Determinants of Price Comparison and Supplier Switching Rates in Selected Sectors

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This study looks into the factors determining price comparisons and supplier switching as revealed by a representative survey of Austrian consumers. Price comparisons and supplier switching can be interpreted as a measure of the competitive pressure that consumers exert on enterprises. Thereby, they influence the intensity of competition in an industry, which in its turn, curbs inflation and boosts growth.

The fundamental driver of switching is the comparison of prices. Those who compare prices not only consider price comparisons but also switching less cumbersome and, hence, switch suppliers more frequently. To a certain extent, search as well as switching costs are perceived to be higher than they actually are, i.e. persons inexperienced in searching and switching suppliers overestimate the difficulties involved.

Price comparison behavior is determined by educational attainment (education levels above apprenticeships), gender and (urban or rural) residence. While Internet use is limited for price comparisons, it reduces the efforts required for comparing prices and switching suppliers to a highly significant extent in all sectors. Moreover, search and switching costs play a major role in explaining sectoral differences in price comparison behavior. Therefore, competition intensity could be increased through education reforms, the promotion of Internet usage, sector-specific reductions of search and switching costs as well as awareness-raising measures. The results can be used for further analyses in the field of competition, productivity and inflation.

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This study was motivated by the inflation peak of 2008 and, with the help of a representative survey (IFES, 2008), tries to trace the levels and determinants of price comparison and supplier switching costs as well as price comparison and switching rates for six sectors. The data are presented in a transparent and easily accessible way to facilitate informed decision-making by competition agencies, and to provide a data source for further analyses in the field of competition, productivity and inflation. Given the existing evidence for the link between inflation and competition intensity, Böheim (2008) and Janger (2008) identify the strengthening of competition on a broader basis – i.e. not only when competition law is violated, but also when the competition level is empirically observed to be low in a sector – as a possibility for curbing price hikes at least temporarily (see Janger and Schmidt-Dengler, 2010, in this issue, for a confirmation of this relation for the medium term). An increase in competition, however, not only dampens or stabilizes inflation, but as a rule also raises productivity and, along with it, growth (e.g. Aghion and Griffith, 2005; Nicoletti and Scarpetta, 2003). It is only when sectoral competition is very strong that adverse effects may occur in the form of reduced innovation (Crespi and Patel, 2008). The intensification of competition may form part of the crisis management strategies currently in planning because faster growth would support the consolidation of public finances (Grossmann et al., 2009).

This study is structured as follows: Section 1 highlights the economic connection of price comparison and supplier switching rates with competition intensity and market efficiency. Section 2 describes the results of the represen-

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tative survey on price comparison and switching activities. Section 3 gives an econometric analysis of the determinants of different price comparison and switching behaviors. Section 4 draws conclusions for economic policy and presents an outlook on potential further analyses.

1 Price Comparison and Supplier Switching Rates as Competition Indicators

Price comparison rates indicate the share of consumers of a product group who shop around before purchasing. Price comparison rates and their determinants such as search costs influence switching rates, i.e. the percentage of all consumers of a product group who switch to another supplier per unit of time – usually per year. In addition, the percentage of consumers who regularly switch suppliers can be taken into account in the switching rate.

Search costs include the opportunity cost of time spent searching as well as associated expenditures such as transportation cost for visiting several shops, telephone costs, costs for purchasing magazines, etc. (Bakos, 2001).

Switching costs are the costs of searching for an alternative product and the costs of the switch itself. Price comparison rates and their determinants mainly yield information on the search cost component of switching costs.

Klemperer (1995) describes the following switching costs:

1. Need for compatibility with existing equipment/products, e.g. razor blades and razors, PC operating system and word processing system or online music store coupled with a digital audio player;
2. Transaction costs (in terms of time and money) of switching suppliers, e.g. switching bank accounts;
3. Costs of learning for products that are functionally or qualitatively identical but differ in handling, e.g. different cake mixes, software packages;
4. Uncertainty about the quality or safety of new products, e.g. drugs;
5. Discounts promised for the future, e.g. airline mileage programs – the more frequently you travel on the same carrier, the lower the cost;
6. Psychological costs of switching: Brand loyalty, e.g. for food or cars. There is socio-psychological evidence that consumers are initially indifferent about competing products, but change their relative preferences by using one brand so that they would perceive a cost of switching brands.

Switching costs may not necessarily be blamed on a given provider. Such costs might arise, for instance, because of a surge in inflation that makes price comparisons more difficult (Gwin and Taylor, 2004), or as a result of technological constraints; in brick production, for example, high product weights impede a geographical switch to alternative suppliers. Consumer characteristics, such as education, gender or place of residence (urban vs. rural areas), may also impact perceived and actual search and switching costs.

Companies may however actively attempt to create switching costs to shield themselves from competition. Advertising, for instance, is a tool for generating brand loyalty. The requirement of technological compatibility, which was already mentioned above, would hardly be necessary for product functionality in most cases. Therefore, price comparison rates, search and switching costs as well as switching rates are important competition indicators. They can be interpreted as a measure for the competitive pressure exerted on firms, i.e. as an indicator of a company's price elasticity of demand. The elasticity of demand is one of the determinants of the markup B_i of an

enterprise and, with reservations, is considered a proxy of competition intensity (e.g. Janger and Schmidt-Dengler, 2010): High markups may result from R&D efforts that justify temporary monopoly rents. Oliveira Martins et al. (1996) show that markups derived from Roeger's method are actually higher in R&D-intensive sectors. The fact that markups substantially vary across countries in these sectors, however, also points to other explanations, such as competition intensity.[2]

The markup B_i, in terms of the Lerner index[3], can be expressed as a function of the elasticity of demand ε_{ii}.[4]

$$B_i = \frac{P - MC}{P} = \frac{1}{\varepsilon_{ii}}$$

For the derivation of this relation, please see the box "Connection between Com-

Connection between Competition Intensity and Elasticity of Demand

The derivation of markups from company-specific elasticity is a textbook case of industrial economics. For a description, see for example Church and Ware (2000, chapter 2).

Let us assume that a monopolist produces the quantity Q at a price P and tries to maximize his profits π.

$$\pi(Q) = P(Q)Q - C(Q)$$

The first derivation yields the standard condition of equality between marginal costs MC and marginal returns MR.

$$P(Q) + \frac{dP(Q)}{dQ}Q = MC(Q)$$

By factoring out P, the left-hand part can be transformed:

$$P(1 + \frac{dP(Q)}{dQ}\frac{Q}{P}) = MC(Q)$$

Given $\varepsilon = -\frac{dQ}{dP}\frac{P}{Q}$ as the monopolist's demand elasticity, the markup B can be described as a function of elasticity:

$$B = \frac{P - MC}{P} = \frac{1}{\varepsilon}$$

In the case of company-specific demand elasticities, e.g. in oligopolistic markets, the relationship is as follows:

$$B_i = \frac{P - MC}{P} = \frac{1}{\varepsilon_{ii}}$$

where $\varepsilon_{ii} = -\frac{dq_i}{dp_i}\frac{p_i}{q_i}$

[2] *Markups might also be low because employees take up a major share of the economic rent that can be achieved on the basis of market power or because there is little pressure on shareholders to push up profits. These effects, however, are likely to be minor especially for the years from 1991 to 2005 as wage shares decreased in most countries and shareholders' profit expectations tended to rise.*

[3] *The difference between price and marginal costs in relation to the price.*

[4] *The way in which the quantity of the good sold by company i responds to a change in the price by that company in contrast to the cross-price elasticity ε_{ij}, i.e. the response of the quantity sold by company j to a price change of company i.*

petition Intensity and Elasticity of Demand." The higher the elasticity of demand, the lower the markup and the higher the intensity of competition. If quantities demanded respond strongly to price changes, i.e. if buyers purchase much less or switch to another supplier when prices go up, prices will approximate marginal costs. Therefore, being elasticity determinants, price comparison and switching rates have an indirect impact on competition intensity.

