

# Intermediation and (Mis-)Matching in Insurance Markets - Who Should Pay the Insurance Broker?\*

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## Abstract

This paper addresses the role of independent insurance intermediaries in markets where matching is important. A controversial matter in the discussion concerning insurance intermediation is the issue of compensation customs and how the latter affect prices, rents, and advice quality in insurance markets. This work compares fee-based and commission-based systems. We show that in a situation with a non-strategic intermediary both remuneration systems are payoff-equivalent. In a second step, allowing for strategic behavior, we discuss the impact of remuneration on the quality of advice. This analysis shows that the possibility of mismatching can provide the intermediary with substantial market power, which however, does not translate into mismatching as long as consumers have rational expectations. We offer a rationale for the use of contingent commissions. In addition, this paper addresses whether or not the recent ban of any commission payments as introduced in countries such as Denmark and Finland is an appropriate market intervention.

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# 1 Introduction

Middlemen play an important role in markets with significant imperfections. Essentially, as pointed out by Yavas (1994), there are two different types of intermediaries that facilitate market transactions. Market makers, on the one hand, such as stock market specialists, act on their own account by buying a certain good from a seller at a bid price and reselling it to buyers at an ask price. On the other hand, matchmakers, such as real estate brokers, simply match sellers and buyers without being an active trading party. As studied by Biglaiser (1993), middlemen are usually experts with superior information about market conditions and product characteristics. Hence, they may enhance market efficiency by providing consulting services for market participants.

In insurance markets, independent agents and brokers act mainly as matchmakers and offer supplementary services for both policyholders and insurance companies. The work of Regan (1997), as well as Regan and Tennyson (1996), suggests that independent agents are better at both assessing risk and servicing consumers in more uncertain markets and in complex product lines than, for example, exclusive agents. However, the primary market function of intermediation depends on the market environment in which transactions take place. One distinction with respect to the intermediary's role obviously needs to be made between life and property-liability insurance (see, for instance, Regan and Tennyson, 2000). In life insurance markets, the broker is mainly concerned with writing new business and matching consumers with appropriate insurance products. Typically, in property-liability insurance, renewal business matters significantly besides new business. Depending on the line of insurance, the broker also has an important function in collecting and providing risk information for the insurance company to prevent adverse selection (see, e.g., D'Arcy and Doherty, 1990, or Schiller, 2009).

Commissions paid by insurance companies are still the major source of underwriting-related income for independent intermediaries. Most commission payments are related to the signing of the contract and are conditioned mostly on the insurance premium. In addition to these "premium-based commissions," intermediaries may also receive "contingent commissions." These commissions are ex post payments of insurance companies based on various performance criteria, such as profitability of the business placed or the volume of business with that specific insurer.

In 2004, events involving major insurance companies and insurance brokerage firms directed the focus of attention to the remuneration of independent agents and brokers. In one rather prominent case, collusion occurred between one of the biggest American insurance brokers and several insurance companies.<sup>1</sup> A coalition of commercial insurance companies agreed to pay contingent commissions for brokers, and in return, the receiving brokers presented their consumers high-premium pseudo-offers from other coalition members. Partly in response to the abovementioned incident,

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<sup>1</sup>See, e.g., Ruquet and Hays (2004).

regulatory changes have been introduced around the world. For example, Finland and Denmark have implemented a ban on any insurance company-paid commissions.<sup>2</sup> Other European countries have not yet gone so far but have rather introduced voluntary codes of conduct, according to which brokers are not allowed to be compensated by both sides of the market, insurance companies and consumers, at the same time.<sup>3</sup> These developments amplify an ongoing discussion that had already led to interventions, such as the European Directive (2002/92/EC) on insurance intermediation. The latter aimed at improving broker service quality by means of information and documentation requirements in combination with professional liability and mandatory liability insurance. In addition, some regulators address transparency of compensation directly. As part of its reform of insurance contract law, Germany, for instance, implemented an act that requires life insurance companies to disclose acquisition and distribution costs as part of the insurance premium.<sup>4</sup>

To understand and evaluate the existing compensation customs, the economic implications of different feasible compensation regimes must be analyzed. In our view, the current compensation-related discussion sums to answering the following questions: Who should pay the broker (consumer vs. insurer)? What is an adequate compensation basis (in particular, volume vs. profitability)? Should the amount of broker compensation be transparent to the consumer? Naturally, well-founded answers to these questions require an analysis that pays attention to the characteristics of the specific insurance markets in question.

In this paper, we are concentrating on lines of insurance in which the broker is mainly concerned with adequate matching, and the broker's role in collecting and providing information for the insurer is of minor importance. Examples may be certain markets for life and property-liability insurance, where products are complex for the consumer, and the main task for a broker is finding an adequate product. As a specific example from the life insurance area that should be well represented by our model, consider variable annuities, which have received significant attention lately. Due to product design, insurers' exposure with respect to actuarial risk is rather limited in this context. However, given the complexity of potential guarantees or other benefits, consumers will value advice that helps to find the best matched product for their needs.

With respect to the importance of matching, our setup is similar to Posey and Yavas (1995) and Posey and Tennyson (1998). In our model, insurance intermediaries are matchmakers only and do not have a role in providing risk-relevant information about clients to insurers. Hence, they are not concerned with limiting adverse selection. Of course, we acknowledge that in some lines of insurance, information regarding the consumer's risk type is critical and is usually collected by the broker as part of the underwriting process. Our point, however, is that most information collected

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<sup>2</sup>See, European Commission (2007), p. 100.

<sup>3</sup>See, Ladbury (2007), p. 29.

<sup>4</sup>See, German Ministry of Justice, "Bundestag adopts new law on insurance contracts," Press Release, July 5, 2007.

is "hard" in the sense that this information is verifiable ex post, implying that truthful information disclosure can be enforced by means of contractual provisions. In such an environment, the broker's discretion or, in other words, her influence on the quality of information for an insurance company, would be negligible.

Given the focus of our theoretical analysis, we are able to derive some general results with respect to the question of who should compensate the broker. Regarding the compensation basis and transparency, our results suggest intuitive and straightforward conclusions, which, however, strongly depend on the structure of our framework. Hence, further analytical research into these aspects seems quite promising.

