Essays on Risk Differentiation and Price Transparency in the Insurer's Pricing Process

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The President:

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To my dear parents / Meinen lieben Eltern
Birgit & Matthias

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Vorwort

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Do Customers Value Cost-Based Price Transparency in Motor Insurance? Effects on Consumers' Purchase Intentions, Loyalty, and Willingness to Pay

Introduction

Current insurance pricing processes are subject to change. On the one hand, this is because of recent external factors, such as political and economic conditions. So, for example, the European Court of Justice (ECJ) concluded in its judgment in March 2011 that gender-specific insurance rates are prohibited from December 21, 2012 in the European Union. And thus, the hitherto main risk-rating factor "gender" was directly banned for use in insurers' underwriting. On the other hand, the relevance of refinement of insurers' pricing structure is reflected in the context how future earnings and competitive advantage can be generated. This doctoral thesis, which comprises four research papers, is aimed to provide new insights into the field of insurance pricing. Recent internal and external developments are critically appraised with special consideration of the customer viewpoint to derive implications for insurers' pricing processes and strategic price communication.

The first paper, "Unisex Insurance Pricing: Consumers' Perception and Market Implications", examines the ongoing discussion about discrimination which occurred, according to the ECJ judgment. Thus, the area of conflict between discrimination law on the one hand, and the principle of actuarial fairness and actuarial equality on the other hand is taken into account. We analyze the questions whether the consumer as an individual feels treated fairly and what implications the ECJ judgment has on the insurance industry and the consumers. Our analysis is based on an international consumer survey to empirically determine the consumers' perception of the use of price differentiation criteria in the key insurance business lines, and its perceived importance. Our results indicate that the consumers perceive the single price differentiation factors in different ways depending on business lines and countries.

The second paper, "A Comparison of Insurers' Usage and Consumers' Perception of Price Differentiation Factors", is an empirical comparison between the insurers' usage of different price differentiation factors and the consumers' perception of these criteria. To empirically test the relationship between price-determining criteria and the consumers acceptance of insurance pricing we divided our analysis into two parts. On the one hand, we analyze the pricing models of the insurance industry by using multivariate regression models. On the other hand, we examine the consumers perceptions of the use of different price criteria, and the degree of acceptance linked to it, by analyzing an international consumer survey using descriptive statistical

analysis. Our findings reveal that the more transparent and accountable the pricing process is the more perceive consumers insurance premiums as “fair”.

The third paper, “Optimizing Insurance Pricing by Incorporating Consumers’ Perceptions of Risk Classification”, empirically tests consumers’ acceptance of currently used risk-rating factors in insurance pricing and their willingness to provide insurers further personal information for pricing. To identify respondents’ preferences, we use descriptive statistical analysis. The provision of personal customer information allows insurance companies to conduct a critical review of attributes requested and used that have a low impact on premium amounts as well as lower consumer acceptance. Our results indicate that consumers highly approve commonly used risk-rating factors when their price-determining function is transparent. Moreover, consumers are willing to provide further personal information when such information is used for pricing.

Finally, with the last research paper, “Do Customers Value Cost-Based Price Transparency in Motor Insurance? Effects on Consumers’ Purchase Intentions, Loyalty, and Willingness to Pay”, we focus on the aspect of transparency in price presentation. We empirically analyze effects of different forms of price presentation in motor insurance (with and without the breakdown of costs of insurance policies) on consumers’ product evaluation and purchase decision using descriptive statistical analysis and structural equation modeling. Our results indicate that an additional cost presentation significantly increases consumers’ satisfaction, exerting a positive influence on their purchase decisions and their resulting willingness to recommend the offer purchased – depending on insurance class. However, their level of willingness to pay does not significantly change in each insurance class. Moreover, our findings reveal that psychographic and socio-demographic consumer characteristics lead to differences in product evaluation.

Einführung

Die Methoden der aktuariellen Prämienkalkulation unterliegen einem gegenwärtigen Wandel. Dieser ist einerseits auf externe Faktoren, wie politische und wirtschaftliche Rahmenbedingungen, der letzten Jahre zurückzuführen. So urteilte der Europäische Gerichtshof (EuGH) im März 2011, dass geschlechtsspezifische Versicherungsprämien in der Europäischen Union mit Wirkung zum 21. Dezember 2012 verboten sind. Damit wurde die Verwendung des bis dahin wichtigen Risikomerkmals "Geschlecht" im Underwriting illegitim. Andererseits wird die Relevanz der Verfeinerung der aktuariellen Prämienkalkulation im Rahmen der Generierung von zukünftigen Erträgen und der Erzielung von Wettbewerbsvorteilen deutlich. Diese Doktorarbeit, die aus vier eigenständigen Forschungsarbeiten besteht, ist bestrebt, neue Einblicke in das Forschungsfeld des Versicherungspricings zu geben. Jüngste interne und externe Entwicklungen werden unter besonderer Berücksichtigung der Kundensicht kritisch gewürdigt, um Implikationen für die Preisgestaltung und strategische Preiskommunikation von Versicherungsunternehmen abzuleiten.

Die erste Forschungsarbeit, "Unisex Insurance Pricing: Consumers' Perception and Market Implications", betrachtet die laufende Diskriminierungsdebatte, die im Rahmen des EuGH-Urteils aufkam. Dabei wird das Spannungsfeld zwischen Gleichbehandlungsgesetz einerseits sowie dem Prinzip der aktuariellen Fairness und Gleichheit andererseits betrachtet. Wir untersuchen die Fragestellungen, inwiefern sich der Kunde als Einzelner fair behandelt fühlt und welche Folgen das EuGH-Urteil für die Versicherungsindustrie und den Kunden nach sich zieht. Unsere Untersuchung basiert auf einer internationalen Kundenbefragung, die dazu dient, die Kundenwahrnehmung hinsichtlich der Verwendung von Preisdifferenzierungsmerkmalen in den Hauptversicherungssparten sowie deren Wichtigkeit empirisch zu bestimmen. Unsere Ergebnisse zeigen, dass Kunden die einzelnen Preisdifferenzierungsmerkmale unterschiedlich beurteilen – je nach Versicherungssparte und befragtem Land.

Die zweite Forschungsarbeit, "A Comparison of Insurers' Usage and Consumers' Perception of Price Differentiation Factors", ist ein empirischer Vergleich zwischen der Verwendung einzelner Preisdifferenzierungsmerkmale in der Assekuranz und der Kundenwahrnehmung dieser Kriterien. Unsere Analyse haben wir in zwei Teile untergliedert, um den Zusammenhang zwischen preisbestimmenden Merkmalen und der Kundenakzeptanz der aktuariellen Prämienkalkulation empirisch untersuchen zu können. Einerseits analysieren wir die Preismodelle der Assekuranz mittels multi-

variaten Regressionsmodellen. Andererseits ermitteln wir die Kundenwahrnehmung hinsichtlich der Verwendung unterschiedlicher Preismerkmale sowie deren Akzeptanz, indem wir eine international durchgeführte Kundenbefragung deskriptiv auswerten. Unsere Ergebnisse veranschaulichen, dass Kunden Versicherungsprämien "fairer" empfinden, je transparenter und nachvollziehbarer die Prämienkalkulation für sie ist.

Die dritte Forschungsarbeit, "Optimizing Insurance Pricing by Incorporating Consumers' Perceptions of Risk Classification", untersucht empirisch die Kundenakzeptanz von Risikomerkmalen, die derzeit in der aktuariellen Prämienkalkulation Anwendung finden, sowie die Kundenbereitschaft, dem Versicherer weitere persönliche Information für die Preisbestimmung zur Verfügung zu stellen. Die Kundenpräferenzen bestimmen wir mittels deskriptiver Analysemethoden. Die Bereitstellung persönlicher Kundeninformationen ermöglicht es Versicherungsunternehmen, abgefragte und verwendete Preisdifferenzierungsmerkmale, die geringen Einfluss auf die Prämienhöhe sowie geringe Kundenakzeptanz aufweisen, kritisch auf deren Verwendung zu überprüfen. Unsere Ergebnisse zeigen, dass Kunden derzeit verwendete Risikomerkmale akzeptieren, wenn deren Einfluss auf die Prämie transparent ist. Weiterhin sind Kunden bereit, Versicherern zusätzliche persönliche Informationen zur Verfügung zu stellen, sofern diese für die Preisbestimmung verwendet werden.

Mit der letzten Forschungsarbeit, "Do Customers Value Cost-Based Price Transparency in Motor Insurance? Effects on Consumers' Purchase Intentions, Loyalty, and Willingness to Pay", betrachten wir den Aspekt von Transparenz in der Preisdarstellung. Empirisch analysieren wir die Effekte verschiedener Formen der Preisdarstellung (mit und ohne Aufschlüsselung der Kosten einer Versicherungspolice) auf die Produktbewertung und den Kaufentscheid von Kunden in der Motorfahrzeugversicherung, indem wir deskriptive statistische Analysemethoden und Strukturgleichungsmodelle verwenden. Unsere Ergebnisse zeigen, dass eine zusätzlich Kostenaufschlüsselung die Kundenzufriedenheit signifikant erhöht. Abhängig von der Versicherungssparte beeinflusst diese den Kaufentscheid der Kunden sowie deren anschliessende Weiterempfehlungsbereitschaft des gekauften Produktes. Die Zahlungsbereitschaft der Kunden ändert sich jedoch nicht in jeder Produktsparte signifikant. Weiterhin veranschaulichen unsere Ergebnisse, dass psychografische und soziodemografische Kundenmerkmale zu Unterschieden in der Produktbewertung führen.

Part I

Unisex Insurance Pricing: Consumers' Perception and Market Implications

Abstract

The main reason for different insurance premiums and benefits is the use of different statistically proven risk factors in actuarial calculations for individuals. Basing its ruling on European Union Directive 2004/113/EC, the European Court of Justice on March 1, 2011, concluded that any gender-based discrimination is prohibited, so gender equality in the European Union (EU) must be ensured from December 21, 2012. Until then, gender-specific premium differentiation was allowed in most EU Member States for risks that are strongly linked to gender. We discuss the relevance of price differentiation criteria from the point of view of insurers, regulators and ethicists, and reflect on the degree of acceptance of such price differentiation by consumers, which is assessed empirically through an international consumer survey conducted in the United Kingdom, Germany, France, Italy and Switzerland. The perception of risk factors and of effective gender-related price differences is considered with respect to motor, annuity, term life and health insurance. Finally, we discuss possible consequences of the new regulation for the insurance industry.[1]

[1]H. Schmeiser, T. Störmer, and J. Wagner, Unisex Insurance Pricing: Consumers' Perception and Market Implications, *Working Papers on Risk Management and Insurance*, No. 112, 2012. This paper has been accepted for publication in *The Geneva Papers on Risk and Insurance – Issues and Practice*, 2014, 39(2):322-350. A German excerpt of this paper with the title "Ungleiches Risiko, gleicher Preis" has been published in *Schweizer Versicherung*, 2012, 3:8–13. The authors gratefully acknowledge financial support by the *Dr. Hans Kessler Foundation*.

1 Introduction

The debate about equal treatment between men and women has a long tradition in Europe and is a fundamental principle of the European Union (EU, Council of the EU, 2004, para. 4). The current EU gender equality law is a combination of "Treaty provisions, legislation and the case law of the European Court of Justice" (ECJ, Burri and Prechal, 2010, p. 1). The origin of gender equality dates back to the Treaty establishing the European Economic Community (EEC) of 1957. Article 119 EEC (now, after the entry into force of the Treaty of Lisbon, Article 157 of the Treaty on the Functioning of the EU (TFEU)) enshrines "the principle of equal pay between men and women for equal work" (Burri and Prechal, 2010, p. 2). Not all countries had integrated this Article into their national legislation by January 1, 1962 as planned. A 2011 ruling of the ECJ reaffirmed the fact that there were "a number of existing legal instruments for the implementation of the principle of equal treatment between men and women in matters of employment and occupation" (ECJ, 2011, para. 15), for example, Council Directive 75/117/EEC (Council of the EC, 1975) and Council Directive 76/207/EEC. In the area of occupational social security schemes, the Council Directive 86/378/EEC was adopted. Further, in the field of pregnancy, motherhood and parental leave, the Council Directive 92/85/EEC, as well as Council Directive 96/34/EC (Burri and Prechal, 2010, pp. 13–14) were set up. In the year 2006, "the Recast Directive 2006/54/EC was adopted in which the existing provisions of different sex equality directives are brought together and some case law of the ECJ is incorporated" (Burri and Prechal, 2010, p. 7).

The European Commission decided to extend gender equality to other areas outside the labor market in the Social Policy Agenda because of several jurisprudence of the ECJ (Commission of the EC, 2003, p. 19). In November 2003 the European Commission presented a proposal for the first Directive outside the area of employment implementing the principle of equal treatment between women and men in the access to and supply of goods and services (Commission of the EC, 2003, p. 1). Article 1 of the proposal decrees that public goods and services also "include services such as banking, insurance and other financial services" (Commission of the EC, 2003, p. 13). The Council of the EU adopted Directive 2004/113/EC (hereinafter called the *Gender Directive*, see Council of the EU, 2004) on December 13, 2004 in order to implement "a framework for combating discrimination based on sex [...], with a view to putting into effect in the Member States the principle of equal treatment between men and women" (Commission of the EC, 2003, p. 6). The main reason for a standardized legal framework is "that sex is not the dominant factor in determining life expectancy". Therefore, "different actuarial calculations for determining premiums [...] for insurance products related to life expectancy must be considered as sex discrimination" (Commission of the EC, 2003, p. 7). "However,

the Directive allowed various exceptions to the principle of equal treatment" (Burri and Prechal, 2010, p. 15).

Article 5(1) of the Gender Directive states: "Member States shall ensure that in all new contracts concluded after December 21, 2007 at the latest, the use of sex as a factor in the calculation of premiums and benefits for the purposes of insurance and related financial services shall not result in differences in individuals' premiums and benefits" (Council of the EU, 2004, p. 41). However, Article 5(2) of the Gender Directive reads: "Notwithstanding paragraph 1, Member States may decide before December 21, 2007 to permit proportionate differences in individuals' premiums and benefits where the use of sex is a determining factor in the assessment of risk based on relevant and accurate actuarial and statistical data" (Council of the EU, 2004, p. 41). This clause allowed an exception for insurance companies as long as they provide actuarial and statistical data that verify gender as an objective risk rating factor.

On March 1, 2011, the ECJ issued a ruling on the validity of Article 5(2) of the Gender Directive in a case brought by the Belgium consumer association Test-Achats ASBL and two Belgian citizens against the Conseil des Ministres of Belgium. The Court considered whether Article 5(2) of the Gender Directive was "compatible with Article 6(2) of the Treaty on EU (TEU), and, more specifically, with the principle of equality and non-discrimination guaranteed by that provision? [And,] if the answer to the first question is negative, [whether] Article 5(2) of the Directive [was] also incompatible with Article 6(2) TEU if its application is restricted to life assurance contracts" (ECJ, 2011, para. 14). The ECJ ruled: "Article 5(2) of [the Gender Directive] of December 13, 2004 implementing the principle of equal treatment between men and women in the access to and supply of goods and services is invalid with effect from December 21, 2012" (ECJ, 2011). On this basis, it was not necessary to answer the second question (ECJ, 2011, para. 34–35). In light of the Court's ruling, it is no longer allowed to treat male and female policyholders differently when calculating premiums and benefits for new insurance contracts.

The ruling has led to a broad public discussion of both the insurance industry and insurance associations as well as consumer organizations. The ongoing debate about discrimination illustrates the area of conflict. Most EU Member States applied Article 5(2) and still allowed the use of gender as a risk-rating factor in calculating their insurance products. Therefore, the judgment will impact on all EU Member States (European Commission, 2012, para. 3). An important aspect of discrimination in insurance is the differentiation between, on the one hand, discrimination law, based on the principle of human rights and the principle of equality among individuals, and, on the other hand, the principle of actuarial fairness and actuarial equality. Hence, the question arises as to whether the customer as an individual feels that he or she is treated fairly and what impact the Gender Directive has on the insurance

industry and policyholders.

In addition to the legal texts, many surveys and much literature are concerned with issues of gender differentiation in the insurance industry as well as the price sensitivity of policyholders. In addition to the legal and economic aspects, ethical issues are also often analyzed. A survey of the EU (see Civic Consulting, 2010a,b,c) deals with the theme of ethically justified price differentiation due to different risk characteristics. However, rather than policyholders as insurance customers, this survey interviews and takes account of consumer organizations, ombudsmen and national insurance and banking associations. Ebner (2010, p. 7) examines differences in the degree of willingness to pay higher premiums among insurance customers as well as their specific behavior patterns in terms of behavioral pricing, but did restrict it to the risk criteria of gender. Furthermore, Homburg and Koschate (2005) analyze price sensitivity in different product lines with high demand for insurance that is usually mandatory, for example, motor and life insurance. They conclude, for example, that the respondents do not require the removal of gender differences in pricing if positive effects are expected for the group as a whole. Borenstein (1989) also analyzes consumers' behavior in competitive insurance markets, but focuses on discrimination based on risk sorting in insurance companies. He points out that the soundness of insurance can be enhanced by a ban on several risk classification factors in actuarial pricing (Borenstein, 1989, p. 38). It should be noted that regulatory intervention in actuarial calculation and, in particular, gender differentiation, has been discussed in scientific literature in the U.S. since the 1970s.[2]

Charges of discrimination mainly relate to ascriptive personality characteristics, for example, gender, ethnic origin or race (see, e.g., Schiek, 2000, p. 229). In the European literature, for example, Schmidt (1989) discusses discrimination against women in private health insurance. Also, Ford and Reifner (1992) consider inequality between sexes in the insurance and financial sector. Buzzacchi and Valletti (2005, p. 71) analyze in their paper the welfare and impact of strategic price discrimination in mandatory insurance markets. Thiery and Van Schoubroeck (2006, p. 190) examine aspects of fairness and equality in actuarial risk selection from a

[2]This followed the initiation of various lawsuits brought by policyholders against the use of gender-specific life tables in actuarial calculations of pension schemes. In the U.S., gender inequality violates Title VII of the Civil Rights Act of 1964. In two decisions – the Manhart case (see U.S. Supreme Court, 1978) and the Norris case (see U.S. Supreme Court, 1983) – the U.S. Supreme Court ruled that pension payments must be equal for both sexes and banned the use of gender-specific life tables. In this context, various authors consider the aspect of gender discrimination in U.S. pension schemes from ethical and economical perspectives (see, e.g., Martin, 1977, 1979; Hedges, 1977; Myers, 1977; Kimball, 1979, 1980; Brilmayer et al., 1979, 1983; Laycock and Sullivan, 1981; Benston, 1982, 1983; Christiansen, 1983; Hickman, 1983). Finkelstein et al. (2009, p. 38) analyze regulatory aspects and their consequences for the insurance industry. They develop an equilibrium screening model to show the impact of gender-based pricing restrictions on annuity products based on the papers of Hoy (1982) as well as Crocker and Snow (1986).

legal standpoint and their impact on insurance companies.

So far, the literature and surveys concerned with issues of gender differentiation in the insurance industry and the price sensitivity of policyholders do not take the customer's point of view into account directly, but rather indirectly through, for example, relevant associations' opinions or court rulings. In the following study, we use a survey to investigate consumers' views on the ethical acceptability of price differentiation factors (survey Part I). In the second part of the survey, to link the judgment of the ECJ with the subject of discrimination in insurance, as previously mentioned, we specifically focus on the assessment of price sensitivity for differentiated premiums based on the gender risk criterion. We believe this point is important because – to our knowledge – in the existing recent literature, customers were not asked about their opinion on gender-specific pricing.

Our contribution focuses on core dimensions along the following line of reasoning: First, we examine the customer's perspective by conducting a broad survey covering different insurance products and several European countries. Second, we compare views on and exposure to price calculation in these countries and product lines. Third, we put the gender criterion in context with other relevant differentiation criteria. Finally, we assess consumers' opinions of the fairness of the resulting price differences.

The remainder of the paper is structured as follows. In the next section, we discuss the importance of risk differentiation in pricing in light of varying perspectives of different stakeholders. We present the viewpoints of insurers, regulators and ethicists (Section 2.1), as well as the customer's view of price differentiation, which is based on new empirical results from our study (Section 2.2). In the subsequent section, we focus on the particular case of the gender criterion, that is, the use of gender as a risk factor in different countries and product lines (Section 3.1) and customers' perceptions of price differences due to gender-based differentiation (Section 3.2). In Section 3.3, we sum up the results of the different stakeholder perspectives and discuss possible implications of the EU ban on gender-based discrimination. Therefore, we focus on customers' reactions, the reactions of the insurance industry and possible further regulatory intervention. Finally, the last section summarizes our findings and presents our conclusions.

2 Risk Differentiation Factors in Insurance Pricing

Differentiation criteria play an important role in insurers' premium and benefit calculations. In this section, the relevance of risk factors for adequate pricing is analyzed from different viewpoints. The insurance industry's goal of price differentiation is to ensure a profitable business model and to avoid adverse selection

effects. From the regulatory viewpoint, differentiation through discrimination, for example, based on race or nationality, should be prevented. From an ethical point of view, differentiated premiums may appear to be antisocial and prohibit solidarity in the group of policyholders. Finally, we introduce new empirical results from a consumer survey that illustrate the customer's point of view.

2.1 Perspectives on Price Differentiation

2.1.1 Insurance Industry's Point of View

Actuarial calculation of risk differentiation in pricing is based on the principle of equivalence, which is deemed to exist when the present values of premiums and benefits are equal. The statistically expected claims costs depend on risk characteristics and form the basis for a risk-adjusted premium calculation (Wang, 2000, p. 15). With the help of price differentiation, an insurance company can minimize the effects of anti-selection.[3] This means the customer portfolio is protected against policyholders leaving because of lower loss expectancy and higher premiums, or taking out a policy because of higher loss expectancy and lower premiums (see, e.g., Borch, 1984, p. 469). The more precisely an insurer is able to calculate expected claim payments, the better it can differentiate premiums. Furthermore, this also enables the acquisition of lower-risk customers with adequately lower premiums. This approach minimizes cross-subsidization in the portfolio (see, e.g., Finkelstein et al., 2009, p. 41).

On the one hand, differentiation by risk exposure is not discrimination but rather, is indispensable for private insurance to function in a competitive market (Rees and Wambach, 2008, p. 95). On the other hand, high premium differentiation can result in the exclusion of higher-risk policyholders, whose premiums might be raised to an unaffordable level. Thus, the more accurately an insurer can calculate premiums and provide policyholders a fair price, the more risk-averse customers take out adequate insurance cover (see, e.g., Rees and Wambach, 2008, p. 45). Furthermore, surveys on price fairness presented, for example, by Homburg et al. (2005), conclude that an apparent motive for customer fairness implies a higher willingness to buy. If policyholders perceive premiums and benefits as fair and justified, they are more

[3] Adverse selection, also known as anti-selection, describes when an insurer and a policyholder have different information regarding risk. Adverse selection can arise in markets with asymmetric information, where at least one party does not have comprehensive insights into a certain issue (see Rothschild and Stiglitz, 1976, p. 629). Therefore, if a prospective client has more information about his estimated risks of loss than the insurer, he takes out his level of coverage based on this information (Association of British Insurers (ABI), 2010, p. 51). Hence, the customer is interested in policies which cover the individual expected risk of loss, and the insurer is unable to provide him such an individual premium. Several authors deal with the phenomenon of adverse selection and its consequences (see, e.g., Crocker and Snow, 1986; Chiappori and Salanié, 2000; Abbring et al., 2003; Cohen and Siegelman, 2009; Gatzert et al., 2012).

willing to accept the premiums determined by the insurer. Several authors discuss the so-called "propitious selection" theory where highly risk-avoiding consumers both reduce the hazard and purchase insurance, while less risk-averse customers are less willing to buy insurance voluntarily (Hemenway, 1990, p. 1064). The main difference with the phenomenon of adverse selection described by Akerlof (1970) is that customers can actively influence their risk behavior. Therefore, customers who avoid high risk are targeted to reduce the hazard (Hemenway, 1990, p. 1064).[4] Thomas (2007, p. 129) justifies the principle of propitious selection where customer demand for insurance is linked with lower risk rather than higher risk.

Customer segmentation into groups plays an important role in risk selection in the insurance industry (Brilmayer et al., 1979, p. 508). From an economic point of view, the principle of premium differentiation is introduced according to actuarial equal treatment of policyholders. The Pareto optimum describes a competitive equilibrium if every single relevant cost or utility factor has its market price (Arrow, 1963, p. 942). A ban on risk-rating factors proscribes the use of available information and leads to suboptimal pricing. Accordingly, similar risks require an identical calculation of insurance premiums, while differing risks are to be treated with differentiation (see, e.g., Jannott, 1994). Individual premiums assure that each policyholder finances his own expected loss or the expected loss of his customer segment. Furthermore, the resulting differentiated premiums per segment are essential for insurance companies to ensure the premium-independent composition of their portfolio, as well as to be efficient and competitive in the market (Groupe Consultatif Actuariel Européen, 2011, p. 21). Ebner (2010) concludes that it is precisely through differentiated prices that higher advantages for both the customer and the insurer can be achieved.

A distinction is made between two forms of premium calculation for policyholders. The primary premium differentiation takes place upon signing of the contract: Pricing is based on "objective" and a priori-determined attributes, for example, in motor insurance, the type of car or motor power (see Meyer-Kahlen, 1988, p. 91). Secondary premium differentiation is carried out after a loss has occurred, that is, based on the experience of the insurer with the specific risk. The individual "subjective" differences between risks within a risk group are calculated *ex post*, that is, in the form of premium adjustments based on individual claims records of the previous year, for example, in motor insurance, through a system of discounts

[4]The phenomenon of adverse selection is due to *hidden information*; moral hazard, by contrast, is due to *hidden action* (see Cohen and Siegelman, 2009, p. 28). Moral hazard describes the excessive risk-taking behavior of individuals and, thus, the increase in the overall risk level. Such behavior occurs when the policyholder is more willing to take a risk and raise his claim/damage probability because of the knowledge that the insurer will assume responsibility for the costs in the event of a covered claim. Shavell (1979) describes the phenomenon of moral hazard in insurance pricing in detail in his paper.

and surcharges (see Meyer-Kahlen, 1988, p. 91). For the insurance industry, it is irrelevant if the risk criteria used are linked to causality. It is important that the criteria be reasonably stable over a sufficiently long period and correlated (ABI, 2010, p. 13).

A recent industry survey of all business lines (see Civic Consulting, 2010a) shows that insurance companies have so far received very few complaints regarding policyholder discrimination on the basis of differentiated premiums. Since 2007, 51% of the surveyed insurance companies have had no complaints, while 21% have had fewer than five cases per year and only 3% have had between five and nine complaints per year (Civic Consulting, 2010a, p. 96). Most of these complaints concern life insurance and annuity products (23%), private health insurance (19%) and motor insurance (15%) (Civic Consulting, 2010a, p. 106). 50% of all complaints concerned refusal to provide services, 38% concerned exclusions and restrictions, and 32% involved prohibitively expensive premiums (Civic Consulting, 2010a, p. 107). The complaints mainly relate to the criteria of age (42% of all filings), disability (38%) and ethnic origin (16%, Civic Consulting, 2010a, p. 108). The low number of complaints is mainly explained by the appropriate legal framework in the EU. However, it is not clear if it is not simply the result of a lack of knowledge on the part of the public regarding anti-discrimination legislation.

2.1.2 Regulatory Point of View

Since 2004, national regulations on gender discrimination have to be compatible with the Gender Directive and the specific conditions of its Article 5(2). However, until the end of 2012, EU Member States used the gender-related risk-rating factor according to national law in different ways (European Commission, 2012, pp. 6–7). The Guidelines on the Application of the Gender Directive state that "all [EU] Member States currently allow gender differentiation for at least one type of insurance" (see European Commission, 2012, para. 3). Article 5(2) of the Gender Directive was only applied in EU Member States which had not already previously implemented gender-neutral tariffing into national legislation (Kokott, 2010, para. 23). Accordingly, the principle of non-discrimination was applied "similarly" in EU Member States, but not "identically".

The starting point for the limitation of differentiated premium calculation in the European insurance industry was Council Directive 2000/43/EC, which abolished discrimination based on racial and ethnic origin (see Council of the EU, 2000a). Schiek (2000, p. 241) explains in detail how several market surveys demonstrate that financial institutions in Germany denied access to banking services to certain nationals in the 1990s. Furthermore, the German Federal Insurance Supervisory Office (1995) forbade discrimination against foreigners in motor insurance. Before

that, various insurers required an additional premium based on the risk criterion of the "foreigner".

The legislator takes precedence over the applicable insurance laws to protect individual rights (see also Ebner, 2010). The Commission of the EC argued in its "Proposal for a Council Directive implementing the principle of equal treatment of women and men in the access to and supply of goods and services" that "equal treatment for women and men is a fundamental right and [...] the freedom to set tariffs must be subject to that right. The separation of men and women into different pools leads to an unjustified difference of treatment [...]. The practice must be judged to be discriminatory and the legislator should therefore take action to prohibit it" (see Commission of the EC, 2003, pp. 7–8). Based on the ban on the gender criterion, the different positions of equality become apparent (Thiery and Van Schoubroeck, 2006, p. 193). Discrimination in pricing is an illustration of the tension between the differentiation of existing legal discrimination law, based on the principle of human rights and the principal of equality between individuals on the one hand, and the principle of actuarial fairness and equality on the other hand.

2.1.3 Ethical Point of View

Aristotle's formula is the basis for the principle of formal justice and can therefore also provide the basis for fair prices. Risk-based premium differentiation aims to treat situations similarly and price risks identically if they are comparable from a risk assessment perspective. The principle of formal justice is the requirement to treat comparable situations equally and non-comparable situations unequally, unless such treatment is objectively justified, that is, treating equals equally (Koller, 2001). Apart from formal equality there is substantive equality. "Substantive equality requires that the roots of inequality be identified, the goal of equality of opportunity be established, and that a legal mechanism be established that will achieve this goal in a principled way" (Centre for Equality Rights in Accommodation (CERA), 2013, p. 2). That is, for example, to achieve substantive equality in insurance pricing, the use of the risk-rating factor motherhood is prohibited (see, e.g., Tobler, 2005).

Actuarial pricing is based on statistical data. The assessment of risk is carried out on the basis of personal customer characteristics which are not always obvious. Hence, insurance companies use criteria that are easy to identify and strongly linked with the target criterion. From an economic point of view, this seems efficient; from an ethical point of view, it may be critical. Doing so results in a generalization, and specific individual cases are not taken into account. Hence, particular cases cannot be assessed individually and partial discrimination may occur (see Britz, 2008, p. 17). Thus, treating individuals equally is a challenge within insurance

portfolios.

The insurance industry uses price differentiation factors to determine the fair price for insurance products. Some are innate factors (e.g., age, racial/ethnic origin, gender) or "given" (e.g., health status), and others are endogenous criteria (e.g., availability of garage parking in motor insurance). The central question is the comparability of different risk features with regard to actuarial calculations. In this context, some features are more influenceable (e.g., smoking habits) than others, such as the gender criterion, which is inextricably linked with the person and represents an immutable attribute: "In addition, a person's gender, unlike, for instance, his age, is not subject to any natural changes" (Kokott, 2010, para. 50). Because the assessment of comparability is time-dependent, the question of who judges comparability, what the comparison is based on, and which differences are considered to be legally relevant is crucial. The regulator issues anti-discrimination rulings for individuals who are negatively affected by law. Society – in our case the consumer – has to discuss the power of the state's influence (see Section 2.1.1). This is in the scope of the following analysis where the customer perception of risk factors will be analyzed.

2.2 Customer Perception of Risk Factors

Various surveys focus on the customers views regarding differentiated premiums in the insurance industry. For example, the above-mentioned survey by Homburg et al. (2005) concludes that consumers are more willing to pay if premiums are fair. A study by Civic Consulting (2010a) focuses on complaints about price differentiation criteria that have reached independent arbitration committees. We observe that in most analyses similar to those by Homburg et al. (2005) and Civic Consulting (2010a), no customers are directly questioned. Thus, the purpose of this section is to introduce our consumer survey and present the results obtained regarding the customers acceptance of price differentiation factors in the insurers pricing process.

2.2.1 Survey Description

The survey was conducted in five European countries about four key insurance products focusing on several price differentiation criteria. The questionnaire was designed to determine consumers' acceptance of various differentiation criteria on the basis of practical examples. A detailed description of that questionnaire can be found in the Appendix.

The survey focused on the product categories motor, annuity, life and health insurance. In each of these product lines, a selection of the most relevant differentiation criteria is considered in Part I of the survey (see Appendix). For motor insurance, the criteria considered are the customer's age, the make of car, mileage

and the customer's gender. For annuity insurance, the consumer's income, health status, smoker status and gender are taken into account. For life insurance, we look at the policyholder's age, body mass index (BMI), hobby and gender, while for health insurance, age, health status and gender are observed.