Theoretical models of industrial economics explicitly take account of the effect of search and switching costs on market efficiency. According to Stahl (1989), the height of search costs determines the share of informed consumers in a market. The lower the search costs, the higher the share of informed consumers and the lower the price dispersion in a market. The market price will tend towards price levels under perfect competition, i.e. lower search costs lead to more efficient market results.

In mature markets, switching costs bring about monopoly rents (Klemperer, 1987). Therefore, suppliers fight hard for market shares in the initial stage of a market (e.g. mobile telephony). The market equilibrium of an oligopolistic industry with switching costs, but noncooperative behavior of market actors may be similar to the one in an oligopolistic industry with collusion but without switching costs. Sharpe (1997) empirically confirms this theory for the savings deposit market: The higher the switching rate in a market, the lower the markups (or the higher the interest rates on savings deposits).

Observations of switching costs and rates are empirically valuable competition indicators because regular statistical data usually do not allow for separating the impact of companies' competitive behavior on the markup from the influence of elasticity (see the box "Connection between Competition Intensity and Elasticity of Demand"). This also means that a market's competition intensity may develop independently from the number of suppliers or the degree of market concentration. For that reason, competition agencies undertake regular monitoring exercises within the framework of their market analyses to assess competition intensity by means of switching rates. For that purpose, they usually carry out highly specific ad hoc investigations or surveys that are tailored to the case at hand and are generally treated as classified. Exceptions to this rule are the European Consumer Markets Scoreboard (European Commission, 2009) that lays out price comparison and switching costs and rates for several service sectors as well as a few large-scale sector-specific studies, for example, on checking accounts (OFT, 2008) or retail banking (European Commission, 2007). However, these usually do not provide links to the personal characteristics of the consumers responding.

When interpreting information on search and switching costs as well as price comparison and switching rates, we have to bear in mind the possibilities for price discrimination and product differentiation. In spite of high price comparison rates or low search costs (i.e. high, but incomplete information), sectoral competition intensity may be restricted by means of price discrimination and product differentiation. In food retailing, for example, outlet strategies allow for price discrimination (brand portfolios and discount portfolios that include similar or the same products), and product differentiation is particularly pronounced (e.g. regionality of dairy products).

2 Survey Results in Descriptive Form

In the late fall of 2008, the Institute for Empirical Social Studies (IFES) conducted personal interviews with 2,000 respondents selected by stratified random and grouped sampling in an ad hoc module of the OeNB's regular Payment Survey.[5] The quality of data obtained in such a way is considered to be high. The survey concentrated on six sectors or products: First, sectors that were key drivers of inflation when inflation peaked in 2008 (food, motor fuels); second, industries that are well known for intensive comparison and switching behavior (electric and electronic products); and third, service sectors in which price comparison and switching rates are considered to be low (banking (checking accounts), insurances (home insurances) and a range of trades (regular services, such as heating system maintenance, vehicle inspections)).

The interview strategy was such that price-induced switching was considered to be conditional on price comparisons, while quality aspects were treated as an afterthought. If switching costs and rates had been surveyed alone, a significant aspect of market activities – price comparisons – would have been disregarded. As a result, important information on price comparison and switching behaviors as well as their determinants would not have been revealed. A switch to another supplier is just the second step in making a purchasing decision – the disclosed preference, as it were –, while the price comparison behavior really indicates whether consumers subject product groups to intensive competition or not.

The European Consumer Markets Scoreboard, for example, also contains questions on price comparison efforts, but does not check the percentage of consumers actually comparing prices. In this study, the combination of these data provides important insights (section 3). Nevertheless, the results of the Consumer Markets Scoreboard are used for comparisons.

2.1 Price Comparison and Switching Behavior

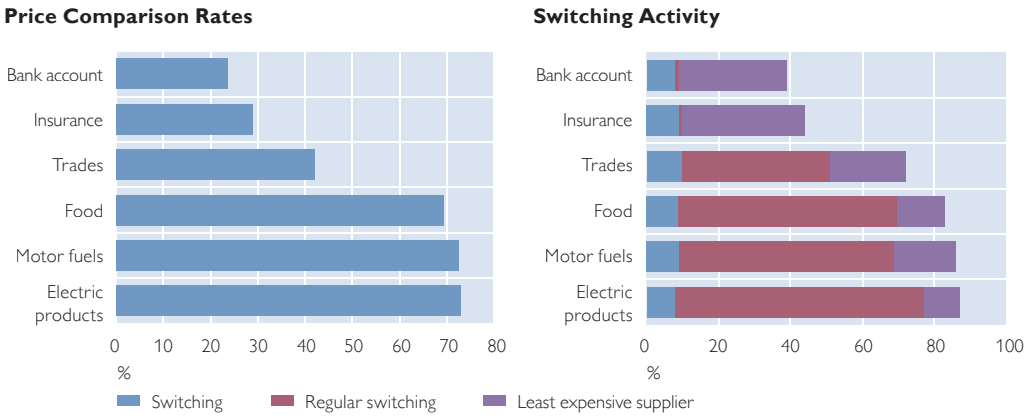
The switching rates not only include actual switches from one supplier to another one but also regular purchases from different suppliers (or "household migration in a market" according to Sharpe (1997)). The rate of switching between suppliers is a typical indicator for service industries with long-term contracts, such as checking accounts, insurances, mobile telephony. Therefore, switching rates are expected to be lower than in manufacturing industries without product lock-in, e.g. in the food and motor fuels sector. With regard to price comparison behavior, however, the difference should be much less marked because a one-time switch to a less expensive service provider may well result in similarly high savings as weekly switches for food purchases.

Chart 1 presents the price comparison and switching rates for the six sectors selected. The data have been adjusted for nonconsumers of the respective sectors, i.e. for persons never buying food (6.6%) or not having a personal account (5.7%), etc. In addition to the switching rate proper, further components were included in the phenomenon of switching activity: The percentage of consumers regularly using several suppliers, the percentage of consumers who stated to have the least expensive supplier so that switching would not

[5] *The author thanks Helmut Stix for this opportunity. The complete questionnaire is available from the author upon request.*

Chart 1

Price Comparison and Switching Rates



Source: OeNB.

make sense for them and the percentage of consumers switching for reasons other than price. The latter group is small in comparison with "price-driven switchers" so that it is safe to assume that the focus on price comparison behavior (vs. quality comparison behavior) will not introduce a strong bias. Differences are pronounced both between price comparison rates and between switching rates, with low rates recorded for the service sectors and high ones for the manufacturing industries.[6] Notwithstanding a relatively high share of consumers believing to have already secured the cheapest banking (checking account) or insurance services (home insurance), switching activity is significantly lower in these two segments than in the manufacturing industries.[7] For the services of trades, the difference is slightly less distinct. Thus, evidence would point to a low company-specific elasticity of demand in the latter three sectors, whereas it seems to be relatively high for food and motor fuels as well as electric and electronic products.[8]

Because of the inflation peak for food and motor fuels recorded in 2008, the values could be above the medium-term average. This can only be clarified by a follow-up survey. Compared with other countries, the switching rates in the Austrian service sectors are below the European average (European Commission, 2009).

