observed, which was also more pronounced than in the first month of each previous year (chart 1).¹¹ It is therefore clear that the introduction of euro cash brought about more price adjustments than usual. Yet the fact that 40% of all prices in the data set in question were adjusted at the time of the changeover also means that approximately 60% of all prices were converted exactly into the new currency.

In addition, an interesting question in this context is whether prices were predominantly increased at that time, which would have exerted upward inflationary pressure. Chart 1 shows that the price changes from December 2001 to January 2002 are almost exactly half increases (blue

line) and half decreases (green line), thus balancing each other out in terms of inflationary effects. In the months immediately after the cash changeover, we can observe a majority of price increases, but this does not differ substantially from the seasonal patterns observed in other years (like the first halves of 2001 and 2004); thus it cannot be attributed to the cash changeover.

Another striking development can be observed in the size of price changes (chart 2) during the cash changeover: Roughly from mid-2001 onward, the average size of price changes dropped noticeably (for price increases and decreases alike), bottoming out at below 10% in January 2002 and only returning to its previous levels toward the end of 2002. This indicates that the cash changeover had an influence on price setting in Austria not only in January 2002 but also in the six months before and after the conversion. In that period, consumer prices were adjusted more often but to a smaller extent than usual. This can probably be attributed to the price monitoring by the Euro

¹¹ Due to two changes in the composition of the basket (each at the beginning of 2000 and 2005) and the resulting changes in definitions for many products, all price changes from January 2000 and January 2005 have been excluded from the analysis, thus they are not reflected in charts 1 and 2; see Baumgartner et al. (2005).

Price Commission before, during and after the cash changeover. In light of these strict monitoring measures, the handling of complaints and the possibility of initiating proceedings against unjustified price hikes by this commission – in combination with the monitoring activities of other institutions, such as the Austrian Chamber of Labor – the majority of price setters appear to have refrained from drastic price increases in the course of the cash changeover.¹²

In addition, it appears that prices were increased and decreased by roughly the same average extent during the changeover period. This confirms the findings of previous OeNB studies, which also concluded that the euro cash changeover had had no noticeable effect on the inflation rate in Austria,¹³ also on the basis of micro CPI data.

3.2 More Frequent Price Adjustments after the Euro Changeover than before

If we look at the pattern in the monthly frequency of price adjustments in chart 1, then no conspicuous differences can be detected between the period immediately preceding the cash changeover (2000 to 2001) and the ensuing period (2002 to 2006): The frequency fluctuates – with few exceptions, notably in January – between 13% and 20%, and no clear trend can be recognized over that period.

However, a trend shift is certainly visible in the average frequency of price adjustments from 2000 onward: For this period, the frequency of price adjustments was an average of 5 percentage points higher than the values observed before 2000 (see also table 2 for a breakdown by period and main CPI components). What caused this trend shift in the year 2000? First, as mentioned above, it could be linked to the increase in the inflation rate in 2000 and the higher values recorded since that time, as the inflation rate is roughly the product of the frequency and size of price adjustments. If the size of price adjustments remained fairly stable over time (as is visible in chart 2), an increasing rate of inflation (given constant weights) can only be explained by an increase in the frequency of price adjustments.

Moreover, a number of liberalization and deregulation measures in the network industries were taken around the year 2000, and those measures probably affected the frequency of price adjustments as well. In 1998, the market for telecommunications services in Austria was completely liberalized, and in 2001 the Austrian electricity market was opened up to private vendors, as was the natural gas market in the following year.¹⁴ The new competition structure on these markets brought about more frequent price adjustments on the part of new providers as well as the former monopolists. One example in

¹² This commission, which was set up at the Austrian Federal Ministry of Economics and Labor, closely monitored the pricing policies of businesses while the Euro-Related Pricing Act (EWAG; Federal Law Gazette I No. 110/1999) was in effect (from 2000 to the end of 2002). In addition to the requirement of dual pricing, the Act also prohibited unjustified price increases in the wake of the cash changeover on pain of substantial administrative penalties.