The poll was carried out in summer 2011 across the United Kingdom ($n = 1\,003$ retained respondents), Germany ($n = 1\,040$), France ($n = 1\,014$), Italy ($n = 1\,013$) and Switzerland ($n = 1\,038$), comprising a total of 5 108 questionnaires answered. The inquiry is representative for the local population structure by age and gender in each country. Respondents graded the four criteria presented in each product line on a scale from 1 to 5 (1 = do not agree, 5 = agree completely).

2.2.2 Presentation of Survey Results and Discussion

Perceptions of the use of price differentiation criteria in the insurance industry, and the degree of importance attributed to it, vary according to the nationality and gender of the respondents. Significant differences are observable with respect to different countries, product lines and genders. Table 1 shows the descriptive statistics of the survey results and indicates the average appreciation rating for the different survey criteria in both gender groups in each of the countries considered, as well as the average standard deviation and significant differences between the mean values. Asterisks (**, *) are used to point out the significance levels between both gender groups within a country, letters (A, a) show significant differences between countries.

Differences Among Countries

When analyzing the reactions to the various risk attributes, two groups of countries emerge, each of which evaluates the factors differently. The first group includes the respondents in the United Kingdom (U.K.), who mostly perceive individual insurance pricing as fair and justified. In comparison to the other four countries, respondents from the U.K. show the highest acceptance on average of all attributes (average: female = 3.21, male = 3.38). Furthermore, respondents in the U.K. have the highest acceptance rate in almost all product lines (14 out of the 16 attributes surveyed), regardless of the respondent's gender. The difference is particularly remarkable when compared with France, where the average acceptance rates are roughly half a point lower (2.75 and 2.87, respectively). Hence, French respondents constitute the core members of the second group: independent of their gender, they are less approving of the use of individual risk factors for differentiated pricing. This finding is also indicated by the overall value in each country (see bottom line in Table 1). Similar to the U.K., responses in France reveal extreme survey results. The majority of the respondents in France do not approve of the use

		United Kingdom		Germany		France		Italy		Switzerland		Overall (all countries)	
		Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
	n	516	487	518	522	517	497	510	503	520	518	2581	2527
Motor	Age	3.64 (1.12)	3.88 (1.09) ** BCDE	3.15 (1.15)	3.54 (1.19) ** ACe	3.03 (1.35)	3.16 (1.34) ABDe	3.25 (1.16)	3.60 (1.15) ** ACE	3.15 (1.24)	3.28 (1.28) AbcD	3.24 (1.22)	3.49 (1.24) **
	Make	3.30 (1.07)	3.47 (1.09) ** BDE	3.01 (1.12)	3.08 (1.22) AC	3.30 (1.20)	3.43 (1.29) BDE	3.05 (1.14)	3.14 (1.22) AC	3.06 (1.18)	3.15 (1.23) AC	3.14 (1.15)	3.25 (1.22) **
	Kilometres	3.52 (1.08)	3.65 (1.14) BCdE	3.32 (1.21)	3.46 (1.24) ACDE	3.42 (1.38)	3.44 (1.34) AE	3.32 (1.20)	3.60 (1.17) ** aE	2.99 (1.31)	3.05 (1.36) ABCD	3.31 (1.25)	3.44 (1.27) **
	Gender	3.80 (1.05)	3.87 (1.12) BCDE	3.25 (1.15)	3.24 (1.20) ACD	3.18 (1.35)	2.82 (1.34) ABE	3.10 (1.21)	2.92 (1.23) * ABE	3.27 (1.21)	3.07 (1.32) * ACD	3.32 (1.22)	3.18 (1.30) **
Annuity	Income	2.80 (1.24)	3.13 (1.26) ** BCE	3.39 (1.24)	3.40 (1.31) AcD	3.19 (1.38)	3.33 (1.39) AbDE	2.83 (1.29)	3.15 (1.31) ** BCE	3.35 (1.32)	3.55 (1.33) * ACD	3.11 (1.32)	3.32 (1.33) **
	Health	2.69 (1.03)	2.76 (1.12) BCDE	2.12 (1.02)	2.20 (1.10) Acde	1.90 (1.00)	2.04 (1.06) * ABD	2.26 (1.02)	2.28 (1.10) AbCE	2.00 (0.96)	2.09 (1.00) AbD	2.19 (1.04)	2.27 (1.11) *
	Smoker	2.83 (1.23)	3.02 (1.27) * BCDE	2.30 (1.17)	2.38 (1.24) AD	2.30 (1.18)	2.55 (1.38) ** AD	2.52 (1.14)	2.78 (1.25) ** ABCE	2.30 (1.16)	2.48 (1.35) * AD	2.45 (1.19)	2.64 (1.32) **
	Gender	2.18 (1.01)	2.48 (1.16) ** BCDE	1.99 (1.00)	2.22 (1.13) ** AC	1.77 (0.96)	2.08 (1.11) ** ABDE	2.06 (1.06)	2.26 (1.10) AC	1.99 (0.96)	2.15 (1.11) * AC	2.00 (1.01)	2.23 (1.13) **
Life	Age	3.61 (1.03)	3.80 (1.05) CDE	3.58 (1.03)	3.79 (1.05) ** CDE	3.35 (1.26)	3.67 (1.17) ** ABD	3.03 (1.15)	3.35 (1.13) ** ABCE	3.34 (1.11)	3.50 (1.13) * ABD	3.38 (1.14)	3.62 (1.12) **
	BMI	3.43 (1.09)	3.55 (1.14) BCDE	2.85 (1.19)	3.04 (1.25) * ACD	2.41 (1.26)	2.81 (1.32) ** ABDE	2.57 (1.16)	3.02 (1.21) ABCe	2.82 (1.26)	3.00 (1.26) ** ACd	2.82 (1.24)	3.08 (1.26) **
	Hobby	3.91 (0.97)	3.97 (1.05) BCDE	3.50 (1.20)	3.58 (1.19) ACE	3.25 (1.37)	3.26 (1.37) ABDe	3.48 (1.14)	3.75 (1.14) ACE	3.35 (1.23)	3.44 (1.30) ** ABcD	3.50 (1.21)	3.60 (1.24) **
	Gender	3.37 (1.04)	3.37 (1.10) BCDE	3.09 (1.07)	3.02 (1.12) ACE	2.95 (1.29)	2.70 (1.26) ** ABd	2.83 (1.17)	3.11 (1.14) ** AcE	2.91 (1.16)	2.74 (1.19) * ABD	3.03 (1.16)	2.99 (1.19)
Health	Age	3.45 (0.94)	3.60 (0.92) * BCDE	3.03 (1.01)	3.16 (1.11) Ad	3.11 (1.19)	3.18 (1.20) A	3.08 (1.00)	3.29 (1.04) Ab	3.06 (1.15)	3.20 (1.19) ** A	3.15 (1.07)	3.28 (1.11) **
	Health	3.67 (0.92)	3.78 (0.97) ** BCDE	2.96 (1.03)	3.05 (1.08) ACEd	2.48 (1.20)	2.69 (1.23) ** ABDE	2.77 (1.17)	3.02 (1.19) AbCe	2.75 (1.12)	2.81 (1.16) ** ABCd	2.93 (1.16)	3.06 (1.19) **
	Gender Social	2.82 (0.90)	2.69 (0.94) * BCdE	2.70 (1.10)	2.53 (1.19) * AD	2.61 (1.22)	2.43 (1.18) * AD	2.98 (1.08)	2.73 (1.07) aBCE	2.71 (1.24)	2.54 (1.22) ** AD	2.76 (1.12)	2.58 (1.13) **
	Gender	2.30 (1.09)	3.03 (1.10) BCDE	1.99 (1.02)	2.61 (1.20) ** ACDe	1.80 (1.02)	2.40 (1.29) ** ABDE	2.27 (1.18)	2.65 (1.18) ABC	2.17 (1.19)	2.66 (1.30) ** AbC	2.11 (1.12)	2.67 (1.23) **
	Overall	3.21 (1.05)	3.38 (1.10) ce	2.89 (1.11)	3.02 (1.18)	2.75 (1.23)	2.87 (1.27) a	2.84 (1.14)	3.04 (1.17)	2.83 (1.18)	2.92 (1.23) a	2.90 (1.16)	3.04 (1.21)

Table 1: Descriptive Statistics of Survey Results: Acceptance of Differentiation Criteria
* or lowercase letters denote significance at the 5% level, ** or capital letters at the 1% level. Reported values denote the average and the standard deviation (given in parenthesis) of the survey results for each risk factor considered and for both gender groups (female, male) in each country. The grades are based on a five-point scale: 1 = do not agree, 5 = agree completely (see also the survey description in the Appendix). The risk factors are grouped by product line (motor, annuity, life, health). The number n denotes the number of respondents in each country-gender group. The significance of difference is given within gender groups in each country (denoted by stars) and between countries (denoted with letters). The letters refer to the countries in the order presented, i.e., A = United Kingdom, B = Germany, and so on.

of several individual risk characteristics (average rating below 3.0; consider, for example, gender or health criteria in annuity insurance and the gender criterion for health insurance, where the average values are 1.77, 1.90 and 1.80, respectively). In comparison to the other countries, France has the lowest acceptance of risk factors, especially for annuity, life and private health products. Establishing prices based on gender differentiation is perceived as unfair in France, in absolute terms (lowest acceptance ratings for annuity and health) and relatively when compared with the U.K. results.

It should be noted that the social policy of each country may have a considerable impact and thus may have clearly influenced the respondents' attitudes towards risk factors. On the one hand, the U.K. can be characterized as a liberal welfare state, where resources are allocated through market forces and the state merely establishes the basic rules and infrastructure for basic social security (see, e.g., Esping-Andersen, 1990). On the other hand, France can be considered as a corporate welfare state with a well-developed social and subsidizing system. The U.K. model is similar to the one in Switzerland with regard to individual attributes and is particularly obvious in the use of income as a pricing criterion for annuity insurance premiums, which Swiss men seem to perceive as fair (average rating of 3.55).

Differences Among Lines of Insurance

When considering the acceptance rates of risk differentiation factors in the four surveyed product lines, the highest acceptance is found in motor insurance (average overall acceptance rate of 3.30), followed by term life insurance (3.25). In private health insurance (2.82) and annuity insurance (2.53), risk differentiation is less accepted. The risk criterion age has the highest customer agreement overall and thus in almost all countries across the four key insurance products. The highest acceptance rate for the use of age is observed for motor insurance (average overall acceptance rate for both genders of 3.37) and the lowest for private health insurance (3.22). However, in the latter case, the rate is still above the neutral level of 3. The gender criterion is accepted the least in almost all product lines, in particular for annuity (2.12) and private health insurance (2.39). For motor and term life insurance, the acceptance rate is around 3.0 or higher (3.25 and 3.01, respectively).

The tendency of the two country groups is also reflected in the significance of the differences in the various product lines. Different reactions in all products can be found, with more pronounced differences between the U.K. rates and those of the other four countries. The U.K. responses were significantly different from the responses from any other country, except for the following pricing criteria: the make of the policyholder's car for motor insurance (not significantly different from

France), income for annuity insurance (not significantly different from Italy) and age for life insurance (not significantly different from Germany).

Differences Between Gender Groups

The analysis of differences in the response behavior of the two genders reveals a heterogeneous picture. On the one hand, no gender-specific significant differences were found in the U.K. in the ratings of all pricing criteria for life insurance, or in France with respect to all the motor insurance pricing criteria, or in Italy with respect to health insurance. On the other hand, male and female respondents in Switzerland offer significantly different ratings of all risk attributes for life and health insurance. In between these extremes, where significant differences appear for all attributes of a product, about half of all ratings of risk factors reveal significant gender-specific response behavior. The overall analysis of all countries demonstrates significant differences between the answers of men and women regarding the use of gender as a pricing criterion for life insurance, and health status as a pricing criterion for annuity insurance.

Correlation Analysis

We want to deepen our analysis by conducting an additional correlation analysis. We examine whether there is a correlation among the various surveyed requested risk classification criteria. This allows us to assess whether the acceptance level of a given attribute is linked to the acceptance level of another attribute.

In the following we briefly outline the correlation of the different attributes' appreciation. By considering the correlation of the rating of individual risk criteria, it is apparent that some attributes are more closely correlated than others. The highest correlation in acceptance is found between the rating of the risk criteria age and gender for motor insurance (Pearson correlation coefficient $\rho = 0.42$). Hence, respondents favorable to the use of the age criterion also advocate the use of gender in price differentiation. Further correlations include the use of health status and age for health insurance ($\rho = 0.40$), and BMI and gender ($\rho = 0.33$) or BMI and hobby ($\rho = 0.33$) for life insurance.

Summary of Survey Results

Our analysis shows that the majority of respondents in most countries accept the use of premium differentiation criteria for insurance pricing. More specifically, the risk factor age is the most accepted risk criterion across all countries for motor, life and health insurance. The risk criteria of the policyholder's personal hobby and age for life insurance as well as income for annuity insurance are also well accepted

by the respondents. The gender criterion in motor insurance and the health status for private health insurance are judged most acceptable, especially by respondents from the U.K.

The greatest differences among the risk criteria examined are observed for health insurance. The use of the criteria age or health status is considered less discriminatory than the use of gender. This is particularly evident when analyzing the survey results of respondents in France or the U.K. Generally speaking, the gender criterion is least accepted in pricing, apart from motor insurance. This can be seen particularly well when ranking the ratings in the different product lines: in most cases, the gender criterion receives the least favorable rating. However, since the ratings are based on a scale in which a rating of 3 corresponds to the neutral position, and the average ratings are concentrated around that neutral position, our results indicate that consumers do not consider the gender criterion as completely unacceptable. To summarize, most consumers accept gender-differentiated calculations when asked about their general acceptance of price differentiation criteria. Overall we also note that customers from the gender group that pays less premium or gets higher benefits in a particular product present higher acceptance levels (see Table 1, e.g., in motor, annuity and health insurance where these differences are significant).

3 The Case of Gender in Insurance Pricing

In countries and product lines where gender differentiation is or was not prohibited, pricing differences are observed and the gender-specific differences are highly relevant. The gender criterion constitutes an important element in actuarial calculations. This is justified by a statistically significant difference in life expectancy between men and women with a relevant impact on mortality tables (Oxera, 2011, p. 8). Further, males and females have significantly different average loss probabilities for given types of insurance policies, because, for example, they behave differently. However, an overview that we outline below demonstrates that the use of the risk-rating factor gender according to national law varied from country to country (before December 2012). We discuss the degrees to which consumers accept gender-specific differences in premiums. Finally, we expand on the possible (long-term) implications of the ECJ ruling and the definite ban on the gender criterion for individual insurance pricing.

3.1 Use of Gender in Different Countries and Product Lines

The use of the gender criterion played an important role in the calculation of risk premiums and actuarial pricing (see, e.g., Society of Actuaries in Ireland, 2004,

p. 19). Primarily in the four business lines considered above – life and pension insurance as well as motor and private health insurance – the gender criterion was very important for pricing. Demonstrable statistical differences in the claims are observed between men and women. Such differences concern pricing criteria, such as the difference in average life expectancy for life and annuity insurance, different driving behavior for motor insurance, and different lifestyles as well as different inclinations to use medical services for private health insurance (see, e.g., Society of Actuaries in Ireland, 2004, pp. 5, 10–11). A study by Oxera (2011) illustrates the need for premium differentiation and the role of the gender criterion. Gender-specific premiums reflected the objective risk of policyholders. Dawkins (2011, p. 1) argues, that the motivation for using gender as a criterion for actuarial calculation is the same as for all criteria: to improve the efficiency of pricing.

The EU ruling follows the fact that the European Commission has concluded from several survey analyses that sex is not the main determining factor for life expectancy (Commission of the EC, 2003, p. 6). Thus, gender-specific differences in prices are always disadvantageous to either one gender group or the other. Gender-specific insurance premiums have been allowed in all 27 countries of the EU (see European Commission, 2012, pp. 6–7) – including the countries in the consumer survey presented in Section 2.2. The underwriter compensates for different risk levels by charging different premiums based on differences in loss probabilities and magnitudes for a given insurance product.

According to Article 5(1) of the Gender Directive, "the use of sex as a factor in the calculation of premiums and benefits for the purpose of insurance and related financial services shall not result in differences in individuals' premiums and benefits" after December 21, 2007 (Council of the EU, 2004, p. 41). The Gender Directive was implemented into national law after having been passed unanimously by all EU Member States and the European Parliament in 2004. Some EU countries have decided "before December 21, 2007 to permit proportionate differences in individuals' premiums and benefits where the use of sex is a determining factor in the assessment of risk based on relevant and accurate actuarial and statistical data" (Council of the EU, 2004, p. 41). The insurer's pricing process is carried out on the basis of differentiation in risk groups using several risk characteristics.

In private health insurance, health-care costs are closely correlated with gender, since higher rates of sickness affect the costs of women until the age of 50. Up to about this age, the rates of hospitalization are higher for men (ABI, 2010, p. 24). Article 5(3) of the Gender Directive states that "in any event, costs related to pregnancy and maternity shall not result in differences in individuals' premiums and benefits" (Council of the EU, 2004, p. 41). Especially in social health insurance, the costs of pregnancy and motherhood are distributed equally between genders, so that everybody is covered at the same price (Civic Consulting, 2010b, p. 66). However,

in private health insurance, three risk factors are used for the actuarial calculation: health status, age at the beginning of the contract and gender of the policyholder (Riedel, 2006, p. 234). Often female policyholders have to pay much higher prices than men. Similar arguments apply to life insurance contracts. Premiums are calculated on the basis of statistical life expectancy and mortality tables (Civic Consulting, 2010b, p. 9). Men have higher mortality rates than women at all ages. Among other factors, behavioral, biological and socio-economical differences result in gender-specific differences in mortality. Thus, in general, men had to pay higher rates for their term life insurance than women of the same age (Civic Consulting, 2010b, p. 9). The gender criterion was also extensively used in annuity pricing. Because the life expectancy for women is on average five years longer than for men, their longer lifespan results in a longer average annuity period in old age, and therefore a higher present value of total annuity payments (ABI, 2010, p. 32). Thus, women had to pay more for their insurance policy because of the longer average period during which benefits are claimed. For motor insurance, the gender risk factor is strongly linked to the age of the policyholder (Kelly and Nielson, 2006, p. 220). Male drivers are likely to make more expensive claims and have accidents more frequently, even if mileage is taken into account (Arvidsson, 2010, p. 41). The average claims costs for an 18-year-old man may be twice as much as those for women (Civic Consulting, 2010c, p. 107). Therefore, young men had to pay considerably more for their motor insurance.

There was a long tradition of using gender as a risk factor in the pricing of insurance, particularly in the five countries studied most closely in our analysis. The gender criterion was used for premium calculation in the four insurance products considered (see European Commission, 2012, p. 6). However, there were several national restrictions on gender-based pricing prior to the ECJ judgment and as a result of the Gender Directive. National law in several EU countries limited the use of the gender criterion for insurance products: In the U.K., for example, while gender has been used universally by insurers as a pricing factor, restrictions are defined in the Sex Discrimination Act of 1975, amended in 2008 (ABI, 2010, p. 9). That Act covers policies that enter into effect on or after April 6, 2008 (Pinsent Masons LLP, 2011, p. 4). In Germany, almost all major insurance companies have used the gender criterion. Gender-neutral tariffs had only been adopted previously for a few insurance classes. Such is the case, for example, for tax-privileged pensions, that is, Riester pensions (Civic Consulting, 2010a, p. 141). However, the subsidization results in the gender-neutral annuity product being priced more attractively for male customers (see Oxera, 2011, p. 21). The General Treatment Act, for example, restricts unequal premiums based on pregnancy in private health insurance. In France, the Penal Code, the Insurance Code and Act 78-17 of January 1978 relating to data, files and freedoms, amended in August 2004, include restrictions on the

use of risk factors. In Italy, the Gender Directive was implemented by Legislative Decree 198/2006. Other restrictions are included in Italy's ISVAP Regulations of May 30, 2009 and Law 40/2007, the Bersani Law, which allows young drivers to take out their first policy in the same bonus-malus category as their parents (Civic Consulting, 2010a, p. 154). In Switzerland, various risk criteria were examined regarding discrimination, but not based on gender. The Insurance Contract Act is now being thoroughly revised. The judgment of the ECJ is not legally binding for Switzerland and has no direct effect on insurance companies with activities in the Swiss market (Pärli, 2011, p. 159). However, a new debate on gender justice could follow the decision of the ECJ. Previous parliamentary initiatives in this context have failed, so far, in Switzerland due to the resistance of the National Council (Pärli, 2011, p. 159).

3.2 Customer Perspective

3.2.1 Survey Description

The second part of our survey introduced in Section 2.2 focused on the four key insurance products and their gender-specific price differences (see also Appendix, Section 2). In that part, specific examples of prices for each gender group in each product line were provided to the participants. The respondents then rated those price differences on a scale from 1 to 4, where 1 means the "difference is too high" and 4 means the "difference is acceptable". In each product, we chose an exemplary male and female customer and their relevant market premium offered by one of the largest insurance companies. In each country we considered the same premium levels and converted the values for the convenience of the respondents at the exchange rates applicable on the date of the survey. Consumers' assessment of price differences allows us to draw conclusions about the level of price sensitivity of customers with regard to gender differentiation. The results are reported in Table 2.

3.2.2 Presentation of Survey Results and Discussion

Let us first recall – as an introduction to the acceptance of the risk criterion gender in the pricing of insurance products – the approval rates regarding the use of the gender criterion presented in Section 2.2 (see Table 1). The highest acceptance for the use of the gender criterion is observed for motor insurance (overall acceptance rating of 3.25), followed by life insurance (3.01), health insurance (2.39) and annuity insurance (2.12). Thus, especially for health and annuity insurance, the use of the gender criterion is not well accepted (values below the neutral level of 3), or customers are less aware of the importance of the use of the gender criterion.[5]

[5]Furthermore, the fact that the use of gender is favorable for women in respect to annuities, not favorable for women in case of a term or whole life insurance contract, plays a role in the response.

	United Kingdom		Germany		France		Italy		Switzerland		Overall (all countries)	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
n	516	487	518	522	517	497	510	503	520	518	2581	2527
Motor	2.61 (0.94)	2.48 (0.98)	2.60 (0.91)	2.43 (0.96)	2.54 (0.96)	2.28 (0.95)	2.65 (0.84)	2.46 (0.88)	2.64 (0.96)	2.40 (1.02)	2.61 (0.92)	2.41 (0.96)
	* C		** c		** AbDe		** C		** c		**	
Annuity	2.09 (0.83)	2.57 (0.82)	1.98 (0.83)	2.46 (0.90)	1.88 (0.83)	2.35 (0.92)	2.18 (0.81)	2.53 (0.80)	2.12 (0.95)	2.61 (0.96)	2.05 (0.86)	2.50 (0.87)
	** BC		** ACDE		** ABDE		** BC		** BC		**	
Life	2.16 (0.86)	2.22 (0.87)	2.24 (0.85)	2.06 (0.81)	2.18 (0.86)	2.05 (0.85)	2.29 (0.80)	2.27 (0.83)	2.01 (0.85)	1.89 (0.87)	2.18 (0.85)	2.09 (0.86)
	dE		** DE		* DE		aBCE		* ABCD		**	
Health	2.16 (0.87)	2.66 (0.84)	2.22 (0.89)	2.57 (0.91)	2.16 (0.91)	2.46 (0.97)	2.56 (0.84)	2.81 (0.84)	2.18 (0.93)	2.56 (0.97)	2.26 (0.90)	2.61 (0.91)
	** cD		** cD		** abD		** ABCE		** D		**	
Overall	2.26 (0.88)	2.48 (0.88)	2.26 (0.87)	2.38 (0.90)	2.19 (0.89)	2.29 (0.92)	2.42 (0.82)	2.52 (0.84)	2.24 (0.92)	2.37 (0.96)	2.28 (0.88)	2.40 (0.90)
	**		**		*		*		**			

Table 2: Descriptive Statistics of Survey Results: Acceptance of Price Differentiation
* or lowercase letters denote significance at the 5% level, ** or capital letters at the 1% level. Reported values denote the average and the standard deviation (given in parenthesis) of the survey results for each product line considered and for both gender groups (female, male) in each country. The grades are based on a four-point scale: 1 = difference is too high, 4 = difference is acceptable (see also the survey description in the Appendix). The number n denotes the number of respondents in each country-gender group. The significance of difference is given within gender groups in each country (denoted by stars) and between countries (denoted with letters). The letters refer to the countries in the order presented, i.e., A = United Kingdom, B = Germany, and so on.

Differences Among Lines of Insurance

The results of the second part of the survey reported in Table 2 demonstrate low acceptance of gender-based price differences in the respondent countries. The respondents judge the price differences as too high (values below the neutral level of 2.5). That is especially true for term life insurance (average overall acceptance rate of 2.14) and annuity insurance (2.28). For private health (2.44) and motor insurance (2.51) price differentiation based on gender is less controversial. The average overall acceptance rate of 2.34 is below the neutral level of 2.5.

Differences Between Gender Groups

Broken down by gender, the acceptance rates of price differentiation for men are higher for private health (overall male acceptance rate of 2.61) and annuity insurance (2.50). The opposite is true of female respondents for motor (2.61) and term life insurance (2.18), where women accept price differences. The different response pattern is due to the large differences in compensation/benefits paid out for the insured event which are favorable, depending on the insurance line, to one or the other gender group. For example, men tend to accept price differences in private health insurance, where premiums for women are higher, while female respondents accept the price difference to their advantage for motor insurance. Very significant differences between the answers of both genders are observable in all product lines and all five countries. The gender-specific difference is simply not significant for term life insurance among respondents in the U.K. and Italy.

Differences Among Countries

When analyzing the response behavior by country, the lowest acceptance of gender-based price differences is observable in France (average acceptance rate of 2.24). The majority of Italian male respondents accept the gender-based price difference for private health insurance (2.81). By contrast, the lowest acceptance rate is found for annuity insurance among French female respondents (1.88). The tendency of a different response behavior among French respondents compared with the other countries is also reflected when comparing the significance levels of differences in the various product lines. Especially for motor insurance, the responses from France are found to be significantly different from those of the other four countries.

However, accordingly, the gender criterion should be rejected for every line of insurance because, for the motor and private health insurance lines, there are also differences in the premiums for both genders. In addition, it should be noted that the gender criterion is only the second most important risk factor after the age criterion in actuarial pricing of annuity and life insurance (see Oxera, 2011, p. II). Thus, the age criterion has a more significant impact on mortality, for example, due to increased illness and accidents, than the gender criterion and is classified as more relevant for insurance pricing (see Civic Consulting, 2010a, p. 59).

Correlation Analysis

Finally, we present the findings from a correlation analysis of the ratings for the acceptance level of the gender attribute (Part I of the survey) and the acceptance level of the corresponding price difference due to gender (Part II). The highest correlation is found for motor insurance with a Pearson correlation coefficient of $\rho = 0.44$. This is followed by health insurance at $\rho = 0.35$, life insurance at $\rho = 0.32$ and annuity insurance with $\rho = 0.13$. Thus, respondents show the greatest acceptance of a gender-based pricing difference for motor insurance. However, the general relevance and the explanation of main cost drivers to customers[6] still seem to play a central role in the insurance industry.

Summary of Survey Results

Our analysis of gender-based price differences shows that the majority of respondents in most countries judge these differences differently in the various lines of insurance. Price differences based on the gender criterion are less accepted in term life, annuity and private health insurance. Since the rating is based on a scale in which a rate of 2.5 corresponds to a neutral position, our results indicate that consumers tend to consider the effective gender-based price differences too high (overall acceptance rate of 2.34). Only in motor insurance does the average approval rate reach 2.5 points. Furthermore, similarly to the general acceptance of the gender criterion, consumers of the group profiting from premium differentiation (i.e., paying a lower premium) still disapprove the amount of the price difference, though to a lesser extent. Summing up, consumers accept the use of the risk criterion gender in premium calculations when asked about their general acceptance of differentiation criteria (see the results in 2.2 and the summary of survey results). However, the amount of the premium differences is not accepted by consumers as soon as specific premium examples are given.

3.3 Possible Implications of the Ban on Gender-Based Discrimination

The ECJ has issued a ruling definitively banning the use of the gender criterion in actuarial calculations for individual prices. The ruling may have important consequences for the insurance industry and customers in the EU. Irrespective of the stakeholder's perspective and of the definition of discrimination "a ban on a relevant risk-rating factor such as gender cannot be achieved without costs" (see ABI, 2010, p. 36). In this section, a number of implications are discussed. Possible consumer behavior and potential responses from market players are outlined as well as

[6]For example, claims adjustment expenses, administrative costs of risk assessment and underwriting as well as operational costs, like acquisition and portfolio commissions (see, e.g., Farny, 2011, pp. 46–47).

possible further regulatory interventions. The implications of the definitive ban on gender-based discrimination are extensive for the insurance industry and may have a strong economic and legal impact on the individual product offering and pricing.

3.3.1 Customer Reactions and Adverse Selection Effects

Following the ban on gender-based discrimination, insurers and policyholders will have unequal access to information on gender characteristics, which may result in further adverse selection effects, as described by Akerlof (1970). Even if the gender characteristic of customers is taken into account by the insurer at the overall portfolio level, adverse selection effects are enhanced, whenever one group of policyholders has to pay an increased risk premium for a statistically lower risk (Owiwo, 2011, p. 8). This may have an impact on the demand for insurance products, at least for markets with low price inelasticity. In the extreme situation of full adverse selection, the subsidizing policyholder group (second group) will no longer take out any insurance policies at all (if not compulsory or critical, see Thiery and Van Schoubroeck, 2006, p. 199) and thus in the long run the portfolio may be formed solely by the members of the first group, which has a higher claims expectancy. Prices will be adjusted accordingly and finally, only one price – the one for the more costly policyholder group – will remain. Furthermore, cross-subsidies between insurance groups of different genders are implied. The higher claims expectancy of the one group will be distributed to all other policyholders of the second group.

The resulting decrease in customer demand may lead to a future limitation on the product offering and to a possible withdrawal by competitors from certain less profitable product lines. Once insurance solutions have been abandoned, substitute products may become attractive. Forms of self-insurance or mutual/investment funds for retirement arrangements may be preferred. Overall, the insurance market may decrease in size along with the quality of the insurance benefits. These effects may be stronger in the annuity and life insurance market, as such insurance is not compulsory, unlike motor insurance, for example (Oxera, 2011, p. 36). On the other hand, for compulsory insurance lines (e.g., motor insurance) further moral hazard behavior may occur, meaning that excessive risks may be taken and that the average risk level may increase.

Finally, let us note that the ban on gender-based discrimination may also give rise to positive reactions from consumers. For example, customers may perceive the insurance industry as ethically and socially better or even more consumer-friendly – especially in light of the fact that effective gender-specific price differences are less accepted.

3.3.2 Possible Reactions by the Insurance Industry

From an insurance industry perspective, several new challenges arise. The invalidity of Article 5(2) of the Gender Directive has considerable consequences for product development and actuarial calculation. Owing to unisex pricing, it is no longer possible to use gender as a risk criterion for individual pricing of policies. In accordance with the provisions of paragraph 17 of the Guidelines on the Application of the Gender Directive, "the use of risk factors which might be correlated with gender [...], as long as they are true risk factors in their own right" is allowed (see European Commission, 2012, para. 17). Thus, a calculation of the risk of damage cannot only take place at the level of the insurance portfolio (including the consideration of gender). However, the definitive premium only represents a mixed tariff (which may be a weighted average by the gender-mix in the portfolio). The results are adverse selection of policyholders and hybrid product tariffs (Groupe Consultatif Actuariel Européen, 2011, p. 9). Because the use of the gender criterion is no longer allowed, market distortion will result. Cross-subsidization from high-risk policyholders to low-risk customers will result.

To achieve an equitable spread of risks in their portfolio, insurers may provide increased direct incentives to specific target customers. Strategic marketing may then include gender-specific sales campaigns (e.g., in magazines with a strong gender-specific readership) and gender-specific individual product-offerings (European Commission, 2012, para. 14). In addition, insurance companies may make increasing use of risk criteria which are correlated with gender if they are independent risk factors, for example, the size of a car engine for motor insurance (European Commission, 2012, para. 17). The available customer data will be increasingly analyzed and correlated risk criteria developed without having to establish a direct reference to gender. Furthermore, the importance of the use of other risk factors independent of the gender criterion may increase, for example, for motor insurance, the length of the customer's driving experience, vehicle safety features and maybe (in the near future), driver tracking technology. These effects lead to a reduction of adverse selection, as the pricing will be based on several risk criteria (not including gender) that may end up mapping risks more precisely than today's use of the gender criterion alone. We will keep in mind, however, even if this price ends up being more equitable, that one factor (namely gender) still remains unused. The transaction costs as well as the administration expenses and the risk premium may increase for insurance companies (Owiwo, 2011, p. 8).