Generally, with respect to the compensation of brokers there is a general intuition that favors a fee-for-advice system, whereby the consumer compensates the broker. One rather naive reason for this type of opinion is that in a fee-for-advice system, advice and the insurance product are sold separately. Thus, welfare would be greater under a fee-for-advice system because in this remuneration system, the broker is not directly affected by the purchasing decision of the potential policyholders. Gravelle (1993, 1994) tackles this type of argument by a theoretical comparison of commission and fee-for-advice-based compensation systems for independent life-insurance agents. In his model, brokers face search costs, and entry into the broker market is endogenous. One of the problems Gravelle identifies is that too few consumers become informed under a fee regime. Consequently, even though a fee-based compensation system may lead to a higher intermediation quality, it is not necessarily superior to a commission system once the number of brokers and overall purchases by consumers are taken into account. Hofmann and Nell (2011) compare fee-for-advice and commission systems in a duopoly market with uninformed consumers, where only matching matters. They show that in a situation with a completely non-strategic broker, a fee-for-advice system is superior to a commission system, due to consumers' transaction costs. In contrast to their model, we explicitly consider the impact of compensation on the quality of advice, which in our view, is one of the key issues with respect to the discussion about regulatory action. Schiller (2009) considers a duopoly market where both matching and risk classification of consumers matter. In this setup, the commission system is also superior as it provides incentives for proper risk classification. Cummins and Doherty (2006) emphasize that profit-related contingent commissions should align insurance company and broker interests with respect to consumers' risk classification. Regan and Kleffner (2010) empirically explore the impact of contingent commissions on the underwriting performance of insurance companies. Among other things they find that higher proportions of contingent commissions are associated with lower loss ratios, which supports the incentive argument for contingent commission payments.<sup>5</sup>

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<sup>5</sup>The two recent event studies Cheng et al. (2010) and Gosh and Hillard (2012) give further support for the incentive argument. In 2004, the New York Attorney General Eliot Spitzer announced a lawsuit against an insurance broker and

This paper challenges recent regulatory ambitions to ban commissions in a specific environment, where the broker is only concerned with matching consumers with appropriate insurance products. One of our first straightforward results is that the choice of compensation system and, hence, the question of who should compensate the broker is irrelevant as long as the broker acts completely non-strategically. In this setting, both a commission and a fee-for-advice system are—apart from bargaining power issues—payoff-equivalent. However, a broker’s superior information about the consumers’ best match together with the ability to mismatch gives the broker endogenous bargaining power with respect to insurance companies. In a pure fee-for-advice system, the broker is unable to execute her bargaining power because she cannot collect any payments from insurance companies. This limitation, on the one hand, has the advantage that the broker does not have any incentives for mismatching, as mismatching reduces the consumers’ willingness to pay for the intermediation service and, consequently, the feasible fee for advice. On the other hand, the broker is tempted to engage in side-contracting with insurance companies, which would transform her bargaining power into monetary payments. As long as side-contracting is efficient, insurance companies will agree on side payments (contingent commissions) to the broker to prevent losing market share, and consumers will be perfectly matched in equilibrium. Hence, when strategic mismatching by the broker is feasible, a fee-for-advice system with efficient side-contracting is, again, payoff-equivalent to a commission system because in a commission system, insurance companies explicitly compete in commission rates, and mismatching does not actually occur in equilibrium. However, if brokers are by law not allowed to collect any payments from insurance companies, efficient side-contracting is questionable. As the broker is still interested in executing her bargaining power, she might be tempted to illegally collect certain payments from a limited number of insurance companies, which might imply mismatching incentives. In consideration of our results, one can argue that any regulatory action that gears into a ban of commission payments to brokers is likely to be ineffective or, even worse, might unintentionally lead to mismatching incentives.

The remainder of the paper is organized as follows. In Section 2, the model framework is introduced and a situation without intermediation is analyzed. Section 3 determines outcomes in intermediated insurance markets and, in particular, compares fee-for-advice and commission-based systems when brokers act completely non-strategically. Consequently, in Section 4, we compare both remuneration systems when the broker strategically matches consumers and discuss further implications of the model regarding recent regulatory reforms and voluntary codes. Finally, Section 5 concludes the paper.

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other involved insurance companies. He further called for elimination of some forms of contingent commissions. Stocks of insurers named in the law suit and insurance companies that used contingent commissions suffered significantly negative return after the announcement. Consequently, both studies indicate that investors believed contingent commissions were valuable for firms.

## 2 Model without intermediation

The purpose of this section is to characterize the market result without intermediation and to determine the welfare loss, which is due to the presence of uninformed consumers in the insurance market. Following D’Aspremont et al. (1979), Hotelling (1929) and Schultz (2004), we consider an insurance market with risk-averse consumers who have heterogeneous preferences. A consumer is located at  $x \in [0, 1]$ , which represents his preference profile.<sup>6</sup> For the sake of simplicity, each individual profile is assumed to be associated with the same marginal cost (expected loss)  $c > 0$ . Due to risk aversion, consumers’ willingness to pay for (full) insurance is  $v > c$ ,<sup>7</sup> and they purchase one insurance policy at most. There are two insurance companies,  $j = 0, 1$ , which are located at the two extremes of the preference profile interval. Company 0 offers a policy at  $x = 0$  and company 1 at  $x = 1$ .

Because insurance is a rather complex product, it is assumed that only a fraction  $\phi \in (0, 1]$  of consumers are informed about their precise preference profile or, technically, their location in the interval  $[0, 1]$  and the firms’ location. Informed and uninformed consumers are uniformly distributed.