¹³ Fluch and Rumler (2005), Kwopil and Rumler (2005).

¹⁴ Fluch and Rumler (2005).

Table 2

Average Frequency of Price Changes for Various Observation Periods ¹					
Per month in %	Before the cash changeover	After the cash changeover	Old basket of goods and services	New basket of goods and services	Overall period
	January 1996 to December 2001	January 2002 to June 2006	January 1996 to December 1999	January 2000 to June 2006	January 1996 to June 2006
Main CPI components					
Unprocessed food	22.0	28.9	20.4	28.1	25.0
Processed food	12.3	14.4	11.2	14.6	13.2
Energy	38.8	47.4	35.6	47.8	42.2
Industrial goods (excluding energy)	9.2	12.1	8.5	11.8	10.6
Services	10.9	15.9	9.3	15.7	13.4
Market-based services	15.0	22.3	12.6	22.0	18.4
Services subject to regulation	4.7	5.5	4.1	5.9	5.4
Total	13.8	18.2	12.4	18.0	15.8

Source: OeNB, Statistics Austria.

¹ In the calculations for observation periods ending in June 2006, the month of January and its frequent price changes are represented above average. This could imply that the frequency of price changes is biased slightly upward compared to the other observation periods, which only include full years. However, this bias is likely to be rather small, as an alternative calculation for the period from the cash changeover to the end of 2005 only yields a slightly lower price adjustment frequency (17.8%) than the period ending in mid-2006 (18.2%).

this context is the COICOP¹⁵ group “communication”: On average over the period from 1996 to 1999, 5.8% of all prices in this group were adjusted each month, while the corresponding figure for 2000 to 2006 was roughly twice as high at 11.5%. As the frequency of price reductions (8.2%) was far larger than that of price increases (2.9%) after the year 2000, the liberalization in the communications sector had a dampening effect on overall inflation. A similar but not quite as pronounced pattern can be observed in the “energy” component before and after the year 2000 (table 2).

Finally, there is one more explanatory factor for the trend shift in the frequency of price adjustments in 2000: Starting that year, the inflation rate was calculated on the basis of a new basket of goods and services using a new weighting scheme and including several new products. In addition, according to Statistics Aus-

tria the introduction of the new basket was accompanied by innovations in data collection, which may have had an impact on the frequency of price adjustments as well: The number of outlets and the number of prices surveyed were increased; more supermarkets – probably with more flexible price setting – and fewer corner shops were surveyed to account for changes in consumption habits; and the quality of price surveys and statistics was generally improved. If these measures had a significant impact on the data collected, then the increase in price adjustment frequency would at least in part be a statistical artifact due to the transition to the new CPI basket. Therefore, it may be possible to attribute the increase in 2000 to partly economic and partly statistical factors.

The seasonal patterns in price adjustments, especially the conspicuous peaks each January, did not change after the euro cash changeover; after

¹⁵ Classification Of Individual Consumption According to Purpose; this is an international classification of CPI components in 12 subgroups according to the purpose of consumption.

2002, the peaks in January were even more pronounced than before (chart 1). The values for January 2004 and January 2006 are especially remarkable, as they are nearly as high as the value recorded during the changeover in January 2002. This, indeed, qualifies the earlier statement that the euro cash changeover led to an unprecedented increase in price adjustments.¹⁶ Based on the new data set, therefore, we conclude that in recent years the phenomenon of price adjustments occurring predominantly at the start of the year has increased independently of the euro cash changeover.