An additional opportunity for portfolio selection is through the modification of the sales commission and through incentives to sales staff, for example, higher commissions for acquiring customers from among the lower-risk gender (Deutsche Rück, 2011, p. 2). The result can be a deliberate exclusion of customers in specific tariffs

(e.g., private insurance, where acceptance of customers is not compulsory under applicable law) and hence, an increase in the adverse selection phenomenon (Owiwo, 2011, p. 9).[7] The termination option of existing contracts emphasizes this effect. Current customers may terminate their old contract and conclude a new one with the unisex tariffs if the latter are more favorable (depending on the product line and the individual gender, see also Kokott, 2010, para. 81). In particular, contracts that can generally be terminated at short notice may imply relatively fast reactions (see, e.g., yearly contracts for motor or private health insurance policies) and changes in the insurers' portfolio composition (Deutsche Rück, 2011, p. 2). Brokers and their corresponding commission scheme for contract renewals may accelerate this trend. Hence, additional transactions costs will be paid by switching policyholders until a new equilibrium with one unisex price is finally established in the market (Owiwo, 2011, p. 9). An increased premium level in unisex tariffs could merely cushion this effect. The aforementioned study by Oxera (2011) predicts that the gender-neutral uniform tariff could result in higher premiums for one or the other gender depending on product lines. On the one hand, a 40-year-old woman may have to pay over 30% more for life insurance, while a 20-year-old woman could have to pay 11% more for motor insurance. On the other hand, a 50-year-old man could pay 5% less for annuity insurance (Oxera, 2011, p. 25).[8]

In an insufficiently competitive oligopolistic market, higher average prices due to market-sharing agreements may result. Gender-neutral premiums may be higher than the accumulated previous rates weighted for men and women because of adverse selection. In part, this is because it is more difficult to calculate an alternative risk criterion by collecting and evaluating data regarding the social and economic circumstances of an insured person and a risk premium may be leveled. Furthermore, those risk factors can change over time and, therefore, may indicate a higher uncertainty for insurers (Kokott, 2010, para. 66). In addition, in the aforementioned preferred group of policyholders a "leveling down effect" may be observed and, in the previously disadvantaged group a "leveling up effect".

The contemplated effects depend, for example, on the amount of the premium, the benefit differences, the transparency of premium calculation for policyholders and finally on the action that customers take to switch tariffs. It is expected that some customers will buy fewer insurance policies due to higher premiums. Policy-

[7] Thiery and Van Schoubroeck (2006, pp. 196–197) express skepticism regarding the subsidy-aversion phenomenon. In particular, the doubts concern the manageability of individual risk factors, the causal link between potential risk factors and the risk itself as well as the enhanced welfare effects of the use of different risk criteria in actuarial pricing and the increasing costs for developing alternative risk criteria.

[8] With regard to the above one-sided approach, further research could indeed analyze the impact of unisex tariffs. Several papers and reports concern the experience of unisex tariffing in different countries and lines of insurance (see, e.g., Wallace, 1984; Brown, 1995; Nova Scotia Insurance Review Board, 2004; Curry and O'Connell, 2004).

holders with a better-than-average risk profile may churn, and the average risk may increase because of adverse selection (Owiwo, 2011, p. 8). To cover the average risk probability and the uncertainty, insurance companies could adopt premium loading or raise the safety margin.

3.3.3 Regulatory Intervention

The gender-neutral premium calculation requires major changes on the part of insurance companies. It may be expected that alternative risk criteria or combinations of risk criteria will take more precedence, for example, "risk factors which might be correlated with gender, as long as they are true risk factors in their own right", for example for motor insurance, car engine size (see European Commission, 2012, para. 17). It therefore follows that a prohibition of the use of the single gender criterion does not automatically result in gender neutrality in insurance pricing (ABI, 2010, p. 40). Such reactions from the insurance industry may lead to further governmental or regulatory intervention in pricing and product development (Civic Consulting, 2010b, p. 36). At the moment, pursuant to Paragraph 18 of the Guidelines on the Application of the Gender Directive only the use of the gender criterion is prohibited (see European Commission, 2012, p. 4). In November 2000, the EU Council adopted Directive 2000/78/EC for establishing a general framework for equal treatment in employment and occupation independent, for example, of someone's age (Council of the EU, 2000b, Art. 1). Furthermore, the Commission of the EC decided in July 2008 in a proposal for a Council Directive to implement "the principle of equal treatment between persons irrespective of religion or belief, disability, age or sexual orientation" (Commission of the EC, 2008, p. 13) outside the field of employment. The ban on other differentiation criteria, for example age or health status, may result. Each intervention in the pricing mechanism may lead to market distortions and may impair the principle of (statistically) fair contributions and benefits.

4 Conclusion

The remaining practice of actuarial calculation based on the gender criterion was examined by the ECJ in 2011. In this paper, we briefly summarize the framework of the ECJ ruling and the importance of risk differentiation from different stakeholder perspectives. We provide an overview on the use of several risk criteria in various countries and product lines and illustrate the implications of the ban on gender-based differentiation for the insurance industry.

The results of our consumer survey are presented in two parts. First, we examine the acceptance of differentiation criteria. The study shows that respondents in

most countries accept the use of risk differentiation. The gender criterion is least accepted in pricing, closely followed by age. Especially for annuity and private health insurance, the gender criterion is less accepted than other criteria. Second, we examine the acceptance of gender-specific price differences. The results illustrate that using gender criteria within the business lines health, annuity and term life insurance is not accepted by consumers as soon as the amount of prevalent price differences is compared side-by-side.

The implications of a prohibition on gender-based discrimination are substantial for actuarial calculation. As a result of cross-subsidies between insurance groups and adverse selection effects, premiums may increase. A withdrawal by insurance companies and a limitation of product offering are possible. Further regulatory intervention may intensify these aspects.

Appendix

The online survey carried out in Summer 2011 captured the consumers' opinion of five European countries comprising the United Kingdom, Germany, France, Italy and Switzerland. In each country a separate language version was defined including figures in the relevant currency. The following socio-demographic information was gathered from the respondents: gender, age, level of education, current job situation and household income. In each country, at least 1 000 responses were collected. The panel was representative in each country with regard to the criteria gender and age (18–65 years). The following sections reproduce the wording of the survey used in the United Kingdom (English version) and the corresponding scales for the responses. The first part of the questionnaire concerns the acceptance of differentiation criteria in general (Section 1) while the second part is about the acceptance of price differentiation with regard to gender (Section 2).

1 Acceptance of Differentiation Criteria (Survey Part I)

Below are several statements about the four key insurance products. Please tell us how accurate you consider these statements to be. Please use the following five-point scale:

1 = I do not agree
2 = fairly inaccurate
3 = neutral
4 = fairly true
5 = I agree completely

Motor Insurance

- Car drivers over the age of 50 incur fewer costs associated with car accidents from a statistical point of view. For this reason, older customers are justifiably charged a lower price in comparison to younger drivers.
- Customers with vehicles of specific makes are associated with higher administrative costs for the insurer (for example, a statistically higher number of calls to the call center). Due to these additional costs, customers in this group pay a correspondingly higher price to avoid all customers being charged more.
- Vehicles used to drive more kilometers each year have a greater risk of damage. Customers who drive a fewer number of kilometers each year therefore receive a price discount in accordance with the average lower risk of damage.
- The accident rate among young men is significantly higher – with otherwise comparable conditions – compared to women of the same age. Accordingly,

young men pay a higher price than young women.

Annuity Insurance

- The average life expectancy of smokers is around 10 years lower than non-smokers. The statistically lower life expectancy justifies a shorter time span for annuity payments in old age, and therefore a lower price.
- Policyholders with good and poor health have different life expectancies. Nevertheless, both groups receive the same annuity payments at the same price in old age.
- If women and men pay the same price for their annuity insurance over the same period of time, the annuity payments in old age should be the same for both genders. Differences in life expectancy and the resulting difference in the level of annuity payments should not be taken into consideration.
- People with a higher income statistically live longer than those with low incomes. When the insurer is establishing its prices, high-earning customers should pay higher prices for their annuity insurance than those with low incomes.

Term Life Insurance

- The life expectancy of women is on average five years higher than that of men. The lower probability of death for women of a certain age should be expressed in the form of lower prices compared to men of the same age.
- The mortality rates are strongly linked to the age of the individual: The probability of death among young people is much lower than among older individuals. The price of life insurance is significantly lower for young customers than older customers.
- The body-mass index, which measures body weight in relationship to body size, is used by many insurers as an attribute when calculating their prices. Overweight people pay higher prices, as they have a statistically worse risk profile.
- The customer's hobbies have an influence on their risk of accidents or death. A customer who pursues a riskier type of sport (for example, combat sports) or a riskier hobby (for example, handling snakes) will therefore pay a higher price.

Health Insurance

- Public health insurance as part of social insurance is the same for all policyholders, although the costs to be assumed are different depending on age and gender. These subsidizations between genders and age groups are appropriate in public insurance.
- Pregnancy and birth have an influence on higher health costs for women. In some countries, these health-specific costs of both genders are covered equally, that is, men subsidize the prices generated by women. In the case of private health insurance (for example, single bedrooms and treatment by the head physician at the hospital), women should pay higher prices than men.
- Depending on the age group, average health costs vary in private health insurance. For this reason, the prices are generally based on the age of the policyholder. This categorization is a justifiable distribution of risks.
- Health levels and existing health problems are relevant when determining the risk profile of the customer. Justifiable pricing in private health insurance requires higher prices or exclusions in health cover for "bad" risks.

2 Acceptance of Price Differentiation (Survey Part II)

On March 1, 2011, the ECJ of justice decided that, from the end of 2012, insurance companies will no longer be permitted to apply gender as an attribute when establishing prices for their products. The basis for this decision is the equal rights of both genders before the Court. Below, we have listed examples about insurance prices for the four products assessed above, taking the differentiation of genders into account. Please assess the price differences provided as examples by considering whether you think the differences are acceptable. Please use the following scale:

1 = I think the difference is too high
2 = I think the difference is slightly too high
3 = I think the difference is fairly acceptable
4 = I think the difference is acceptable

Motor Insurance: The accident rate among young men is significantly higher – with otherwise comparable conditions – compared to women of the same age. The 22-year-old male driver pays on average 900 GBP each year, while a woman of the same age only pays 700 GBP.

Annuity Insurance: Men and women have different life expectancies. For a lump sum payment of 90 000 GBP at the age of 55, a 65-year-old woman will receive 400

GBP on a monthly basis from the beginning of her retirement, while a man of the same age will receive 450 GBP.

Term Life Insurance: The life expectancy of women is higher than that of men. An insurance policy with the lump sum payment of 90 000 GBP in the event of death costs 160 GBP a year for a 40-year-old man and 110 GBP for a woman of the same age.

Private Health Insurance (single-bed rooms and head physician treatment at the hospital): Pregnancy and birth have an influence on increasing health costs for women. Due to these costs associated with a specific gender, a 30-year-old woman will pay on average 80 GBP per month, while a man of the same age will pay only 70 GBP.

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Part II

A Comparison of Insurers' Usage and Consumers' Perception of Price Differentiation Factors

Abstract

Customer segmentation and differentiated pricing within the insurance industry are strongly based on risk characteristics that are proven to be statistically significant. Differences in the risk profile play an essential role in determining individual insurance premiums. First, we analyze the use of individual pricing criteria in the four key business lines (motor, annuity, term life and private health insurance) in the United Kingdom, Germany, France, Italy and Switzerland. Insurance premiums from more than 45 insurance companies are collected for various risks and customer types. A multiple linear regression analysis is carried out on the data set to determine the impact of selected factors on the price. Second, we reflect our results on the consumers' perception of the use of price differentiation criteria from an international survey carried out in the same five countries. This allows us to compare the consumers' perception with the industry's practice regarding the use of selected pricing factors. Finally, on the basis of this comparison, we derive implications for strategic pricing.[1]

[1] T. Störmer and J. Wagner, A Comparison of Insurers' Usage and Consumers' Perception of Price Differentiation Factors, *Working Papers on Risk Management and Insurance*, No. 139, 2013. This paper will be submitted shortly to an academic journal.

1 Introduction

A significant part of pricing in the insurance industry is based on the classification of risks. Firms generally use a rating system to categorize the underwritten risks. Individual risk factors are determined and used to calculate the individual actuarial premium. "The economic motivation is quite simple: without [risk classification or some effective substitute] voluntary markets will fail to cover all potential policyholders who desire insurance" (Powers, 2010, p. 2). Welfare effects and the profitable impact of categorical risk rating for insurance companies are often discussed in the literature (see, e.g., Hoy, 1982; Crocker and Snow, 1986). As a result of the ban on the use of gender as a risk-rating factor in insurance products by the European Court of Justice (ECJ) from December 21, 2012 (ECJ, 2011, p. 7), a broad discussion on the adequate use of pricing factors has arisen again in the European insurance industry. In this context our aim is to compare in an empirical study the influence on the price of selected criteria used in the insurers' practice and the acceptance by the consumers of these pricing factors.

The starting point for several scholarly analyses on the implications of risk classification is based on judgments of the U.S. Supreme Court in the 1970s and 1980s (see, e.g., U.S. Supreme Court, 1978, 1983). In this context, several authors analyze implications of gender-based discrimination and the ban on the use of gender as a risk-rating factor in U.S. pension schemes (see, e.g., Hedges, 1977; Martin, 1977; Myers, 1977; Brilmayer et al., 1979; Kimball, 1979; Laycock and Sullivan, 1981; Benston, 1982; Hickman, 1983). Besides regulatory aspects, economic aspects are taken into account. The use of price differentiation factors and its relevance are analyzed in detail from the economical point of view. Several authors focus on the effects of risk categorization based on available perfect as well as imperfect information from the cost perspective (see, e.g., Rothschild and Stiglitz, 1976; Doherty, 1981; Borenstein, 1989). Up to now, the calculation of risk-adjusted insurance premiums has been based on economic theories. In order to define a pricing formula it is important "to have an estimate loss distribution for the underlying risk" (Wang, 2000, p. 32). Borch (1961) was one of the first to apply the utility theory of Von Neumann and Morgenstern to the actuarial risk theory in order to analyze optimal demand for insurance with the aim of deriving utility-based premiums. Bearing in mind that costs of insurance cover are correlated with the risk's characteristics (Walters, 1981, p. 2), the insured person in life insurance or the insured object in property insurance, the identity of the consumer and the risk to be insured play a much more prominent role in the price finding process in the insurance industry compared to other industries. However, the customers' perception and their acceptance of price differentiation criteria are not analyzed in detail in the academic literature. Only few scientific studies explicitly focus on the relationship between

price and consumer perception in the science of marketing itself. These studies reveal a significant correlation between the aspect of pricing and "how consumers perceive a price" (Vaidyanathan and Aggarwal, 2003, p. 453). The relationship between how companies determine prices and how consumers appreciate the pricing approach is essential for corporate profitability. Bolton et al. (2003) analyze several factors which influence the consumers perception regarding fair prices. Consumers suspect that the selling price of a product is higher than its rationally fair price, even though it is lower than their willingness to pay (Bolton et al., 2003, p. 474). The authors note that this assumption changes, the more accountable and transparent the pricing process is.

Our purpose is to analyze the relative importance of selected price differentiation criteria in the insurer's pricing of its products and to compare these results with the view of consumers. Thus, in order to perform a quantitative comparison, we collect data through two different procedures. On the one hand, in order to assess the impact of different risk factors in actuarial pricing, a data set of about 5 500 premium observations is gathered from online price calculators of 45 different insurance companies in five countries and four product lines (motor, annuity, term life and private health insurance). For this a standard set of risk profiles (of individual customer's and risk characteristics) is used. The influence of selected risk factors on the price is analyzed by using separate multivariate linear regression models in each product line. The standardized regression coefficient for each risk factor informs about the height of the impact (relevance) for the price determination of insurance. Since the impact of the various criteria differs from country to country, we derive the weights for the selected factors in each country for each product line considered (where available). By doing so we obtain an overview indicating the relevance of the selected risk factors by product line and country. On the other hand, through an international consumer survey we asked more than 5 000 consumers about their perception of selected factors used by insurers for determining the price of insurance. This allows us to assess the customers' degree of acceptance of price factors. We borrow our data set from Schmeiser et al. (2014) where a similar approach has been taken to assess the consumers' acceptance of the use of gender in the pricing of insurance products. In order to determine the consumers' perceptions of the use of different price criteria, and the degree of importance linked to it, we examine the respondents' results using descriptive statistics. We indicate the average appreciation rating as well as the average standard deviation for the selected differentiation criteria in each country and each product line. Lastly, we compare the weight of certain risk factors in insurance industry pricing with the acceptance rate of consumers. Several conclusions can be derived. For example, it can be noticed that most criteria used in the insurance industry's pricing models are well accepted by consumers. However, the gap between the weighting of the relevance in the effective

use of these criteria in the pricing models and in the consumer's degree of acceptance is high depending on the country and the product line in question.

The remainder of the paper is structured as follows. In Section 2, we lay out the strategic importance of different price differentiation factors for insurance companies in four product lines (motor, annuity, term life and private health insurance). From that literature review we distill a selection of pricing factors for our analysis. In Section 3, we first describe in detail the data collection of the insurance premiums for the analysis of the industry's pricing models (Section 3.1). The model framework of the insurance industry's pricing is given in Section 3.2 and applied to the full data set. In Section 3.3, we present the results of our analyses, that is, an overview of the weights for the selected risk factors used in the insurers' pricing in the various countries and product lines. In Section 4, we describe the international survey used to measure the consumers' perception related to the use of selected risk factors in actuarial pricing (Section 4.1). We summarize our findings in Section 4.2. In Section 5, we compare and discuss the obtained results from the two viewpoints, insurance industry and consumers. Lastly, Section 6 presents our conclusions.

2 Price Differentiation in Insurance

In order to operate in a profitable way, that is, to attract customers and to compensate claims payments in the event of losses covered by the policies, insurance companies need to charge adequate premiums. The actuarial equivalence principle requires that the expected premium payments from the insured must be equal to the expected value of the payments to the insured. This implies that each policyholder pays a premium in accordance with its own risk profile. Premiums derived from this principle, a practice known as risk-based pricing, yield different values depending, for example, on differences in the probability of loss or damage.

Risk categorization serves to measure cost differences between several risk types and therefore, supports the insurance company in defining different risk groups of policyholders based on their respective loss probabilities. As one of the first authors, Williams (1957) analyzes the advantages and disadvantages of risk classification, in both economic and social terms. In this connection he makes reference to the issue that risk categorization could lead to monopoly prices and problems with discrimination among the different risk groups (Williams, 1957, p. 14). In almost all product lines in each European country, supply is highly differentiated and monopolies do not exist. Discrimination between various risk groups can be reduced by an extensive and precise underwriting process. Furthermore, the more efficient the risk classification system is, the more accurately the insurer can reduce its underwriting costs. The insurance industry is a strongly regulated market with regard to

discrimination based on risk-rating factors (see, for example, Williams, 1957, p. 21 and Crocker and Snow, 2000; Hoy, 2006). The Actuarial Standards Board (2005) has set up standards to take into account the anti-discrimination aspect as well as the adequacy of risk rating in insurance pricing. Thus, risk characteristics should meet certain general requirements, namely "relationship of risk characteristic and expected outcomes, causality, objectivity, practicality, applicable law as well as industry and business practices" (Actuarial Standards Board, 2005, p. 4).

The use of different risk-rating factors in (non-compulsory) insurance products is important to offer adequate insurance cover for potential policyholders (Powers, 2010, p. 5). It is essential to categorize heterogeneous risks adequately and to define an appropriate size for the risk classes in order to determine the optimal insurance premium (Bond and Crocker, 1991, p. 177). Hence, unfavorable effects of moral hazard and adverse selection can be minimized in the insurer's portfolio. The phenomenon of moral hazard often causes costs to the insurance company after conclusion of the contract. It is possible for the policyholders to change their risk behavior, after they have taken out insurance cover, in a way that negatively influences insurers' costs. Adverse selection occurs, for example, when risks due to insufficient relevant information about the potential policyholders cannot be pooled homogeneously. When information asymmetries lead to adverse selection, the long-term financial viability of an insurance company can potentially be threatened (Actuarial Standards Board, 2005, p. 5). Rothschild and Stiglitz (1976) also developed a model to measure the effects of incomplete information to derive implications for the improvement of welfare effects for the insurance companies. "The precondition for profitable rate classification is access to information on the loss distributions of different classes in insureds" (Doherty, 1981, p. 294). According to Abraham (1985, p. 405) inadequate or incorrect evaluation and application of underwriting standards concerning risk categorization can lead to market failure in voluntary (non-compulsory) insurance markets. Lower-risk individuals are underinsured because they may retreat due to self-insuring while higher-risk individuals may pay insufficient premiums for adequate insurance cover (Borenstein, 1989, p. 25). Risk categorization is applied to treat individuals and risks with similar characteristics equally, to operate in a most cost-effective way, to provide the policyholders a broad range of insurance cover, and to protect the system's validity (see Actuarial Standards Board, 2005, p. 8).

In the following sections we lay out relevant pricing factors in the four selected business lines (motor, annuity, term life and private health insurance). For example, in almost all business lines gender and age criteria lead to significant differences in the final policy price for the same coverage. Depending on the exact product there are further risk differentiation criteria "helping to reduce overall risk, as well as enabling insureds to pay approximately in proportion to their relative hazard of

loss" (Walters, 1981, p. 7). Table 1 provides an overview of the factors described in the following sections.

Motor	Annuity	Term Life	Health
Age	Age	Age	Age
Gender	Gender	Gender	Gender
Type of car	Smoking habits	Smoking habits	Health status
Annual mileage	Health status	Hobbies	Lifestyle
Garage			

Table 1: Overview of Selected Risk-Rating Factors per Line of Business

Risk Factors Used in Motor Insurance

In motor insurance, numerous criteria are typically used to define risk classes: on the one hand the criteria concern the driver characterized, among other factors by its age and gender, and, on the other hand they regard the car and its usage, for example, the type of car, the annual mileage, and the parking location (see, e.g., Walters, 1981, p. 13; Werth, 1995, p. 2; Connel et al., 2012, p. 2). In the following, we review a selection of the most important factors. The driver's *age* is a main factor because based on statistical data "youthful drivers, as a group, have accidents more often than older drivers" (Connel et al., 2012, p. 3). Furthermore, the policyholder's *gender* results in differences regarding the likelihood of suffering an accident (see, e.g., Association of British Insurers (ABI), 2010, p. 34). Both criteria have a strong correlation with other risk-rating characteristics, for example, gender combined with age and type of car (Association of British Insurers (ABI), 2010, p. 18). The most statistically significant relationship is between the number and severity of accidents and the driver's gender and age. According to statistics, young men aged between 17 to 25 years cause higher claims costs and male risk affinity is more pronounced. Thus, male policyholders in this age group pay a higher premium than women at the same age (Association of British Insurers (ABI), 2010, p. 20). In addition to the driver's gender and age, the *type of car* is an important pricing factor (Werth, 1995, p. 29). Drivers of low-range cars, that is, small engine size and less prestigious make of car, tend to drive more carefully than drivers of powerful cars and notable brands of sports car manufacturers (Crocker and Snow, 2000, p. 12). Furthermore, it can be observed that the type of car, in particular the engine size and model of car, has a high correlation with the gender and age factors. Men often drive more powerful cars than women, and younger drivers tend to buy more powerful cars than older drivers (Oxera, 2011, p. 1). Also *annual mileage* as a risk factor is based on the assumption that policyholders with a lower yearly driving distance have significantly higher accident rates per kilometer (Kelly and Nielson, 2006, p. 227). This criterion is often related to the age factor. Young drivers often

have a lack of driving experience the less they use their car. The same applies for older policyholders, for example, due to a reduction in concentration or other health aspects. Between the ages 25 to 65 the link between the annual mileage and the driver's age is less pronounced (Kelly and Nielson, 2006, p. 227). Finally, the *garage* criterion, that is, where the car is normally parked (outside or in a garage) is important (Etgar, 1975, p. 617). The use of this risk-rating criterion is justified by accidental natural disasters such as hail or storm (Etgar, 1975, p. 617).

Risk Factors Used in Annuity Insurance

Risk rating in annuity insurance is closely mapped to mortality rates linked to the *age* and *gender* of the insured. Furthermore, the underwriting process is predominantly dependent on the use of detailed medical information (Association of British Insurers (ABI), 2010, p. 27). The majority of insurance firms take *gender, age, smoking habits,* and *health status* into account for their calculations (see, e.g., Perkins, 2003, p. 547). In addition, specific mortality tables linked to professional groups are used to statistically determine the individual risk situation. Women have lower mortality rates than men at every age (Werth, 1995, p. 2). The consequence is that a male insured person typically receives a higher annual payment at retirement age than a female policyholder who pays the same monthly premium during the contract period (respectively invests the same amount for an annuity product against payment of a single premium) due to the shorter stream (until death) of annuity payments (Civic Consulting, 2010b, p. 9). Furthermore, medical issues and aspects of a healthy lifestyle influence individual longevity. According to these aspects, "life expectancy is central to pricing annuities" (Association of British Insurers (ABI), 2010, p. 31). The relationship between gender and personal lifestyle as well as genetic differences between both genders are often taken into account in public debates (Association of British Insurers (ABI), 2010, p. 33).

Risk Factors Used in Term Life Insurance

In a similar way to annuity insurance, the pricing models of life insurance compared to those of motor insurance are much less complex regarding the number of risk-rating criteria used. The scientific literature often deals with risk classification based on observable attributes that cannot be influenced, that is, *gender* and *age* (see, e.g., Thiery and Van Schoubroeck, 2006, p. 191). These characteristics play an important role in pricing term life insurance. Mortality statistics imply, for example, that male policyholders pay on average a higher insurance premium than female policyholders, irrespective of age. Furthermore, the mortality rate rises with age (Association of British Insurers (ABI), 2010, p. 29). However, mutable characteristics such as *smoking habits* and *hobbies* (e.g., diving and hang gliding) also have a significant

influence on individual risk behavior as well as the policyholder's mortality risk and are therefore taken into consideration in pricing. The importance of this aspect for use in actuarial pricing is on the one hand, "a consequence of a direct physical aspect (as in the case of evidence establishing a casual link between smoking and heart disease) or merely [on the other hand], a statistical relationship" (Bond and Crocker, 1991, p. 178). Schoenborn and Benson (1988), for example, prove the relationship between the smoking habit and individual risk behavior. They sum up that smoking negatively influences one's personal health and that smokers tend to live more unhealthily than non-smokers. The smoker criterion is firmly anchored in the insurance industry's pricing.

Risk Factors Used in Private Health Insurance

As well as the policyholder's *age* and *gender*, numerous risk differentiation criteria are added to the private health insurance pricing models. Additional criteria include *health status* at the time of conclusion of the contract and *lifestyle* (eating, smoking and exercise habits, Van de Ven et al., 2000, p. 317). Generally, insurers charge a supplementary premium or exclude certain services of insurance cover for higher-risk individuals. Insurance premiums vary between both genders aged 35 and 55 depending on gender-based health conditions and therefore, statistically different medical costs (Association of British Insurers (ABI), 2010, p. 25). In addition, men and women have a different demand pattern for medical services. When determining the premium for women, costs of pregnancy and motherhood are typically taken into account (if not forbidden by law, see, e.g., Council of the EU, 2004, p. 41). The criterion age is applied to reflect the increasing likelihood of disease and death at the end of one's life (Civic Consulting, 2010a, p. 61). Several insurance companies restrict the age of entry and form provisions to cover the policyholders' rising costs in older age. Questions regarding a healthy lifestyle become more and more important in underwriting individual risks. This is due to the fact that empirical studies furnish clear evidence of a significantly positive link between healthy nutrition as well as sufficient exercise and health status.

3 Pricing Practice in the Insurance Industry

In the following section, we describe in detail the methodology followed for collecting premiums that describe the industry's pricing practice. Then we define pricing regression models in each product line to calculate the weights of the selected risk factors on the insurance premium. We apply the models on our cross-country data set. Finally, we report the results obtained from the models in each country and for each business line.

3.1 Description of the Data Panel

Using the online premium calculators of 45 different insurance companies in five European countries we have collected, 5 482 premium figures for four different key product categories in the year 2012. The countries covered by our study are the United Kingdom (U.K.), Germany, France, Italy and Switzerland. The product categories analyzed are motor ($n = 4\,542$ observations), annuity ($n = 66$ observations), term life ($n = 568$ observations), and private health insurance ($n = 306$ observations).

The selection of insurance companies is based upon their size and premium volume, in order to represent the market leaders in each country. Also, direct insurers are included in order to take into account the broad range of premiums available on the market.[2] We solely collect premiums offered to online customers (and not via the agents or broker channels) in order to gain comparable rates, even if these rates may be systematically subject to risk surcharges in comparison to the other channels. The online premiums can be considered more neutral since they do not include further personal discounts (e.g., rebates that are often granted by agents). The companies included in our analysis are listed in Table 2.

Business Line	U.K.	Germany	France	Italy	Switzerland
Motor	Aviva Zurich Churchill	Allianz Europa Helvetia	AXA	AXA Direct Line HDI	AXA BaloiseDirect Die Mobiliar
Annuity	Aviva	Allianz ERGO Direkt CosmosDirekt			
Term Life	Aviva Virgin Money Liverpool Victoria	Allianz ERGO Direkt CosmosDirekt	Groupama	AXA Onlife	Helvetia SwissLife Generali
Health	Aviva Health-on-Line AXA	Allianz Hallesche ARAG HanseMerkur Concordia R&V			Helsana CSS Sanitas Sanagate Concordia Groupe Mutuel Rhenusana

Table 2: Overview by Country and Business Line of the Insurance Companies Included in the Panel

[2]Premium calculators on the internet can mostly only be found for the U.K., Germany and Switzerland in motor, term life and private health insurance. To date, calculating premiums online is only possible for a few insurance companies in France and Italy. Noteworthy to mention about data collection is that computation possibilities vary not by country but by business lines. While there are online premium calculators in each country for the classical and more frequently required motor insurance as well as for the less complex term life insurance, far fewer online premium calculators are available for the more advice-intensive annuity and private health insurance. This is partially due to the complexity of the latter products.

In the following section, we describe in detail the risk factors and values considered in each business line. For each product we consider a risk to be insured with given characteristics (e.g., the driver's gender or the model of the car in motor insurance). The characteristics define the values for selected risk factors in each business line (see Table 1). Different values for the characteristics of each risk factor are tested in order to assess the weight of each factor and the significance among companies and countries. In each product line the extent of insurance cover is calculated according to a standardized set of options in order to ensure comparability across countries and products. For example, in motor insurance our "standard" is a policy with yearly premium payments, for a non-lease car, one single driver, private usage, premium level 100%, no claims history, etc.[3] Table 3 at the end of this section gives a synoptic overview of the parametrization used in setting up our data panel.

Motor Insurance

The insurance policy that we consider for our data collection covers accidental damage to the policyholder's car, legal liability to third parties, for injury or damage to property including vehicles, as well as fire and theft. We gathered premiums in all five countries from a total of 13 different insurance firms. In the U.K., Germany, Italy and Switzerland many companies provide online premium calculators whereas in France only AXA provides a calculator which allows our defined standard cover to be chosen.

On the basis of the risk factors shown in Table 1, we include the factors age AG, gender GE, make and type of car MA, kilometrage KI (annual mileage) and garage GA in our risk profile.

- The age range analyzed includes the ages from 18 to 65 years. From 18 to 28 years premiums are gathered for each year (i.e., $AG = 18$, $AG = 19$, ...) in order to take into account that premiums vary considerably in younger age groups and to increase the precision of our modeling. From 30 years onwards, the data collection is based on five-year increments.[4]

- In all cases, the data collection includes profiles for both genders, female and male, which are coded as $GE = 0$ and $GE = 1$.[5]

[3] A detailed description of the product characteristics is available from the authors upon request.

[4] Premiums are computed for 19 age classes. For the U.K. insurers, premiums are only partially available, starting at the age of 25 years. This is, for example, the case at Aviva for car type B, while in the case of Zurich premium calculations are only available for policyholders/drivers aged 30 and older. In the case of Churchill, the computation for car type A is possible only from the age of 25 years onwards and for car type B only for persons of 40 years of age and over. In France, that is, in the case of AXA, the starting age is 19 years.

[5] In the case of DirectLine (Italy), premiums are not gender-differentiated for car types B and C.