Consumers face a disutility from purchasing an imperfectly matching insurance product. If insurance companies charge premiums  $\alpha_0$  and  $\alpha_1$ , consumer  $x$  receives a net benefit  $v - \alpha_0 - tx$  from buying a policy from insurer 0 and  $v - \alpha_1 - t(1 - x)$  from buying a policy from insurer 1, where  $t > 0$  measures the marginal disutility of a mismatch.<sup>8</sup> An informed consumer is indifferent about buying from company 0 and 1 if she is located at

$$x = x(\alpha_0, \alpha_1) \equiv \frac{\alpha_1 - \alpha_0 + t}{2t} \quad (1)$$

Uninformed consumers only form expectations  $x^e$  and  $\alpha^e$  regarding their actual own profile  $x$  and prices  $\alpha$ . Their respective net benefit of buying insurance coverage is  $v - \alpha_0^e - tx^e$  if coverage is purchased from company 0 and it is  $v - \alpha_1^e - t(1 - x^e)$  if consumers buy from insurer 1. Because we concentrate on symmetric Nash equilibria in pure strategies<sup>9</sup>, where both insurance companies

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<sup>6</sup> “Preference profile” here refers to the consumer’s individual preferences concerning the insurance product characteristics.

<sup>7</sup> This approach, which does not directly refer to expected utility maximization of consumers simplifies the remaining analysis with respect to the impact of mismatch risk. The latter can be interpreted as a background risk, which is of minor importance for the strategic interaction in our model setup. Our implicit assumption is therefore that consumers are risk averse with respect to insurable loss and risk neutral with respect to mismatch risk. However, in Appendix A, we show how both concepts relate to each other for the model without intermediation.

<sup>8</sup> If the consumer is neither located in  $x = 0$  nor in  $x = 1$ , he is unable to buy a perfectly matching product. This leads to a difference between his most preferred product characteristics and those offered. The resulting disutility of mismatch is measured by the distance between the consumer’s location  $x$  and the chosen product, multiplied by  $t$ .

<sup>9</sup> For further analyses concerning mixed-strategy equilibria and the existence of a pure-strategy equilibrium see, e.g., Hofmann and Nell (2011), Schultz (2005) and Varian (1980).

set the same price  $\alpha^*$  and serve both groups of consumers, uninformed consumers with rational expectations  $x^e = \frac{1}{2}$  are ex ante indifferent between both firms, as  $\alpha_0^e = \alpha_1^e = \alpha^*$ . Consequently, they randomly choose their insurance carrier. Subsequently, we assume that in this case each insurance company attracts half of the uninformed consumers.

To simplify our analysis, the willingness to pay for consumers  $v$ , is assumed to be<sup>10</sup>

$$v \geq c + \left( \frac{2 + \phi}{2\phi} \right) t. \quad (2)$$

Insurer 0's demand is given by

$$D_0(\alpha_0, \alpha_1) = \phi \frac{\alpha_1 - \alpha_0 + t}{2t} + (1 - \phi) \frac{1}{2}. \quad (3)$$

and firm 1's respective demand is given by  $D_1(\alpha_1, \alpha_0) = 1 - D_0(\alpha_0, \alpha_1)$ . Given (3) the profit of company 0 is

$$\pi_0(\alpha_0, \alpha_1) = (\alpha_0 - c) \left[ \phi \frac{\alpha_1 - \alpha_0 + t}{2t} + (1 - \phi) \frac{1}{2} \right]. \quad (4)$$

Equilibrium prices are given by

$$\frac{\partial \pi_0}{\partial \alpha_0} = \frac{\phi [\alpha_1 - 2\alpha_0 + c] + t}{2t} \stackrel{!}{=} 0. \quad (5)$$

Using the symmetry of the problem, we can obtain the symmetric Nash equilibrium price level of

$$\alpha^* = c + \frac{t}{\phi} \quad (6)$$

and a resulting equilibrium profit of

$$\pi_j^* = \frac{t}{2\phi}. \quad (7)$$

The uninformed consumers' ex ante net benefit  $y_u^e$  is given by

$$y_u^e = v - c - t \left( \frac{2 + \phi}{2\phi} \right). \quad (8)$$

Obviously, price competition increases in the fraction of informed consumers  $\phi$ . Hence, there is a positive external effect working to the advantage of uninformed consumers, as  $\frac{\partial y_u^e}{\partial \phi} > 0$ .

On the other hand, informed consumers realize the respective ex ante net benefit

$$y_i^e = v - c - t \left( \frac{4 + \phi}{4\phi} \right). \quad (9)$$

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<sup>10</sup>The opposite case with a lower willingness to pay for insurance is not considered, as in the case without intermediation, there would be two separate monopolistic markets without any competition between insurance companies.

Comparing (8) and (9) highlights the welfare loss due to the random matching of insurance companies and uninformed consumers. Because the latter do not have any information about their own location, they choose their respective insurance company randomly. Thus, from a social planner's perspective, half of the uninformed consumers match with the wrong insurance company. This mismatching causes a welfare loss of

$$(1 - \phi) \left( \frac{1}{2}t - \frac{1}{4}t \right) = (1 - \phi) \frac{1}{4}t. \quad (10)$$

Using (7), (8), and (9), the overall welfare in the economy, given by the weighted sum of ex ante net benefits  $(y_u^e, y_i^e)$  and insurers' profits  $\sum_j \pi_j^*$  is

$$\Phi^* = v - c - \left( \frac{2 - \phi}{4} \right) t. \quad (11)$$

The derived overall welfare without intermediation is the reference for the social profitability of intermediation in markets with uninformed consumers.

### 3 Intermediation

In this section, a completely non-strategic (honest) insurance broker is incorporated into the analysis. We focus on the welfare-increasing effect of an honest intermediary who exclusively improves the matching process between uninformed consumers and insurance companies.

In the considered situation, a broker can only be valuable if she has—compared to uninformed consumers—access to superior information. For the sake of parsimony, the broker is assumed to be endowed with an information technology that incurs variable cost  $k > 0$  and reveals the profile  $x$  of a consumer perfectly.

In line with Posey and Yavas (1995), we assume a monopolistic broker market. Naturally, this is an over-simplification. Of course, in real-world markets, intermediaries compete with each other. However, certain segments of insurance intermediary markets are highly concentrated (see, e.g. Cummins and Doherty, 2006). But even in markets with multiple intermediaries, obtaining a second opinion would typically be rather costly for consumers, due to considerable search costs. The latter fact provides each single intermediary with market power. Intermediary market power can also result from the possibility of strategic behavior, as analyzed in Section 4. In this context, one may argue that broker advice is a credence good (Darby and Karni, 1973) because it is difficult for consumers to even ex post determine whether they were served appropriately or not (see also Emons, 1997 or Sülzle and Wambach, 2005).