2.2 Information Sources for Price Comparisons

The type of information sources and the intensity of their use can provide information on search costs. Chart 2 highlights the first and second most frequent information sources indicated (multiple answers were possible) and Internet usage for price comparisons. In many cases, the Internet can greatly facilitate price comparisons. Nevertheless, Internet usage is only significant in electric and electronic retailing where consumers frequently visit diverse web

[6] *Food, electric equipment and motor fuel retail trade are also service sectors, but they sell goods and not services.*

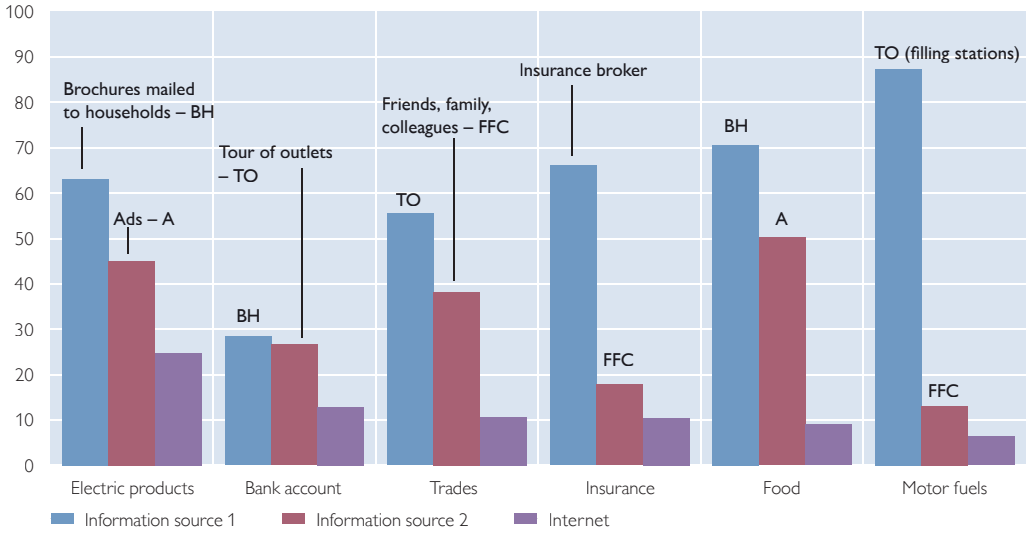
[7] *Section 3 demonstrates that persons stating that they already use the least expensive supplier are significantly less likely to compare prices. Therefore, actual switching activity could be even lower.*

[8] *Company-specific elasticity of demand may be high in spite of a low price elasticity of demand for the entire market, e.g. the overall price elasticity of demand is relatively low in the food sector.*

Chart 2

Information Sources for Price Comparisons

%; multiple answers possible; ranked by degree of Internet usage



Source: OeNB.

platforms for price comparisons. In sectors with intensive price comparison activities, however, the main information sources are brochures mailed to households and different kinds of advertisements. Through these two channels, prices are communicated to consumers fairly proactively, while in the service sectors consumers are typically challenged to get price information themselves. For insurances, the price comparison "power" lies with insurance brokers. There is no anecdotal evidence that insurance brokers would regularly send price comparisons to households. Likewise, the frequent identification of friends, family and colleagues as an information source can be taken as a sign of high price comparison efforts and the avoidance of price competition by enterprises.

2.3 Reasons for Not Comparing Prices

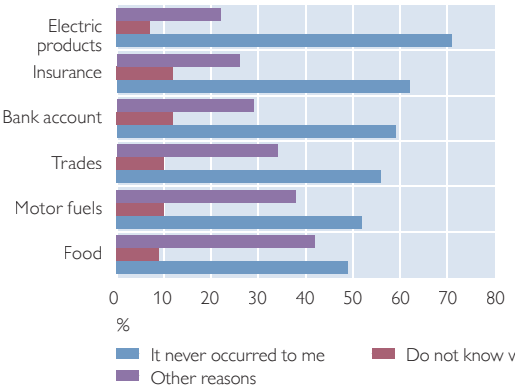
Chart 3 analyzes the behavior of those consumers who do not compare prices. Here, answers were compiled in two steps. In a first step, respondents were offered the following answer options: "It never occurred to me" (to compare prices), "I do not know where" (to get information on prices) and "Other reasons." The first answer points to lacking awareness of the possibility of comparing prices and/or switching suppliers. This lack is not attributable to consumers alone, but could also be caused by relevant advertising activities and the building of brand loyalty. Many insurance companies and banks, for example, do not use prices in advertising, but try to generate popularity and trust through reputation advertising. The second option yields the share of persons who would like to compare prices, but do not know where to do so. This points to supply-side obfuscation or the inability of consumers to gather and assess information.

In a second step, the "Other reasons" were specified in greater detail. The main aim was to determine the cost-benefit ratio of price comparisons. When you understand search costs as

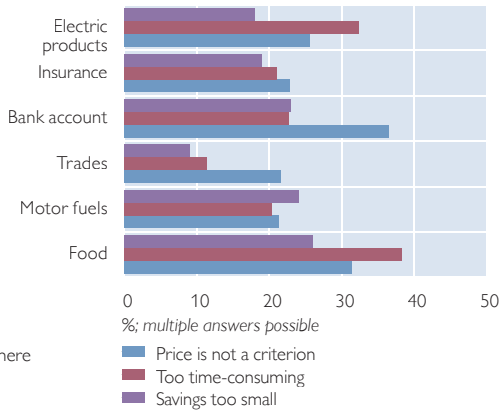
Chart 3

Reasons for Not Comparing Prices

Price Awareness vs. Lack of Information



Cost-Benefit Ratio (Other Reasons)



Source: OeNB.

an investment, searches are only carried out if the return on this investment is sufficiently high. Here it is difficult to distinguish whether potential savings or the size of the search costs are responsible for the final outcome (multiple answers were possible).

Furthermore, chart 3 indicates that the predominant reason for not comparing prices is the consumers' lacking awareness of price comparison options. However, we have to bear in mind that the populations differ strongly (e.g. only a few consumers for electric products vs. many consumers in banking). Supply-side obfuscation amounts to roughly 10% and is slightly higher for banks and insurance companies. This value is relatively low, but if all 10% of consumers started to compare prices this would certainly stimulate each of the sectors examined.

An analysis of the other reasons identified shows that the cost-benefit ratio plays a role for a strong minority of consumers (20% to 40%) so that the reduction of search costs might well contribute to a reassessment of this ratio, as in the model from Stahl (1989) cited above. Otherwise, there could be a stable equilibrium of little switching and a lack of attractive offers in sectors with low switching activity: If the switching rate is minimal because of either high switching costs or lacking price awareness, there is hardly an incentive for companies to offer new products and this, in its turn, hardly motivates customers to switch suppliers. This cycle of effects was also found for the British checking account market (OFT, 2008).