- For analyzing the factor linked to the type and value of the car, we select three car models that are representative for the current new car registrations in each segment. For compact cars we select VW Golf (MA = A), for the mid-size category we choose Audi A4 (MA = B), and for luxury cars we select Porsche 911 (MA = C).[6] Note that premiums for mid-size and luxury cars (car types B and C) cannot be computed on the websites of all companies. Zurich (U.K.) does not disclose premiums for car types B and C. Moreover, premiums for car type C are not available online from Aviva and Churchill (both U.K.), Helvetia (Germany), AXA (France) and Die Mobiliar (Switzerland).
- In our risk profiles, we set the estimated amount of annual kilometers driven to 5 000 ($KI = 0$) and 20 000 kilometers ($KI = 1$). Depending on the country and the insurance company, pre-determined levels of annual kilometrage are defined (typically one lower and one higher value). If these do not match our values exactly we choose the closest option. We also consider the conversion from miles to kilometers in the case of U.K. insurers. We note that in the cases of AXA and HDI (both in Italy) no premium differences are found based on yearly kilometers.
- The risk differentiation criteria "garage" has two options: the car is left on a public road overnight (no garage, $GA = 0$) or parked in a garage ($GA = 1$). Even though this criteria is requested by almost all insurers, as we will see below, its impact on the premium is limited.

Annuity Insurance

Four online tariff calculators in two countries, the U.K. and Germany, are available for the computation of the nonforfeiture value in annuity insurance. The nonforfeiture value is the monthly insurance benefit paid to the insured. The premium calculation is available for one company in the U.K. and for three companies in Germany (see Table 2). We choose an immediate annuity against payment of a single premium of 100 000 EUR with a guaranteed lifetime annuity payment. The selected product does not include cover for death risks, provision for surviving dependents or dynamism. In our observations we will report the nonforfeiture value for the given single premium obtained for different risk profiles.

Considering the risk-rating factors reported in Table 1 we find that smoking habits and health status are not differentiated by the premium calculators that we

[6]The exact specifications and values of the cars are as follows: VW Golf 1.4 TSI (122 PS, 1390 cc, value 25 581 EUR), Audi A4 Avant 2.0 TFSI Quattro S (211 PS, 1 840cc, 43 612 EUR), Porsche 911 Carrera (345 PS, 3 614 cc, 115 696 EUR). The respective type designation is pursuant to German standards and the selected cars are top tier of car registration statistics. In order to ensure comparability, we select the same car type for each country based on engine power and purchase price.

found. Thus we focus our analysis on the factors age (AG) and gender (GE).

- We observe risk profiles for ages ranging from $AG = 20$ to $AG = 65$ years (based on five-year increments). Note that in the case of Aviva in the U.K. the online calculation is only possible from 55 years onwards.
- The data collection is performed for both genders, female and male, which are coded as $GE = 0$ and $GE = 1$.

Term Life Insurance

The premiums for life insurance are calculated in all five countries with the aid of tariff calculators. 12 insurance companies are included in our data panel. The selected insurance policy includes the payment of the insured amount (100 000 EUR) to the surviving dependents in case of death of the insured person during the contract term (10 years).

Since the risk factor "hobbies" is not controlled for explicitly in online premium calculators, we consider the age (AG), gender (GE), and smoking habits (SM) to characterize the policyholder's risk profile.

- The age range analyzed is from 18 to 65 years. Years are analyzed per unit up to the age of 21, while from the age of 25 onwards the data collection is based on five-year increments. Some insurance companies set a maximum age based on the contract term which limits our data gathering for higher ages.[7]
- Premiums are collected for both genders defined by $GE = 0$ (female) and $GE = 1$ (male).
- The third criterion is smoking status. It distinguishes between non-smokers ($SM = 0$) and smokers ($SM = 1$). We note that the insurers AXA (Italy) and Groupama (France) do not charged different premiums according to the smoking status.

Private Health Insurance

The selected product in private health insurance is a supplementary hospital insurance with free choice of doctor and hospital, private medical treatment as well as the comfort of single or two-bed rooms. Premiums for private health insurance are collected in three countries, the U.K., Germany and Switzerland. Overall, premiums are gathered for 16 different insurance companies.

[7]For example, in the U.K. in the case of Aviva the computation of the premium is possible only up to the age of 55, in Germany in the case of Allianz and ERGO Direkt up to age 60, in France in the case of Groupama up to the age of 45, in Italy in the case of Onlife up to the age of 60, and in Switzerland in the case of SwissLife up to the age of 50, and in the case of Generali up to the age of 60.

Online tariff calculators differentiate premiums according to the age (AG) and the gender (GE) of the policyholder.

- We consider risk profiles with ages ranging from 20 years to 65 years. The maximum age of entry varies from company to company, thereby limiting the evaluation of premiums.[8]
- We collect premiums for both genders (female $GE = 0$, and male $GE = 1$). We observe that three insurance companies in the U.K. (Aviva, Health-on-Line, and AXA) charge unisex premiums. This is also the case in Switzerland for the insurance companies Sanagate and Concordia.

Overview

The following two tables provide an overview of the data panel. Table 3 summarizes the risk factors considered in each business line and the values taken by the factors in the risk profiles considered. Table 4 presents the number of premium observations in our data set by business line in each country.

Business Line	Factor	Variable	Values
Motor	Age	AG	18 – 65
	Gender	GE	Female (0), Male (1)
	Type of car	MA	VW Golf (A), Audi A4 (B), Porsche 911 (C)
	Kilometrage	KI	5 000 (0), 20 000 (1)
	Garage	GA	No (0), Yes (1)
Annuity	Age	AG	20 – 65
	Gender	GE	Female (0), Male (1)
Term Life	Age	AG	18 – 65
	Gender	GE	Female (0), Male (1)
	Smoker	SM	No (0), Yes (1)
Health	Age	AG	20 – 65
	Gender	GE	Female (0), Male (1)

Table 3: Overview of Risk-Rating Factors Considered in Different Business Lines
For each factor the representing variable and the values taken are reported. The values in brackets represent the coding used in the regression models.

3.2 Design of the Regression Models

In this section, we will use the data panel described in Section 3.1 in order to empirically derive the influence of the different risk-rating criteria on the insurance premiums (the nonforfeiture value in annuity insurance). For this, we will develop

[8]German insurance companies typically impose limits with a maximum entry age of 64 years (Allianz, Hallesche, and Concordia). R&V has an entry age limit of 60. In Switzerland the maximum entry age is fixed in the case of Concordia at 64 years, and in the case of Rhenusana at 59 years.

Business Line	U.K.	Germany	France	Italy	Switzerland
Motor	430	1 216	288	1 368	1 240
Annuity	6	60	–	–	–
Term Life	148	148	36	100	136
Health	60	112	–	–	134

Table 4: Number of Observations in the Data Panel by Business Line in Each Country

a multiple linear regression model in each business line (motor, annuity, term life and health insurance). Since the factors are weighted very differently among the five countries we apply the models separately on the observations in each country. First, we present aggregated results for the five countries, second, we report separate regression results for all countries and business lines.

In motor, term life and private health insurance, our aim is to find the weighting coefficients in the explanatory variables for defining the price PR, the independent variable. In annuity insurance the independent variable will be NV, the nonforfeiture value which defines the monthly insurance benefit based on the various price factors and their specific characteristics. The regression models include the risk factors or control variables introduced previously. In addition to the variables summarized in Table 3, we include a categorical variable for the country CO in each model. In order to process the five possible values UK, DE, FR, IT, CH standing for the U.K., Germany, France, Italy and Switzerland, we introduce four related dummy variables CO^j, with j = DE, FR, IT, CH ($CO^j = 1$ if $CO = j$, and else $CO^j = 0$). When analyzing the data on a country-by-country basis (see Section 3.3) we will omit CO in the regression models. In each model α designates the intercept or constant and ϵ represents the standard error or disturbance term.[9]

We illustrate the results of each regression analysis in a specific table (see Tables 5 to 8). In doing so, we refer to the estimated beta-coefficients according to the risk factors with their resulting standard error. In addition, we illustrate the results of the two-tailed t-test by indicating the p-value and significance. Asterisks (***, **, *) are used to point out the significance levels (1%, 5%, 10%). The weighting of the relevance of different risk-rating criteria can be read from the standardized beta coefficients (stand. β_i).

Motor Insurance

The pricing regression model for the motor insurance product includes the five variables introduced in Table 3 and the country control variable CO. The categorical

[9]In all models, we check our data for multicollinearity. The severity of multicollinearity can be quantified with the help of the variance inflation factor (VIF). The highest VIF values obtained in the factors across our four models are far below 5 which typically indicates that no collinearity exists.

variables country CO and type of car MA are transformed into dummy variables for processing in the regression model. We introduce car type related dummy variables MA^j, with $j = \text{B}$ and C ($MA^j = 1$ if $MA = j$, and else $MA^j = 0$; i.e., car type A is coded by the configuration $MA^{\text{B}} = MA^{\text{C}} = 0$). Thus our regression model for the motor insurance premium reads as follows:

$$PR = \alpha + \beta_1 AG + \beta_2 GE + \sum_{j \in \{\text{B,C}\}} \beta_3^j MA^j + \beta_4 KI + \beta_5 GA + \sum_{j \in \{\text{DE,FR,}\atop \text{IT,CH}\}} \beta_6^j CO^j + \epsilon. \quad (1)$$

Running this model on the data set of motor insurance premium observations, we obtain estimated values and significance levels of the beta-coefficients. The results are reported in Table 5.

Variables	Est. (β_i)	St. Error	p-value	Sig.	Stand. β_i
α	3 547.72	75.23	0.0000	***	
AG	−24.13	1.12	0.0000	***	−0.206
GE	274.67	32.13	0.0000	***	0.081
MA^{B}	353.38	37.09	0.0000	***	0.162
MA^{C}	1 770.24	43.30	0.0000	***	0.520
KI	400.56	32.13	0.0000	***	0.118
GA	−53.19	32.13	0.0979	*	0.043
CO^{DE}	−1 499.03	62.51	0.0000	***	−0.440
CO^{FR}	−1 605.20	83.08	0.0000	***	−13.736
CO^{IT}	−1 839.92	62.24	0.0000	***	−0.844
CO^{CH}	718.34	62.38	0.0000	***	0.211
$n = 4\,542$, adjusted $R^2 = 0.595$					

Table 5: Empirical Results of the Pricing Regression Model on the Risk Factors in Motor Insurance

We observe that all variables, with the exception of the factor garage GE are significant at the 1% level. Besides the premium differences between countries which are of high relevance, we are mostly interested in the impact of the risk-rating factors. The type of car MA (stand. $\beta_i = 0.520$ resp. 0.162) and the policyholder's age AG (stand. $\beta_i = -0.206$) have the most important impact on the premium. That is, car types B and C go along with premium surcharges of 353 EUR and 1 770 EUR compared to car type A. Higher aged policyholders obtain lower premiums (24 EUR less per year). Next, the annual mileage KI (stand. $\beta_i = 0.118$) has a more important impact than the gender GE (stand. $\beta_i = 0.081$) criterion. The higher kilometrage (20 000 instead of 5 000 kilometers per year) goes a long with a surcharge of 401 EUR. Male policyholders pay *ceteris paribus* 275 EUR more than female customers. Almost all insurance companies consider the criterion garage GA when the contract is concluded. However, the differentiation on the availability of garage parking has no clear influence on the actuarial tariff. Overall our pricing model explains about 60% of the variance.

Annuity Insurance

Following the procedure for the price in motor insurance, we propose a regression model for the nonforfeiture value in annuity insurance including the risk-rating factors age AG and gender GE as well as the country of observation. The model reads as follows:

$$NV = \alpha + \beta_1 AG + \beta_2 GE + \beta_3^{\mathrm{DE}} CO^{\mathrm{DE}} + \epsilon. \tag{2}$$

The model coefficients that can be derived from our data set are detailed in Table 6. All control variables in the model are highly significant and the model explains more than 90% of the variance. We again observe large differences between the countries considered (Germany versus U.K.). Furthermore we note that the age AG of the policyholder (stand. $\beta_i = 0.568$) has a much higher impact in premium calculation (4 EUR nonforfeiture value per age year) than the gender GE of the policyholder (stand. $\beta_i = 0.087$, 18 EUR more for male policyholders) which plays a rather unimportant role.

Variables	Est. (β_i)	St. Error	p-value	Sig.	Stand. β_i
α	294.41	20.20	0.0000	***	
AG	4.09	0.26	0.0000	***	0.568
GE	18.37	7.25	0.0139	**	0.087
CO^{DE}	−220.09	13.43	0.0000	***	−0.601
$n = 66$, adjusted $R^2 = 0.923$					

Table 6: Empirical Results of the Nonforfeiture Value Regression Model on the Risk Factors in Annuity Insurance

Term Life Insurance

The regression model for the price of term life insurance includes the risk-rating factors age AG, gender GE, and the smoking status SM. Furthermore, we add the country as a control variable. Thus, the model reads:

$$PR = \alpha + \beta_1 AG + \beta_2 GE + \beta_3 SM + \sum_{\substack{j \in \{\mathrm{DE,FR,} \\ \mathrm{IT,CH}\}}} \beta_4^j CO^j + \epsilon. \tag{3}$$

The results obtained for the regression coefficients are presented in Table 7. With regard to the three risk-rating factors age, gender, and smoking status, all of them are significant in the determination of the policyholder premium. The age AG criterion (stand. $\beta_i = 0.507$) is the most important.

Furthermore, male risks pay 263 EUR more than their female counterparts. Smokers pay on average 251 EUR more than non-smokers. Finally, premiums in

Variables	Est. (β_i)	St. Error	p-value	Sig.	Stand. β_i
α	−1 543.65	156.00	0.0000	***	
AG	45.85	3.12	0.0000	***	0.507
GE	263.01	90.24	0.0037	***	0.099
SM	251.29	90.24	0.0055	***	0.095
CO^{DE}	307.52	125.00	0.0142	**	0.362
CO^{FR}	216.86	201.25	0.2817		0.082
CO^{IT}	933.79	139.19	0.0000	***	10.317
CO^{CH}	43.85	127.92	0.7319		0.017
$n = 568$, adjusted $R^2 = 0.339$					

Table 7: Empirical Results of the Pricing Regression Model on the Risk Factors in Term Life Insurance

Germany and Italy differ significantly from those in the U.K. (reference country). In France and Switzerland the premium difference is not significant (at any of the levels considered).

Private Health Insurance

The pricing regression model of private health insurance includes the risk-rating factors age AG and gender GE as well as the control variable for the country. We set the model as follows:

$$PR = \alpha + \beta_1 AG + \beta_2 GE + \sum_{j \in \{\mathrm{DE,CH}\}} \beta_3^j CO^j + \epsilon. \tag{4}$$

The results (Table 8) underline the significance of the policyholder's age in risk-rating (stand. $\beta_i = 0.296$) and yield a premium increase of 10 EUR per year. Since three U.K. companies charge unisex premiums, it is not surprising to see the gender criterion to be insignificant in the cross-country regression model. In Section 3.3, we analyze the coefficients from the regression model on a country-basis. When considering the country coefficients, we notice that the premium levels in Germany and Switzerland, in comparison to the U.K., are significantly lower.

Variables	Est. (β_i)	St. Error	p-value	Sig.	Stand. β_i
α	683.65	50.00	0.0000	***	
AG	9.98	0.92	0.0000	***	0.296
GE	−18.85	25.41	0.4590		−0.020
CO^{DE}	−1 028.42	35.59	0.0000	***	−1.667
CO^{CH}	−891.53	34.54	0.0000	***	−0.952
$n = 306$, adjusted $R^2 = 0.775$					

Table 8: Empirical Results of the Pricing Regression Model on the Risk Factors in Private Health Insurance

In order to conclude this section, it is important to point out that the age criterion AG is one of the most important risk-rating factor to differentiate premiums in the business lines considered. The factor age AG is even the most important, except in motor insurance where the type of car (and therefore implicitly the value of the risk) is more important. Furthermore, we have observed that the country plays an important role with regard to the level of the premium. Thus, in the following section, we consider the weights and significance of the risk-rating factors separately in each country.

3.3 Overview: Insurer's Usage of Price Differentiation Factors

The aim of this section is to provide an overview of the relevance of the selected risk-rating factors in each business line on a country level. That is, we adapt the regression models introduced in Section 3.2, see Equations (1) to (4), by leaving out the country control variables CO^j. While running the regression models on a data subset for each country we are able to determine country- and product-specific weights for the selected risk factors.

In summary, the regression models used in this section are as follows:

- Motor insurance:

$$PR = \alpha + \beta_1 AG + \beta_2 GE + \sum_{j \in \{\mathrm{B,C}\}} \beta_3^j MA^j + \beta_4 KI + \beta_5 GA + \epsilon. \quad (5)$$

- Annuity insurance:

$$NV = \alpha + \beta_1 AG + \beta_2 GE + \epsilon. \quad (6)$$

- Term life insurance:

$$PR = \alpha + \beta_1 AG + \beta_2 GE + \beta_3 SM + \epsilon. \quad (7)$$

- Private health insurance:

$$PR = \alpha + \beta_1 AG + \beta_2 GE + \epsilon. \quad (8)$$

We use the regression models (5) to (8) in each country to determine the coefficients of the risk-rating factors and their significance for risk differentiation. In Table 9, we report a summary of the results including the standardized beta coefficients and the significance level (number of asterisks linked to the two-tailed t-statistics) in each country and business line.

Business Line	Variables	U.K.		Germany		France		Italy		Switzerland	
Motor	AG	−0.65	***	−0.32	***	−0.27	***	−0.48	***	0.08	***
	GE	0.13	***	0.11	***	0.17	***	0.19	***	0.07	***
	MA^{B}	−0.08	**	0.05		0.76	***	0.37	***	0.56	***
	MA^{C}	(a)		0.71	***	(a)		0.43	***	1.11	***
	KI	0.12	***	0.24	***	0.35	***	0.01	(c)	0.20	***
	$GA^{(\mathrm{b})}$	−0.00		−0.00		0.00		−0.00		−0.06	***
Annuity	AG	0.89	**	0.93	***						
	GE	0.35	(d)	0.12	**						
Term Life	AG	0.73	***	0.66	***	0.90	***	0.62	***	0.72	***
	GE	0.07		0.11	*	−0.00		0.17	**	0.17	***
	$SM^{(\mathrm{e})}$	0.23	***	0.23	***	−0.00		0.01		0.25	***
Health	AG	0.83	***	0.95	***					0.64	***
	$GE^{(\mathrm{f})}$	−0.03		0.06	**					−0.11	

Table 9: Empirical Results of the Regression Models on the Influence of the Risk-Rating Criteria per Business Line and per Country
The reported values denote the standardized beta coefficients and the two-tailed t-statistics. *,**, and *** represent the respective significance at the 10%, 5%, and 1% levels.
Remarks: (a) The premiums for car types B and C cannot be computed for several insurance companies. (b) The garage criterion is collected by almost all insurance companies. However, it has no impact on the premiums in the majority of the companies. (c) In Italy, for most insurance companies, no differences are found based on the yearly kilometrage. (d) In our data set, observations are only available from one company in the U.K. (for ages over 55 years). (e) Premiums are indifferent from the smoking status in France and Italy. (f) The majority of the selected insurance companies calculate unisex premiums.

Almost all risk-rating factors have a significant influence on the insurer's pricing models in each country and business line, as far as the data may be determined reliably. From Table 9 differences of the factors' impact and relevance can be noticed when comparing the four business lines and the individual countries.

When considering the personal risk factors age and gender, we observe that both characteristics imply highly significant differences in the premium models. The age attribute AG leads to the most significant differences in premiums and benefits. The age-dependent probability of loss in motor insurance or the higher rates of sickness in older age in private health insurance translate into significant influence on the part of the age factor. In most countries and business lines age is more important than the other (also immutable) characteristic which is gender. A driver's style in motor insurance, gender-driven mortality in annuity insurance, as well as healthcare costs in private health insurance are influenced by the insured's gender. Except for countries or business lines where unisex premiums are applied, the gender criterion GE has significant impact but is of lower weight than the age criterion.

Not only immutable factors influence the insurance premium, but also attributes which can be influenced by the insured person are highly relevant in insurance pricing, for example, the annual mileage KI in motor insurance which is more important than the driver's gender GE with regard to the likelihood of suffering an accident (see, e.g., Germany, France, and Switzerland). Furthermore, the smoker

criterion SM in term life insurance plays an important role in determining the individual insurance premium.

Table 9 also enables an analysis of the differences among the countries under consideration. For example, in motor insurance, the age attribute AG is the main factor influencing actuarial pricing in the U.K. (stand. $\beta_i = -0.65$). It is of much less importance in the other four countries. The annual mileage KI does not play an important role in the pricing model of the insurers in the U.K. (stand. $\beta_i = 0.12$), but it is the second most important attribute in the pricing models of insurers in France (stand. $\beta_i = 0.35$, and Switzerland (stand. $\beta_i = 0.20$)) when comparing the standardized beta coefficient values.

4 Consumers' Perception of Pricing Criteria

The aim of this section is to concentrate on the consumers' perception of selected risk-rating criteria. We first briefly describe the consumer survey carried out and the data set obtained. The data set is borrowed by the authors from the yet-to-be published paper by Schmeiser et al. (2014). Using descriptive statistics we second present the findings on the consumers' perception in Table 10.

4.1 Description of the Data Panel

An online consumer survey (see also Schmeiser et al., 2014) focusing on several price differentiation criteria was carried out in summer 2011 in five European countries, that is, the U.K. ($n = 1\,003$ retained respondents), Germany ($n = 1\,040$), France ($n = 1\,014$), Italy ($n = 1\,013$), and Switzerland ($n = 1\,038$) as well as in four key business lines, namely, motor, annuity, term life, and private health insurance. In total the related data set comprises 5 108 fully answered questionnaires. For each of the product lines price differentiation criteria are considered in the survey (compare with the risk differentiation criteria described in Section 2, Table 1). In motor insurance, the factors considered are the customer's age and gender, the make and type of the car, and the annual kilometrage. In annuity insurance, the consumer's gender, smoking status, health status, and income are taken into account. For term life insurance, policyholder's age and gender, body mass index (BMI), and hobbies are considered, while for health insurance, age, gender, and health status are observed. Respondents were asked to grade the four factors presented in each business line on a five-point Likert scale from "do not agree" (coded as 0) to "agree completely" (coded as 1). The questionnaire is designed to determine consumers' perception of the (ethical) use of different pricing criteria on the basis of practical examples. For each factor a statement is formulated and participants are asked how acceptable they consider these statements to be on the rating scale. In each

of the five countries the panel capturing the consumers' opinion is representative of the local population structure by age (18 – 65 years) and gender. A detailed description of the questionnaire can be found in the Appendix (see Part I of the survey) of Schmeiser et al. (2014).

4.2 Survey Results

In the following section, we present the results from the consumer survey. The consumers' acceptance of several differentiation criteria in the four business lines considered is the focus of our analysis. The survey results are illustrated in Table 10. The values that are reported show the average appreciation rating (values between 0 and 1) and the related standard deviation for the different pricing criteria in each country and business line. Results above the value 0.5 indicate a positive acceptance of the risk factor, while results below 0.5 specify a rejection of the criterion. The last column of Table 10 indicates the average value and standard deviation of acceptance over all countries for each risk factor in its business line.

		U.K.	Germany	France	Italy	Switzerland	Average
Motor	Age	0.69 (0.28)	0.59 (0.30)	0.52 (0.34)	0.61 (0.29)	0.55 (0.32)	0.59 (0.31)
	Gender	0.71 (0.27)	0.56 (0.29)	0.50 (0.34)	0.50 (0.30)	0.54 (0.32)	0.56 (0.32)
	Make	0.60 (0.27)	0.51 (0.29)	0.59 (0.31)	0.52 (0.29)	0.53 (0.30)	0.55 (0.30)
	Kilometrage	0.64 (0.28)	0.60 (0.31)	0.61 (0.34)	0.62 (0.30)	0.51 (0.33)	0.59 (0.32)
Annuity	Gender	0.33 (0.27)	0.28 (0.27)	0.23 (0.26)	0.29 (0.27)	0.27 (0.26)	0.28 (0.27)
	Smoker	0.48 (0.31)	0.34 (0.30)	0.36 (0.32)	0.41 (0.30)	0.35 (0.32)	0.39 (0.32)
	Health	0.43 (0.27)	0.29 (0.27)	0.24 (0.26)	0.32 (0.26)	0.26 (0.24)	0.31 (0.27)
	Income	0.49 (0.31)	0.60 (0.32)	0.56 (0.35)	0.50 (0.33)	0.61 (0.33)	0.55 (0.33)
Term Life	Age	0.68 (0.26)	0.67 (0.26)	0.63 (0.31)	0.55 (0.29)	0.60 (0.28)	0.63 (0.28)
	Gender	0.59 (0.27)	0.51 (0.27)	0.46 (0.32)	0.49 (0.29)	0.46 (0.29)	0.50 (0.29)
	BMI	0.62 (0.28)	0.49 (0.31)	0.40 (0.33)	0.45 (0.30)	0.48 (0.32)	0.49 (0.31)
	Hobbies	0.73 (0.25)	0.63 (0.30)	0.56 (0.34)	0.65 (0.29)	0.60 (0.32)	0.64 (0.31)
Health	Age	0.63 (0.23)	0.52 (0.27)	0.54 (0.30)	0.55 (0.26)	0.53 (0.29)	0.55 (0.27)
	Gender	0.41 (0.29)	0.33 (0.29)	0.27 (0.30)	0.36 (0.30)	0.35 (0.32)	0.35 (0.30)
	Gender Soc.**	0.44 (0.23)	0.40 (0.29)	0.38 (0.30)	0.46 (0.27)	0.41 (0.31)	0.42 (0.28)
	Health	0.68 (0.24)	0.50 (0.26)	0.40 (0.30)	0.47 (0.30)	0.44 (0.29)	0.50 (0.29)

Table 10: Descriptive Statistics of Survey Results on the Consumers' Acceptance of Selected Risk-Rating Criteria per Business Line and per Country
The reported values denote the average and the standard deviation (given in parentheses) of the survey results for each risk factor considered in each country. The grades range from 0 ("do not agree") to 1 ("agree completely") on a five-point Likert scale. The risk factors are grouped by product line (motor, annuity, term life, and private health).
Remarks: ** Refers to social health insurance and to be contrasted with gender in private health insurance.

The consumers' degree of acceptance towards the use of the selected price factors differs from country to country and along the lines of business. The highest approval rates are observed on the risk factors in motor insurance. The four surveyed risk factors bear average approvals above 0.5 (neutral level) in all countries. The low-

est ratings are found in annuity insurance where consumers take a rather critical perspective on risk segmentation and differentiation of the benefits (nonforfeiture value). In annuity insurance, only the criterion "income" of the insured person is above the neutral level (average mean of 0.55). However this is not a typical risk-rating factor (compare with Table 1). In each product, the pricing attribute age receives the highest customer support with average values of 0.63 in term life, 0.59 in motor, and 0.55 in private health insurance. The gender factor, less approved in annuity and health insurance (ratings of 0.28 and 0.35), is reasonably supported in motor (0.56) and term life insurance (0.50).

Furthermore, we observe lower consumer acceptance of influenceable attributes. Thus, the risk factors on smoking habits and health status in annuity insurance receive low average rates of acceptance, that is, 0.39 and 0.31. Similarly the BMI is least accepted as a pricing factor in term life insurance (average rating of 0.49). When analyzing the acceptance ratings on a country level, one may conclude that the U.K. respondents are mostly in favor of the use of price differentiation criteria in almost all business lines. They strongly support the use of all considered pricing criteria in motor and term life insurance with average ratings all above 0.5. Overall, in contrast to the U.K., French respondents reject the use of risk-rating factors the most, especially in annuity insurance. Finally, we observe that the factors in the product line annuity insurance receive the lowest approval rates. Conversely, the differentiation criteria in motor insurance are the most widely accepted.

5 Comparison of the Insurers' and Consumers' Perspectives

"The heart of any insurance system is its method of classifying risks and setting prices" (Abraham, 1985, p. 403). The more precisely an insurer can calculate its premiums, the more cost-effective insurance cover becomes. Furthermore, fairer actuarial premiums can be offered to customers. It is essential to reduce information asymmetries between insurers and consumers to ensure that this aspect is taken into account. Improving this requires thorough knowledge of the individual customer risk profile on the one hand, and knowledge of the customer acceptance of the perceived risk pricing used in the insurance industry on the other hand. On this basis, we point out implications for an efficient strategic pricing approach.

We compare the insurers' usage of risk-rating factors in their pricing models with the consumers' perception of the criteria followed. The bases for this analysis are the data gathered from insurance companies (Section 3) and the results from the consumer survey (Section 4). Using regression models on the insurers' data, we have derived the height and relevance of the coefficients linked to the risk-rating factors in five countries and in each business line. With descriptive statistics we

have analyzed the mean acceptance of selected differentiation criteria.

Comparing both viewpoints, it can be noticed that criteria used mainly in the pricing models of the insurance industry are well accepted by consumers. However, the weighting of the relevance in the effective use of these pricing criteria in the pricing models and the consumer's degree of acceptance are different. The age attribute, for example, has a high influence on the insurers' pricing process in almost all business lines in all countries. This pricing criterion denotes also high consumer approval rates in almost all product lines. However, the effect on pricing of this criterion is much more pronounced in insurers' pricing models in comparison to the consumers' judgment where acceptable factors have a rather similar reputation. This is particularly obvious in term life. On the one hand, in the industry pricing of life insurance, the age factor has a rather high impact on pricing (high values of the regression coefficients), whereas the gender criterion is weighted much lower (smaller regression coefficients). On the other hand, consumers value age and gender as acceptable at average values (over all countries) of 0.63 and 0.50 respectively.

However, there are risk factors where the industry use and consumer acceptance are less aligned. This is, for example, the case in term life insurance with regard to the smoker criterion. The insured person's smoking habit has developed into a stable pricing criterion in the insurer's pricing model. However, the same criterion is rejected by the consumers in annuity insurance (where the effect of smoking in death statistics is the same). The use of the gender criterion is refused by the consumers, but gender plays a less important role in the differentiation of insurance premiums when compared, for example, to the age factor.

Furthermore, it can be noted that consumers better accept premium surcharges based on risk attributes that can be influenced (cf. hobbies in term life or kilometrage in motor insurance) than premiums differentiated along immutable criteria (cf. for example, the gender criterion in health insurance). This particularly applies to business lines where the insured person's mortality risk is a main influencing factor in the insurer's pricing model, that is, term life insurance. However, in the same business lines it can also be observed that the use of criteria correlated with the insured's mortality risk are rejected by the consumers (e.g., health status and smoker habits in annuity insurance as well as the body mass index criterion in term life insurance).

In contrast, in motor insurance no significant differences are recognizable in the consumer's acceptance of the four pricing criteria (all factors are rated with values between 0.55 and 0.59), while the insurance industry differentiates with more detail the weight of the factors (for example, kilometrage and age are most important after the car type in the pricing model). The consumers similarly accept the use of both influencable attributes, that is, type of car and annual mileage, as well as the immutable attributes, that is, the policyholder's age and gender. This may indicate

that the use of individual risk characteristics and information which consumers provide the insurer in the application process are more evident to the consumers in motor insurance than in annuity and term life insurance.

In conclusion, attributes playing the most important roles in the pricing process of insurance companies are often well accepted by consumers. The differences detected between the insurers' use and the consumers' perception of selected pricing criteria could be integrated in future strategic pricing or customer information initiatives. The first way, that is, to adapt the pricing loadings and rebates, may allow insurers, for example, to retain or promote certain customer relationships. The second way, that is, to inform customers more precisely on the rationale of the risk-rating factors used may increase the understanding and acceptance of the attributes, the calculation model, and the final price for the customers.

6 Conclusions

As a result of the ban on gender discrimination in actuarial calculations pursuant to the ruling of the ECJ on March 1, 2011, discussions among the public, the industry, and academics focused on the insurance industry's pricing models. In this paper, we first describe the relevance of the use of price differentiation factors in the insurance industry and then summarize the main influencing factors used in the pricing models of various business lines.

To investigate the importance of different pricing criteria in actuarial pricing and the consumers' acceptance of their use in the pricing process, we gather data in two parts. First, we collect insurance premiums of 45 insurance companies in five countries to analyze the importance of selected price differentiation criteria in the insurers' pricing in four business lines. The results of our analysis show that almost all considered pricing factors have a significant influence on insurance pricing in each country and business line. Differences are observable according to the relevance of various price differentiation criteria. The policyholder's age plays the most important role as a pricing criterion in the pricing models of all considered business lines. Furthermore, pricing criteria which can be influenced by the insured person are also highly relevant in insurance pricing. Such attributes include, for example, the annual mileage in motor insurance and the smoker criterion in term life insurance. Second, we use data obtained from an international consumer survey in the same countries and business lines to assess the consumers' acceptance of different pricing criteria. The results clearly indicate that the consumers accept the "age" criterion as the most relevant factor in insurance pricing. However, risk classification and price differentiation based on influenceable pricing factors, like BMI in term life insurance as well as smoking habits and health status in annuity

insurance, are rejected by consumers.