Our analysis will be divided into two parts, which differ with respect to the payment structure

for the insurance company, broker, and consumer. In the first case, the broker is compensated directly by the insured (fee-for-advice system). Particularly, neither communication nor monetary transfers between the broker and the insurance company occur. In this remuneration system, an insurance company cannot distinguish between informed and initially uninformed consumers who were informed by a broker. In the second case, insurance companies pay the broker (commission system). As the broker is compensated for every initially uninformed consumer, insurance companies can distinguish between initially informed and uninformed consumers.

### 3.1 Fee-for-advice

Let us now turn to the analysis of the fee-for-advice remuneration system. The sequence of the game is as follows: At stage 1, insurance companies simultaneously announce their prices  $\alpha_j$ . Then, at stage 2, the broker makes a take-it-or-leave-it offer  $f$  (fee-for-advice) for **her** advice service.<sup>11</sup> At stage 3, uninformed consumers decide whether or not to request advice. Finally, at stage 4, all consumers decide whether and where to purchase an insurance policy.<sup>12</sup>

Solving the problem using backward induction, we begin analyzing stage 4. At this final stage we must distinguish between two different types of initially uninformed consumers: those who requested advice at stage 3 and those who decided to remain uninformed. Both groups have three options: Buy insurance from company 0, buy insurance from company 1, or remain uninsured. If consumers prefer to remain uninformed, then at stage 4, they will expect symmetric price offers  $\alpha_j = \alpha \forall j$  and randomly purchase insurance from one of the two insurance companies. Therefore, if  $\alpha \leq v - \frac{1}{2}t$ , uninformed consumers prefer to buy insurance. As any fee-for-advice is sunk at stage 4, consumers at the location  $x \in [0, 1]$  who consulted with a broker are indifferent between purchasing insurance from company 0 and company 1 if

$$v - \alpha_0 - tx - f = v - \alpha_1 - (1 - x)t - f \quad (12)$$

and therefore,

$$x = \frac{\alpha_1 - \alpha_0 + t}{2t}. \quad (13)$$

Thus, if insurance companies charge symmetric prices with  $\alpha_j = \alpha \forall j$ , initially uninformed consumers, who became informed at stage 3, prefer to buy their insurance policy at the “nearest” insurance company if  $\alpha \leq v - \frac{1}{2}t$  holds. In this case, the net benefit of becoming informed is

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<sup>11</sup>We do not consider any specific kind of explicit negotiations with any arbitrary allocation of bargaining power, because this would only imply a reallocation of rents between the broker and insurance companies.

<sup>12</sup>Because in equilibrium all uninformed consumers either ask for the broker’s services or remain uninformed, other game sequences have no impact on the qualitative results. The game might be reorganized without any loss of generality, such that the broker offers the price for his service at stage 1, immediately before the insurers announce their premiums.

$v - \alpha - f - \frac{1}{4}t$ . Without loss of generality, we now use the interim assumption that both consumer types purchase insurance at stage 4. The fact that insurance is purchased by all types of consumers in equilibrium will be shown subsequently.

At stage 3, uninformed consumers prefer to become informed about their own profile if

$$v - \alpha - f - \frac{1}{4}t \geq v - \alpha - \frac{1}{2}t \Leftrightarrow f \leq \frac{1}{4}t. \quad (14)$$

At stage 2, the broker offers her advice service at  $f = \frac{1}{4}t$  and yields non-negative profits of<sup>13</sup>

$$\kappa^f = (1 - \phi) \left( \frac{1}{4}t - k \right). \quad (15)$$

In this situation—due to (12)—all uninformed consumers purchase the advice service and become informed about their own profile. As the broker makes a take-it-or-leave-it offer, the equilibrium fee-for-advice is  $f = \frac{1}{4}t$ . Otherwise, if  $k > \frac{1}{4}t$  holds, all uninformed consumers prefer to remain uninformed about their profile. Therefore, no intermediation takes place and the equilibrium results derived in Section 2 are unchanged.

The profitability condition  $k \leq \frac{1}{4}t$  has direct implications for the relevance of intermediation in different types of insurance markets. As the product space in our model is normalized to one, we cannot directly model different types of markets. Our model, however, still enables us to draw conclusions based upon specific characteristics of commercial versus individual insurance markets. Obviously, different types of insurance markets can in our framework be characterized by the parameters  $k$  and  $t$ .

Real insurance markets' structure suggests that intermediation tends to be more relevant in commercial and reinsurance than in non-commercial markets. This observation can also be explained in our framework. One might argue that the range of potential preference profiles in commercial markets is relatively larger than in non-commercial markets, implying that the disutility of mismatch, measured by  $t$ , ceteris paribus is greater in commercial markets. Although the costs of advice  $k$  in commercial insurance markets are also presumably greater than in non-commercial markets, intermediation becomes more profitable if the relative increase in the disutility of mismatch exceeds the increase in the costs of advice.

Given that the broker's advice activities are profitable, eventually each consumer makes an informed decision at stage 4. Therefore, the insurers' price decision at stage 1 is as if all consumers are initially informed. Using  $\phi = 1$  and  $f = \frac{1}{4}t$ <sup>14</sup>, the analysis of Section 2 leads directly to the

<sup>13</sup>For the sake of simplicity, we assume that uninformed consumers accept the offer if they are indifferent between accepting and rejecting.

<sup>14</sup>Again, a variation of  $f$  can be interpreted as a change in the allocation of bargaining power between the parties involved.

equilibrium premium

$$\alpha^f = c + t \quad (16)$$

and a resulting equilibrium profit of

$$\pi_j^f = \frac{t}{2}. \quad (17)$$

In a situation in which consumers pay the brokerage fees directly, the ex ante net benefit of informed and uninformed consumers is given by

$$y_i^f = v - c - \frac{5}{4}t \quad (18)$$

and

$$y_u^f = v - c - \frac{3}{2}t. \quad (19)$$

The resulting overall welfare  $\Phi^f$  in this situation equals the weighted sum of the ex ante net utilities of consumers (18) and (19) and both the profits of the broker (15) and the insurance companies (17) with

$$\Phi^f = v - c - (1 - \phi)k - \frac{1}{4}t \geq \Phi^* \text{ if } k \leq \frac{1}{4}t. \quad (20)$$

In this case, intermediation leads to an increase in welfare if and only if  $k \leq \frac{1}{4}t$ . Another straightforward implication of (20) is that subsidizing the intermediary's variable cost always increases welfare.