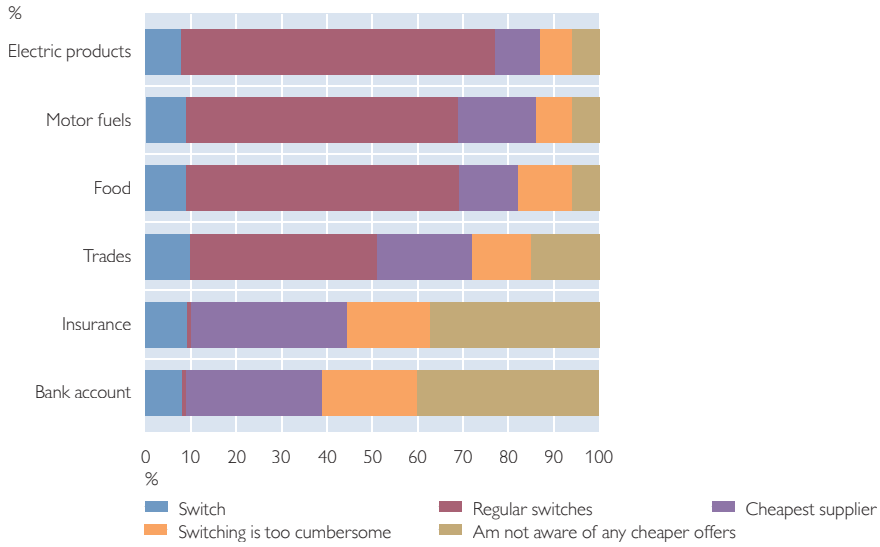
2.4 Switching Rates

While chart 1 outlined switching activities, chart 4 presents all the facets of the question on whether consumers switch suppliers and, if not, why. The additional dimensions "Switching is too cumbersome" and "Am not aware of any cheaper offers" play a role especially in the case of banks and insurance companies; the latter answer virtually is the flipside of price comparison behavior and confirms the interview strategy's focus on price comparisons.

In particular for the banking and insurance sector but also for different trades, chart 4 (as well as charts 1 and 5) provides clues that the company-specific

Chart 4

Switching Activity and Reasons for Not Switching



Source: OeNB.

demand could be inelastic for the products of firms in these sectors. This is all the more true as companies additionally have possibilities for price discrimination and product differentiation. In banking, for example, a classic case of price discrimination is student accounts. However, a comprehensive assessment can only be given after more extensive investigations modeled after international studies such as the one carried out by the British Office of Fair Trading (OFT, 2008).

Price discrimination and product differentiation can reduce competition intensity even in sectors with strong switching activity, e.g. in food retailing. Therefore, the survey presented here is to be seen as a first step in the evaluation of competition intensity.

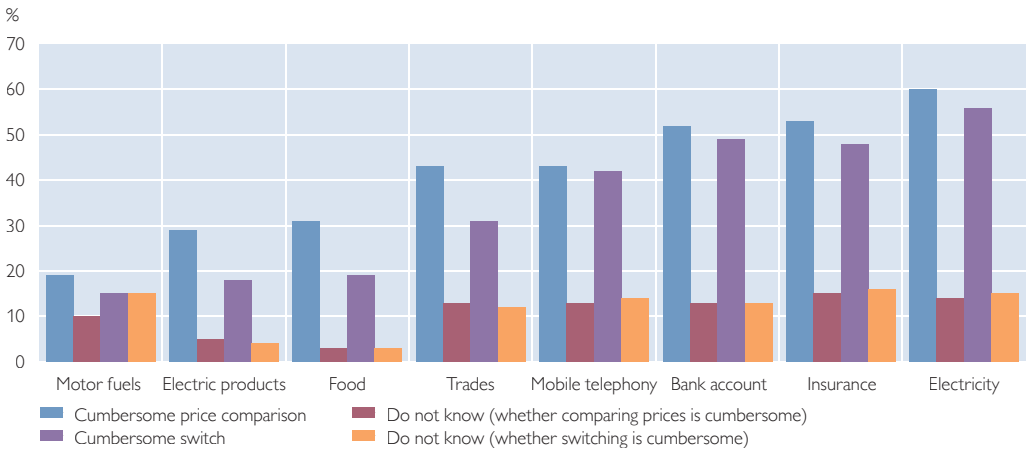
2.5 General Price Comparison and Switching Efforts

At the end of the questionnaire, a batch of questions readdressed the issue of price comparison and switching efforts collectively because the above questions about search and switching costs had been skipped in the interview of those consumers who compare prices or switch suppliers. Since we did not use the full range of questions and wanted to get more data for comparisons, we added two product groups (electricity and mobile telephony). The answer "I do not know how cumbersome it is to switch suppliers/compare prices" also permits conclusions on switching and search activities.

Chart 5 shows that price comparison and switching efforts are almost identical or perceived as such. The sectors can be grouped in three categories: First, sectors with little efforts (motor fuels, electric products and food), second, sectors with medium efforts (trades, mobile telephony) and, third, sectors with high efforts (checking accounts, home insurance and electricity). In a European comparison, Austria stands out as a country where consumers find it most difficult to compare prices in service sectors (European Commission, 2009). Hence, the survey corroborates

Chart 5

Price Comparison vs. Switching Efforts



Source: OeNB.

studies of OECD (2007) that showed low competition intensities in service sectors.

This again supports the focus of the questionnaire on price comparison behavior. Mobile telephony is an example illustrating that competition can be fierce in spite of perceived high search and switching costs – in the early stages of a market, as described above. Over time, search and switching costs are likely to result in a declining level of competition.

3 Econometric Identification of Price Comparison and Switching Determinants

In addition to the answers to the questions proper, the survey collected data on numerous personal parameters, such as education (level of educational attainment), income (net personal income), gender, place of residence, Internet usage, occupation (employment vs. school attendance, retirement, etc.) and social class[9]. By means of these personal characteristics and the responses to the above-mentioned questions, this section tries to identify significant determinants of price comparison and switching activity.

The answers of the individual respondents are adjusted by their sample weights before estimations are performed.[10] Apart from income data, the individual variables are almost complete; around 25% of the respondents did not provide information on their earnings. The missing values were imputed from other available variables. The variables, even the income variable, are not continuous, but contain category numbers (e.g. 1 for income brackets from EUR 500 to EUR 750, 2 for EUR 751 to EUR 1,000, etc.). The original categories defined for the survey were regrouped because of their high number and converted into dummy variables. Table 3 (in the annex) describes the variables and identifies the related ref-

[9] *A variable constructed from income and education data on the respondent and the household head's occupational status by IFES, the institute carrying out the survey.*

[10] *In the case of divergence from the population structure, the structure of the actual interviewees is adjusted to the population structure by weighting to obtain a really representative sample.*

erence category for the interpretation of estimates.[11] The software package Stata 10 is used to perform the estimates.

3.1 Determinants of Price Comparisons

The factors influencing the probability of price comparisons are estimated by means of a simple binary model of the functional logit type (e.g. Cameron and Trivedi, 2009).

$$p_i \equiv \Pr(y_i = 1 \mid x) = \Lambda(x_i'\beta) = \frac{e^{x_i'\beta}}{(1 + e^{x_i'\beta})}$$

where:

$$x_i'\beta = \beta_1 + \beta_2 Income + \beta_3 Gender + \beta_4 Place\ of\ residence + \beta_5 Occupation + \beta_6 Social\ class + \beta_7 Education + \beta_8 Internet$$

Without exception, the determinants should be independent of the probability of price comparison, the variable to be explained.