The comparison of the results of both analyses shows that there are considerable differences in the weighting of the relevance of different pricing criteria between the insurers' use and the consumers' acceptance. Even if a criterion plays an important role in the pricing model and even if the consumers support the use of that criterion, the gap between the weighting in the insurance pricing model and the consumers' level of acceptance may be large. A detailed study of these differences may provide information for strategic pricing management (with the customers in mind) and reveals the need for additional information to consumers in order to foster their understanding and support. Lastly, it should also be born in mind that several aspects of our analyses can be deepened by further research. For example, the available data base is rather small in certain places (e.g., with regard to figures in annuity insurance in the U.K.) and the knowledge on the consumers' opinion might be enlarged through additional surveys (including, for example, information on consumers' financial literacy).

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Part III

Optimizing Insurance Pricing by Incorporating Consumers' Perceptions of Risk Classification

Abstract

Insurers primarily set premiums using cost-oriented pricing methods based on claims history. Customer-oriented pricing has yet to be widely applied. This article empirically tests consumers' acceptance of used and (currently) unused risk characteristics in motor and term life insurance pricing in the United Kingdom, France, and Germany. We derive implications concerning how insurers' can use the knowledge of consumers acceptance or rejection of specific price-determining factors when standardizing their pricing schemes. The results indicate that consumers highly approve commonly used risk-rating factors when their price-determining function is transparent. Furthermore, consumers are willing to provide insurance companies further personal information when such information is used for pricing. The provision of personal information allows insurance companies to conduct a critical review of attributes requested and used that have a low impact on premium amounts and lower consumer acceptance.[1]

[1] T. Störmer, Optimizing Insurance Pricing by Incorporating Consumers' Perceptions of Risk Classification, *Working Papers on Risk Management and Insurance*, No. 140, 2013. This paper has been accepted for publication in *Zeitschrift für die gesamte Versicherungswirtschaft* (forthcoming). It has been published online at `http://link.springer.com/article/10.1007/s12297-014-0287-1`. A German excerpt of this paper with the title "Am Puls des Kunden" has been published in *Schweizer Versicherung*, 2014, 4:8-12.

1 Introduction

The current volatile economic environment represents a major challenge for the insurance industry (Seiler et al., 2013, p. 1). The highly competitive market has turned out to be characterized by cost pressure (Capgemini and Efma, 2013, p. 8). The saturation of the European insurance markets can be seen in the −2.0% total real premium volume decrease that occurred in Western Europe in 2012 (−5.9% in 2011, Seiler et al., 2013, p. 33). A similar picture is emerging in the three largest European insurance industries, namely, the United Kingdom (U.K.), France, and Germany. While in the U.K. (−2.1%) and France (−5.5%) real premium volumes decreased, the German insurance market recorded slight growth of 0.3% (Seiler et al., 2013, p. 35). Although premium declines have reduced in the last year, however, premium levels have not returned to their pre-crisis levels (Seiler et al., 2013, p. 20).

In addition, insurance companies undertook internal consolidation and optimizing processes over previous years, mainly in response to external conditions such as regulatory requirements and the incorporation of new technologies (Schmidt-Gallas and Beeck, 2007, p. 7). Consequently, business processes as well as administrative and distribution costs are already largely optimized (Schmidt-Gallas and Beeck, 2007, p. 7). To examine how future earnings, growth, and competitive advantage can be generated (Gard and Eyal, 2012, p. 1), the adequacy and refinement of insurers' current pricing structure is a topic of much debate. Studies show that price management will, in the coming years, take on new importance for the insurance industry (Schmidt-Gallas and Beeck, 2007; Scherer and Schmeiser, 2010; Simon Kucher & Partners, 2011a,c; Gard and Eyal, 2012; RGA and Towers Watson, 2013).

Existing pricing methods and strategies are based on established economic principles of cost-oriented insurance operations (IBM Global Business Services, 2006, p. 2). However, these existing pricing processes are evolving because of recent legal,[2] political, and economic conditions, on the one hand, and of scientific progresses in medical, technical, and information sciences (Actuarial Standards Board, 2005, p. 9). In addition, changing consumer needs also influence pricing structure. The current pricing process is highly cost-oriented, with 75% of insurance companies having a strong actuarial pricing focus based on risk costs (Gard and Eyal, 2012, p. 3). This high proportion indicates that actuarial pricing is expected to remain standard industry practice. However, to generate profitable future growth,

[2]From a regulatory viewpoint, for example, the judgment of the European Court of Justice (ECJ) led to an adjustment of existing underwriting on March 1, 2011 introducing a ban on the use of the gender criterion in insurance pricing. Because of the court's decision, insurance companies had to offer unisex premiums from December 21, 2012 onwards in the European Union (EU, ECJ, 2010, p. 7). In this specific context, the question arose whether current risk-based pricing methods are adequate.

managers attach great importance to the possibility of customer-oriented pricing (Schmidt-Gallas and Beeck, 2007, p. 7), a pricing method that incorporates consumers' willingness to pay as well as consumer group segmentation (Gard and Eyal, 2012, p. 3).

This study aims to analyze current pricing practices in Europe to discuss how additional future growth can be generated in saturated markets. This analysis considers continued technological change and newly developed customer preferences that drive insurance demand. We provide background information regarding insurers' pricing practices based on risk classification. We also consider individual consumer needs and their perception of price determination within the insurance industry as part of discussing opportunities and challenges associated with customer-specific pricing.

To prove whether customer-oriented pricing is applicable in an insurance context, we ask customers themselves of their opinion regarding insurance pricing. The study reports on an international consumer survey conducted over 1500 questionnaires answered in the U.K., France, and Germany. The poll is used to analyze consumers' acceptance of currently used risk factors and their readiness to offer insurers further information revealing personal price-determining characteristics in the context of receiving a price for motor and term life insurance. In particular, the study addresses the following questions. First, which personal price-determining risk characteristics requested by insurers do customers find acceptable? Second, do consumers recommend the use of such information in determining premiums? To identify respondents' preferences, we use descriptive statistics, reporting on the average appreciation rating for various risk characteristics as well as the average standard deviation for each product line and each country. The results indicate differences in consumers' degree of acceptance between countries as well as across product lines. In addition, a high degree of acceptance of commonly used price-determining factors can be observed across all countries and product lines, but only when the use of such factors is comprehensible and transparent to customers. Knowing consumers' preferences regarding accepted price-determining factors enables insurers to calibrate their pricing models to best meet consumer price expectations. Furthermore, implications for price communication can be derived. Consumers' understanding of the insurance pricing process can be increased by improving the transparency of current practices (Störmer and Wagner, 2013, p. 21). If less complicated and more comprehensible insurance policies can be provided, consumers' consumption costs will be reduced (Abraham, 1985, p. 417).

The remainder of the study is structured as follows. Next, we provide a review of relevant literature. In Section 2, we analyze insurance pricing practices in Europe. Section 2.1 provides an overview of Europe's three largest insurance markets. In Section 2.2, we consider the theory of risk differentiation as applied by the insurance

pricing process for motor and term life insurance. In Section 3, first, we describe the recent international consumer survey (Section 3.1). Second, we present our results for each country and each product line (Section 3.2). We summarize the main findings in Section 3.3. In Section 4, we discuss the results of our analysis with a focus on the implications for adjustment to current pricing schemes and strategic price communication. Finally, Section 5 presents our conclusions and future research implications.

Literature Review

The facets of actuarial pricing are described in detail in the scientific literature. The economic relevance and welfare implications of cost-oriented risk-based insurance pricing have often been analyzed in detail (Arrow, 1963; Rothschild and Stiglitz, 1976; Hoy, 1982; Borch, 1984; Crocker and Snow, 1986; Powers, 2010). As one of the first authors, Williams (1957) views the method of economical price discrimination in light of insurance pricing and takes regulatory requirements into account. Doherty analyzes market conditions that can prove profitable for an insurer to differentiate risks between various groups (Doherty, 1980, 1981, 1983). Abraham (1985, p. 403) identifies risk classification and setting prices based on such classifications as "the heart of any insurance system." As risk classifications grow more efficient, information asymmetries decrease. Several authors who deal with this issue state that risk classification can prevent adverse selection (Rothschild and Stiglitz, 1976; Hoy, 1982; Abraham, 1985).

In addition to economic effects, many authors analyze the consequences of regulatory decisions upon risk-based pricing (Venezian, 1984; De Wit, 1986; Crocker and Snow, 1986, 2000; Hoy, 2006; Thiery and Van Schoubroeck, 2006; Thomas, 2007, 2008). Abraham (1985) argues that the consequences of risk classification include moral issues. He considers that different loss expectations because of different risk types justify variations in insurance premiums between individuals. However, insurance also collectively covers risks in the event that a member of a risk group suffers a loss. Conflicts emerge between these two levels of risk when the probability of loss occurrence and the size of possible losses depend on variables that "have unacceptable social or moral connotations" (Abraham, 1985, p. 406), for example, policyholder nationality or gender. Walters (1981) defines standards to incorporate the regulatory aspect requiring insurance premiums not to be imposed on an unfairly discriminatory basis. Therefore, risk classification is mainly based on "homogeneous, well-defined, and practical" characteristics (Walters, 1981, p. 1).

Public and scientific discussions regarding fair risk classification in Europe emerged following the 1980s ban on "foreigner" being considered a risk factor (Schwarze and Wein, 2005, p. 175).[3] The adoption of Council Directive 2004/113/EC again prompted questions regarding the adequacy of several risk-rating factors used in underwriting (Buzzacchi and Valletti, 2005; Thiery and Van Schoubroeck, 2006).

These discussions have also driven analyses seeking to enhance currently used risk-rating factors. For risk classification in life insurance, various studies examine the relevance of genetic health risks and the use of genetic tests for insurance pricing (Christianson, 1996; Brockett et al., 1999; Hoy and Lambert, 2000; Morris, 2010; Durnin et al., 2012).[4] Furthermore, the link between life expectancy and health consciousness has been increasingly discussed (Hambrecht et al., 2000; Fillenbaum et al., 2007; Pell et al., 2008; Löllgen and Löllgen, 2009; Löllgen et al., 2009; Ford et al., 2011; Behrens et al., 2013). Löllgen and Löllgen (2009) indicate that common diseases such as cardiovascular diseases often reflect an unhealthy lifestyle. Their development and progression can be mitigated and mortality can be reduced by a changed lifestyle and greater awareness of health issues (Löllgen and Löllgen, 2009, pp. 553–554). Thus, medical findings may turn out to be important to life insurance price determination in the future.

Also approaches are analyzed in literature taken by nonlife insurance, in particular motor insurance, for the development of risk-based pricing. In particular, the issue of usage-based technologies has been at the forefront of public and scientific discussions (Wenzel, 1995; Edlin, 1999; Khazzoom, 2000; Ippisch and Thiesse, 2007; Bolderdijk and Steg, 2011; Litman, 2011a; Lemaire et al., 2012). Litman (2011b) provides a detailed overview of various methods and considers the advantages and disadvantages of each model. Wenzel finds that the implementation of usage-based technologies in current pricing models enables an insurer to price "more on a driver's relative exposure to a potential accident" (Wenzel, 1995, p. 1). However, until now, this mechanism incurred high costs as well as raised data protection concerns and

[3] American research intensively dealt with fairness issues and the adjustment of insurers' pricing methods because of gender discrimination during the late seventies. The starting point of this process in the U.S. were debates on the adequacy of using group mortality tables in pricing pension plans that result in different pension payments for both sexes. Several authors analyze whether the use of these gender-specific tables is fair and examine how they may lead to gender discrimination in pension scheme calculation (Hedges, 1977; Martin, 1977; Myers, 1977; Brilmayer et al., 1979; Kimball, 1979; Laycock and Sullivan, 1981; Benston, 1982, 1983; Hickman, 1983). Two U.S. Supreme Court judgments (the Manhart Case, U.S. Supreme Court, 1978 and the Norris Case, U.S. Supreme Court, 1983) ruled that the use of life tables that lead to differences in pension payments for each sex violates Title VII of the 1964 Civil Rights Act.

[4] The use of genetic tests in pricing life insurance is banned within most Western Europe states, with a few exceptions for high sum insurance (Durnin et al., 2012, p. 127). This aspect is not further explored in this study because the use of genetic tests continues to have little relevance for insurance pricing.

therefore, did not enjoy widespread use.[5] New technologies as well as advances in data collection and storage could enable insurers to reduce implementation costs and communicate premiums in a transparent manner (Ippisch and Thiesse, 2007; Simon Kucher & Partners, 2011b).

In the field of marketing science, customer-oriented pricing in reference to consumers' perception regarding pricing and the company relevance is often only discussed in terms of goods and services. Consumers assess a product's value and quality based on its price (Schechter, 1984; Dodds and Monroe, 1985; Burton and Lichtenstein, 1990; Bolton and Drew, 1991). Shipley and Jobber (2001, p. 304) argue that price influences consumers' selection of a preferred brand and therefore, understanding consumers' needs "is key to effective pricing." Zeithaml analyzes the challenges service providers face to evaluate customers' needs and develop products accordingly (Zeithaml, 1981, 1988). Matzler et al. (2006) investigate various dimensions of price satisfaction and find that price transparency, price fairness, price reliability, and price confidence (among others) have a lasting effect on consumers' satisfaction (Matzler et al., 2006, p. 216).

However, customer-oriented pricing is fetching an increasingly important avenue for the insurance industry to achieve profits in today's competitive market environment. Furthermore, customer behavior is changing, which also impacts insurer's pricing strategies (Catellani et al., 2004; Maas et al., 2008; Bain & Company, 2012; Ernst & Young Global Limited, 2012; Capgemini and Efma, 2013). New technologies can support insurer's ability to meet the challenges of pricing process refinement (IBM Global Business Services, 2006; Maas et al., 2008; Scherer and Schmeiser, 2010; Insurance Europe, 2013a).

This study creates a novel contribution to the literature. In considering the status quo, the question arises concerning how insurers' pricing models can be developed to benefit both the customer and the insurer. Therefore, we combine two literature traditions, namely, that on risk classification based on cost-oriented pricing and that on customer-oriented pricing based on consumers' willingness to pay. We analyze how consumers' perceptions can impact the risk-adequate pricing process based on price-determining factors. In addition, we address the question of whether consumers are willing to go beyond current pricing practices. This question is relevant to insurers because the more precisely an actuarial unit's cost can be determined, the more efficient and profitable pricing will be. From the consumers viewpoint, in contrast, targeted use of personal information for pricing serves to increase transparency and ease of comprehension.

[5]The pay-as-you-drive (PAYD) approach has been partially tested through pilot projects and was successfully implemented in pricing motor insurance by several countries, for example, the U.K. and the Netherlands. Insurers in Germany and France have also considered introducing PAYD insurance rates.

2 Insurers' Pricing Practices for Motor and Term Life Insurance in Europe

This section provides comparative overviews of the three largest European insurance markets as well as risk classification practices for motor and term life insurance. These overviews are designed to provide the understanding of national insurance markets' structures as well as classification practices across different product lines. These considerations provide a basis for the questionnaire presented in Section 3.1 and the discussion of the survey results in Section 3.2.

2.1 Overview of the European Insurance Market

In terms of world market share, the European insurance industry[6] remains the world's largest industry (33.3% in 2012), ahead of North America (30.2%) and Asia (29.2%) with a total premium volume of 1535 billion USD (Seiler et al., 2013, p. 33). Life insurance premiums currently comprise 33.4% of global premiums (876 billion USD), while nonlife insurance premiums comprise 33.1% of global premiums written (659 billion USD, Seiler et al., 2013, p. 33). The insurance industry's market penetration (premiums in % of GDP) amounts to 6.73%, while insurance density (premiums per capita) amounts to 1724.4 USD (Seiler et al., 2013, p. 33 and p. 40). Measured by total gross premiums, the U.K (336 billion USD), France (288 billion USD), and Germany (256 billion USD) are the largest and most important insurance markets in Europe (The data relate to the year 2012, Organisation for Economic Co-operation and Development, 2012). All three countries recorded a decrease in premiums in 2012, in life insurance, and the U.K. also recorded a decrease in nonlife insurance premiums (Seiler et al., 2013, pp. 38–39).

Premiums written vary not only from country to country but also between product lines. In addition, regional markets differ in terms of structure, while various product lines differ regarding the risk factors used in pricing. In the following section, we first provide a detailed overview of these differences with a focus on environmental determinants behind the development of various distribution structures across the three main European insurance markets. Second, we consider the theory of pricing practices with a focus on risk classification in motor and term life insurance.

[6] The European segment includes Western (31.7% of global premiums written) as well as Central and Eastern Europe (1.6%). The latter countries together comprise one percent of global premiums written (Seiler et al., 2013, p. 33).

Insurance Industry in the United Kingdom

In terms of total premium income, the U.K.'s insurance industry is the third largest in the world after the U.S. and Japan as well as the largest in Europe with a market share of 6.8% (Seiler et al., 2013, p. 35). 22% of total EU premium income are generated in the insurance industry of the U.K. (Association of British Insurers (ABI), 2013, p. 2). Life insurance is the industry's largest product line, comprising 70% of total premium income in 2011 (Insurance Europe, 2013b, p. 3). The nonlife insurance sector's market penetration amounted 11.3% in 2012 (life insurance 8.4%), and insurance density reached 4 350 USD (Seiler et al., 2013, pp. 40–40). The sector's current workforce of 320000 employees illustrates its economic importance to the U.K. (ABI, 2013, p. 3).

The insurance industry has a long history in the U.K. Low market entry barriers and an active private sector played a key role in the industry's development. These factors signify that the insurance industry is strongly characterized by a competitive entrepreneurial spirit (Wolf, 2009, p. 44). For historical reasons, its first product line was marine insurance, a segment giving rise to current global player *Lloyd's of London* (Wolf, 2009, p. 43). Property insurance emerged following the great fire of London in 1666, an event which triggered global rising demand for insurance coverage (Wolf, 2009, p. 42). The high number and concentration of insurance companies as well as the U.K.'s deregulated environment resulted in a highly specialized and diversified market. This history explains the market's global role (Wolf, 2009, p. 43).

The insurance market is strongly self-regulated, that is, self-regulating organizations ensure consumer protection and prevent increased state level regulation (Wolf, 2009, p. 44). The market's structure is moderately fragmented and the industry encompasses smaller insurance companies as well as globally oriented firms (MarketLine, 2012c, p. 17). Insurers' business models and product ranges are often similar, with the consequences that consumers exhibit high levels of price sensitivity and insurers' experience low profit margins (MarketLine, 2012c, p. 17). Thus, a highly competitive market environment exists.

Overall, buyer power is moderate and insurance substitutes are low (MarketLine, 2012c, p. 12). Low consumer loyalty can be attributed to high willingness to compare premiums and benefits before selecting a provider. This willingness has contributed to the successful establishment of several insurance product comparison websites (MarketLine, 2012c, p. 13). In sum, U.K. customers are independent, have a high tendency to switch insurers, and are rather financially strong and have very price sensitive traits that (among others) are reflected in their use of different distribution channels.

Brokers are the most widely used distribution channel for nonlife insurance, with a 37% market share, followed by direct writing (35%), bancassurance (12%), affinity groups (11%), company agents (4%), and other channels (1%, ABI, 2013, p. 14). Distribution channel use has changed the most in the highly competitive motor insurance product line because of new technologies (e.g., the Internet) as well as increased collaborations with car dealers (CEA Insurers of Europe, 2010, p. 10). For life insurance, consumers prefer personal advice: 76% of policies are purchased from independent financial advisors offering whole of market advice, 17% from non-intermediaries, and 7% by single tied advisors (ABI, 2013, p. 14).

Insurance Industry in France

With a market share of 5.3%, the French insurance industry is the fifth largest in the world (after the U.S., Japan, the U.K., and China) and the second largest in Europe (Seiler et al., 2013, p. 35). Analogous to the U.K., life insurance is the French industry's largest product line, comprising 66% of total insurance premium income in 2011 (Insurance Europe, 2013b, p. 3). Total premium to GDP ratio amounted to 8.9% and premiums per capita totaled 3 543 USD in 2012 (Seiler et al., 2013, pp. 40–41).

The French insurance industry's development can be traced to royal efforts in 1686 (Fédération Française des Sociétés d'Assurances, 2007, p. 10). France's interventionist policy during the 20th century had a significant impact on the insurance industry (Fédération Française des Sociétés d'Assurances, 2007, pp. 14–17). Consequently, the state interfered in the market through regulation, state social insurance, and nationalization (Stüdli, 2013).

The French market has a compact structure. Large companies (i.e., AXA, BNP Paribas Group, CNP Assurances SA and Crédit Agricole Group) dominate the insurance market with only a few small providers offering alternatives (MarketLine, 2012a, p. 13). Financial institutions and banks that expanded into the insurance market serve as an important sales channel (MarketLine, 2012a, p. 16). Regulation is strict, though not as strong as in other financial sectors (MarketLine, 2012a, p. 15). As in the U.K., new technologies have increased French customers' market power. Aggregators and the possibility of obtaining online information regarding prices and services have led to increased transparency (MarketLine, 2012a, p. 13). Therefore, policyholders exhibit increased price sensitivity and decreased loyalty to a particular provider (MarketLine, 2012a, p. 13).

The French insurance market uses several types of distribution channels, for example, tied agents, insurance brokers, salaried sales forces, and direct writing mutuals as well as banks and financial institutions (CEA Insurers of Europe, 2010, p. 23).

However, recently, the highly competitive market environment and influence of new technologies have led to a consolidation of channels. Direct marketing and alternative distribution channels, for example, car dealers and manufacturers, are gaining influence (CEA Insurers of Europe, 2010, p. 23). The consumers preferred channel varies with product line. The nonlife market is dominated by tied agents and direct writing offices, which together account for approximately 35% of market share, followed by brokers (CEA Insurers of Europe, 2010, p. 24). In life insurance, policies are mainly sold by financial institutions and banks (64%), followed by direct writing (15%), brokers (12%), and agents, who account for 7% (CEA Insurers of Europe, 2010, pp. 23–24). In the nonlife sector, the concept of bancassurance performs well in motor insurance. In this product line, insurance and banking are closely linked (7% market share, CEA Insurers of Europe, 2010, p. 10).

Insurance Industry in Germany

Measured by global premium volume, the German insurance industry is the sixth largest in the world (market share works out 5%, Seiler et al., 2013, p. 41). Total premium income distribution between life (49%) and nonlife insurance (51%) was nearly equal in 2011 (Insurance Europe, 2013b, p. 3). Its penetration amounted to 6.7% and insurance density reached 2 804 USD in 2012 (Seiler et al., 2013, pp. 40–41).

Germany's insurance industry has its roots in cooperative associations and state initiatives (Wolf, 2009, p. 63). It is fundamentally based on the principle of reciprocity. In addition to cooperative associations, public fire insurance companies created in the 17th century led to monopoly institutions that existed until 1994 (Wolf, 2009, p. 65). The private insurance sector evolved along with emerging liberalism and concomitant public opinion on private provision. Apart from its early emergence, historical reasons also meant the insurance market was mainly a national geographic operating market (Wolf, 2009, p. 70). In addition, the German insurance market remained highly regulated until the introduction of the single European market (Wolf, 2009, p. 81). State regulation was introduced in 1901, however, self-regulation in the form of an ombudsman was only adopted in 2000 by the Confederation of the German insurance industry (Wolf, 2009, p. 73).

The market structure is moderately fragmented, as in addition to the large companies (i.e., Allianz Group, AXA, ERGO Versicherungsgruppe AG, and Generali Deutschland Holding AG), a multitude of small insurers exist, unlike in France (MarketLine, 2012b, pp. 2–3). Competition within the industry is (partly) high because of the lack of diversity and undifferentiated products as well as a high number of similar market players (MarketLine, 2012b, p. 17). In the past decade, the buyers' market power has risen because of new technologies' impact on the demand

process, especially in the nonlife insurance sector. Consequently, consumers have become increasingly independent and price sensitive with low loyalty (MarketLine, 2012b, p. 13). This is especially noticeable in motor insurance where price competition is fierce and growth rates are low. In life insurance, however, buyers' power is rather low because of higher switching costs (MarketLine, 2012b, p. 15).

The classical German distribution channel is the exclusive sales organization (CEA Insurers of Europe, 2010, p. 25). However, distribution channels have expanded because of deregulation and technological developments (Jannott, 2001, p. 598). Although, cost-oriented online insurers recorded rising growth rates, agents still sell over 60% of nonlife insurance policies (CEA Insurers of Europe, 2010, p. 25). Motor insurance market shares can be broken down as follows: agents (61%), brokers (17%), company employees (10.2%), other intermediaries (7%), and bancassurance (4.8%, CEA Insurers of Europe, 2010, p. 25). In life insurance, most insurance policies are offered by agents (46.5%), followed by brokers (21%) and bancassurance (20.3%), company employees (9.8%), and other intermediaries (2.4%, CEA Insurers of Europe, 2010, p. 25). The bancassurance channel is much less important than in France, and the broker channel is much less important than in the U.K.

The European insurance industry developed different market structures because of various economical, political, and legal as well as cultural conditions. For strategic price management, different national consumer patterns should be incorporated into planned customer communication and product distribution. The abovementioned circumstances have, for example, formed different distribution channels that consider individual consumers' information and purchasing behavior in each country and for each product line.

2.2 Theory of Insurers' Pricing Principles

The marketing aspects of pricing insurance were largely ignored in the past as companies focused on cost-covering underwriting and satisfactory profits (Murdock and McGrail, 1994, p. 1). In addition, insurance companies balked at revealing too much insight into their pricing processes, not least because of concern over increasing regulatory intervention and the possible competitor reproduction of premium models (Murdock and McGrail, 1994, p. 1). The high (75%) proportion of cost-oriented pricing is attributable to some of these aspects (Gard and Eyal, 2012, p. 3).

The standard approach of determining premiums follows the actuarial pricing model – a practice which is not expected to change for the predictable future (Gard and Eyal, 2012, p. 3). The core insurance business is risk coverage, that is, a policyholder transfers "the financial consequences of an existing risk for a known [...] amount (premium)" to the insurer, which granted him to take over it in the

event of a claim (Teufel et al., 2001, p. 4). Therefore, to remain solvent, insurers must balance two different responsibilities: (1) the "need to earn sufficient income from premiums to cover anticipated claims" (Oxera Consulting, 2012, p. 5) in proportion to their relative hazard of loss and (2) the need to ensure policyholders' economic situations by making appropriate payouts (De Wit, 1986, p. 645). To maintain this complex and constantly changing balance, detailed knowledge is required concerning possible individual loss occurrence, the probability of potential damage, and expected claims amount. Thus, risk selection and differentiation are fundamental components of insurers' underwriting and pricing processes. The aim of risk-adequate pricing is to determine costs for one actuarial unit as precisely as possible by using risk-determining factors.

Cost-oriented pricing and customer-oriented pricing requires calculating costs as accurately as possible. In the first case, premiums are calculated based on the claim's expectation value and extra costs for safety loading and operating costs surcharge as well as installment, insurance tax, and profit margin (Belth, 1967, p. 386). Furthermore, precise data on relevant costs are essential to identify the profit-maximizing combination of price and quantity needed to utilize the consumers' willingness to pay (Farny, 2011, p. 45).

The *law of large numbers* is highly relevant to insurers' underwriting at a cost-covering level. The more comparable and preferable uncorrelated risks existing in an insurance portfolio, the more predictable the expected claims experience will be (Teufel et al., 2001, p. 4). Risk characteristics are used to map and evaluate the probability distribution of damage. Therefore, risk-rating factors have to be "based on sound actuarial principles and related to actual or reasonably anticipated experience" (Actuarial Standards Board, 2005, p. 9). Based on these criteria, the insurer defines several risk groups with similar probabilities of loss occurrence and expected claim amounts. Each group's premium depends on its expected loss (Abraham, 1985, p. 407).

For insurance companies, accurate underwriting is the foundation of a solvent business (Teufel et al., 2001, p. 20). Therefore, insurers seek to determine an individual customer's expected loss probability as precisely as possible before offering insurance coverage (Rothschild and Stiglitz, 1976, p. 632).[7] Degree and extent of

[7]From an economic viewpoint, risk-adequate pricing based on various risk-rating factors help to reduce information asymmetries (Teufel et al., 2001, p. 17). This phenomenon is widespread in the insurance market, with the consequence that insurers often only know a potential policyholder's average loss occurrence probability (Teufel et al., 2001, p. 17). Without risk differentiation based on individual consumer data, insurance companies determine price based on the worst risk. The result is that "good" risks are too expensive and the premiums for "bad" risks are accordingly too low (Abraham, 1985, p. 408). These adverse selection effects can lead to financial losses, and under unfavorable management or market conditions, they can also result in market failure with negative effects for society as a whole (Akerlof, 1970, p. 488). Furthermore, inadequate risk evaluation and classification lead to unfavorable risk behavior (namely, moral hazard, Abraham, 1985, p. 405).

risk classification depends upon, among other factors, both the size of the insurer's portfolio and cost aspects. Risk-based pricing is cost-intensive (Walters, 1981, p. 1). Consumers' data have to be collected over a long period before they can be used as a statistically proven risk-rating factor (ABI and Oxera, 2010, p. 13). Therefore, highly differentiated risk classification is not economically desirable or even cost-effective for every insurance company (Crocker and Snow, 1986; Borenstein, 1989). In addition, risk classification and the avoidance of adverse selection will not yield advantage to every customer. Currently used risk factors represent customers' "levels of safety or levels of activity" (Abraham, 1985, p. 414). Therefore, risk-averse individuals usually pay lower premiums for insurance coverage. By contrast, high-risk individuals pay more for their insurance policies and thus, benefit from less accurate risk selection and subsequent inadequate premiums (Teufel et al., 2001, p. 12).

Current risk classification procedures face some significant challenges. Besides a competitive market environment, various risk-rating factors "commonly used are being questioned by regulators" (Lemaire et al., 2012, p. 22). Therefore, insurers must find risk-rating factors that can be determined as accurately as possible and also earn social acceptance (Lemaire et al., 2012, p. 22). These aspects together with legislated increasing transparency requirements mean that the intensified application of customer-oriented pricing can create a competitive advantage (Murdock and McGrail, 1994, p. 1).

Until now, cost-oriented pricing stood at the forefront of underwriting. If insurers know which risk factors out of the high volume of collected data will be accepted by customers, they can give these increased prominence when determining premiums. However, less accepted risk characteristics that have low impact on the premium amount should be accorded reduced prominence or dropped from price calculations. Furthermore, greater customer involvement in the pricing process may increase their understanding of pricing practices and insurers' need for data. These in turn could lead to better data quality. Consequently, insurance premiums can be calculated more precisely and customers equity can be defined more exactly (Erdönmez et al., 2006, p. 39). The more precisely a risk can be identified and valuated, the better insurance companies can avoid miscalculations (Werner, 2013, p. 65). Thus, customer-oriented pricing based on technical risk-based underwriting represents a significant competitive advantage in a competitive market. On the one hand, refined cost-covering pricing is possible, and on the other hand, such a practice renders it much more difficult to reproduce competitors' premium structures. Usage-based premiums may support this development in future (Erdönmez et al., 2006, p. 51).

Rothschild and Stiglitz (1976, p. 648) argue, "if individuals were willing or able to reveal their information, everybody could be made better off."

Pricing of Motor Insurance

The motor insurance industry incorporates the majority of risk factors in underwriting. This reflects the fact that vehicle-specific attributes as well as individual customer characteristics are taken into consideration in premium calculation. However, while insurance companies gather an average of 21 risk characteristics on consumers, they only apply 12 different risk-rating factors in their pricing practices (Erdönmez et al., 2006, p. 38). Analyses of European insurers' pricing models illustrate the influence of various risk characteristics on insurance premiums (Erdönmez et al., 2006; Störmer and Wagner, 2013). In terms of person-specific attributes, *age* has the highest significant influence on premium calculation (Erdönmez et al., 2006, p. 40). With regard to vehicle-specific attributes, *type of car* has a highly significant influence upon risk premium. Higher value vehicles incur higher surcharges (Hoy, 1982, p. 321 and Störmer and Wagner, 2013, p. 13). *Annual mileage* is another important risk factor used in underwriting as a great number of kilometers traveled per year means higher crash costs (Litman, 2011a, p. 1) and "the number of claims at fault" (Lemaire et al., 2012, p. 22). Other factors having influence include *purpose* and *number of drivers* as well as the vehicle's *initial registration date* (ABI and Oxera, 2010, p. 19). Furthermore, environmental factors are used in the underwriting process. In urban areas, higher traffic means a higher likelihood of accidents compared to less populated areas (Etgar, 1975, p. 617). This aspect is determined by the policyholder's *place of residence*. Although many insurers collect data regarding the presence of a garage, for most companies, the *garage criterion* has no significant impact on final premium (Störmer and Wagner, 2013, p. 17). Table 1 shows typical risk-rating factors used in motor insurance. Vickrey (1968) argues that the current methods are based on reliable and up-to-date consumers' information. However, these practices may favor "policyholders with less integrity and responsibility" who may tend to provide more unfavorable than favorable information (Vickrey, 1968, p. 471). Therefore, Vickrey was one of the first authors to consider ways to adapt risk classifications used in premium calculation in relation to kilometers traveled per year (Vickrey, 1968, p. 472). Technological progress gradually led these usage-based methods to be gradually applied throughout Europe (mainly in form of PAYD). Insurers can contribute to risk avoidance through implementing this approach as PAYD enables insurers to ensure insurance premiums to reflect individual risk behavior. "Safe behaviors should be rewarded and risky behaviors penalized" (Bolderdijk and Steg, 2011, p. 5). Moreover, use of this technology leads "to increasing actuarial accuracy" (Litman, 2011a, p. 1). Lemaire et al. (2012) argue that an "accurate rating system should include annual mileage [tracked with PAYD technologies] and bonus-malus as the two main building blocks, possibly supplemented by the use of other variables such as age and territory."