Thus, if intermediation is individually rational for uninformed consumers, it will also be profitable from a social planner's perspective. However, a comparison of (7) and (17) indicates that market intermediation by a broker reduces the insurers' profits. This is due to an increase in market transparency, which intensifies price competition in the insurance market.

### 3.2 Commission system

Turning towards the commission system, we now address whether or not the latter result concerning the social profitability of intermediation remains the same. Generally, in a commission system brokers are compensated by insurance companies for successful intermediation. Therefore, in this system insurance companies have the opportunity to price-discriminate between (informed and uninformed) consumers who directly buy coverage and initially uninformed consumers who buy coverage via the broker.

In line with the previous section, the sequence of the game with a commission system is as follows: At stage 1, insurance companies simultaneously announce their prices  $\alpha_{ij}$  for informed and  $\alpha_{uj}$  for uninformed consumers. Then, at stage 2, the broker makes a price offer  $g$  (commission) for providing advice. At stage 3, uninformed consumers decide whether or not to request the advice

service. Finally, at stage 4, all consumers decide whether and where to purchase an insurance policy.

In a commission system, the decision problem for uninformed consumers at stages 3 and 4 is only slightly changed compared to the fee-for-advice system. The request for advice in stage 3 is initially free of charge as the insurance company bears the commission  $g$ . If uninformed consumers utilize the broker's advice service and subsequently purchase insurance, the commission  $g$  will affect prices for insurance at stage 4.

Considering the group of informed consumers first, the price  $\alpha_{ij}$  for informed consumers can be derived directly from the analysis in Section 2 using  $\phi = 1$ . The equilibrium insurance premium for informed consumers, therefore, corresponds to

$$\alpha_i^c = c + t. \quad (21)$$

If markets for informed and uninformed consumers cannot be separated, uninformed consumers can buy insurance products that are designed for informed consumers. Consequently, they have three available options: not purchasing any insurance, directly purchasing insurance without any advice, and buying insurance after utilizing the broker's service. In a commission system, not buying insurance is, in any case, associated with a net benefit of zero. If uninformed consumers decide to buy insurance, they will be able to directly buy insurance from a randomly chosen insurance company at the price  $\alpha_i^c$ . Purchasing insurance after requesting advice from the broker is profitable for uninformed consumers as long as

$$v - \alpha_u - \frac{1}{4}t \geq v - c - \frac{3}{2}t \quad (22)$$

holds. The LHS of (22) corresponds to the net benefit of uninformed consumers from buying insurance coverage via the broker, whereas the RHS relates to the net benefit from randomly buying insurance coverage from one of the two insurance companies in the market for informed consumers.

In equilibrium, insurers will set premiums such that (22) holds as an equality. Rearranging this, we obtain

$$\alpha_u^c = c + \frac{5}{4}t. \quad (23)$$

Obviously,  $\alpha_u^c = \alpha_i^c + \frac{1}{4}t$ . Due to (2), both uninformed and informed consumers derive a positive net benefit from purchasing their designated contract at the prices  $\alpha_i^c$  and  $\alpha_u^c$ .

At stage 3, the broker makes a take-it-or-leave-it commission offer  $g$  to the insurance companies. Due to the fact that the broker would still be able to offer her services under a fee-for-advice

system directly to uninformed consumers who could subsequently purchase insurance at the price for informed consumers, the commission offer  $g$  makes insurance companies indifferent between both remuneration systems. Therefore,

$$\frac{1}{2}(\phi\alpha_i^c + (1 - \phi)[\alpha_u^c - g] - c) = \pi_j^f \quad (24)$$

must hold. Rearranging (24) by using (17), (21), (23) yields

$$g = \frac{1}{4}t. \quad (25)$$

Consequently, as the broker extracts the revenue of intermediation, insurance companies' profits

$$\pi_j^c = \frac{t}{2} \quad (26)$$

as well as social welfare for  $k \leq \frac{1}{4}t$

$$\Phi^c = v - c - (1 - \phi)k - \frac{1}{4}t = \Phi^f \geq \Phi^* \text{ if } k \leq \frac{1}{4}t \quad (27)$$

are unchanged compared to the fee-for-advice system.

### 3.3 Discussion and Extensions

Thus far, we have analyzed three types of markets: no intermediation, intermediaries paid by fee-for-service, and intermediaries paid by commissions. Our analysis has shown that the overall welfare increases whenever intermediation is profitable and that the choice of compensation, and hence the question of who should compensate the broker, is irrelevant as long as the broker acts completely non-strategically. Under the assumptions of this section, both commission and fee-for-advice systems are—apart from bargaining power issues—payoff-equivalent.<sup>15</sup> Given the results for exogenously given market setups or compensation systems, an interesting next step is an analysis of how these situations may evolve and what the different parties' incentives are.