However, the changeover period remains unique in terms of the average size of price changes: Chart 2 shows that the substantial drop during the time around the changeover (as mentioned in chapter 3.1) was only temporary. In the course of 2003, the size of price adjustments returned to its previously recorded level of approximately 15% and has fluctuated around that mark ever since. Therefore, the euro cash changeover influenced price setting in Austria for approximately one-and-a-half years, specifically from mid-2001 to early 2003. Unusual but short declines in the extent of price adjustments were again observed in January 2004 and in January 2006; this is linked to the aforementioned phenomenon of price adjustments occurring more frequently in January but by smaller amounts.¹⁷

4 Price Structure before and after the Euro Cash Changeover

Attractive pricing plays an important role in the Austrian retail sector. These prices have a signaling effect, are intended to encourage impulse purchases, and provide consumers with a point of reference in the structure of prices.¹⁸ The most common form of attractive pricing is known as psychological pricing, that is, using prices which end in 9 (or 90). These prices are intended to give the impression that a product is priced especially reasonably, as consumers tend to ignore the digits after the decimal point or the final digits in multi-digit prices.¹⁹ Other commonly used attractive prices are even prices (multiples of 10 or 100) and what are known as fractional prices (prices ending in 25, 50 or 75). A previous OeNB study²⁰ revealed that approximately 90% of all prices in retail food shops were psychological or even prices before the cash changeover. In contrast, attractive prices play a less important role in the energy sector and in services. The data set used in this study now allows us to analyze the incidence of attractive prices using a broad basis of some 40,000 prices recorded each month over an observation period of approximately ten years. In particular, we will scrutinize the price structures before and after the euro cash changeover.

¹⁶ However, the frequency of price decreases (green line in chart 1) in January 2002 was still not exceeded by the values for January in any other year.

¹⁷ As mentioned earlier, the values for January 2000 and January 2005 were excluded from the analysis due to the transition to new baskets of goods and services.

¹⁸ Fluch and Stix (2005).

¹⁹ This psychological phenomenon is referred to as „rational inattention“ in the literature and has been analyzed by authors such as Basu (1997) and Bergen et al. (2006).

²⁰ Fluch and Stix (2005).

4.1 Definition of Attractive Prices

For our examination of the price structure and the incidence of attractive prices in Austria, it is necessary to provide a precise definition of this term. There is no generally accepted definition of attractive prices, as they often depend on specific pricing conventions on each market as well as the relevant currency units. Therefore, we have chosen a pragmatic solution for the purposes of this study: All prices which are frequently used by price setters to make their products appear attractively priced are qualified as such. Given the currency changeover in 2002, it is necessary to develop two definitions of attractive prices – one for prices in schillings and another for prices in euro. In addition, it is important to note that different price patterns are used for attractive pricing in different price categories. For example, we would consider ATS 9.90 to be an attractive price, while ATS 1,023.90 would probably not qualify. This means that attractive prices should be defined differently in each price category in order to ensure that the percentage interval between two attractive prices remains constant. Specifically, in the category up to ATS 10, all prices in the sample which end in x.00, x.50 and x.90 are defined as attractive prices for the schilling era. In the price category from ATS 10 to ATS 100, this applies to all prices which end in x0.00, x5.00 and xx.90; and in the category from ATS 100 to ATS

1,000, attractive prices are all those which end in xx0.00, xx5.00, xx9.00 and xxx.90. Above that category, the corresponding multiples of those prices are considered attractive. For prices in euro, an equivalent definition was used, but the categories were reduced in size by a factor of 10.

This definition comprises all psychological and even prices up to the higher price categories, but only those fractional prices which end in 50 – i. e. not prices ending in 25 and 75, as the latter are not typically used as attractive prices on the Austrian retail market. The subjective content of our definition is therefore evident; the definition should be regarded as an “upper limit” for the number of attractive prices actually intended as such by the sellers. We consider the disadvantage that too many prices might be classified as attractive in this way to be less problematic than omitting important attractive prices.²¹

4.2 Temporary Collapse in the Share of Attractive Prices after Euro Cash Changeover, Large Differences between Goods Groups

Using the definition discussed above, we computed the share of attractive prices among all prices for all goods over all months. The figures shown in table 3 and chart 3 are unweighted averages for the main CPI components.²² The figures confirm the findings of previous studies, which were based on a smaller data set and re-

²¹ For a sensitivity analysis, the investigation was also carried out using an alternative, somewhat narrower definition of attractive prices which excluded prices ending in xx5.00 and in xxx.90 above the ATS 100 level. The results with regard to the share of attractive prices in various goods groups (table 3) and over time (chart 3) do not change in qualitative terms; only the level of these figures is on average 7 percentage points lower.