Pricing of Term Life Insurance

Term life insurance pricing requires as accurate as possible calculation of the policyholder's probability of dying over a specific timeframe (ABI and Oxera, 2010, p. 27). Therefore, policyholder *age* has the highest impact in risk-based pricing (Störmer and Wagner, 2013, p. 14) because of its correlation with mortality rate (De Wit, 1986, p. 645). Furthermore, information regarding customer *health status* and *body mass index (BMI)* are often used for pricing term life insurance. In this context, medical examinations are sometimes essential prior to the conclusion of a contract. Personal behavior factors are taken into consideration, such as *alcohol consumption, medications required*, and *hobby participation* (Löllgen and Löllgen, 2009, p. 554). The attribute of *smoker* or *nonsmoker* has a high influence on insurance premium, reflecting smokers' increased risk of death from lung cancer (Fillenbaum et al., 2007, p. 66). In addition, policyholder's *place of residence* is used to map socio-economic status (ABI and Oxera, 2010, p. 27). Furthermore, urban areas have lower environmental quality, therefore, access to healthcare is often more expensive (De Wit, 1986, p. 654). The risk factor of *occupation* accounts for the risk class of the policyholder's profession (De Wit, 1986, p. 654). Table 1 presents an overview of main risk-rating factors used in term life insurance.

Business Line	Main Risk-Rating Factors
Motor	Age, vehicle make, annual kilometers, purpose of vehicle, occupation, place of residence, homeowner, initial vehicle registration, garage, engine output, type of vehicle financing, marital status, drivers, owner of a railcard, vehicle replacement value, *use of a black box*(1), *integrated tracking device*
Term Life	Age, illnesses/disabilities, smoker, BMI, body size, hobbies, occupation, education level, alcohol consumptions, taking medications

Table 1: Overview of Main Risk-Rating Factors Used in Motor and Term Life Insurance
The risk factor *use of a black box* is only applied in pricing motor insurance in the U.K. The attribute *integrated tracking device* is used by insurance companies in the U.K. and France.
Remark: (1) A black box is a device installed in the car that records policyholder's way of driving via wireless and/or GPS, and processes the data concerning its kilometers traveled as well as the location and time of traveling (Buzzacchi and Valletti, 2005, p. 73).

Breakthrough medical discoveries may affect the insurers' risk classification systems in future, for example, the link between healthy lifestyle behavior and decreasing mortality (Behrens et al., 2013, p. 361). Therefore, several low-risk lifestyle attributes (such as *regular exercises, balanced diet*, and *long-term nonsmoker*) have a positive impact on the probability of dying in a specific timeframe (Behrens et al., 2013, p. 361). "*Regular physical activity* helps to prevent heart and vascular diseases", especially for people older than 65 years (Löllgen et al., 2009, p. 213). Furthermore, *balanced nutrition* reduces the risk of diseases and premature death (Fillenbaum et al., 2007, p. 70).

Thus, a healthy lifestyle and health conscious behavior (e.g., *relaxation, regular health checks, and quality sleep*) promote health and decrease mortality risk (Löllgen and Löllgen, 2009, p. 554).

Technological developments offer insurance companies the possibility of optimizing their risk-based pricing. Vehicle-related technologies offer the possibility for precise data collection. Communication and information technologies, in turn, enable simplified data collection and a systematic evaluation of the gathered information (IBM Global Business Services, 2006, p. 6 and Ernst & Young Global Limited, 2012, p. 27). In addition, technologies can support insurers' development of price and communication strategies that can be tailored to customers' needs (Ernst & Young Global Limited, 2012, p. 27). Such a process, however, requires knowing how consumers understand and evaluate current pricing practices. Therefore, analyzing the difference between the use of price-determining risk factors and consumers' acceptance of these factors will enable insurance firms to further refine and tailor their pricing policies to best balance consumer price expectations with the firm's continued financial solvency.

3 Consumers' Acceptance and Readiness to Make Personal Risk Factors Available for Insurers' Pricing

Only 10% of insurance firms practice customer-oriented pricing (Gard and Eyal, 2012, p. 3). Customer-oriented pricing means "the whole process of added value for customers and disgorgement of value for insurers. This is based on the comprehensive knowledge of individual customer's needs and to design from this knowledge products for the respective target group" (Schmidt-Gallas and Beeck, 2007, p. 11). Integrating customers' views of pricing and their price sensitivity in the initial method of "cost-oriented pricing [...] based on claims experience" (Gard and Eyal, 2012, p. 2) can help a firm achieve competitive advantage.

Furthermore, the issue of transparency plays an important role in demand for insurance. 77% of consumers favor "transparent and clear documentation" in insurance quotes (Maas et al., 2008, p. 5). Thus, transparency ranks most important for price sensitive consumers (Maas et al., 2008, p. 6). Public debate is already addressing the need to improve transparency. At EU level, transparency and a uniform Europe-wide approach to this topic are the main drivers of financial industry regulation (Maas et al., 2008, p. 10).

A cross-national (i.e., the U.K., Germany, France, Italy, and Switzerland) consumer survey conducted in 2011 shows that commonly used price-determining factors in insurance pricing enjoy wide acceptance by the majority of the population (Schmeiser et al., 2014, p. 10). In each of four requested product lines (i.e., motor, annuity, term life and private health insurance), the most relevant price differentiation criteria are taken into account by the authors of the study. The questionnaire was designed such that the respondents explicitly know that all requested attributes are already applied in the insurer's premium calculation.

On this basis, this study examines whether or not consumers accept commonly used risk factors even if not explicitly informed of their use in pricing. Furthermore, we intend to deepen our analysis by examining which individual consumer characteristics support the further development of insurers' pricing process. Based on these findings and the increased relevance of technological developments for improved data collection and analysis, the question arises which additional person-specific attributes customers would make available to insurers for use in premium calculation.

The purpose of this section is to analyze consumers' acceptance of insurers' using various price-determining risk factors as well as their willingness to provide personal information for insurers' underwriting. The analysis of consumers' acceptance regarding various risk factors focuses on whether or not insurers' pricing process requires adjustment to align with consumers' expectations. Insurers can increase their pricing model's efficiency by incorporating the additional risk-rating factors and personal information that consumers are comfortable sharing. Therefore, we consider which currently used characteristics enjoy general acceptance by consumers and thus, could be granted greater consideration in current premium calculation compared to less accepted attributes. We also investigate which characteristics might play a role in future pricing models to elaborate upon current premium calculation models that incorporate customers' views.

3.1 Survey Description

In this section, we present the results of a cross-national online consumer survey conducted in July 2013 in the U.K. (n = 503 respondents), Germany (n = 500), and France (n = 504). A total of 1507 consumers were surveyed in their respective language version. The questionnaire was designed to gather information regarding consumers' opinions of insurance pricing and to identify their judgment concerning the acceptability of insurers asking about various individual risk characteristics or incorporating them into pricing in motor and term life insurance. The survey sample is representative for the local population concerning gender and age (18–65 years) for each country. Furthermore, four additional socio-demographic characteristics

were collected: (co-)deciders for private households on the subject of insurance, level of education, current job situation, and household income.

Respondents were given two separate lists of 35 risk criteria one tailored for each insurance line. The lists provided both currently used as well as unused risk factors in insurance pricing (as per the criteria described in Section 2.2). The currently used risk factors comprise the most relevant price differentiation criteria. That is, for motor insurance, the characteristics of a vehicle selected are: *car make, kilometers driven per year, garage or street kept, initial registration date, type of financing, purpose, number of drivers, engine output, replacement value, use of a black box, and presence integrated tracking device*. Policyholder attributes considered are: *age, homeowner status, marital status, place of residence, owner of a railcard*, and *occupation*. For term life insurance, currently used attributes included in the survey are: customer *age, smoker status, body size, BMI, highest educational attainment, occupation, hobbies, illnesses/disabilities, alcohol consumption*, and *medication use*. Currently unused characteristics include, for example, attributes of one's personal lifestyle or behavior. Furthermore, the unused attributes comprise a group of factors requested for use as control group to identify logical response patterns. This group includes, for example, the customer's *shoe size* or if he or she is a *dog owner*. To allow comparison between product lines, 27 criteria were used in both motor and term life insurance attribute lists. Moreover, this approach allows conclusions to be drawn regarding consistent responsiveness. All risk factors included in the questionnaires are provided in the Appendix. The respondents were provided with a simple list of attributes and indicated their acceptance of each using a five-level Likert scale ranging from "1 = I feel this is not acceptable" to "5 = I feel this is entirely acceptable." The questionnaire can be found in the Appendix.

3.2 Data Analysis and Survey Results

The survey reveals that consumers' acceptance of various risk-rating factors and their willingness to provide information to insurers differs across both *the three countries surveyed* and *the two product lines requested*. Table 2 shows the descriptive statistics of our survey results. These results depict the average consumers' approval ratings for each risk characteristic in each country and product line as well as the average standard deviation. The letters (A, a) indicate significant differences between mean values in the three countries surveyed.

3.2.1 Currently Used Risk Factors in Insurance Pricing

The 35 attributes investigated cover attributes already used in pricing motor and term life insurance. We included 15 factors currently employed in pricing motor insurance common to all three countries. The factor *use of a black box* is only

applied in U.K. insurer's pricing models. The attribute *integrated tracking device* is used by British and French insurance companies. Ten attributes currently used in term life insurance pricing models were included. All currently used attributes are marked by an asterisk (* used in motor insurance, ** used in term life insurance, and *** used in both product lines) in Table 2.

When analyzing consumers' acceptance level of these surveyed risk factors, we discover that consumers accept the majority of currently used price determining factors in comparison to attributes not yet used. In addition, differences exist between the three countries and across both product lines.

Country Comparison

U.K. respondents exhibit the highest acceptance of insurers asking about commonly used characteristics for inclusion in pricing both motor (11 out of 17 currently used attributes) and term life insurance (7 out of 10 attributes). Furthermore, U.K. respondents also express the highest average willingness to provide insurers with personal information above the average with a mean of 3.48 in motor and 3.40 in term life insurance. Moreover, U.K. respondents give 6 motor insurance attributes a rating of 4. Neither of the surveyed groups in France and Germany gives such high ratings. The French respondents have higher acceptance and readiness to provide information to insurers (mean of 3.18) than German respondents (2.92) in motor insurance. In term life insurance, the opposite pattern emerges. Respondents in both these countries reject mainly the same currently used criteria.

Comparison of Insurance Lines

When analyzing the results from product lines, the overall acceptance level of currently used risk factors is higher in motor insurance (3.18) than in term life insurance (2.98). The criteria *kilometers* and *engine output* in motor insurance receive the highest acceptance and willingness to provide such information to insurers, with a mean of 3.90.

In general, most consumers express higher support for vehicle-specific criteria rather than person-specific characteristics. The latter are partially rejected, for example, *owner of a railcard* (1.92), *homeowner* (2.18) and *marital status* (2.34). By contrast, *age* as a personal factor outside of respondent's control receives high reception in both product lines. In fact, in term life insurance, *age* is the most supported risk-rating criterion, with a mean of 3.60.

3.2.2 Currently Unused Risk Factors

The criteria surveyed comprise three groups. In addition to commonly used risk factors (group one), we also included attributes that have been discussed in the

Attributes	United Kingdom		France		Germany		Overall (all countries)	
	Motor	Term Life	Motor	Term Life	Motor	Term Life	Motor	Term Life
n	503	503	504	504	500	500	1507	1507
Vehicle make*	4.05 (1.13) CB	2.71 (1.51) cB	3.40 (1.32) A	2.74 (1.42) AC	2.97 (1.32) A	2.07 (1.27) AB	3.47 (1.33)	2.51 (1.44)
Annual kilometers*	4.08 (1.04) c	3.07 (1.37)	3.89 (1.02) C	3.17 (1.38)	3.72 (1.09) aB	2.62 (1.38)	3.90 (1.06)	2.95 (1.40)
Corrective lens user	3.10 (1.36)	2.79 (1.34) c	2.84 (1.31)	2.68 (1.33) C	2.48 (1.25)	2.21 (1.19) aB	2.80 (1.33)	2.56 (1.31)
Garage*	3.85 (1.08) B	2.41 (1.34)	3.44 (1.22) AC	2.68 (1.35)	3.56 (1.09) B	2.14 (1.29)	3.62 (1.14)	2.41 (1.34)
Age***	3.93 (1.12) CB	4.05 (1.09) Cb	3.34 (1.20) A	3.36 (1.26) A	2.48 (1.25) a	3.39 (1.25) A	3.49 (1.23)	3.60 (1.24)
Gender	2.93 (1.43)	3.14 (1.47)	2.44 (1.35)	2.48 (1.38)	3.56 (1.09)	2.42 (1.35)	2.53 (1.40)	2.68 (1.44)
Vegetarian	1.55 (0.94) B	2.30 (1.28) CB	1.71 (1.02) Ac	1.92 (1.05) AC	3.21 (1.24) b	1.99 (1.17) AB	1.60 (0.97)	2.07 (1.18)
Smoker**	2.76 (1.41) B	3.76 (1.41)	2.35 (1.25) Ac	2.67 (1.35)	2.22 (1.31) b	3.19 (1.40)	2.44 (1.35)	3.21 (1.46)
Homeowner*	2.32 (1.30) c	2.29 (1.27) C	2.21 (1.28)	2.22 (1.26) C	2.01 (1.22) a	1.89 (1.09) AB	2.18 (1.27)	2.13 (1.22)
Dog owner	2.05 (1.20)	2.05 (1.16) c	2.19 (1.24)	2.02 (1.13)	2.02 (1.21)	1.85 (1.06) a	2.09 (1.22)	1.97 (1.12)
Place of residence*	3.72 (1.17) CB	3.16 (1.38)	3.18 (1.37) A	2.79 (1.39)	2.77 (1.31) A	2.35 (1.24)	3.22 (1.34)	2.77 (1.39)
Cyclist	2.53 (1.28)	2.80 (1.32)	2.46 (1.24)	2.32 (1.22)	2.21 (1.21)	2.35 (1.24)	2.40 (1.25)	2.49 (1.28)
Body size**	2.32 (1.35) CB	2.56 (1.40) CB	1.88 (1.09) A	2.16 (1.22) A	1.81 (1.08) A	1.95 (1.11) A	2.00 (1.20)	2.22 (1.27)
Engine output*	4.20 (0.98) C	2.84 (1.51) b	3.91 (1.07) C	3.11 (1.42) a	3.58 (1.14) A	2.44 (1.39) b	3.90 (1.10)	2.80 (1.47)
BMI**	1.97 (1.18)	3.14 (1.46) cB	1.90 (1.10)	2.19 (1.25) Ac	1.68 (1.03)	2.46 (1.30) ab	1.85 (1.11)	2.60 (1.40)
Marital status*	2.20 (1.26) b	2.56 (1.36) c	2.57 (1.34) a	2.67 (1.34)	2.25 (1.31) a	2.34 (1.25)	2.34 (1.31)	2.53 (1.32)
Shoe size	1.61 (1.00)	1.73 (1.00)	1.78 (1.06)	1.79 (1.03)	1.58 (0.98)	1.64 (0.98)	1.65 (1.02)	1.72 (1.01)
Owner of a railcard*	1.81 (1.08)	1.82 (1.05)	2.06 (1.11)	1.95 (1.10)	1.89 (1.11)	1.72 (0.99)	1.92 (1.10)	1.83 (1.05)
Motorcyclist	3.08 (1.32)	3.14 (1.46)	2.95 (1.32)	2.58 (1.31)	2.69 (1.30)	2.90 (1.39)	2.91 (1.32)	2.87 (1.37)
Education level**	1.93 (1.13)	1.95 (1.13)	1.91 (1.14)	1.92 (1.08)	1.91 (1.17)	1.83 (1.09)	1.92 (1.15)	1.90 (1.10)
Occupation***	3.15 (1.31) b	3.40 (1.28) b	2.66 (1.34) a	2.71 (1.35) ac	2.40 (1.28)	2.90 (1.30) b	2.74 (1.35)	3.00 (1.34)
Religion	1.57 (0.99)	1.67 (1.03)	1.63 (1.00)	1.68 (0.99)	1.54 (0.96)	1.60 (0.95)	1.58 (0.98)	1.65 (0.99)
Creditworthiness	2.84 (1.36)	2.30 (1.30) C	2.74 (1.30)	2.44 (1.26) C	2.23 (1.23)	1.94 (1.10) AB	2.60 (1.33)	2.23 (1.24)
Income/assets	1.91 (1.14) CB	2.07 (1.21)	2.15 (1.24) A	2.15 (1.23) A	2.09 (1.23)	2.05 (1.17)	2.05 (1.21)	2.09 (1.20)
Hobbies**	2.03 (1.16)	2.66 (1.32) b	2.32 (1.23) C	2.35 (1.23) aC	1.81 (1.10) B	2.41 (1.33) B	2.05 (1.22)	2.47 (1.30)
Organ donor/blood donor	2.06 (1.21)	2.39 (1.31) c	2.20 (1.29) C	2.24 (1.27)	1.83 (1.12) B	2.10 (1.19) a	2.03 (1.22)	2.24 (1.26)
Illnesses/disabilities**	3.75 (1.19) CB	3.94 (1.17) CB	2.64 (1.31) A	2.83 (1.38) AC	2.63 (1.33) A	3.21 (1.30) AB	3.01 (1.38)	3.33 (1.37)
Initial vehicle registration*	3.79 (1.20)	-	3.51 (1.28)	-	3.44 (1.21)	-	3.58 (1.24)	-
Type of vehicle financing*	2.73 (1.32)	-	2.37 (1.27)	-	2.34 (1.31)	-	2.48 (1.31)	-
Purpose of the vehicle*	4.11 (1.05) CB	-	3.72 (1.15) Ac	-	3.45 (1.21) Ab	-	3.76 (1.17)	-
Drivers*	4.17 (1.03) C	-	3.86 (1.11) C	-	3.08 (1.31) AB	-	3.70 (1.24)	-
Vehicle color	2.38 (1.36) CB	-	2.17 (1.24) AC	-	1.78 (1.13) Ab	-	2.11 (1.27)	-
Use of a black box*	3.38 (1.26) C	-	2.79 (1.31)	-	2.47 (1.30) A	-	2.88 (1.34)	-
Integrated tracking device*	3.96 (1.08) C	-	3.21 (1.14)	-	3.30 (1.19) A	-	3.49 (1.19)	-
Vehicle replacement value*	4.10 (1.01) CB	-	3.82 (1.15) AC	-	3.30 (1.29) AB	-	3.74 (1.20)	-
Preventive medical checkups	-	3.37 (1.25) b	-	2.84 (1.34) a	-	3.04 (1.33)	-	3.08 (1.32)
Sleep patterns	-	2.56 (1.29) B	-	2.22 (1.17) A	-	2.07 (1.17)	-	2.28 (1.23)
Balanced diet	-	2.80 (1.39) B	-	2.15 (1.18) AC	-	2.36 (1.27) B	-	2.44 (1.31)
Access to healthcare	-	3.08 (1.35)	-	2.51 (1.31) c	-	2.74 (1.27) b	-	2.78 (1.33)
Hours of work	-	2.93 (1.32)	-	2.25 (1.18)	-	2.23 (1.20)	-	2.47 (1.28)
Alcohol consumption**	-	3.79 (1.24) CB	-	3.15 (1.37) A	-	3.26 (1.37) A	-	3.40 (1.36)
Taking medications**	-	3.86 (1.09) CB	-	2.98 (1.32) A	-	3.12 (1.26) A	-	3.32 (1.29)
Exposure to stress	-	3.13 (1.30)	-	2.36 (1.19)	-	2.55 (1.25)	-	2.68 (1.29)

Table 2: Descriptive Statistics of Survey Results: Acceptance of the Use and Willingness to Provide Personal Characteristics
The reported values denote the average and standard deviation (given in parenthesis) of the survey results for each risk factor considered and for both business lines (motor, term life) in each country. The grades are based on a five-point Likert scale: 1 = do not agree, 5 = agree completely. The number n denotes the number of respondents in each country. The significance of difference is given between countries (denoted with letters). The letters refer to the countries in the presented order, i.e., A = United Kingdom, B = France, C = Germany. Lowercase letters (a, b, c) denote significance at the 5% level and capital letters (A, B, C) at the 1% level. The currently used attributes are marked by an asterisk (* used in motor insurance, ** used in term life insurance, and *** used in both product lines).

scientific literature as well as in public debates (Section 2.2), for example, use of PAYD technology in motor insurance and healthy lifestyle attributes in term life insurance (group two). We also included notional attributes for use as control variables to verify whether differentiated response behavior was displayed (group three). For this purpose, among others, motor insurance risk-rating factors were queried analogically in the term life insurance list.

Cross-Country Comparison

In analyzing the survey results, consumers in all countries clearly reject attributes not yet used in insurers' pricing practices with a few exceptions. Excluding the notional attributes, the average approval rates for currently unused criteria are lower than the scale's neutral point (a rating of 3 corresponds on our five-level Likert scale to the neutral position). As in the case of currently used risk factors, U.K. respondents have the highest average approval rate for currently unused risk factors in both product lines, followed from respondents from France and Germany.

Comparison of Insurance Lines

Our analysis of the attributes requested by both insurance lines reveals differences in consumers' willingness to provide support for the insurers' use of personal information. Consumer approval of collection and use of personal information is higher on average in term life insurance than in motor insurance. Notably, despite the fact that consumers are willing to provide health status information to insurers and engage in behavior such as *having preventive medical checkups*, which indicate a high willingness to share personal information with insurers, some attributes currently not used in insurers' pricing garner higher approval rates than some currently used characteristics. In term life insurance, for example, *access to healthcare* and *exposure to stress* ranked higher than currently used risk factors *BMI* and policyholder's *hobbies*. Furthermore, some vehicle-specific characteristics and criteria regarding traffic achieve a higher rating on the scale for term life insurance compared to person-specific attributes, for example, *engine output* and *kilometers traveled per year* as well as *motorcyclist* in comparison to *hobbies*, *sleep patterns*, and *highest educational certificate attained*. Regarding the first three characteristics, U.K. respondents would provide personal information concerning *kilometers traveled per year* and *motorcyclist*. In term life insurance, French respondents are willing to inform insurers regarding their *engine's output* and also *kilometers traveled per year*. In motor insurance, the criterion *integrated tracking device* (3.49) has fairly widespread acceptance; this level is calculated excluding respondents from the U.K., where this criterion (3.96) as well as *use of black box* (3.38) are established risk-rating factors, which enjoy high consumer acceptance. German and French respondents demon-

strate higher approval for the *use of a black box to record individual driving behavior* (2.88) as a price-determining risk attribute compared to some already used risk factors in pricing motor insurance, for example, *owner of a railcard* (1.92), *homeowner* (2.18), *type of vehicle financing* (2.48) and policyholder's *occupation* (2.74). Furthermore, health aspects that may affect policyholder's driving ability are assessed as relevant for pricing motor insurance, for example, *illnesses/disabilities* with a mean of 3.01 and *corrective lens user* (2.80, compared to *owner of a railcard* with 1.92 or *homeowner* with 2.18).

Finally, socio-demographic factors are negligible in consumers' acceptance rates for both currently used and currently unused risk factors. In fact, male respondents show a higher level of acceptance than female respondents. Furthermore, younger respondents are both more satisfied with currently used risk-rating factors and more willing to provide insurers with further information compared to older respondents. However, the differences in response behavior are considerably higher between nationalities than because of other socio-demographic factors.

3.3 Summary of Survey Results

The results of our analysis show that consumers mainly accept price-determining risk factors whose usage they can understand. This comprehension, in turn, requires customers to be able to place the risk-rating factors in context within the premium calculation process of the respective product line. The average approval rate of commonly applied risk characteristics is (in all three countries surveyed and both product lines) higher compared to attributes which have (at present) no effect on premiums. This can be observed particularly in the response behavior of U.K. respondents, who express the approval of the most and highest use of typical risk factors in motor insurance, that is, *engine output, drivers, vehicle make* and *kilometers traveled per year*. A similar picture emerge in term life insurance, where respondents across all countries prefer the use of established risk-rating factors, for example, policyholder's *age, health status*, and *smoker* criteria.

On the one hand, the research underlines the findings in Schmeiser et al. (2014) regarding consumers' acceptance of currently used risk factors in the insurance industry. The results of the consumer survey conducted in 2011 show that customers support the use of premium differentiation criteria in insurers' pricing practices in almost all product lines surveyed (Schmeiser et al., 2014, p. 10). In addition, in the current analysis, consumers mostly accept the risk-rating factors applied in pricing motor insurance. Moreover, respondents from the U.K. have the highest approval rates compared with the French and German consumers surveyed. The same pattern applies to term life insurance, where consumers generally accept the already used

price-determining factors. However, this is not the case for the criterion *hobbies*, whose use in premium calculation is rejected by the current survey's respondents. In addition, consumers are no longer willing to provide gender-specific information for insurers' premium calculation. Since the ECJ judgment, this feature can no longer serve as a differentiation criteria in insurers' pricing processes.

On the other hand, this study substantially expands the study results of Schmeiser et al. (2014). In contrast with the 2011 survey, the current poll does not indicate which characteristics are used for pricing and which do not affect premiums. However, the respondents almost exclusively support the use of already applied risk-rating factors in both product lines. Table 3 presents an overview of consumers' acceptance of the main risk-rating factors used in motor and term life insurance.

	Motor	Term Life
Accepted by Consumers	Annual kilometers Engine output Purpose of the vehicle Vehicle replacement value Drivers Garage Initial vehicle registration Age *Integrated tracking device* Vehicle make Place of residence *Use of a black box*	Age Alcohol consumptions Illnesses/disabilities Taking medications Smoker Occupation
Rejected by Consumers	Occupation Type of vehicle financing Marital status Homeowner Owner of a railcard	BMI Hobbies Body size Education level

Table 3: Consumers' Acceptance of the Main Risk-Rating Factors Used in Motor and Term Life Insurance
The risk factors *integrated tracking device* and *use of a black box* are not used in motor insurance pricing models of all three countries surveyed. However, use of *integrated tracking device* is accepted by consumers of all countries surveyed whereas *use of a black box* is accepted by British respondents – a country where this risk-rating factor is already used for pricing motor insurance.

Of the total 15 main risk factors in motor insurance, 10 are accepted by consumers for pricing. Vehicle-specific attributes generally enjoy high acceptance, for example, *kilometers traveled per year* and *engine output*. However, consumers mainly reject person-specific risk-rating factors, for example, *owner of a railcard, homeowner, marital status*, and *occupation*. The only vehicle-specific refused characteristic is *type of vehicle financing*. In term life insurance, consumers accept 6 of 10 price-determining factors. In addition to *age*, which is a major criterion in pricing term life insurance, consumers especially support the use of factors mapping policyholders'

illnesses and health status (e.g., *alcohol consumptions, illnesses/disabilities, taking medications*, and *smoker*). Most respondents reject the use of consumer data regarding physique (*BMI* and *body size*). Also, policyholders disapprove the use of the risk-rating factor *hobbies*.

In addition, our research confirms the results that the majority of customers would be willing to provide personal information for further pricing model refinement (Maas et al., 2008, p. 10). Consumers are willing to provide insurers with further information concerning their health status in both product lines, for example, *illnesses/disabilities* in motor insurance and *having preventive medical checkups* in term life insurance. Moreover, consumers support the use of some attributes not currently applied more than the use of already applied differentiation criteria in premium calculation. This is the case for *usage-based technologies* in motor insurance in comparison to *owner of a railcard, homeowner*, and *type of vehicle financing*. Furthermore in term life insurance, consumers express higher approval for attributes that do not yet affect premiums (e.g., *access to healthcare, preventive checkups*, and *exposure to stress* than for established differentiation criteria, e.g., policyholder's *hobbies* and *BMI*).

4 Implications for Insurers' Price Management

In reference to management inquiries, the most effective lever for gaining market share and increasing profits in the coming years is the effective employment of customer-oriented pricing (Erdönmez et al., 2006; Schmidt-Gallas and Beeck, 2007; Gard and Eyal, 2012). A decisive factor for such effective use is knowing what clients want (Murdock and McGrail, 1994, p. 4). Customers often observe today's insurers pricing practices and the current premium calculation as opaque and complicated (Maas et al., 2008, p. 11). Understanding consumers' needs could help reduce information asymmetries between insurer and consumer as well as "achieve sufficient margin" (Gard and Eyal, 2012, p. 4).

Thus, the main goal of this study is to understand customers' perception of the current risk-rating process and estimate to what extent they are ready to help refine the process through the provision of additional personal characteristics. Therefore, we conducted a cross-national consumer survey in the three main European insurance markets. We analyzed consumer acceptance of 35 selected – both already used and notional – price differentiation criteria with descriptive statistics to derive implications regarding how insurers can calibrate their pricing models applying knowledge of consumers preferences regarding risk classification.

Our results produced two main findings. First, by evaluating consumers' perceptions, we are able to show that the majority of consumers accept the use of long-

established risk-rating criteria as their price-determining function can be traced. This is the case for both product lines; consumers prefer risk-rating criteria having a high impact on their premium amount. Second, respondents are willing to provide insurers with further information for pricing. Some attributes not currently used in pricing practices garner higher approval ratings than some currently used characteristics. From these results, it is possible to derive implications for both the refinement and elaboration of the current pricing models and improvement of strategic price communication.

Nowadays, a range of customer information is collected in the insurance purchase process, but some are not applicable in determining the final premium amount (Störmer and Wagner, 2013, p. 17). To optimize the pricing process and reduce customers' perceived lack of transparency, data collection should be kept to the necessary minimum. Consumer-specific data should primarily be gathered only if the information is both accepted by consumers and relevant to insurers' pricing. While this study reveal that the main risk-rating factors used for insurance pricing are accepted by consumers, it remains necessary to analyze whether a stronger weighting of these characteristics in determining premiums would lead to higher earning returns (e.g., *age* in both business lines, *vehicle-specific characteristics* in motor insurance, and *attributes regarding health status* in term life insurance). Furthermore, currently used risk factors that are rejected by consumers should be checked to determine if they impact premiums. Criteria that do not significantly influence premiums should not be asked in the purchase process. In term life insurance, the risk factors *BMI* and *hobbies* may be examined to determine their application in pricing. If necessary, it could be practical to swap these attributes for more accepted factors not currently used in pricing. For example, consumers are ready to provide health aspects to insurers, that is, *access to healthcare* and *exposure to stress*. In motor insurance, usage-based attributes have higher approval rates than some currently used price-determining factors, for example, *homeowner, type of vehicle financing*, and policyholder *occupation*. Insurers have the opportunity to adjust their pricing practices by applying stronger weighting to clearly explainable and "objectively" perceived risk factors.

In addition, transparency plays a role in consumer's decision to buy insurance policies. Through targeted customer-oriented communication in the context of early explanation of the use of different risk factors, consumers can be made more sensitive to the importance of using such information to derive personally responsive premium rates. Communicating clearly the need for and application of such information reduces the consumer's perceived risk[8] during the purchase process. The more a consumer can understand process' relevant aspects, the lower its perceived risk

[8]Cunningham et al. (2005, p. 167) define perceived risk "as a multidimensional construct of physical loss, financial loss, psychological loss, time loss, performance risk, and social risk."

(Cunningham et al., 2005, p. 167). Hence, the aspects most often criticized by policyholders, such as high opacity and low reproducibility, can be improved. In this manner, a higher customer acceptance of risk-based pricing can be achieved, and the consumer's decision to buy could be positively influenced (Maas et al., 2008, p. 11).

In conclusion, companies may be well advised to integrate consumers' perception of risk classification in their pricing process to achieve competitive advantage. High consumer acceptance of commonly used risk factors and high willingness to provide further personal information to insurers may permit the fine adjustment of current pricing methods. At the same time, risk assessment must be effective in cost-benefit terms. Risk-based pricing cannot meet all social aspects and consumer needs, but "insurers who can combine sound, [amongst others, through target-customer-oriented marketing] and relevant rating variables with the public's view of what is better will obviously be more successful" (Walters, 1981, p. 14).