Let the situation with no intermediation be the starting point. In this case consumers who are uninformed about their own profile choose a product randomly. Hence, half of them buy the wrong insurance policy. The fact that a share of consumers is uninformed provides insurers with

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<sup>15</sup>This result changes if insurance companies are able to distinguish between ex ante uninformed and informed consumers. It can be shown that in a commission system brokers and insurance companies have an incentive to separate markets to extract rents from uninformed consumers. If this separation of markets between ex ante uninformed and informed consumers is feasible, a commission system is the preferable compensation system both for the broker and the insurance companies. However, the separation of markets does not affect social welfare. It solely affects the allocation of rents.

additional market power. As they can extract information rents, their respective profits increase in the share of uninformed consumers. Given this equilibrium result for the no-intermediation case, insurers do not have any positive incentives to hire an intermediary. However, obviously, a market situation without intermediation will not be sustainable if the information technology necessary for identifying consumer profiles is not too costly. In the latter case, there is incentive for intermediaries to enter the market and provide matching services. Due to the inefficient product choice without intermediation, uninformed consumers' willingness to pay for efficient matching can be extracted by a broker offering advice for a fee. The result in this situation is that both informed and uninformed consumers benefit from intermediation as insurance premiums and hence insurers' profits decrease. Thus, insurers are harmed by intermediation but do not have any means of preventing brokers from offering matching services. Given that intermediation is profitable, brokers can alternatively be compensated by insurers. The fee-for-advice system is an outside option for the broker. Therefore, under a commission system, broker profits cannot be lower than under a fee-for-advice system. Summarizing the above, we can conclude that in a situation with a completely non-strategic broker, a commission system is not more attractive for insurance companies and brokers than a fee-for-advice system. However, as will be shown in the next section, when brokers have the ability to act strategically in the sense of guiding consumers to the wrong carrier, they prefer to be compensated by insurance companies.

One simplification used in this analysis is that product differentiation is exogenous. Insurance companies are located at the two extremes of the profile space. If, however, product differentiation is treated as endogenous, it will be affected by intermediation or market transparency. As shown by Schultz (2004) for the situation without intermediation, insurers would locate outside the product space. Introducing intermediation increases market transparency and, hence, intensifies competition, which translates into less product differentiation and lower insurer profits. Consequently, consumers' utility and social welfare increases.<sup>16</sup>

## 4 Quality of advice

The previous analysis implicitly rests on the assumption that the broker acts completely non-strategically and matches each uninformed consumer with the appropriate insurance product. Comparisons for different broker remuneration systems, however, should definitely account for the strategic behavior of both the broker and the insurance companies, as fee-for-advice and commission systems may lead to different incentives with respect to quality of advice. With respect to the quality of advice, perhaps the most persistent reservation to a commission system is based on the argument summarized by Gravelle (1994) that

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<sup>16</sup>A formal proof following Schultz (2004) and Focht (2009) is provided in Appendix B.

... "a commission system gives greater incentives to provide biased advice to unsophisticated potential consumers."<sup>17</sup>

In light of this reservation, we briefly evaluate a broker's incentives to provide bad advice under the different remuneration systems. In our model setup, the broker might engage in matching uninformed consumers with the inappropriate insurance company, but she will only do so if this is profitable and increases her payoffs.

Let us now consider a situation in which the broker is interested in increasing her own payoffs by means of mismatching. As we assume that consumers are rational, any mismatching activities negatively affect the expected disutility of uninformed consumers and, consequently the ex-ante profitability of intermediation. Without loss of generality, we only consider the case in which the broker colludes with insurance company  $j = 0$ . Hence, the broker can steer a total amount  $\lambda \in [0, \frac{1}{2}]$  of uninformed consumers, whose appropriate provider of coverage is insurance company  $j = 1$ , to insurance company  $j = 0$ .

Generally, for any given  $\lambda$ , the expected disutility of mismatching for uninformed consumers corresponds to

$$\left[ \left( \frac{1}{2} + \lambda \right)^2 + \left( \frac{1}{2} - \lambda \right)^2 \right] \frac{t}{2} = \left[ \frac{1}{4} + \lambda^2 \right] t. \quad (28)$$

In a fee-for-advice system, the ex ante participation constraint of uninformed consumers with mismatching changes to

$$v - \alpha - f - \left[ \frac{1}{4} + \lambda^2 \right] t \geq v - \alpha - \frac{1}{2}t \Leftrightarrow f \leq \left[ \frac{1}{4} - \lambda^2 \right] t. \quad (29)$$

As the disutility strictly increases in  $\lambda$ , an obvious implication of (29) is that any mismatching negatively affects the broker's ability to extract rents from uninformed consumers via a fee-for-advice  $f$ . Therefore, if the broker is unable to receive any payments from insurance companies, she will not engage in any mismatching activities. In this case, the market outcome corresponds to our analysis in section 3.1.

However, considering the equilibrium in a pure fee-for-advice system, there are substantial incentives for side-contracting when the latter is feasible. To illustrate these incentives, let us consider a very simple situation, where the insurance premiums correspond to  $\alpha^f = c + t$  and the broker does not face any costs from mismatching, due to a future loss of reputation.<sup>18</sup> In this case, the broker can reach an agreement with insurance company 0 that she—in return for certain payments—directs  $\lambda$  uninformed consumers, whose appropriate provider of coverage is insurance company 1,

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<sup>17</sup>Gravelle (1994), p. 425.

<sup>18</sup>See, e.g., Bolton et al. (2007) or Schiller (2009) for such models.

to insurance company 0. Any side-contracting opportunities provide the broker endogenous bargaining power because following the broker's advice is a weakly dominant strategy for uninformed consumers. Hence, the broker can threaten insurer 0 to steer all uninformed consumers to insurer 1 if a side-contract is rejected.

Subsequently, we illustrate how the broker can execute her endogenous market power by a simple bonus contract. Generally, insurers are unable to observe consumer preference profiles. However, to implement mismatching incentives, a flat per capita bonus  $\beta > 0$  can, for example, be related to the total number of (uninformed) consumers that the broker directs to an insurer. Given that insurer 0 must pay a per capita bonus for each mediated uninformed consumer, the respective profit function of insurer 0 changes to

$$\pi_0 = \phi \frac{t}{2} + (1 - \phi) \left( \frac{1}{2} + \lambda \right) [t - \beta]. \quad (30)$$

As long as  $\beta \leq t$ , company 0 always accepts the side-contract, because its profits are higher than its profits without any uninformed consumers ( $\phi \frac{t}{2}$ ). Thus, the broker basically would demand a per capita bonus  $\beta = t$  from insurer 0 and would maximize her profits by choosing  $\lambda = \frac{1}{2}$ . However, (rational) uninformed consumers anticipate that the broker will match all consumers with insurance company 0. In this situation they would be indifferent between buying insurance coverage from the broker and randomly buying insurance from either insurance company. Their willingness to pay for the intermediation service would be zero, which implies  $f = 0$ .