²² In this case, weighting in the aggregation would have a distorting effect, as mainly services (which bear relatively few attractive prices) are assigned a higher weight in the basket, which would bias the results downward. The mere addition of the attractive prices recorded across all goods would also distort the results in favor of locally surveyed products (with many recorded prices) compared to centrally surveyed products and services. For further information on the problem of central versus local collection of prices, please refer to Baumgartner et al. (2005).

Table 3

Share of Attractive Prices before and after the Euro Cash Changeover

Unweighted average in %

	Before the cash changeover January 1996 to December 2001	After the cash changeover January 2002 to June 2006
Main CPI components		
Unprocessed food	85.7	68.8
Processed food	88.5	66.7
Energy	18.1	25.9
Industrial goods (excluding energy)	60.7	55.9
Services	51.1	40.1
Total	62.7	52.5

Source: OeNB, Statistics Austria.

vealed that the relative share of attractive prices was highest in the food sector and lowest in the energy and service sectors. On average, more than 85% of all schilling prices for processed and unprocessed food in this sample were attractive prices (1996 to 2001). In the case of industrial goods (excluding energy), the share was only 60%, for services approximately 50%, and in the energy sector only 18%.

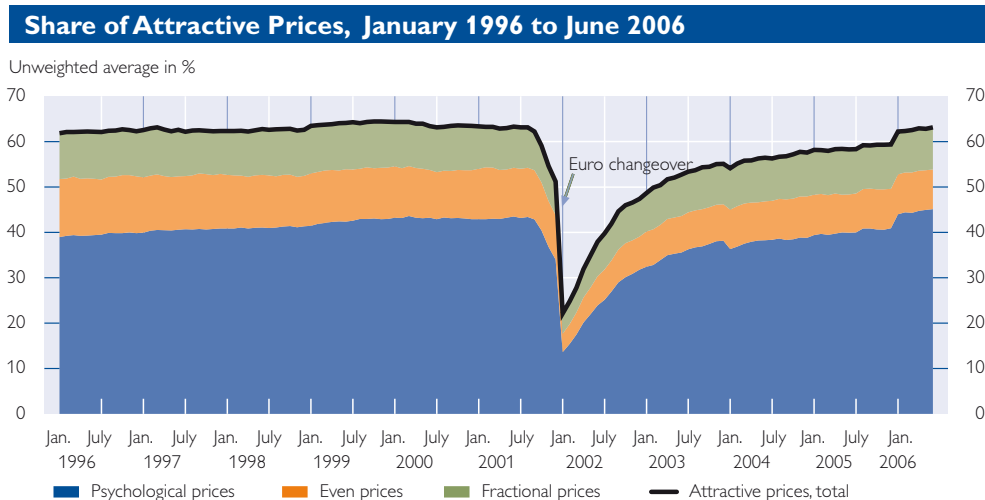
In the period after the changeover, the shares of attractive prices were substantially lower for most CPI components, which indicates that the changeover had a substantial impact on the structure of Austrian consumer prices. The exception to this pattern is the energy sector, where the share of attractive prices rose to some 26% after the changeover. In addition to other factors, this might be attributed to the liberalization measures on the Austrian electricity and natural gas markets in 2001 and 2002, which apparently led to the increased use of attractive prices in that sector. Overall, the results give the impression that attractive prices play a less important role in euro than they did in schillings. The question of whether this represents a permanent change in the Austrian retail price

structure or merely came about in the transition phase can be answered looking at the shares of attractive prices over time as depicted in chart 3.