5 Conclusions

As previous research presents evidence regarding the importance of adjusting pricing models because of regulatory and economical aspects, this research explores the necessity of standardizing insurance pricing schemes considering consumers' perception. To successfully integrate customer elements into pricing strategies, insurers need to know consumers' understanding of price and their acceptance of various price-determining factors.

We surveyed consumers in three European countries (the U.K., France and Germany) regarding their acceptance of commonly used risk-rating factors and their readiness to provide personal information for use in insurers' pricing process. We analyzed their responses to derive strategies for optimal adjustment of pricing practices. The results illustrate that insurers' use of risk-rating factors and consumers' perception of commonly used attributes are strikingly similar. Consumers show highest preference for price-determining factors whose application and impact on the premium they can understand. A stronger weighting of these characteristics in premium calculation can lead to higher profits. However, various risk-rating factors that have not yet been used in pricing insurance have higher approval ratings than some commonly used factors. Insurers would therefore be well advised to check and standardize their pricing models regarding these attributes. In a highly competitive market, customer acceptance of the pricing process and the premium to be paid produces a key competitive advantage. Customer-oriented pricing can make a significant contribution to performance enhancement and strengthening the customer relationship (Murdock and McGrail, 1994, p. 2).

Conclusively, the results of this research can be extended in several directions. An important aspect relates to the question of how consumers' willingness to pay can be increased through customer-oriented pricing.

Appendix

The online survey was conducted in summer 2013 and captures consumers' opinions in three European countries, that is, the U.K., France, and Germany. Each country was offered a separate language version including figures in the relevant currency. The following socio-demographic information was gathered from the respondents: gender, age, (co-)decider of private households concerning insurance, level of education, current earnings situation and net household income. In each country, approximately 500 responses were collected. The panel is representative for each country's population concerning gender and age (18–65 years). The following sections reproduce the wording of the survey used in the U.K. (English version) and the corresponding scales for the responses. The first part of the questionnaire concerns motor insurance (Section 1), while the second part asks about term life insurance (Section 2).

1 Pricing Motor Vehicle Insurance

Various characteristics of a customer and the vehicle are considered to calculate the price of motor vehicle insurance. We are going to show you various personal and vehicle characteristics.

Do you feel that it is acceptable to ask about these characteristics or take them into account for pricing?

Please answer with the following five-point scale:
1 = I feel this is entirely acceptable
2 = I feel this is somewhat acceptable
3 = Neutral
4 = I feel this is somewhat unacceptable
5 = I feel this is not acceptable

- Vehicle make
- Kilometers traveled per year
- Corrective lens user
- Garage
- Age
- Gender
- Vegetarian
- Smoker

- Homeowner
- Dog owner
- Place of residence
- Cyclist
- Body size
- Engine output
- Body Mass Index (BMI)
- Marital status
- Shoe size
- Owner of a Railcard
- Motorcyclist
- Highest educational certificate
- Occupation
- Religion
- Creditworthiness
- Income/assets
- Hobbies
- Organ donor/blood donor
- Illnesses/disabilities
- Initial vehicle registration
- Type of vehicle financing
- Purpose of the vehicle
- Drivers
- Vehicle color
- Use of a black box to record individual driving behavior
- Integrated tracking device in case of theft
- Vehicle replacement value

2 Pricing Term Life Insurance

Various characteristics of a customer are considered to calculate the price of term life insurance. We are going to show you various personal characteristics.

Do you feel that it is acceptable to ask about these characteristics or take them into account for pricing?

Please answer with the following five-point scale:
1 = I feel this is entirely acceptable
2 = I feel this is somewhat acceptable
3 = Neutral
4 = I feel this is somewhat unacceptable
5 = I feel this is not acceptable

- Vehicle make
- Kilometers traveled per year
- Corrective lens user
- Garage
- Age
- Gender
- Vegetarian
- Smoker
- Homeowner
- Dog owner
- Place of residence
- Cyclist
- Body size
- Engine output
- Body Mass Index (BMI)
- Marital status
- Shoe size
- Owner of a Railcard
- Motorcyclist

- Highest educational certificate
- Occupation
- Religion
- Creditworthiness
- Income/assets
- Hobbies
- Organ donor/blood donor
- Illnesses/disabilities
- Having preventive medical checkups
- Sleep patterns
- Balanced diet
- Access to healthcare
- Hours of work
- Alcohol consumption
- Taking medications
- Exposure to stress

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Part IV

Do Customers Value Cost-Based Price Transparency in Motor Insurance? Effects on Consumers' Purchase Intentions, Loyalty, and Willingness to Pay

Abstract

The aspect of cost plays a decisive role for insurance companies as well as consumers and regulatory authorities. On one hand, insurers concentrate on reducing costs to improve their profitability. On the other hand, there is a clear public demand for increased cost transparency in insurance contracts. Thus, this paper aims to analyze how consumers' product evaluations might be influenced by adding an extra cost presentation to the normal price-quality display. We conducted an experimental study (n = 1100) utilizing a German online panel to investigate the effects of cost-based price presentation in motor insurance on consumer satisfaction regarding price transparency, purchase intention, loyalty, and willingness to pay (WTP). Our results reveal that an additional cost presentation significantly increases consumers' satisfaction, exerting a positive influence on their purchase decisions and their resulting willingness to recommend the offer purchased albeit without a change in level of their WTP – depending on insurance class. Moreover, our findings indicate that psychographic and socio-demographic consumer characteristics lead to differences in product evaluation.[1]

[1] T. Störmer, Do Customers Value Cost-Based Price Transparency in Motor Insurance? Effects on Consumers' Purchase Intentions, Loyalty, and Willingness to Pay, *Working Papers on Risk Management and Insurance*, No. 144, 2014. This paper is currently under review at the *The Geneva Papers on Risk and Insurance – Issues and Practice*, and has been presented at the annual meeting of the Asia-Pacific Risk and Insurance Association in July 2014. The authors gratefully acknowledge financial support by the *Dr. Hans Kessler Foundation.*

1 Introduction

A direct consequence of the global financial crisis is a loss of public confidence in the financial sector. Therefore, regulatory authorities have striven to ensure that legislation considers transparency requirements. At the European Union (EU) level, for example, the Revision of the Insurance Mediation Directive (IMD 2) and the Markets in Financial Instruments Directive (MiFID II) aim to harmonize current legislation and standards to improve consumer protection for insurance as well as financial products.

An important pillar of IMD 2 is the obligation to disclose costs incurred within an insurance company for all insurance products offered for sale. Articles 15–20 of the revised Directive clearly propose that disclosure of "the amount of any variable remuneration received by the sales employees of insurance undertakings and intermediaries [is mandatory] for the sale of nonlife products with a transitional period of 5 years" (European Commission (EC), 2012, p. 9). For life insurance contracts, the disclosure obligation already applies. In Germany, for example, life and health insurers have been obliged to show the total costs in insurance contracts since 2008.[2] Furthermore, the EC argues in its Proposal for a Directive of the European Parliament and of the Council on Insurance Mediation that the "disclosure of the different elements of the total price – including the intermediary's remuneration – will enable the customer to choose on the basis of insurance cover, linked services (for example if the intermediary does claims handling), and price" (EC, 2012, p. 10).

Regulatory authorities argue that consumers need to know the total costs for an actual comparison of insurance products, independent of business line. In contrast, the insurance industry and insurance associations stress that current transparency standards in nonlife insurance are sufficient to meet consumers' expectations (The German Insurance Association (GDV), 2012, p. 1), and not least, through technological progress leading to a product evaluation based on the amount of insurance cover and the respective premium paid.

It is crucial to consider customers' understanding of transparency in the ongoing debate regarding the creation of increased transparency in buying nonlife insurance. Consumers make their current purchase decisions based on essential product characteristics such as scope of benefits and price. The question remaining is whether consumers judge planned mandatory cost information as an essential product fea-

[2]Since 2008, with the entry into force of the Regulation on Information Obligations for Insurance Contracts, insurance companies are obliged to provide policyholders with information regarding "the total cost of the insurance, including all taxes and other cost components" (German Parliament, 2007, para. 1) as well as "any additional costs, if applicable, stating the total amount payable and any possible additional taxes, fees, and costs not levied via or charged by the insurer" (German Parliament, 2007, para 1). The aforementioned provisions apply for life and health insurance.

ture and therefore an important purchase criterion. Furthermore, would customers pay more for cost transparency, such that any required adoption of such a scheme could be implemented on a cost-effective basis for insurer and consumer, without leading to higher premiums for the insurance portfolio as a whole?

This paper aims to analyze this question by asking consumers themselves regarding the nonlife product of motor insurance using an empirical survey conducted online in Germany. The sample ($n = 1100$) is representative of the local population concerning gender and age (18–65 years). This paper provides several contributions. First, we analyze whether an additional cost disclosure influences consumers' satisfaction with respect to transparency. For this purpose, we use a 2 x 2 between-subjects design. Respondents were shown one product card with a motor insurance offer, out of four variations of cards that only differed in terms of the product line surveyed (partially comprehensive as well as comprehensive insurance) and the additional presentation of costs incurred by insurance companies (administration and claims costs, insurance tax, and insurer's profit). The four product cards ($n = 275$) in total had the same structure. Second, we develop a transparency-based consumer decision model that a consumer uses when buying insurance. This model enables us to test the influence of consumers' satisfaction regarding perceived transparency on their purchase decision, loyalty, and willingness to pay (WTP). Third, we investigate the impact of psychographic (consumers' expertise and perceived risk with motor insurance products, price consciousness, and switching intention) as well as socio-demographic characteristics on consumers' product evaluation, namely, purchase decision, loyalty, and WTP.

We perform various analyses to test the research hypotheses. First, to analyze consumers' perception of transparency, we apply statistical significance tests (t-test) subsequent to the descriptive statistics. Second, we use structural equation methodology to assess the complex relationships of the transparency-based decision model. Finally, we use pairwise parameter comparisons considering the critical ratio ($C.R.$) for differences in product evaluation based on various groups.

The findings of the study provide various insights that could help both practitioners and regulators better understand the role of cost-based transparency in motor insurance. The investigation reveals significant differences between the answers given for the four subsamples. No significant differences in the answers for both product lines exist when respondents evaluate the product cards for today's presentation without costs. However, responses differ when it comes to the assessment of the two product offers with the cost presentation. Thus, customers with partially comprehensive insurance do not value cost transparency. However, an additional cost presentation significantly increases consumers' satisfaction with comprehensive insurance, exerting a positive influence on their purchase decision and their resulting willingness to recommend the offer bought. However, their WTP

shows no increase – depending on insurance class. Moreover, our findings indicate that psychographic and socio-demographic characteristics are determinants of these observed differences in consumer product evaluation.

This paper is organized as follows. In section 2, we review the relevant scientific literature. On the basis of this overview, we prepare our research hypotheses in an insurer's context and formulate our research model. Next, in section 3, we outline insurer's premium cost calculation practices to determine cost components of a motor insurance contract to ensure a realistic cost presentation in the product cards used in our survey. In section 4, we describe the research methodology of our study. Section 5 presents the results and the hypotheses tested. Finally, the implications of our analysis and future research are discussed in section 6.

2 Theoretical Background and Research Hypotheses

Insurance products are intangible and not standardized like other services (Zeithaml, 1981, p. 186). Therefore, depending on the product type, insurance is often an elusive product for consumers, who often find it challenging to be fully informed about the product – particularly its benefits and costs – before signing a contract, because of extensive information described in detailed and technical insurance terms and conditions (Wandt, 2012). These aspects have the consequence that transparency is a widely discussed issue relating to insurance, especially its pricing.

Consumers' decision-making process when buying and the corresponding companies' behavioral pricing processes have been studied in detail in marketing science (Monroe, 1973; Zeithaml, 1981; Oliver and Swan, 1989; Rust and Zahorik, 1993; Anderson et al., 1997; Monroe and Lee, 1999; Homburg et al., 2005). In an insurance context, the consumer's purchase decision is often only analyzed from an economic viewpoint with regard to the utility theory by Von Neumann and Morgenstern (1944). However, several studies investigate the influence of price presentation on consumers' purchase decision and their WTP for life insurance (Wakker et al., 1997; Albrecht and Maurer, 2000; Zimmer et al., 2009, 2012; Huber et al., 2014). Furthermore, several authors deal with the aspect of transparency in pricing but often with regard to perceived price fairness (Kahneman et al., 1986; Oliver and Swan, 1989; Campbell, 1999; Bolton, 2003; Bolton and Alba, 2006; Ferguson and Ellen, 2013). In an insurance context, only a few authors investigate aspects of consumers' decision-making process when buying insurance (Matzler et al., 2006; Huber and Schlager, 2011).

Previous studies have not addressed, the extent to which transparency as a form of price presentation affects customer perceptions of nonlife insurance and whether

transparency can be seen as a decision criterion for purchasing insurance. Given the increasing discussions on the issue of transparency, it is important to analyze a consumer's decision-making process to provide an understanding of the extensive phenomenon of transparency when buying insurance. Accordingly, the research questions for this study are as follows: Do consumers perceive a planned mandatory cost presentation providing increased transparency? Do consumers judge cost transparency as an essential product feature? Furthermore, what impact will this perception have on their purchase decisions and willingness to recommend insurance? In addition, does consumer WTP increase with a higher transparency perceptions so that a required cost presentation could be implemented in a cost-effective manner for insurance companies and consumers without leading to higher premiums for the insurance portfolio as a whole?

2.1 The Link between Price Presentation and Price Transparency Perceptions

The price of a product or service is a complex construct that represents a positive or a negative purchase criterion for consumers (Lichtenstein et al., 1993, p. 234). In order to influence this consumer perception, price presentation plays an important role. The impact of different manners of price presentation on consumers' purchase behavior has widely been studied (for example, Tversky and Kahneman, 1981; Kahneman et al., 1986; Oliver and Swan, 1989; Bearden et al., 2003; Carter and Curry, 2010; Peine et al., 2010). Ferguson and Ellen (2013, p. 404) argue that it is important for companies to know when they can take an economic advantage through targeted disclosure of various parts of price information. Kahneman et al. (1986) analyze the influence of price charges and determine that consumers assess prices as being more fair when supposing that higher prices represent the company's costs. These findings are confirmed in several studies by Bolton (for example, Bolton, 2003; Bolton and Alba, 2006). In addition, Sinha and Batra (1999) as well as Oliver and Swan (1989) determine that consumers satisfaction is affected by perceptions of price information. Matzler et al. (2006) investigate, among others, the influence of price transparency and price fairness on consumers' satisfaction in an insurance context. Furthermore, alongside political demand decreased costs in insurance contracts, studies show that consumers desire more transparent and fair insurance products (Maas et al., 2008; Bain & Company, 2012; Ernst & Young Global Limited, 2012) regarding cost transparency (Scherer and Schmeiser, 2010, p. 36). Moreover, Sinha and Batra (1999, p. 240) reveal correlations between consumer perception regarding price information and different product categories. Thus, with regard to consumer perceptions concerning price transparency, we hypothesize the following:

H1: An additional presentation of costs has a positive effect on consumers' perceptions concerning price transparency.

H2: Consumer perceptions concerning price transparency based on an additional cost presentation vary depending on the scope of insurance cover.

The alternative hypotheses imply that an additional cost presentation has no impact on consumers' satisfaction regarding price transparency and that consumer satisfaction regarding price transparency does not change depending on the scope of insurance cover.

2.2 The Link between Price Transparency Perceptions and Product Evaluation

An insurance policy's price plays an essential role in a consumer's decision whether to take out insurance (Laury and McInnes, 2003, p. 219). Nowhere is this more so than in competitive insurance markets such as the German motor insurance industry (Insurance Europe, 2007, p. 32). Price is a complex construct and thus affects consumers' purchase decision either positively or negatively (Lichtenstein et al., 1993, p. 234). Consumers do not always have complete information regarding product utility and price and thus make their purchase decision based on the information available to them (Kim et al., 2008, p. 546). This lack of information leads to a decision-making process under uncertainty (Monroe and Lee, 1999, p. 210), especially in an insurance context (Diacon and Ennew, 2001; Huber and Schlager, 2011). This is due to the fact that consumers often perceive insurance products as more complicated and complex than other services and goods (Zeithaml, 1981, p. 188). This perception may be positively affected by the more consumers notice pricing practices to be less complex and more transparent (Kimes, 1994, p. 24).

Consumer satisfaction results from fulfilled perceptions (Churchill and Surprenant, 1982, p. 492). Bearden and Teel (1980, p. 22) state that satisfaction is a "function of consumer expectations operationalized as product attributes." In this study, we focus on the satisfaction that consumers perceive in cost-based price transparency with correlations to consumers' product evaluation. Accordingly, we define satisfaction as the perception that customers agree with the presented form of price transparency, and that this type of presentation meets their expectations. Therefore, we state the following:

H3: Consumer satisfaction concerning price transparency positively influences their purchase decision.

Today's opportunity to compare different product offers regarding extent of insurance cover and price allows customers to more independently meet their needs. Especially in the easier-to-understand business classes of property and casualty insurance, online comparison portals enable consumers to compare various product offers. However, for insurers, it is crucial yet at the same time difficult to retain profitable customers in such a highly competitive market environment (Chow and Holden, 1997, p. 275). Today's "unit of value is the customer relationship" (Jacob, 1994, p. 215). "It doesn't pay to have satisfied customers, it pays to have loyal ones" (Chow and Holden, 1997, p. 276). Thus, it is a decisive factor for insurers to understand what drives customer loyalty and how it can be increased (Anderson and Swaminathan, 2011, p. 221). In an insurance context, policyholders want more insights into current pricing practices and ask for greater price transparency (Bain & Company, 2012). If a company is successful in satisfying consumers' needs and consumers purchase the product offered, this relationship affects consumers' willingness to recommend the product and therefore their loyalty (Chow and Holden, 1997, p. 295). Furthermore, loyalty influences consumers' risk perception regarding a company, and thus, loyal consumers are prepared to pay higher prices when they are satisfied with the product or service used (Chow and Holden, 1997, p. 290). Chow and Holden (1997, p. 295) state that increased customer loyalty leads to a domino reaction with consequences for "repeat sale and referrals, revenues and market share growth." Therefore, we hypothesize the following:

H4: Consumer purchase decisions positively influence their willingness to recommend the product to other people.
H5: Consumer loyalty positively influences consumers' WTP.

The alternative hypotheses imply that consumer satisfaction concerning price transparency has no positive impact on consumers' purchase decisions and that consumer purchase decisions do not positively influence willingness to recommend the product as well as that consumer loyalty does not positively influence WTP.

2.3 The Link between Consumer Characteristics on Product Evaluation

In addition to marketing communications, behavioral aspects also affect consumer product evaluation. Therefore, psychographic as well as socio-demographic consumer attributes characterize consumers' product perceptions and purchase behavior (Wells and Sciuto, 1966; Monroe and Lee, 1999; Campbell, 1999; Homburg and Giering, 2001; Mittal and Kamakura, 2001; Bolton, 2003; Peine et al., 2010).

Scientific research considers various factors to be important in consumers' decision-making process when buying products. However, aspects around the risk topic

and uncertainty have the greatest effect on consumers' purchase decisions in our research context of insurance. In addition and complementary to the features of perceived risk and consumer expertise, we focus on two further features, price consciousness and switching intentions, because of the special environment of the German motor insurance market. This business market is strongly competitive with a high consumer willingness to switch insurer (Insurance Europe, 2007, p. 32). Furthermore, the market is characterized by high cost pressure because of low margins and price-conscious consumers (Insurance Europe, 2010, p. 21).

Consumers' risk perceptions have a high influence on their decision-making processes (Zikmund and Scott, 1974; Kahneman and Tversky, 1979; Bearden and Teel, 1980; Diacon and Ennew, 2001; Matzler et al., 2006; Kim et al., 2008; Slovic, 2010; Huber and Schlager, 2011; Barseghyan et al., 2013). Jacoby and Kaplan (1972) define seven different types of perceived risk. In an insurance context, two of interests are financial and product risk. Both types of risk may prevent consumers from making a purchase decision and bias their satisfaction regarding transparency (Kim et al., 2008, p. 546). Moreover, consumer perceptions concerning price information depends on their price consciousness. The results of Gabor and Granger (1961, p. 177) reveal a positive significant relationship between perceptions of price information and consumers' level of price consciousness. Furthermore, consumers' switching intentions influence their satisfaction regarding transparency (Tellis and Gaeth, 1990; Homburg and Giering, 2001). The more satisfied consumers are, the lower their switching intentions (Homburg and Giering, 2001, p. 46).

Among psychographic consumer characteristics, socio-demographic attributes characterize consumer product perception (Gabor and Granger, 1961; Bearden and Teel, 1980; Donthu and Garcia, 1999; Homburg and Giering, 2001; Laury and McInnes, 2003; Ulbinait and Kučinskien, 2013). Therefore, to analyze whether consumer product evaluations differ depending upon various psychographic and socio-demographic characteristics, we formulate the following two hypotheses:

H6: Consumer product evaluations differ with respect to various psychographic consumer characteristics.

H7: Consumer product evaluations differ with respect to various socio-demographic consumer characteristics.

The alternative hypotheses imply that consumer product evaluations do not differ with respect to psychographic as well as socio-demographic consumer characteristics.

2.4 Experimental Study Framework

Figure 1 shows the experimental framework of the study. The aim is to utilize this framework to analyze whether consumers perceive a planned mandatory cost presentation as improved transparency and what impact this perception will have on their purchase decisions, willingness to recommend insurance, and WTP. Therefore, we conduct three independent analyses.

The model setup for Analysis 1 comprises two independent variables as well as one dependent variable. *Price presentation* (with and without an additional cost representation) and *product class* (partially comprehensive and comprehensive insurance) are the independent variables. The dependent variable is consumers' perceived *transparency satisfaction*. Accordingly, a 2 x 2 between-subjects design builds the basis for the model framework of Analysis 1.

Analysis 2 comprises the main theoretical framework of this study. The underlying logic of this transparency-based consumer decision-making model is that consumers make purchase decisions (*Purchase*) based on their satisfaction with perceived transparency (*Transparency satisfaction*). Consumers' purchase decisions positively affect their willingness to recommend the offer (*Loyalty*). We measure if consumer loyalty increases *WTP* for motor insurance. We use structural equation modeling to investigate our hypotheses. We specifically analyze the reliability of the various items of the four constructs and asses their validity.

Analysis 3 considers the question of how the independent variables – *psychographic* (consumers' expertise, perceived risk with motor insurance products, price consciousness and switching intention) as well as *socio-demographic characteristics* – operate as predictor variables to affect the dependent variable of *consumer product evaluation*. On the basis of the main model, we perform pairwise parameter comparisons considering the *C.R.* for differences in product evaluations based on various groups.

3 Premium Cost Calculation in Motor Insurance

Calculating the cost components of motor insurance contracts for both product lines included in our survey is required for manipulating the two independent variables of price presentation and product class. To avoid biases in this context, it is important that only price presentation differs between each offer. Thus, structure and value of insurance contracts remain the same in both product lines. Furthermore, the precise cost calculation is crucial to ensure a realistic cost-based price presentation.

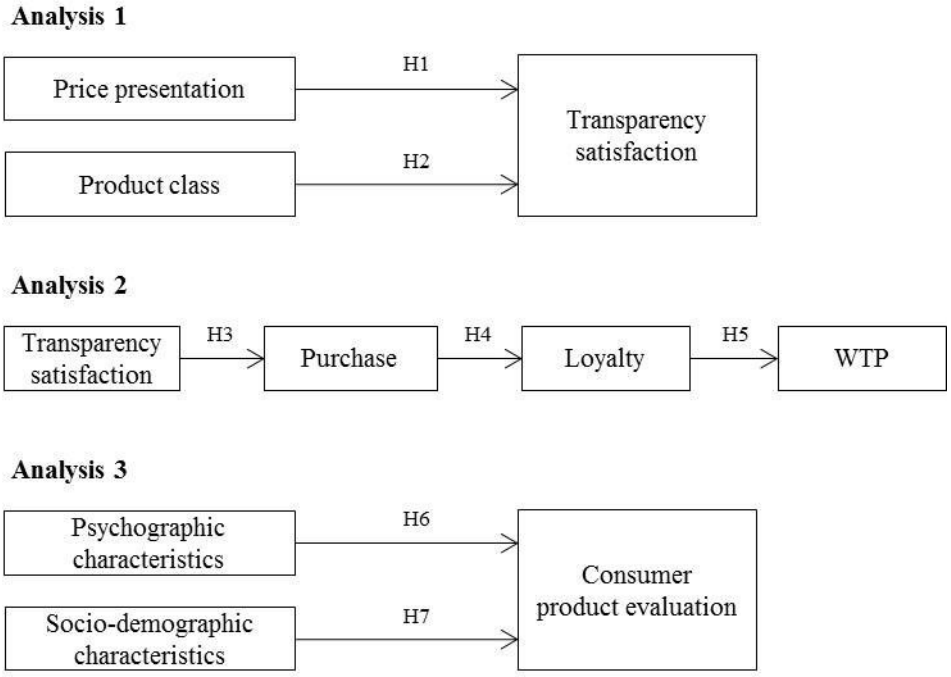

Figure 1: Experimental Framework

In addition, we ensure comparability between the different product offers. These are important requirements to test the hypotheses in Section 5. In the following, we describe in two steps how the cost components of motor insurance contracts are composed.

The premium cost calculations are based on the financial and technical results of the German motor insurance industry in 2012, which are provided in Table 1. These available data allow us to determine the required values for calculating the several cost components of motor insurance policies.

Financial and technical results	Insurance class	
	Partially comprehensive	Comprehensive
Written gross premiums G_w (without T)	1 462	7 211
Gross claims expenditure CE_g	985	6 632
Claims ratio CLR	67.5%	92.2%
Combined ratio CR	91.7%	106.2%

Table 1: Financial and Technical Results
Reported values of G_w and CE_g are in millions of euros (EUR m). All values presented are from GDV (2013, pp. 55–57).

In a first step, the underlying consumption for calculating costs for the four product offers constitutes the general premium cost model for nonlife insurance according to Farny (2011, p. 66). Insurance companies determine premiums with regard to loss occurrence probability and size of possible losses (Insurance Europe, 2010, p. 33). Accordingly, the gross premium G of a motor insurance contract is calculated on the basis of the following cost components: Risk costs RC (gross claims expenditure CE_g plus a safety margin M[3]), operational costs OC, underwriting profit UP, and insurance tax T.

$$G = RC + OC + UP + T.$$

We report the results of the premium cost calculation in Table 2.

	Insurance class			
	Partially comprehensive		Comprehensive	
CE_g	985.00	56.62%	6 632.00	77.29%
M	−81.41	−4.68%	−394.39	−4.60%
OC	353.80	20.34%	1 009.54	11.76%
UP	204.68	11.76%	−36.06	−0.42%
T	277.70	15.96%	1 370.00	15.97%
G	1 739.77	100.00%	8 581.09	100.00%

Table 2: Premium Cost Calculation
Reported values in the respective left-hand column of each insurance class are in millions of euro (EUR m).

Risk costs RC serve to cover indemnities likely to occur in the future in an insurance portfolio, and contain a safety margin M that constitutes the contribution margin for potential excess of loss (Farny, 2011, p. 62). Operational costs OC include costs for acquisition and administrative expenses (Insurance Europe, 2010, p. 7). The insurance tax T amounts 19% for motor insurance products in Germany.

To determine the several cost components of motor insurance policies we proceed as follows:

- $G = G_w + T$

[3]The underlying model only contains a safety margin and no reinsurance costs. This is due to the fact that reinsurance costs cannot be steadily determined without reliable quantitative data. This lack is compensated by using gross indemnity payments.

- UP results from CR and interest I.[4]
- Cost ratio $COR = CR - CLR$

Thus, the values of the cost components of motor insurance contracts for partially comprehensive insurance are: 51.9% risk costs RC, 20.3% operational costs OC, 11.8% underwriting profit UP, and 16% insurance tax T. For comprehensive insurance amounts, the values are as follows: 72.7% risk costs RC, 11.8% operational costs OC, -0.4% underwriting profit UP, and 16% insurance tax T.

In a second step, we calculate the premiums of a motor insurance contract for both partially comprehensive and comprehensive insurance. The premium calculations are based on the same assumptions for both product lines to ensure comparability and are as follows:

- The chosen example policyholder is 40 years old, married, owner of a home with a garage, and acquired a drivers' license at the age of 18 years.
- The example selected a new VW Golf car,[5] which is the most common registered vehicle in the German passenger car market (WirtschaftsWoche, 2013, p. 11).
- Additional vehicle-specific price-determining risk factors are EU average annual mileage of 15 000 km (Insurance Europe, 1999, p. 31), the policyholder and partner are the most common drivers, the policyholder is the vehicle owner, the vehicle is exclusively private use, the vehicle was bought with credit financing (80% of car purchases are financed in Germany, Verbraucherzentrale Hessen, 2013, p. 1), and the registration district corresponds to an area with average claims costs (namely, Sontheim, Insurance Europe, 2007, p. 28).
- The deductible amounts to 150 euros for partially comprehensive, and 300 euros for comprehensive insurance (inclusive of 150 euros for partially comprehensive insurance).
- The offer contains no additional services.

[4]Interest is the result of insurer's capital investment. In accordance with the minimum duration of a motor insurance contract, we use a corresponding maturity of one year. However, studies show that it may be assumed that the average customer relationship in motor insurance is of a longer period but without indicating precise terms (for example, AutoScout24 Media, 2011). As the basis for the interest rate, we use Allianz's average investment interest rate, which amounted to 5.7% in 2012 (Allianz Versicherungs-AG, 2012, p. 8).

[5]The detailed description and value of the car are as follows: VW Golf VII 1.4 TSI (140 PS, 103 KW, value 23 000 euros). The respective type designation is pursuant to German standards. Besides, the fact that this car model is at the top tier of car registration statistics, the car's engine power correspondents to the average engine power of 137.4 PS in Germany in 2013 (Heide, 2013, p. 1).

The corresponding premium for partially comprehensive insurance amounts 82.54 euros, and for comprehensive insurance, the premium totals for 169.80 euros. The percentage values of the first calculation based on the financial and technical results are used to express the cost components of a motor insurance contract to the subjects of the empirical study. Finally, the price presentation was shown to the respondents in form of a pie chart in absolute euro terms. To simplify the information in the pie chart, we use customer-oriented wording. Therefore, we indicate risk costs *RC* as *claims costs* and underwriting profit *UP* as *insurer's profit*.

Thus, the calibration for partially comprehensive insurance reads as follows: 43 euros for claims costs, 17 euros for operational costs, 10 euros for insurer's profit, and 13 euros for insurance tax. For comprehensive insurance, the values presented are as follows: 123 euros for claims costs, 20 euros for operational costs, and 27 euros for insurance tax. Due to the fact that underwriting profit *UP* is slightly negative in comprehensive insurance, no *insurer's profit* can be specified because of rounding in absolute euro terms.

4 Method of the Experimental Study

4.1 Experimental Design for Different Price Presentations

Our aim is to analyze whether an additional presentation of costs in an insurance contract influences consumers' product evaluation. For this purpose and to test our research hypotheses, we conduct an empirical study using varied price presentations of a motor insurance offer. The structure is consistent in each offer. It offers a brief mention of the respective product line with a short description of insurance benefits and the premium to be paid. The offers only differ in the additional presentation of costs incurred by the insurance companies.

The *product dimension* comprises the two product lines of partially comprehensive and comprehensive insurance. Motor vehicle liability insurance is excluded from the offerings because this is a mandatory insurance required by law in Germany. Therefore, the customer is not free to decide whether to purchase such insurance coverage. The *cost dimension* comprises a product card without cost representation and a product card with cost presentation, the latter of which contains information regarding administration and claims costs, insurance tax, and insurer's profit. In terms of their design, the insurance offers without cost presentation are absolutely identical to those product cards providing cost breakdown information. The only difference is that the two offers without cost presentation end after presenting the insurance premium (Part 1 of each offer), whereas the product cards with cost presentation also contain a pie chart providing cost information (Part 2 of offers with cost presentation, Offers 2 and 4). Therefore, we use a 2 x 2 between-subjects de-

sign, comprising the four different product offers. Table 3 provides an overview of the various price presentations.

Product Dimension	Cost Dimension	
	No Cost Presentation	Cost Presentation
Partially Comprehensive Insurance	Offer 1	Offer 2
Comprehensive Insurance	Offer 3	Offer 4

Table 3: Overview of Product Offers

4.2 Survey Design and Procedure

The experimental study is based on an online survey conducted in Germany in January 2014 in the corresponding national language of German. The sample is representative of the German population concerning gender and age (18–65 years). Table 4 displays detailed descriptive statistics.