In fact, side-contracting with only one insurance company is suboptimal as long as intermediation is profitable ( $k \leq \frac{1}{4}t$ ). Assuming that advice is profitable, examining the preference profile and matching every consumer with the appropriate provider of insurance coverage increases the extractable rent (and social welfare). Therefore, in equilibrium the broker examines the preference profile for each individual uninformed consumer and matches her with the appropriate insurer implying  $\lambda^{mf} = 0$ . To maximize profits, the broker charges a fee  $f^{mf} = \frac{1}{4}t$  and a per capita bonus  $\beta^{mf} = t$ .

Consequently, in a fee-for-advice system with efficient side-contracting, consumers' net benefit is unchanged compared to a situation without side-contracting with  $u_i^{mf} = v - c - \frac{5}{4}t$  and  $u_u^{mf} = v - c - \frac{3}{2}t$ . Profits of insurance companies are reduced to  $\pi_j^{mf} = \phi \frac{t}{2}$ . The broker's profit is  $\kappa^{mf} = (1 - \phi) [\frac{5}{4}t - k]$ . Compared to a situation without strategic intermediation, side-contracting only affects the distribution of rents between the broker and the insurance companies. Social welfare in this case corresponds to the situation with truthful intermediation with

$$\Phi^{mf} = v - c - (1 - \phi)k - \frac{1}{4}t = \Phi^f = \Phi^c \leq \Phi^* \text{ if } k \leq \frac{1}{4}t. \quad (31)$$

Let us now turn to mismatching incentives in a commission system. Considering our previous results, it is striking that the incentive pay in a side-contracting situation, and in particular the bonus rate  $\beta$ , resembles a contingent commission paid by insurance companies. This indicates that the analysis for a pure commission system works in a quite similar manner. The main difference in a commission system is the fact that both companies explicitly compete for uninformed consumers. In equilibrium, the broker can offer the commission rate  $g^{mc} = \frac{5}{4}t$  to both companies. Hence, a commission system with mismatching opportunities for the broker will lead to the same outcome as the fee-for-advice system with  $u_i^{mc} = v - c - \frac{5}{4}t$ ,  $u_u^{mc} = v - c - \frac{3}{2}t$ ,  $\pi_j^{mc} = \phi \frac{t}{2}$ ,  $\kappa^{mc} = (1 - \phi) [\frac{5}{4}t - k]$  and

$$\Phi^{mc} = v - c - (1 - \phi)k - \frac{1}{4}t = \Phi^f = \Phi^c \leq \Phi^* \text{ if } k \leq \frac{1}{4}t. \quad (32)$$

With respect to real-world markets, a commission system seems to be the straightforward approach for reaching efficient market outcomes, due to the explicit competition for uninformed consumers. However, irrespective of the specific remuneration system our analysis highlights the fact that volume-based contingent commissions can be an effective means for brokers to extract rents from insurance companies. But it is also important to note that contingent commissions in connection with rational consumers do not lead to any mismatching in equilibrium.

Before we further summarize our main results, it may be worthwhile to discuss how our analysis relies on the specific model framework. First, one may suppose that whenever insurance companies have some bargaining power, they are actually able to realize additional profits from mismatching activities and mismatching may become some kind of rent-seeking activity for insurance companies. In fact, the distribution of bargaining power between the broker and the insurance companies should neither significantly affect the distribution of rents nor the broker's mismatching intensity. The reason for this result is quite straightforward. Due to her discretion regarding whether and how to match uninformed consumers, the broker always has a certain endogenous bargaining power. An individual insurance company has incentives to outbid its opponent as long as accepting rather than rejecting the side-contract leads to (weakly) higher profits. However, competition in the broker market may limit the broker's rent extraction abilities by means of potential mismatching. But given that it is costly for consumers to shop for alternative brokers, the endogenous market power of a specific broker sustains.

The assumption that mismatching does not negatively affect the broker is also not very restrictive. If mismatching is costly, for example due to associated future losses in credibility, the broker may not mismatch all uninformed consumers. In a situation in which mismatching costs lead to  $\lambda < \frac{1}{2}$ , some uninformed consumers will be matched with insurance company 1. Hence, costs of mismatching limit the broker's ability to extract rents from insurance companies. How-

ever, consumers' benefits are not affected by any mismatching costs. With respect to social welfare, mismatching costs will be substituted by reputation costs.

## 5 Conclusions

The core question that this paper addresses is as follows: Which party (insurer or consumer) should compensate the insurance broker? The analysis shows that, when brokers act completely non-strategically, the choice of remuneration system in matching markets does not matter. In both remuneration systems, the broker perfectly matches all uninformed consumers.

However, a meaningful analysis must take into account the broker's incentive problem. Due to her private information and the ability to mismatch uninformed consumers, the broker has endogenous bargaining power when dealing with insurance companies. In a situation with a strategic broker in which (efficient) side-contracting is feasible, insurance companies must agree upon side-payments (contingent commissions) in order not to lose market share. As long as all insurance companies pay contingent commissions, uninformed consumers will be perfectly matched. In this situation, a fee-for-advice system is, again, payoff-equivalent to a traditional commission system. In the latter, insurance companies explicitly compete in contingent commissions and mismatching does not actually occur as long as all companies pay these commissions. In our model, contingent commissions are paid due to a prisoners' dilemma situation. Here, these commissions are only a means for the broker to extract rents from insurance companies.

However, if brokers are by law not allowed to collect any payments from insurance companies, efficient side-contracting is questionable. As the broker is still interested in executing her endogenous bargaining power, she might be tempted to illegally collect certain payments from a limited number of insurance companies, which might imply certain mismatching incentives. Therefore, as one important implication, our results indicate that any regulatory action geared towards a ban of commission payments to brokers is likely to be ineffective, or even worse, might unintentionally lead to mismatching incentives. If a ban of commissions can be enforced perfectly, in our setting it would not have an effect on social welfare. Brokers would only be unable to collect any rents from insurers. As soon as enforcement of the ban is imperfect, social welfare may be negatively affected, as there is a danger of mismatching. In short, enacting a ban on commission payments cannot increase but may decrease social welfare.