For each month from the beginning of 1996 until the end of 2006, chart 3 shows the share of attractive prices broken down into psychological, even and fractional prices. Here it becomes visible that psychological prices account for the largest proportion of attractive prices (blue area; approximately 40% of all prices on average, or two thirds of the attractive prices), followed by even prices (orange area; 17% of attractive prices) and fractional prices ending in 5 or 50 (green area; 16% of attractive prices). These relative shares have also hardly changed over time, with only the share of psychological prices increasing slightly at the expense of even prices.

The overall share of attractive prices remained fairly constant between 62% and 64% from January 1996 to Q3 2001. Starting in October 2001, this figure dropped sharply, reaching a low of 22% in the changeover month of January 2002. Over the year 2002, the share of attractive prices recovered, already reaching 40% by mid-year and nearly 50% by

Chart 3



Source: OeNB, Statistics Austria.

the end of 2002. In 2004 and 2005, the share of attractive prices slowly approached the 60% mark once again. However, it was not until early 2006 that the share of attractive prices returned to the approximate level recorded before the euro cash changeover (about 62%).

This development clearly reflects the conversion of prices during the euro changeover. Due to the changeover, attractive prices in schillings were lost when converted exactly into euro. The Euro-Related Pricing Act required Austrian businesses to indicate prices in schillings as well as euro from October 2001 to the end of February 2002. Some stores obviously began to price products in line with the future euro framework already in October 2001, as the share of attractive schilling prices began to decrease in that month. At the same time, the share of prices which were set attractively in euro terms (not shown in chart 3) rose considerably in the months leading up to the changeover. However, most businesses continued to base their pricing on the schilling framework well into the first months of 2002. This is con-

firmed by the relatively large share of prices which remained unchanged between December 2001 and January 2002 (60%; see chart 1). All prices that had been attractive in December 2001 but were not changed in January 2002 were not attractive any longer in euro. Many retailers evidently did not adjust their prices to the euro framework until later in 2002, as is reflected by the substantial increase in the share of attractive euro coupled with the sharp decrease in the share of prices which would have been attractive in schilling terms in the months after the cash changeover. The analysis in chapter 3 demonstrated that – contrary to popular conjecture – prices were not predominantly rounded up in the course of conversion, but that upward and downward price adjustments roughly balanced each other out.

Until the end of 2005, the use of attractive prices was still less common than it had been before the changeover. Only in early 2006 did attractive prices once again play a similar role in Austria's price structure as in the years prior to the changeover. The price structure there-

fore did not undergo any lasting changes due to the currency conversion. Ultimately, the price setting conventions specific to the Austrian consumer market appear to have resurfaced, albeit after a relatively long transition period.

A study conducted by the Deutsche Bundesbank also indicates comparable figures for the share of attractive prices in Germany before and after the euro changeover. In its monthly report for January 2004, the Deutsche Bundesbank reported that the share of attractive prices for a selection of 25 products had fallen from 80% in September 2001 to around 40% in January 2002 and then risen again to some 70% by September 2003.²³ Therefore, the price structure prevailing in Germany before the changeover had not yet been restored two years after the transition.

5 Summary and Conclusions

An analysis of CPI micro data for the period from 1996 to 2003 indicates that consumer prices in Austria are adjusted approximately once per year on average, and that significant sectoral differences exist in this regard. The prices of food and energy products are changed relatively often, while prices for services are adjusted less frequently. Except in the service sector, some 45% of all price changes are reductions, meaning that prices are not increased substantially more often than they are decreased. At more than 10%, the average size of price adjustments is considerable for both increases and decreases.

Using micro data, it is also possible to examine a question which has been discussed extensively in the media: whether the changeover to euro cash has brought about inflationary effects in Austria. Like other studies on this topic, this study does not identify any effect on the aggregate rate of inflation, at least not for the changeover month of January 2002. The frequency of price adjustments did increase during the changeover period, but the upward and downward adjustments were roughly balanced. The size of price changes likewise showed a high degree of symmetry between price increases and decreases in January 2002. However, these results refer to the aggregate, which therefore does not rule out the possibility that specific products may have seen unusual price increases.