Table 1 shows the coefficients estimated for the preferred specification. In binary models, the coefficient cannot be directly interpreted as a marginal effect or as a contribution to the probability of occurrence for the event investigated. Therefore, table 1 only reveals whether a specific variable significantly influences the probability of occurrence and, if yes, whether this impact is positive or negative. An example of the calculations is given below. Because of the correlations existing between the explanatory variables, in particular between education, income and social class, the coefficients are not completely stable, but as a rule, retain their significance level and at any rate their positive/negative sign for many different estimation specifications. For example, a constituting variable of the social class – the occupational status of the household head (worker, employee, liberal profession, etc.) – was used instead of the social class itself to minimize the correlation with education and income. This, however, only resulted in marginal changes.

Higher net personal incomes only significantly reduce the probability of price comparisons for electric products, while their impact, by and large, remains insignificant for the other sectors. This is surprising since a higher income normally means higher opportunity costs for the time spent on price comparisons. Women are significantly less likely to compare prices of electric products, home insurances, regular services of trades as well as motor fuels, while they are significantly more likely to make food price comparisons.[12] Price comparisons for electric products, checking accounts and home insurances have a significantly lower probability in cities. Retirees perform significantly fewer price comparisons for checking accounts, while homemakers are significantly more likely to compare food prices, just like members of lower social classes. The latter, however, carry out significantly fewer comparisons of checking account fees. Persons without access to the Internet are significantly less likely to compare prices for home insurances because they can only do so by calling their insurance broker.

The most interesting finding is that higher education levels raise the probability of price comparisons in almost all cases. At education levels above com-

[11] *We experimented with numerous types of categorization by defining more or less income classes and more or less education categories and by shifting the limits of the individual ranges, etc. These different grouping types relying on the basic pattern of low/high only have a marginal impact on coefficients.*

[12] *The gender variable only takes account of those women and men who actually purchase products. Therefore, the results are not distorted by persons not buying the relevant products.*

pulsory schooling plus apprenticeship, the probability of price comparisons increases for all sectors with the exception of motor fuels and the services of trades.[13] This might be explained by the intensified promotion of interdisciplinary skills in upper secondary and tertiary education that could also be relevant for comparing prices: Analyzing and critically evaluating information is considered an important interdisciplinary skill that might apparently be neglected in compulsory schooling and apprenticeships.

To illustrate their economic significance, average marginal effects were calculated from the coefficients presented in table 1.[14] Thus, university education increases the probability of comparisons for home insurance premiums by 12%, while the absence of Internet access reduces it by 5%. These differences are relevant in economic terms.

3.2 Reasons for a Lack of Price Comparisons

The survey defined three possible answers for not comparing prices. Therefore, a multinomial logit model is estimated that calculates for each explanatory variable the way in which it

Table 1

Determinants of Price Comparisons: Factors Influencing the Probability of Price Comparisons

	Food	Electric and electronic products	Current accounts	Home insurance	Trades	Motor fuels
Income – low	0.231	–0.377*	0.053	0.293	0.400*	–0.073
Income – medium	0.047	–0.690***	0.275	0.521***	0.318	–0.298
Income – high	–0.031	–0.643**	0.220	0.070	0.123	–0.105
Gender	0.431***	–0.471***	–0.090	–0.324**	–0.412***	–0.292**
Place of residence	–0.043	–0.457***	–0.348***	–0.654***	–0.147	0.177
Occupation – jobless	0.037	–0.672**	0.212	–0.074	–0.018	–0.947**
Occupation – student	–0.718***	–0.370	–0.263	0.105	–0.001	–0.605**
Occupation – retired	0.186	0.045	–0.312*	–0.185	–0.224	–0.196
Occupation – home	1.167***	–0.220	–0.379	0.441	0.389	–0.079
Class – B	0.432*	0.285	–0.571**	0.335	0.077	0.364
Class – C	0.469*	–0.180	–0.451*	0.179	0.051	0.134
Class – D	0.324	–0.093	–0.314	0.369	0.119	–0.434
Class – E	0.754**	0.174	–0.786**	0.255	1.226***	0.244
Education – apprenticeship	0.286	0.076	0.204	0.055	0.361*	0.130
Education – vocational school	0.693***	0.812***	0.417*	0.481**	0.611**	0.109
Education – upper secondary school	0.542**	0.701***	0.462*	0.407	0.812***	0.402
Education – university	0.284	0.758**	0.150	0.583*	1.139***	0.685*
Internet	0.009	0.095	0.056	–0.252*	0.196	0.148
Constant	–0.240	1.519***	–0.880**	–1.165***	–1.026***	1.005**
Observations	1,817	1,680	1,849	1,645	1,448	1,540

Source: Author's calculations.

*Note: *** p<0.01, ** p<0.05, * p<0.1.*

[13] *The effect is not significant for persons with university education in the food sector and for checking accounts (but the sign is positive).*

[14] *To calculate the marginal effect of variable x on the probability of occurrence for variable y, the probability function is partially differentiated with respect to x. The marginal effect* $\partial p / \partial x_j$ *for the logistic function*

$$p_i \equiv \Pr(y_i = 1 \mid x) = \Lambda(x_i'\beta) = \frac{e^{x_i'\beta}}{(1 + e^{x_i'\beta})} \quad is \quad \Lambda(x_i'\beta\left\{1 - \Lambda(x_i'\beta)\right\}\beta_j$$

influences the probability of occurrence of the option $y_i=j$ relative to the base case $y_i=1$ (e. g. Cameron and Trivedi, 2009):

$$\Pr(y_i = j \mid y_i = 1) = \frac{\Pr(y_i = j)}{\Pr(y_i = j) + \Pr(y_i = 1)} = \frac{e^{x_i'\beta_j}}{(1 + e^{x_i'\beta_j})}$$

The explanatory variables used are the same as in section 3.1. Table 4 (in the annex) presents the results for each sector. The first half shows the figures for the impact of the explanatory variables on the respondents' probability of selecting the option "It never occurred to me" instead of the base case "Other reasons" (for not comparing prices). By analogy, the second half indicates the results for the option "I do not know where" (to get information on prices). Given the low number of observations, the data for food, electric and electronic products as well as motor fuels have to be analyzed with caution and especially the food sector is, in fact, not interpretable.

Among persons with incomes (above those of the lowest income group) the share of those who do not bother to compare prices for checking accounts and home insurances is significantly higher than among all other income groups. At the same time, comparing checking account fees is not an issue for the two lowest social classes, either.[15] Women do not compare motor fuel prices for other reasons, while city dwellers tend not to reflect on such prices. Persons with university education refrain from price comparisons in all sectors – except food and electric products – for other reasons.

Persons who do not have access to the Internet are significantly more likely to fail to know where to compare the prices of home insurances. Apart from that, the results for the answer "I do not know where" only show a few significant correlations.

Because of the low number of observations, an econometric analysis of "Other reasons" does not make sense. With regard to the important issue of excessive time required, the general time-related question (section 3.4) yields substantially better information.