It is important to note that our analysis rests on the assumption of rational expectations. This approach is straightforward and in line with existing theory. However, it cannot explain why insufficient advice is actually given in real-world insurance markets with intermediation. In light of the recent financial crisis, it seems fruitful to explicitly concentrate on the formation of expectations and, in particular, the role of intermediaries in this context. Still, an analysis based upon rational

expectations is an important first step towards understanding insurance intermediation, which can serve as a benchmark for future research.

Finally, let us briefly return to our initial questions regarding compensation bases and transparency. In light of our analysis, it is questionable why the transparency of compensation should have a significant impact on advice quality. The specific amount or differences in the size of commissions should not be informative per se. However, it might be advantageous for consumers to know whether contingent commission agreements exist or not.

Our analysis provides us with an explanation of why commissions and, in particular, contingent commissions are being used in the market. Due to superior information, brokers may possess market power and commissions may enable them to collect rents based upon this advantage. Generally, contingent commissions are unnecessary for efficient matching, as long as a ban of side-payments from insurance companies can be enforced. If this is not the case, insurance companies must agree upon contingent commissions in order not to lose market share. It needs to be highlighted, however, that our assumption of a monopolistic broker market amplifies this argument. In a competitive setting, where brokers possess less or no market power, they cannot collect rents from insurance companies. To generate net income, it seems likely that brokers in this situation focus on consumers via a fee-for-advice system and offer additional services.

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## A Appendix A

The indifference condition for a risk-averse and informed consumer who can observe both insurance contracts  $(\alpha_i, I_i)$ , is

$$Eu(W - \alpha_0 - L + I_0(L) - tx) = Eu(W - \alpha_1 - L + I_1(L) - t(1 - x)) \quad (33)$$

where  $L$  is an insurable loss,  $I_i$  denotes the indemnity function of insurer  $i$ , and  $x$  is deterministic as the consumer knows his profile. The risk-neutral insurance companies compete in contracts  $(\alpha_i, I_i)$ . As in the monopoly case (Stiglitz, 1977) it is optimal for insurers with respect to risk allocation and the extractable rents to fully insure the risk-averse consumers ( $I_i = L$ ) and charge a positive loading  $z_i$  such that  $\alpha_i = E(L) + z_i$ .<sup>19</sup> The premium or, respectively, the loading  $z_i^*$  is endogenously determined in oligopolistic price competition. If consumers are sufficiently risk averse, they will prefer a full insurance contract to the outside option of being uninsured. For  $I_i(L) = L$ , the indifference condition (33) simplifies to (1).

Uninformed and risk-averse consumers face additional risk as they do not know their actual profile  $x$ . This risk of mismatch can be considered as background risk, which increases the optimal amount of insurance. Assuming that insurance is limited to (full) coverage with respect to  $L$ , we can conclude that full insurance is optimal for uninformed consumers, as well. For uninformed consumers the mismatch risk is equivalent for both insurance contracts. As they expect insurers to offer the same contracts, they are indifferent regarding where to buy insurance. Consequently, they randomly choose their insurance carrier.

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<sup>19</sup>See, e.g., Hofmann and Nell (2011) for a similar approach.

## B Appendix B

Assume that insurers endogenously choose their respective locations  $a$  (insurer 0) and  $b$  (insurer 1). Insurer 0's demand is

$$D_0(\alpha_0, \alpha_1, a, b) = \phi \frac{\alpha_1 - \alpha_0 + (a + b)t}{2t} + (1 - \phi) \frac{1}{2}. \quad (34)$$

and firm 1's respective demand is  $D_1(\alpha_1, \alpha_0, a, b) = 1 - D_0(\alpha_0, \alpha_1, b, a)$ . The resulting profit of company 0 is

$$\pi_0(\alpha_0, \alpha_1) = (\alpha_0 - c) \left[ \phi \frac{\alpha_1 - \alpha_0 + (a + b)t}{2t} + (1 - \phi) \frac{1}{2} \right]. \quad (35)$$

Equilibrium prices are given by

$$\frac{\partial \pi_0}{\partial \alpha_0} = \frac{\phi [\alpha_1 - 2\alpha_0 + c] + \phi(a + b)t + (1 - \phi)t}{2t} \stackrel{!}{=} 0. \quad (36)$$

Using the symmetry of the problem, one can obtain the symmetric Nash equilibrium price level of

$$\alpha^* = c + \frac{(b - a)(\phi(a + b) + 2 + (1 - \phi))t}{3\phi}. \quad (37)$$

Using (35) and (37) yields the optimal locations

$$a^* = \frac{7\phi - 9}{8\phi} < 0, b^* = 1 - \frac{7\phi - 9}{8\phi} > 1. \quad (38)$$

Product differentiation decreases in market transparency, as  $\frac{\partial a^*}{\partial \phi} > 0$  and  $\frac{\partial b^*}{\partial \phi} < 0$ .

Inserting in (37) yields

$$\alpha^* = c + \frac{3(3 - \phi)}{4\phi^2}t \quad (39)$$

and

$$\pi_j^* = \frac{3(3 - \phi)}{8\phi^2}t. \quad (40)$$

We observe that  $\frac{\partial \pi_j^*}{\partial \phi} < 0$ . Hence, insurers' profits decrease as market transparency increases.

Intermediation is profitable if  $k \leq \frac{1}{4}(b^* - a^*)t$ . If the latter holds, the broker informs all initially uninformed consumers ( $\phi = 1$ ), implying

$$\hat{a} = -\frac{1}{4}, \hat{b} = \frac{5}{4}, \quad (41)$$

and the premium in a fee-for-advice system

$$\hat{\alpha}^f = c + \frac{3}{2}t \quad (42)$$

with the respective fee

$$\hat{f} = \frac{3}{8}t. \quad (43)$$

In a commission system, we obtain the premiums

$$\hat{\alpha}_i^c = c + \frac{3}{2}t \quad (44)$$

and

$$\hat{\alpha}_u^c = c + \frac{15}{8}t. \quad (45)$$

The insurer profits for both compensation systems are

$$\hat{\pi}_j = \frac{3}{4}t. \quad (46)$$

The analysis above shows that intermediation leads to less product differentiation and lower insurance profits.  $\square$