A total of $n = 1\,100$ questionnaires were answered. Thus, each individual product card subsample contains a total of approximately $n = 275$. Each subsample only received one product card to assess. In allocating the respective product offers, respondents who were policyholders of motor vehicle liability insurance as well as policyholder of partially comprehensive insurance received a product card for *partially comprehensive insurance*. Survey participants who were owners of comprehensive insurance obtained a *corresponding comprehensive insurance* product card. The quotation of the two groups was a 50-50 division.

The survey is divided into three main parts. Following the introductory cover letter, we identify our target group by requesting various screening characteristics, namely, age, (co-)decider for private households on the subject of insurance, as well as whether the respondent dealt with the topic of motor insurance within the past 12 months. In the first main part of the survey, the respondent's psychographic variables, *consumers expertise, perceived risk with motor insurance products, price consciousness*, and *switching intention* are measured.

In the second main part of the survey, respondents received a page with the following information: "You will now see a product offer for an insurance quote. We kindly ask you to closely observe this offer in order to review it later. The offer is exemplary to understand with respect to the insured vehicle. Moreover, the aspect of your personal no-claims discount does not matter in the offer." On the basis of this information, respondents were shown one of the four product cards. The offer is been introduced with the following description: "You have decided to purchase a new vehicle – a VW Golf with a value as new of 23 000 euros. It is your

Age						
18–29	30–39	40–49	50–59	60–69		
221	195	263	246	175		
Gender						
Male	Female					
558	542					
Car owner						
Yes	No					
1051	49					
(Co-)decider on subject of insurance						
Key decider	Co-decider					
825	275					
Household size (person)						
1	2	3	4	5 or more		
204	419	252	160	65		
Monthly household income (net in TEUR)						
Under 1.5	1.5 < 2	2 < 3	3 < 4	4 < 5	5 and more	Unspecified
159	196	300	207	84	58	96
Number of children under 18 years						
No	1	2	3 or more			
718	220	115	47			
Family status						
Married	In a relationship	Divorced / widowed	Single			
531	282	105	182			
Current job situation						
Full-time	Part-time	Self-employed	Unemployed	Retired	Homemaker	Student (full-time)
502	168	98	40	133	95	64
Highest level of education						
Elementary school	Apprenticeship	Secondary school	University-entrance diploma		University / college	
32	251	305	265		247	
Purchase of motor insurance within past 12 months						
Yes	No					
656	444					
Type of current motor insurance						
Motor liability insurance		Partially comprehensive insurance		Comprehensive insurance		
148		402		550		
Sales channel						
Personal, insurance agent	Personal, broker	Online direct insurer	Insurer's website	Online comparison portal	Other	
508	106	168	115	138	65	
Payment frequency						
Annual	Semi-annual	Quarterly	Monthly			
476	200	253	171			

Table 4: Sample Description

goal to take out comprehensive insurance (or partially comprehensive insurance, depending on the respective product card) for your new VW Golf in addition to the motor vehicle liability insurance. Now, you are offered the following insurance offer to protect your vehicle." Following the product offer presented, the questionnaire comprised questions regarding participants' product evaluation: *satisfaction with perceived price transparency*, *purchase intentions toward the product*, *willingness to recommend the offer*, and *WTP*.

In the third and final part of the survey, *socio-demographic attributes* such as gender, car ownership, household size, monthly household income (net), number of children under 18 years, family status, current job situation, and highest level of education are measured. Moreover, this final part included questions concerning participants' current motor insurance situation such as any purchases of motor insurance within the past 12 months, type of current motor insurance, the sales channel of any prior purchases, and usual payment frequency.

4.3 Measurement of Variables

All scales measuring the applied constructs have been validated in previous studies. However, we adapted the scales to ensure applicability in the context of insurance. For all constructs, we have included multi-item measures to make latent constructs measureable, such as consumer preferences and attitudes. To ensure constancy in data collection and evaluation, a seven-level Likert scale is used questionnaire-wide, with options for all items ranging from "1 = does not apply at all" to "7 = fully applies." We only have adapted the scale wording with respect to the specific consumer's evaluation of the offer (namely, for the three constructs of *consumer purchase intention*, *WTP*, and *loyalty*). Here we have used a probability scale analogous to the question wording ranging from "1 = very unlikely" to "7 = very likely."

To analyze consumer evaluation of the product offer, we use five attributes. Each of these attributes was conceptualized through various items. The construct *purchase intention* consists of three items from Kozup et al. (2003, p. 33). *Loyalty* in context of positive word-of-mouth communications is based on three items of Zeithaml et al. (1996, p. 36).

Next, as no scale has yet been established for *consumer satisfaction with perceived price transparency* we developed a six-item scale. We checked this developed scale using confirmatory factor analysis. When developing this scale, we used already established items from Homburg et al. (2005, p. 87), Huber and Schlager (2011, p. 20), and Matzler et al. (2006, p. 231). In addition, for measuring *WTP* for motor insurance with respect to transparency, we developed our own three-item scale and tested it using confirmatory factor analysis. In a first step, analogous to our research question, we asked consumers: "How likely would you be to purchase this motor insurance even if you have to pay a higher premium for the presentation of cost components?". Second, we asked the participants: "How likely would you be to pay a higher motor insurance premium for the presentation of cost components?". The mean value of these two items builds the construct *WTP* in our model. In addition, participants were asked – "How much more would you pay for such a cost representation?" – if they gave one of the two previous questions a rating above 4. Consumers indicated their WTP in euros.

Moreover, we collected several *psychographic variables* in order to test differences in consumers' product evaluation. The level of *consumers' expertise with motor insurance premiums* was measured using five items. These are from Mishra et al. (1993, p. 344), Kopalle and Lindsey-Mullikin (2003, p. 234), and Huber et al. (2014, p. 20). *Price consciousness* was gauged by employing three items: one item from Donthu and Garcia (1999, p. 20) and two items from Lichtenstein et al. (1993, p. 243). *Perceived risk with motor insurance* was determined using five items based

on three items from DelVecchio (2005, p. 194), and two items from Huber and Schlager (2011, p. 24). Moreover, we investigated *switching intentions* on the basis of four items from the study of Burnham et al. (2003, p. 122). All scale items and their reliabilities are presented in detail in Tables 5 and 6.

In addition to these four psychographic characteristics, we collected various *socio-demographic attributes* as described in Section 4.2 to analyze differences in consumers' product evaluation.

5 Data Analysis and Results

5.1 Descriptive Statistics

Tables 5 and 6 display the descriptive statistics of consumer evaluations and psychographic consumer variables by reference to each of the four product offers. The first insights reveal only slight differences in consumer response behavior across all product cards.

Thus, consumer attitude and behavior with respect to motor insurance products can be described without reference to product and cost dimension as follows: The average consumer is medium experienced with the product class and its premiums, is price-conscious, associates the purchase and the resulting financial risk as rather low, and shows a low switching intention.

When analyzing consumer evaluation of the product offers, perceived satisfaction concerning price transparency rises the highest approval rating. Consumers who judged Offers 2 and 4 – with cost representation – show significantly higher satisfaction, especially for comprehensive insurance. Moreover, the respondents are willing to purchase the product offer shown. Their willingness to recommend is also above the neutral level of four. However, on average, respondents do not show a higher willingness to simply pay to receive an additional cost presentation.

5.1.1 Significances between Product and Cost Dimension

In our first analysis, we use t-tests[6] to analyze whether an additional cost presentation leads to differences in consumer perceptions in terms of perceived price

[6]We checked our data for normality and variance homogeneity. To prove the data for normality, we conducted a Shapiro-Wilk test, which showed a highly significant deviation from normality with an error probability of $p < 0.001$. Therefore, we cannot assume a normal distribution. To check the data for variance homogeneity, we performed the Levene's test. Whereas for cost dimension variance homogeneity can be assumed, in terms of product dimension, namely, for differences between partially comprehensive and comprehensive insurance, variance homogeneity does not apply ($p < 0.001$). Therefore, because by reason of its robustness also when assumptions are violated and because of the large sample size (for example, Kang and Harring, 2012), we use the t-test to analyze the data regarding significant differences between both independent similarly sized groups, namely, cost and product dimension.

Constructs with Items	Offer 1	Offer 2	Offer 3	Offer 4	FL	CA
n	276	274	275	275		
Satisfaction with perceived price transparency						**0.91**
The presentation of price composition is complete and correct.	4.48 (1.33)	4.77 (1.35) *	4.44 (1.55)	4.99 (1.29) **	0.83	
The presentation of price composition is clear and understandable.	4.65 (1.39)	5.06 (1.46) *	4.59 (1.53)	5.27 (1.25) **	0.81	
I have a clear overview about the costs of the motor insurance.	4.88 (1.34)	5.04 (1.34) D	4.93 (1.51) **	5.39 (1.20) B	0.65	
I know what I have to pay and what I get.	4.95 (1.30)	5.09 (1.42) d	4.90 (1.35) **	5.33 (1.31) b	0.69	
I am satisfied with the presentation of price composition.	4.68 (1.47)	4.91 (1.41)	4.49 (1.56)	5.08 (1.38) **	0.86	
The presentation of the price composition meets my expectations.	4.72 (1.36)	4.68 (1.41) d	4.53 (1.54) **	4.92 (1.27) b	0.77	
Purchase intention						**0.94**
How likely would you be to purchase this motor insurance?	4.42 (1.60)	4.33 (1.63) D	4.40 (1.63) *	4.70 (1.44) B	0.92	
Given the price information shown, how probable is it that you would consider the purchase of this motor insurance?	4.60 (1.55)	4.45 (1.58) d	4.53 (1.61)	4.74 (1.50) b	0.91	
How likely would you be to purchase this motor insurance, given the price information shown?	4.44 (1.64)	4.37 (1.64) d	4.43 (1.67)	4.64 (1.51) b	0.92	
Loyalty						**0.93**
How likely is it that you would recommend this motor insurance to others?	4.32 (1.52)	4.27 (1.56)	4.19 (1.58)	4.50 (1.54) *	0.93	
How likely is it that you would recommend this motor insurance to someone asks your advice?	4.29 (1.56)	4.31 (1.57)	4.23 (1.60)	4.45 (1.54)	0.92	
How likely is it that you would encourage friends and relatives to buy this motor insurance?	4.09 (1.51)	4.09 (1.59)	4.05 (1.54)	4.27 (1.54)	0.88	
Willingness to pay						**0.80**
How likely would you be to purchase this motor insurance even if you have to pay a higher premium for the presentation of cost components?	3.28 (1.44)	3.15 (1.43)	3.10 (1.54)	3.27 (1.47)	–	
How likely would you be to pay a higher motor insurance premium for the presentation of cost components?	3.20 (1.40)	3.18 (1.44)	3.03 (1.50)	3.26 (1.52)	–	

Table 5: Measurement Scales and Relevant Data
Reported values denote the average and the standard deviation (given in parenthesis). The grades are based on a seven-level Likert scale: 1 = does not apply at all, 7 = fully applies. The letters refer to the product cards in the presented order, i.e., A = Offer 1, B = Offer 2, C = Offer 3, and D = Offer 4. The letters denote significant differences between product dimensions and asterisks between cost dimensions. * or lowercase letters denote significance at the 5% level, ** or capital letters at the 1% level. FL denotes the factor loadings of each item, and CA indicates Cronbach's Alpha of each construct.

Constructs with Items	Offer 1	Offer 2	Offer 3	Offer 4	FL	CA
Expertise						**0.85**
I am well informed about prices of motor insurance.	4.33 (1.41)	4.33 (1.38)	4.54 (1.33)	4.46 (1.38)	0.81	
I am considered somewhat of an expert when it comes to knowing the price of motor insurance products.	3.56 (1.44)	3.42 (1.44)	3.62 (1.41)	3.57 (1.54)	0.83	
My friends think of me as a good source of price information regarding motor insurance.	3.89 (1.44)	3.66 (1.54)	3.94 (1.56)	3.82 (1.55)	0.84	
When purchasing motor insurance, friends and family ask me for advice.	3.80 (1.58)	3.69 (1.57)	3.78 (1.52)	3.75 (1.66)	0.72	
I am familiar with the topic of motor insurance premiums.	4.13 (1.50)	4.03 (1.57) d	4.36 (1.41)	4.31 (1.58) b	0.76	
Price consciousness						**0.73**
I will compare prices of more than one insurer before I decide to purchase a motor insurance.	5.69 (1.36)	5.40 (1.55) *	5.49 (1.45)	5.29 (1.53)	0.88	
I usually purchase the cheapest motor insurance.	4.53 (1.46) c	4.60 (1.46) D	4.16 (1.51) a	4.09 (1.54) B	0.65	
I will compare more than one insurer to take advantage of low prices for my motor insurance.	5.46 (1.41)	5.33 (1.57)	5.45 (1.50)	5.20 (1.53)	0.89	
Perceived risk						**0.80**
You need to be careful when buying a motor insurance since a lot can go wrong.	4.29 (1.41)	4.43 (1.48) d	4.23 (1.54)	4.17 (1.51) b	0.61	
Given the financial expenses associated with purchasing a motor insurance, there is substantial financial risk.	3.26 (1.50)	3.27 (1.52)	3.07 (1.58)	3.15 (1.54)	0.80	
Due to the financial commitment, I am unlikely to buy a motor insurance.	2.67 (1.56)	2.79 (1.66)	2.49 (1.44)	2.61 (1.55)	0.70	
Considering the investment involved, purchasing a motor insurance would be risky.	3.36 (1.34)	3.52 (1.44) D	3.26 (1.39)	3.18 (1.51) B	0.84	
Given the financial expenses associated with purchasing a motor insurance, there is substantial financial risk.	3.51 (1.38)	3.57 (1.40)	3.34 (1.41)	3.42 (1.49)	0.77	
Switching costs						**0.79**
Switching to a new insurer will probably result in some unexpected hassle.	3.17 (1.40)	3.34 (1.45)	3.09 (1.44)	3.21 (1.43)	0.81	
I worry that the service offered by other insurers won't work as well as expected.	3.88 (1.43)	4.12 (1.41) d	3.90 (1.55)	3.84 (1.46) b	0.72	
Switching to a new insurer will probably involve hidden costs.	3.31 (1.40)	3.45 (1.41)	3.25 (1.39)	3.46 (1.47)	0.82	
I don't know what I'll end up having to deal with while switching to a new insurer.	3.68 (1.51)	3.73 (1.74)	3.48 (1.60)	3.56 (1.74)	0.79	

Table 6: Measurement Scales and Relevant Data – continued
Reported values denote the average and the standard deviation (given in parenthesis). The grades are based on a seven-level Likert scale: 1 = does not apply at all, 7 = fully applies. The letters refer to the product cards in the presented order, i.e., A = Offer 1, B = Offer 2, C = Offer 3, and D = Offer 4. The letters denote significant differences between product dimensions and asterisks between cost dimensions. * or lowercase letters denote significance at the 5% level, ** or capital letters at the 1% level. FL denotes the factor loadings of each item, and CA indicates Cronbach's Alpha of each construct.

transparency (cost dimension), and whether differences exist in responses between the two product types surveyed (product dimension). Hypothesis 1 predicts that an additional cost presentation has a positive effect on consumer perceptions concerning price transparency. In contrast, Hypothesis 2 states that consumer perceptions concerning price transparency based on an additional cost presentation will vary depending on the scope of insurance cover.

The analysis of differences reveals significant differences between responses to the two products as well as cost dimensions. Table 5 and 6 show these results. The letters (A, a) indicate significant differences between mean values in the two product lines requested (partially comprehensive and comprehensive insurance), while asterisks (*, **) report the significant differences between mean values in the two types of cost presentations (without and with cost presentation).

No significant differences in the answers of both product lines exist when respondents evaluate the product cards without costs (Offer 1 compared with Offer 3). However, responses differ concerning the assessment of the two product offers with cost presentations (Offer 2 compared with Offer 4).[7] That is because customers with a partially comprehensive insurance do not value cost transparency (Offer 1 compared with Offer 2). However, an additional cost presentation significantly increases perceptions of price transparency by consumers with comprehensive insurance (Offer 3 compared with Offer 4).

Therefore, Hypothesis 1 has to be rejected for consumers with partially comprehensive insurance, whereas Hypothesis 1 is not rejected for consumers with comprehensive insurance. In addition, Hypothesis 2 is not rejected. Customers with comprehensive insurance prefer a more transparent price presentation with additional indications of costs incurred by the insurer compared with consumers of partially comprehensive insurance, who do not value price transparency.

Furthermore, the results indicate that a consumer with comprehensive insurance values price transparency, with provision of such positively influencing their purchase decisions. At the same time, consumers' willingness to pay does not increase on average.

[7]This result is also confirmed through analyzing the data with pairwise parameter comparisons considering the critical ratios (C.R.) for differences. Thus, a $C.R. > 1.96$ ($p < 0.05$) indicates significant differences between various groups (Homburg and Giering, 2001, p. 52). The calculation of *C.R.* for parameter difference tests enables us to indicate test statistics between studied groups, in this case, the four product cards were surveyed. When analyzing the differences between Offers 2 and 4, significant differences are observable (*C.R.* 2.21, $p < 0.05$). The prerequisite for calculating *C.R.* is an appropriate group model with fixed measurement weights. This condition is fulfilled by our transparency-based decision model, which is presented in detail in Section 5.2.

5.1.2 Consumers' Willingness to Pay

Similar results are observable in the declaration of total euro amounts. Table 7 reports the average amounts for each product card for both average WTP by all respondents as well as positive WTP by subjects who indicated their WTP with a value above four on the scale. Irrespective of WTP, the results underline our previous findings. Thus, consumers with partially comprehensive insurance do not value cost transparency compared with those with comprehensive insurance. The results for product dimensions (Offer 2 compared with Offer 4) are significant at the 5% level for consumers with a positive WTP. In this case, consumers' WTP for an additional cost presentation amounts on average to 31.67 euros for comprehensive insurance, a business line in which consumers value price transparency. Considering the WTP of all respondents, these values are considerably smaller than those for consumers with a positive WTP. However, consumers with comprehensive insurance show WTP higher amounts, especially for Offer 4 with an additional price presentation.

WTP Expressed in Euros How much premium would you pay more for a presentation of cost components in euro?	**Insurance Class** Offer 1	Offer 2	Offer 3	Offer 4
Average WTP	276 7.11 (21.86)	274 5.63 (14.71)	275 7.17 (20.41)	275 8.41 (22.60)
Positive WTP	75 26.17 (35.64)	70 22.05 (22.13) d	75 26.30 (32.13)	73 31.67 (34.58) b

Table 7: Average and Positive Willingness to Pay Expressed in Euros
The reported values in the first line contain the number n of respondents, and the reported values in the second line denote the average and the standard deviation (given in parenthesis). The letters below denote significant differences between product dimensions and refer to the product cards in the presented order, i.e., A = Offer 1, B = Offer 2, C = Offer 3, and D = Offer 4. Lowercase letters denote significance at the 5% level, capital letters at the 1% level.

Further analyses are necessary to test the Hypotheses 3 to 7.

5.2 Testing the Transparency-Based Decision Model

The structural model of Analysis 2 aims to investigate the antecedents of consumer purchase behavior based on cost-based price transparency. The underlying logic is that perceived price transparency influences consumers' purchase intention to buy motor insurance with consequences on their loyalty and WTP. The model allows us to analyze the effects of cost-based price presentation on consumers' product evaluations.

The basis of the decision-making process is the entire sample of $n = 1\,100$.[8]

5.2.1 Test of Validity and Reliability

To analyze the accuracy of scaling procedures and the hypothesized set of model relationships as shown in Figure 1, we check their validity and reliability using confirmatory factor analysis developed by Jöreskog (1977). To ensure convergent and discriminant validity, the analysis contains all constructs concerning consumer product evaluation analogous to Analysis 2. The analysis is based on a maximum-likelihood ratio test.

To evaluate the convergence of our model in total, we examine the following global fit measures: The chi-square/degree of freedom value $\chi^2/df = 2.407$ ($\chi^2 = 679.191$, df =275, $p < 0.001$) indicates a good model fit ($\chi^2/df \leq 2.5$, Homburg and Baumgartner, 1995, p. 169). The estimated model yields a goodness-of-fit index *GFI* of 0.956, and an adjusted goodness-of-fit index *AGFI* of 0.927. For both descriptive global fit measures, a threshold value of 0.9 is proposed (Homburg and Baumgartner, 1995, p. 166). The root mean square error of approximation *RMSEA* is 0.026 and thus indicates a good model fit if the threshold value is less than equal to 0.05 (Homburg and Giering, 2001, p. 54). In addition, the comparative fit index *CFI* is 0.964, above the threshold value of 0.9 (Homburg and Giering, 2001, p. 363). Therefore, all values indicate a good model fit.

In addition, the local fit measures for the constructs indicate good convergent validity. All *item loadings* are determined using principal component analysis. Their values are all above the threshold value of 0.5 as suggested by Anderson and Gerbing (1988). In addition, composite reliability for all factors is above the threshold value of 0.6 (Bagozzi and Yi, 1988, p. 82), with all factors having values above 0.9. Furthermore, all model's paths are significant with $p < 0.001$. *Cronbach's Alpha* values for each construct are high and in general above the threshold value of 0.7 (Nunnally, 1978, p. 245). The reliability of all constructs is quite good. To determine whether the model meets the requirement of discriminant validity, we apply the Fornell and Larcker (1981) test. The proposed threshold value for average variance extracted *AVE* is 0.5 (Fornell and Larcker, 1981, p. 46).

[8] As the results of Analysis 1 reveal significant differences between the four product offers, we also have analyzed our model for the four subsamples that were the basis of Analysis 1. We found for all subsamples analog significant item paths and significant correlations between the four constructs ($p < 0.001$). Thus, the base model is confirmed in its entirety for motor insurance in total as well as for each insurance class with and without cost presentation. However, we have decided to focus on the entire sample when reporting the model's results because of the importance of our research question of whether consumers value cost-based price transparency as an essential purchase criterion, and whether this attitude influences their willingness to pay in the business line of motor insurance as a whole.

AVE of our latent variables is as follows: *AVE Transparency satisfaction* = 0.596, *AVE Purchase* = 0.840, and *AVE Loyalty* = 0.829. In addition to the good convergent validity already proven, the values of the Fornell and Larcker test also indicate the good discriminant validity of our model.

Table 5 and 6 summarize the results of validity and reliability analyses. Finally, all values for the conducted analysis achieve the required threshold levels, and therefore indicate a strong evidence of reliability and validity for the transparency-based decision model.

5.2.2 Test of the Model's Effects

We use a structural equation model to analyze our hypotheses 3 through 5. With the help of causal modeling analyses, we establish the relationships between our constructs. To test the effect of consumer satisfaction concerning price transparency on consumers' product evaluations, we analyze the relationships between the constructs using path analysis. Figure 2 shows the final model including path coefficients estimates and coefficients of determination R^2, which are indicators for model fit.

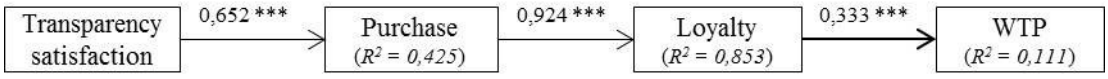

Figure 2: Results of the Transparency-Based Structural Model
Reported values denote the standardized estimates of structural equation coefficients as well as the coefficients of determination R^2. The asterisks denote the significance level, * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

When considering R^2, two constructs show high values for variance explained above the threshold level of 0.3 (Herrmann et al., 2006, p. 44). Thus, the model explains 42.5% of the variance in *Purchase*, and 85.3% of the variance in *Loyalty*. However, the model only explains 11.1% of the variance of *WTP*. Therefore, it seems that other factors influence *WTP* that are not considered in our model. However, this study investigates the influence of perceived satisfaction with regard to price transparency on consumers' product evaluations.

The three hypotheses formulated here are highly significant at the 0.001 level, and all path coefficients estimates are above the threshold of 0.2 by Chin (1998). Consumer satisfaction concerning price transparency has a strong positive influence on consumers' purchase decisions ($\beta = 0.652$, $p < 0.001$), as stated by Hypothesis 3. The strongest impact occurs on their willingness to recommend the product offer to other people ($\beta = 0.924$, $p < 0.001$), corroborating Hypothesis 4. Considering Hypothesis 5, consumer willingness to recommend a motor insurance policy impacts their WTP ($\beta = 0.333$, $p < 0.001$).

Finally, we conclude that perceived satisfaction regarding cost-based price transparency directly influences consumers' product evaluations.

5.3 Differences in Product Evaluation Due to Predictor Variables

The objective of Analysis 3 is to check whether psychographic and socio-demographic consumer characteristics as predictor variables have a significant influence on differences in consumers' product evaluations. The formulated hypotheses state that consumer product evaluations differ with respect to both psychographic (H6) as well as socio-demographic characteristics (H7). To check these two hypotheses, we use significance tests. On the basis of our main model, we perform pairwise parameter comparisons considering the *C.R.* for differences to indicate significant differences between various groups and latent variables. These two groups are: predictor variables (socio-demographic and psychographic characteristics), and latent variables (transparency satisfaction, purchase, loyalty, and WTP). We perform the analyses based on our entire sample ($n = 1\,100$) because we are interested in showing which consumer characteristics generally drive consumers' perceptions regarding price transparency and their product evaluations, namely, purchase intention, loyalty, and WTP.

Psychographic Characteristics

Hypothesis 6 states that product evaluations differ with respect to psychographic consumer attributes. We analyze this impact for the four possible predictor variables (*consumer expertise*, *price consciousness*, *perceived risk*, and *switching intention*). Specifically, we investigate the influence of the four predictive variables by subdividing the respective seven attribute levels (in accordance with the seven-level Likert scale) into two categories: "negative attitude" and "positive attitude." The results of significant differences indicate that psychographic characteristics impact consumers' product evaluations.

Whereas *consumers' expertise* has no influence on their product evaluations, *WTP* significantly differs between non price-conscious consumers compared with consumers who are rather price-conscious, with a critical value of 7.48 at the 0.05 level. Furthermore, *consumers' perceived risk* with motor insurance products leads to differences in their *satisfaction regarding transparency* (*C.R. of 3.92,* $p < 0.05$). In addition, *switching intention* and *satisfaction concerning transparency* have a significant difference with a *C.R. of 3.00* ($p < 0.05$) for consumers with a low willingness to switch insurer compared to consumers with high switching intention.

Therefore, Hypothesis 6 is not rejected. *Consumers' switching intention* and *risk perception* result in differences in perceived satisfaction with price transparency. However, *consumers' price consciousness* impacts their WTP.

Factors leading to differences in consumers' product evaluations with respect to all facets investigated are reported in Table 8 concerning both psychographic and socio-demographic variables.

Characteristic Type	Transparency Satisfaction	Purchase	Loyalty	WTP
Psychographic	Perceived risk Switching intention			Price consciousness
Socio-Demographic	Age Monthly net income Sales channel	Household size Number of children	Current job situation Payment frequency	Current job situation Sales channel Payment frequency

Table 8: Consumer Characteristics that Lead to Differences in Consumers' Product Evaluation

Socio-Demographic Characteristics

Hypothesis 7 predicts that socio-demographic attributes will lead to differences in consumers' evaluation of a motor insurance policy. The results of the pairwise parameter comparisons considering *C.R.* reveal the influence of various socio-demographic characteristics on consumers' product evaluation.

Gender exerts no effect on consumers' product evaluations. *Transparency satisfaction* significantly differs by consumer *age*. The differences are the highest for younger consumers compared with older respondents. For example, subjects aged between 18 and 29 years compared with those of 59 and 60 years of age (*C.R.* 4.01, $p < 0.05$). Furthermore, *transparency satisfaction* significantly differs by *monthly household income* level. This perception differs the most between incomes under 1 500 euros and between 3 000 $<$ 4 000 euros (*C.R. 2.53*, $p < 0.05$).

Household size also influences consumers' *purchase intentions*. Significant differences exist between one-person households, and households with five or more persons (*C.R. 2.61*, $p < 0.05$). In addition, three-person households (*C.R. 2.43*, $p < 0.05$) differ in their purchase intentions compared with households having five or more persons. Consumer *purchase intentions* are also affected by *number of children under 18 years*. Therefore, childless households have buying behavior different than households with three or more children (*C.R. 2.78*, $p < 0.05$).

In contrast, *current job situation* influences *WTP*. All interviewed groups show a different WTP compared with students, with pensioners showing the highest differences (*C.R. 3.86*, $p < 0.05$). Furthermore, students show a different *loyalty* compared to retired policyholders (*C.R. 2.74*, $p < 0.05$).

Sales channel also affects consumers' *transparency satisfaction*. Significant differences can be seen between the use of an online comparison portal and personal contact, either with an insurance agent (*C.R. 2.78*, $p < 0.05$) or a broker (*C.R. 3.35*, $p < 0.05$).

Moreover, consumers' usual *payment frequency* has a significant effect on *WTP*. Differences exist between consumers who annually pay and those who pay half-yearly (*C.R. 2.46*, $p < 0.05$). In addition, the most common payment method influences consumers' *loyalty*. This varies the most according whether payments are made monthly payment or annually (*C.R. 2.70*, $p < 0.05$).

Therefore, Hypothesis 7 is not rejected. Socio-demographic consumer characteristics influence consumers' product evaluations. While *age*, *monthly net income*, and the *sales channel* used affect *consumers' transparency perceptions*, factors expressing *household size* influence *consumers' purchase intentions*. In contrast, consumer *loyalty* is characterized by *current job* and usual *payment frequency*. *Job situation* and *payment arrangements* lead also to significant differences in *WTP*, as well as preferred *sales channel*.

6 Discussion and Implications

This study analyzes the influence of a cost-based price presentation upon consumers' satisfaction regarding price transparency, purchase intention, loyalty, and WTP. In doing so, we determine the premium of partially comprehensive and comprehensive insurance contracts, and calculate the underlying cost components for both policy types. On this basis, we test how consumers evaluate an additional cost presentation across both product lines. To do so, we show participants of a representative German online panel one of four product cards. On the one hand, the product offer contains a today's price benefit presentation without a cost presentation, and on the other hand, the product offer comprises a today's price benefit presentation with an additional cost presentation. These two possibilities are tested for both product lines. We present respondent with the cost components in form of a pie chart, including claims costs, operational costs, insurer's profit, and insurance tax. All product cards are identical in terms of their structure and content – the single difference being that one product offer per business line contains an additional cost presentation after showing the premium.

Implications for the Regulator and Insurers

Broken down by insurance class, our results indicate that policyholders of partially comprehensive insurance do not value an additional presentation of cost components accrued by an insurance company. In contrast, satisfaction regarding price transparency increases for consumers with comprehensive insurance, and positively influences their purchase decision and loyalty. However, consumer WTP does not increase on average as a consequence of perceived satisfaction.

However, when considering the results for consumers with a positive WTP in euro terms, the values obtained in our survey indicate that consumers with comprehensive insurance would pay significantly more than those with partially comprehensive insurance. Moreover, consumers with a positive WTP have on average a fourfold higher level of WTP compared with the WTP of all consumers.

In addition, our transparency-based decision model reveals a highly significant impact of perceived satisfaction concerning cost-based price transparency upon consumers' purchase decisions. This resulted in a very strong significant effect on consumers' willingness to recommend the product after purchase. However, consumers' likelihood to recommend the motor insurance offer has the lowest impact on consumers' WTP.

These results are important with regard to a possible mandatory disclosure of costs in nonlife insurance. Our study findings indicate that consumers recognize the cost-based price presentation. However, not all consumers value the presented type of price presentation. This may be explained by the fact that consumers' expectations have not been fulfilled based on the specific presentation of cost components shown in the survey. Furthermore, consumers' WTP varies considerably, depending on whether consumers have a positive or average WTP.

It should be noted that a standardized mandatory cost disclosure for insurance companies would not take these aspects into account. Also, the examined differences in consumers' purchase behavior resulting from socio-demographic and psychographic characteristics are not considered. The implication of this is that policyholders who do not desire an additional cost presentation in insurance contracts are still required, to pay for this disclosure. Moreover, an implementation of this project leads to costs borne by insurance companies that results in cross-subsidization. That is, the insurance collective as a whole has to shoulder the resulting costs, independently of consumer transparency perceptions and WTP.

Thus, mandatory cost disclosure could be defined as insurance companies offering an additional cost presentation for insurance policies. However, each consumer can decide, expressly and voluntarily, if he wants a presentation of cost components in addition to the current price benefit information. Therefore, the general public demand for greater cost transparency in nonlife insurance is taken into account in connection with the fact that each consumer can take an independent decision regarding whether or not he demanded the service offered.

Future Research

In addition to the analysis into how cost-based price transparency impacts consumers' purchase decisions, the topic of price transparency provides various directions for future research. Of great interest is how cost-based price presentation may

appear so that all consumers recognize and value it, regardless of product category and business line. In this context, it is also of interest if another type of cost presentation would increase consumers' WTP. Another basis for further studies is the question of which additional factors influence consumers' WTP, and whether our transparency-based decision model is applicable to other industries in which price transparency is also an important issue.

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