3.3 Determinants of Switching Suppliers

A multinomial model is estimated in order to clarify the reasons why consumers switch suppliers or not. Out of the six answers to the question on supplier switches, the first four options were summarized as they all stand for switching activity and/or for exploiting market opportunities. This group is compared with the responses "There are cheaper [shops], but switching to them is too cumbersome" and "Since I do not compare prices I do not know a cheaper supplier."

In addition to the usual explanatory variables, the question on price comparisons was also included here. This is a key finding of the estimation (table 5 in the annex): Persons who compare prices assess switching to be less arduous in all sectors and/or switch suppliers with high significance.

Even when they know cheaper suppliers, persons with high incomes and women find it laborious to switch providers of regular services of trades; city dwellers consider switching suppliers significantly less cumbersome for electric products and motor fuels and

[15] *An explanation of this apparent contradiction might be that account fees are too low for triggering price comparisons by persons with higher incomes, while persons from lower social classes have insufficient information and education for actively considering to switch bank accounts.*

more complicated for home insurances. Retirees perceive switching to be too arduous in almost all sectors. Persons with education levels above apprenticeships find switching troublesome for food, electric products and motor fuels. Persons without Internet access consider switching motor fuel suppliers to be too cumbersome.

The option "Since I do not compare prices …" is essentially driven by factors that also determine price comparison behavior (education, place of residence) and serves for checking consistency.

In addition to grouping the first four possible responses together, the data for the answer "I already have the cheapest supplier" were analyzed separately. In the checking account, home insurance and motor fuel sectors, persons without Internet access are significantly less likely to fall into this group. Likewise, this group includes significantly fewer persons who compare prices. Therefore, the statement "I already have the cheapest supplier" would have to be called into question.

3.4 General Price Comparison and Switching Efforts

As explained above, separate questions addressed the efforts involved in comparing prices and switching suppliers at the end of the questionnaire in order

Table 2

Who Finds Comparing Prices Cumbersome?

	Food	Electric and electronic products	Current accounts	Home insurance	Trades	Electricity	Motor fuels	Mobile telephony
Income – low	–0.362**	–0.530***	–0.514***	–0.643***	–0.669***	–0.534***	–0.216	–0.515***
Income – medium	0.061	–0.272	–0.629***	–0.699***	–0.622***	–0.557***	0.091	–0.213
Income – high	0.075	–0.021	–0.074	–0.405	–0.217	–0.362	0.139	0.047
Gender	0.107	0.376***	0.047	–0.097	0.272**	0.154	0.242	0.257**
Place of residence	–0.656***	–0.355***	0.338***	0.299**	0.345**	0.310**	–0.411**	–0.083
Occupation – jobless	0.464	0.366	–0.193	–0.646*	–0.564	–0.181	0.133	–0.200
Occupation – student	0.441*	–0.461*	–0.516*	–0.295	–0.245	–0.324	0.376	–0.225
Occupation – retired	–0.039	–0.150	–0.108	–0.274*	–0.304*	0.024	–0.337*	0.014
Occupation – home	–0.412	–0.553*	–0.145	–0.131	–0.034	0.274	–0.416	0.078
Class – B	–0.007	0.459*	0.332	0.302	0.536**	0.023	0.722**	0.266
Class – C	–0.367	0.266	0.169	0.306	0.744**	–0.034	0.748**	0.318
Class – D	0.035	0.226	0.096	0.231	0.479	–0.074	1.228***	0.192
Class – E	–0.497	–0.049	0.533	0.680*	0.596	0.251	0.921*	0.824**
Education – apprenticeship	0.295	–0.051	–0.057	0.169	0.016	0.250	0.378	–0.066
Education – vocational school	0.331	0.004	0.321	0.808***	0.171	0.567**	–0.149	0.132
Education – upper secondary school	0.533**	0.337	0.292	0.984***	0.835***	0.344	0.755**	0.361*
Education – university	0.108	0.055	0.372	1.048***	0.555*	0.276	0.743*	0.634**
Internet	0.244*	0.498***	0.437***	0.445***	0.458***	0.540***	0.774***	0.596***
Price comparison yes	–0.689***							
Price comparison yes		–0.088						
Price comparison yes			–0.572***					
Price comparison yes				–0.777***				
Price comparison yes					–0.301**			
Price comparison yes							–0.898***	
Constant	–0.254	–1.010**	0.362	0.410	–0.600	0.555	–2.037***	–0.503
Observations	1,782	1,635	1,654	1,491	1,378	1,703	1,499	1,710

Source: Author's calculations.

*Note: *** p<0.01, ** p<0.05, * p<0.1.*

to raise the number of observations. The factors determining the probability that price comparisons or switches are perceived as laborious were estimated by means of a simple logit model as described above.

For price comparison efforts, persons who actually compare prices also assess these efforts to be lower with high significance, as explained in section 3.3. Persons without Internet access find price comparisons substantially more laborious. Women believe that comparing prices of electric products, trades services and mobile telephony requires more efforts. City dwellers perceive price comparisons to be less arduous for food, electric products and motor fuels and more cumbersome for checking accounts, home insurances and the services of trades. This could be due to the fact that the number of suppliers facilitates comparisons in the first three sectors, whereas price comparisons are more complex in the other sectors and rural areas have a lower supplier density; this makes comparisons easier ("spoiled for choice"). Likewise, persons with education levels above apprenticeships frequently find price comparisons troublesome.

The results for switching efforts are in line with those for price comparisons (table 2).

4 Conclusions

The results of this survey – the first representative one of this type for Austria – can be applied in many ways. On the one hand, they highlight several areas for stimulating sectoral price comparison and switching activities and thereby competition intensity. Intensive competition dampens inflation in the medium term and has a stabilizing effect on inflation; as a rule, it raises productivity. On the other hand, the data can be used as a basis for further analyses.

Surveying price comparison behavior proved to be effective since the fundamental driver of switching is price comparisons. Those who compare prices not only consider price comparisons but also switching less cumbersome and, hence, switch suppliers more frequently. This also shows that to a certain extent, search as well as switching costs are perceived to be higher than they actually are, i.e. persons inexperienced in searching and switching suppliers overestimate the difficulties.

Intersectoral Measures

In a medium- to longer-term perspective, there are two approaches to encouraging price comparison behavior that, in part, require further analysis: Education reforms and gender differences. Educational attainment has a significantly positive effect on the probability of price comparisons, while the price comparison behavior of women and men differs by sector. Women compare prices significantly less often for electric products, home insurances, regular services of trades and motor fuels, but more frequently for food. The reasons for these differences would have to be examined in greater detail. The starting points for analyses are likely to be found in typical career choices of women and men (low share of women in technical occupations which, in its turn, is related to the educational system) as well as in women's stronger involvement in household activities.

Because of the time required for educational reforms, such reforms are certainly not suited as short-term measures to control inflation.

In the short- to medium-term perspective, the survey indicates that while Internet usage has been limited as yet for the purpose of price comparisons, searching the web very significantly facilitates price comparisons and switch-

ing in all sectors.[16] Internet use can be supported through several channels: On the one hand, by fostering competition in the broadband segment where Austria still lags behind countries with high competition intensities and, on the other hand, by ensuring the further improvement of the technological infrastructure that additionally stimulates the economy.

Finally, the outcome sets the scope for promoting awareness-raising measures, e.g. by means of officially supported information on prices – as it is already provided by the Chamber of Labor today – for sectors that hardly use their product prices in advertising and do not actively communicate them to consumers in contrast, for example, to food retailers.