Overall, the available calculations indicate that the legal (Euro-Related Pricing Act) and institutional (Euro Price Commission) measures to prevent unjustified price hikes during the changeover period were successful, thereby preventing any noticeable euro price effects such as those witnessed in other countries.²⁴

An analysis of the extended data set, which includes prices up to mid-2006, shows that seasonal patterns in price adjustment frequency and in the size of price changes have hardly changed since the changeover, but that the frequency of price changes has increased over time. More precisely, the frequency of price adjustments already began climbing in the year 2000. This coincided with the

²³ In light of the limited quantity of data (25 products) on which the Deutsche Bundesbank's study is based, any direct comparison of the share of attractive prices with the results of this study (641 products) would not be very meaningful; see also Deutsche Bundesbank (2002).

²⁴ Ercolani and Dutta (2006).

increase in the aggregate rate of inflation and (roughly) with the liberalization measures in network industries (telecommunications, electricity and natural gas).

In addition to the economic reasons mentioned above, a statistical effect probably also contributed to the increase in the frequency of price adjustments. In 2000, a new basket of goods and services was introduced for the Austrian CPI, and Statistics Austria also made several improvements to its price surveys. These measures were intended to minimize missing and erroneous survey data, which often cause prices to appear unchanged in the statistics, and to reflect the structural changes in Austria's consumer markets (more supermarkets, fewer corner shops). It is possible that these improvements in data collection are reflected in these calculations as a rising price adjustment frequency over time.

The price structure in Austria was also influenced by the euro changeover. Before the conversion, the Austrian retail market (and to a lesser extent the services market) was characterized by a large share of attractive prices. However, those prices lost their signaling effect when converted precisely at $ATS\ 13.7603 = EUR\ 1$. After the changeover, this was reflected in a temporary collapse in the share of attractive prices among all the prices included in the data set. In the ensuing months, especially after the dual pricing requirement lapsed in February 2002, the share of attractive prices gradually recovered. This indicates that after a certain transi-

tion period, the structure of euro prices largely returned to the price structure observed prior to the changeover. Therefore, the use of attractive prices in the Austrian retail sector has regained the considerable importance it enjoyed before the changeover.

If we assume that attractive prices have a signaling effect and provide consumers with a point of reference in the price structure, a different structure involving less attractive prices will confront consumers temporarily with higher costs – in the form of search costs. In this respect, it was advantageous that dual pricing was only required for a relatively short period of time after the changeover, as this enabled the structure of euro prices to consolidate quickly and thus offered consumers a better frame of reference for their purchasing decisions.

The question of the incidence of attractive prices is also relevant from a monetary policy perspective, as a number of country studies on price setting in euro area countries have identified attractive prices as a factor inducing price rigidities.²⁵ Accordingly, it appears to make sense for many firms to avoid small price changes and to delay price adjustments in order to set new prices at a more attractive level later. This delayed price adjustment can manifest itself at the macro level as increased inflation persistence. The extent of inflation persistence in turn determines the speed at which an economy adjusts to various macroeconomic shocks and is also partly

²⁵ *Dhyne et al. (2006)*.

responsible for the transmission of monetary policy to the real economy.

As any change in the price setting process exerts considerable influence on the transmission of monetary policy, the OeNB will continue to

examine questions on the frequency and size of price adjustments and on the structure of prices. In this context, new data sources which are also based on individual prices (such as producer prices or import prices) should be included in the analysis.²⁶

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²⁶ For example, Lünemann and Wintr (2006) examine the frequency of price changes on the Internet and observe that Internet prices – at least in euro area countries – are more flexible than prices in retail shops. The distribution channel can thus also have an influence on the flexibility of prices.