Sector-Specific Measures

As the survey shows, there are in part considerable obstacles to comparing prices and switching suppliers and the cost-benefit ratio of price comparisons is frequently poor. This result is confirmed by EU surveys. Overall, the low competition intensities found in some service sectors by international organizations are supported by this study.

Low price comparison and switching costs can keep sectors in an equilibrium in which consumers do not switch because there are no attractive alternatives and enterprises do not develop attractive products because consumers do not switch. Thus, switching costs can effectively hinder innovation and make market entry more difficult for newcomers (the return on innovation projects decreases if the switching rate is expected to be low).

Therefore, detailed studies modeled after other countries should be prepared for sectors with minimal price comparison and switching activity.

Price comparison websites could take over the function of providing regular price information that is fulfilled by brochures mailed to households in sectors with high switching activity. In the insurance sector, for example, existing price comparison websites could be used more intensively when Internet use rises.

Of course, "normal" competition policy remains relevant for enforcing competition law. The survey also revealed that price comparison activities decline with rising incomes in a few sectors. If the elasticity of demand decreases, it becomes more important again to focus on issues of market concentration in competition policy.

Perspectives for Further Analysis

Another step in investigating the determinants of price comparison and switching behavior would be harmonized international surveys. An issue that remains unclear in this survey is the impact of differences between urban and rural areas on price comparison and switching activity. While city dwellers compare prices less frequently, they consider the efforts required to be higher in some sectors and lower in others. Because of the advantages offered by the higher supplier density in cities, a more homogeneous picture would have been expected.

The survey's data can also be used for further analyses. If comparable international data become available, in-depth studies can be carried out, for example, on competition, productivity and inflation. The survey also suggests that the determinants of search costs are very similar to those of switching costs so that they could be covered together in theoretical models.

[16] *In case of a strong increase of price comparisons on the Internet, firms are likely to respond by making their offering more difficult to compare (e.g. Ellison and Ellison, 2009).*

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Annex

Table 3

Description of Dummy Variables

Variable	Range	Share (%)	Reference category
Income – very low	Up to EUR 750	28	yes
Income – low	EUR 751 to EUR 1,350	32	
Income – medium	EUR 1,351 to EUR 2,100	33	
Income – high	EUR 2,101 or more	8	
Place of residence	0 = cities with less than 50,000 people	68	n.a.
	1 = cities with more than 50,000 people	32	
Gender	0 = male	49	n.a.
	1 = female	51	
Education – no apprenticeship	Compulsory schooling	19	yes
Education – apprenticeship	Compulsory schooling plus apprenticeship	40	
Education – vocational school	Technical or vocational middle school	15	
Education – upper secondary school	Upper secondary academic or vocational school, university access examination	17	
Education – university	Technical college, university, academy of education, academy for social work	9	
Occupation – jobholders	Full- or part-time employees	60	yes
Occupation – jobless	Unemployed, alimony recipient without income	3	
Occupation – student	Apprentice, pupil, student	8	
Occupation – retired	Retired person	23	
Occupation – home	Homemakers without own income	5	
Class – A	Highest social class	10	yes
Class – B		21	
Class – C		41	
Class – D		18	
Class – E	Lowest social class	9	
Internet	0 = Internet access at home	57	
	1 = no Internet access	43	

Source: OeNB, IFES.

Table 4

Why Are Prices Not Compared?

	Food	Electric and electronic products	Checking account	Home insurance	Trades	Motor fuels
Factors influencing the probability of selecting the option "It never occurred to me" versus the base case "Other reasons"[1]						
Income – low	0.108	–0.378	0.440*	0.741*	0.243	0.390
Income – medium	0.647	–0.823	0.611*	0.852**	0.877*	–0.543
Income – high	0.176	–2,081	0.942*	0.585	–0.601	–1.615
Gender	0.207	–0.242	–0.024	–0.065	0.142	–0.672*
Place of residence	–0.412	0.078	0.024	0.232	0.090	0.872*
Occupation – jobless	–0.135	–1.755	0.834	0.128	–2.941**	–1.351
Occupation – student	0.657	–0.259	–0.011	0.286	1.220	–2.050*
Occupation – retired	–0.068	0.551	0.080	0.199	–0.381	–0.126
Occupation – home	2.307*	0.461	0.294	1.026*	–0.201	0.319
Class – B	–0.896	–0.972	0.385	–0.145	–0.052	–1.556*
Class – C	0.230	–0.685	0.440	0.157	–0.352	–1.520
Class – D	–0.157	0.039	1.250**	0.529	0.160	–1.198
Class – E	0.195	–2.144	1.342**	0.633	–0.649	–0.914
Education – apprenticeship	0.540	0.605	0.144	0.114	–0.137	–0.306
Education – vocational school	0.505	0.386	–0.050	–0.121	–0.652	–1.162*
Education – upper secondary school	0.650	0.318	–0.380	–0.508	–0.088	–0.978
Education – university	0.236	1.559	–0.653*	–0.962*	–1.286*	–2.782**
Internet	0.124	–0.542	–0.263	–0.179	0.055	–0.904*
Constant	–0.513	2.278	–0.136	0.184	0.640	3.177*
Factors influencing the probability of selecting the option "I do not know where" versus the base case "Other reasons"						
Income – low	0.671	0.791	0.409	0.144	–0.200	–0.001
Income – medium	0.817	–1.425	0.166	0.066	0.484	–0.678
Income – high	–28.761**	–0.688	0.188	0.139	–1.319	–0.056
Gender	0.735	–0.906	0.225	0.264	–0.307	–0.667
Place of residence	–1.376*	0.582	–0.194	–0.082	–0.670	–0.120
Occupation – jobless	–0.365	–36.081**	0.081	0.248	0.941	–34.787**
Occupation – student	1.871*	–34.590**	0.190	0.600	1.435	–1.629
Occupation – retired	0.937	0.319	0.176	0.036	0.181	1.120
Occupation – home	1.995	–33.537**	0.461	0.033	–0.562	–33.067**
Class – B	17.077	–0.300	0.138	–0.049	0.897	–33.791**
Class – C	17.729**	–0.503	0.231	0.509	0.129	–0.439
Class – D	17.745**	0.156	0.888	0.972	0.029	–0.016
Class – E	20.083**	–0.202	1.111	0.768	0.800	0.982
Education – apprenticeship	2.079*	0.696	0.097	0.708*	–0.925	0.019
Education – vocational school	2.442*	0.543	–0.106	–0.222	–1.013	–3.297*
Education – upper secondary school	0.691	1.349	–1.446*	–0.059	–1.022	–1.035
Education – university	–28.461**	2.428	–0.994	0.263	–0.816	–2.394
Internet	–0.185	–0.595	0.106	0.545*	0.114	–1.068
Constant	–21.825**	–0.911	–1.512*	–2.056*	–0.738	0.604
Observations	277	199	1,097	859	532	230
chi^2	x	10,037.740**	76,855**	56,829*	68,445**	13,720.912**

Source: Author's calculations.

[1] *Explanation: Factors with one or more asterisks make a significant positive (+) or negative (–) contribution to the probability of selecting the option "It never occurred to me" versus the base case "Other reasons." For example, respondents with university education were significantly less likely to choose the option "I never thought about comparing the fees of my current account." Therefore, if respondents with university education refrain from comparing prices, they are significantly more likely to do so for reasons other than a lack of awareness. Other reasons describe the cost-benefit ratio of price comparisons, i.e. potential savings are disproportionate to the time spent on comparisons.*

*Note: *** p<0.01, ** p<0.05, * p<0.1.*

Table 5

Why Do Consumers Not Switch Suppliers?

	Food	Electric and electronic products	Checking account	Home insurance	Trades	Motor fuels
Factors influencing the probability of selecting the option "There are cheaper …, but switching is too cumbersome" versus the base case "Switching activity"						
Income – low	0.243	0.064	–0.005	0.018	0.263	–0.130
Income – medium	–0.301	–0.580	–0.257	–0.082	–0.125	–0.302
Income – high	0.173	–0.534	–0.243	0.336	0.820*	0.029
Gender	0.056	–0.229	0.015	0.185	0.442*	0.347
Place of residence	–0.053	–0.630*	0.059	0.280*	0.077	–0.642*
Occupation – jobless	–0.936	–32.207**	0.301	0.368	–0.368	–0.077
Occupation – student	–0.499	–0.048	0.110	0.714*	–0.371	0.209
Occupation – retired	0.741**	0.518*	0.113	0.371*	0.247	0.446*
Occupation – home	0.450	0.721	0.379	0.297	0.966*	1.057*
Class – B	0.065	–0.356	0.326	0.831**	0.929*	0.218
Class – C	–0.327	–0.264	0.220	0.663*	0.628	0.013
Class – D	–0.125	–0.011	0.505	0.875*	0.122	0.148
Class – E	0.528	0.553	0.581	0.728*	0.312	0.218
Education – apprenticeship	–0.097	0.490	0.000	0.162	–0.708*	0.378
Education – vocational school	0.844*	1.110*	0.150	0.472*	–0.110	0.822*
Education – upper secondary school	0.693*	0.809*	0.149	0.251	0.077	1.422**
Education – university	0.493	0.178	0.107	0.541	–0.614	1.558**
Internet	0.075	–0.196	0.017	0.081	0.369	0.796**
Price comparison yes	–1.123**					
Price comparison yes		–0.916**				
Price comparison yes			–2.845**			
Price comparison yes				–2.834**		
Price comparison yes					–1.307**	
Price comparison yes						–1.558**
Constant	–1.702**	–1.903**	–0.349	–1.305**	–2.132**	–2.649**
Factors influencing the probability of selecting the option "Since I do not compare prices, I am not aware of any cheaper suppliers" versus the base case "Switching activity"						
Income – low	–0.488	–0.053	1.931	–0.933	0.276	–0.003
Income – medium	–0.500	–0.429	1.175	–0.927	0.175	–0.067
Income – high	–0.216	–0.712	1.053	–1.572	0.335	–0.451
Gender	–0.169	0.130	0.610	–0.967	0.179	0.603*
Place of residence	0.861**	0.718**	–0.745	–1.371	0.622**	1.374**
Occupation – jobless	–0.339	–0.955	0.908	–31.280**	–0.230	–0.439
Occupation – student	–0.066	–1.193*	1.488	–32.376**	0.521	–0.879
Occupation – retired	0.038	–0.497	–1.194	–1.062	–0.138	0.778*
Occupation – home	0.337	–0.293	1.189	–32.254**	0.916*	0.405
Class – B	0.735	0.459	–1.849**	–2.285*	0.798*	–0.110
Class – C	0.342	0.392	–3.131**	–1.599	0.582	–0.437
Class – D	0.143	0.992	–4.437**	–1.987	0.650	–0.227
Class – E	0.725	1.327	–33.407**	–34.140**	0.581	–0.788
Education – apprenticeship	–0.253	–0.110	–1.635*	–1.728*	0.373	–0.268
Education – vocational school	0.118	0.050	–0.305	–32.893**	0.687*	–1.094*
Education – upper secondary school	–0.432	0.119	–1.899*	–1.769*	0.248	–0.311
Education – university	0.755	0.320	–2.443*	–2.309	–0.134	–0.618
Internet	0.405	0.599*	–0.605	–0.440	0.015	0.029
Price comparison yes	–2.818**					
Price comparison yes		–2.926**				
Price comparison yes			–0.498			
Price comparison yes				0.688		
Price comparison yes					–2.268**	
Price comparison yes						–4.301**
Constant	–1.932*	–2.189*	–1.350	–0.012	–2.401**	–1.294
Observations	1,817	1,680	1,849	1,645	1,448	1,540
chi^2	215.354**	24,262.976**	12,202.917**	8,081.316**	176.456**	235.166**

Source: Author's calculations.

*Note: *** p<0.01, ** p<0.05, * p<0.1.*

Table 6

Switching Efforts

	Food	Electric and electronic products	Checking account	Home insurance	Trades	Electricity	Motor fuels	Mobile telephony
Income – low	–0.208	–0.001	–0.140	–0.271	–0.389*	–0.146	–0.115	–0.257
Income – medium	0.391*	0.460*	–0.296	–0.361*	–0.318	–0.465**	0.160	–0.231
Income – high	–0.277	0.193	0.109	–0.116	–0.074	–0.060	–0.371	0.000
Gender	0.188	0.216	0.186	0.218*	0.179	0.197	0.139	0.254**
Place of residence	–0.566***	–0.499***	0.572***	0.574***	0.350**	0.429***	–0.756***	–0.012
Occupation – jobless	–0.323	0.389	–0.555*	–0.737*	–1.291***	–0.565*	0.004	–0.069
Occupation – student	0.581**	0.754***	–0.283	0.136	–0.004	–0.015	0.778***	0.144
Occupation – retired	–0.378**	–0.451**	–0.147	–0.173	–0.404**	–0.114	–0.650***	0.193
Occupation – home	0.270	0.106	–0.149	–0.382	–0.675*	0.145	–0.209	0.205
Class – B	0.995**	0.648*	0.223	0.603**	0.398	0.070		
Class – C	1.064**	0.579	0.093	0.543*	0.551*	–0.024		
Class – D	1.672***	1.098**	0.033	0.554*	0.698*	–0.207		
Class – E	1.726***	1.313**	0.486	1.112***	0.910**	0.393		
Education – apprenticeship	0.563**	0.538**	–0.181	0.157	0.149	0.165	0.299	0.043
Education – vocational school	0.173	0.243	0.001	0.480**	0.052	0.441*	–0.408	–0.108
Education – upper secondary school	0.725**	0.654**	0.177	0.741***	0.657**	0.471**	0.698**	0.168
Education – university	0.844**	0.538	0.133	0.634**	0.398	0.249	0.227	0.429*
Internet	0.944***	1.082***	0.519***	0.401***	0.738***	0.528***	1.231***	0.685***
Price comparison yes	–0.894***							
Price comparison yes		–0.661***						
Price comparison yes			–0.444***					
Price comparison yes				–0.790***				
Price comparison yes					–0.232*			
Price comparison yes							–1.240***	
Constant	–2.874***	–2.752***	–0.020	–0.492	–1.444***	0.260	–1.390***	–0.414**
Observations	1,773	1,627	1,670	1,480	1,377	1,676	1,487	1,702

Source: Author's calculations

*Note: *** p<0.01, ** p<0.05, * p<0.1.*