Deception under Competitive Intermediation

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Abstract

This paper analyzes the incentives of intermediaries, such as financial advisors, mortgage brokers, or salespeople, to educate consumers who misperceive the value of products. Two types of firms sell products through common-agent intermediaries and pay commissions for sales. One type sells a transparent product, the other sells a deceptive product that has hidden fees, qualities, or risks. Each intermediary chooses which product to promote and whether to educate consumers about the hidden attributes. Each consumer visits a fixed number of intermediaries and buys one promoted item. When consumers are aware of the hidden attributes, deception does not occur and commissions are competed away. When consumers are unaware of the hidden attributes, deception occurs if and only if the degree of misperception is large. If deception occurs, intermediaries earn high commissions despite competition. Further, because consumers ultimately bear the cost of such commissions, consumer welfare in the case is lower than in an alternative case where intermediaries cannot educate consumers. A policy regulating commissions can lead intermediaries to reveal any hidden attributes.

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1 Introduction

Intermediation is prevalent in industries such as mortgages, mutual funds, and insurance.\(^1\) A central role of intermediaries in these industries is to help consumers make better purchase decisions, as product attributes, fee structures, and contract terms are so complicated that some consumers can misperceive the value of the products. Indeed, recent empirical evidence suggests that consumers are inattentive to certain “hidden” fees.\(^2\) Consumers may also misperceive future returns of actively-managed mutual funds relative to those of index funds, overlook a bad quality of real estate, or over-estimate the likelihood of accidents an insurance plan covers. Although intermediaries as experts are supposed to educate consumers about the product attributes, there is a concern that commissions from product providers may distort the incentives of intermediaries.\(^3\)

This paper investigates conditions under which competing intermediaries motivated by commissions serve their educational role. Section 2 summarizes empirical evidence on deception and commissions in which intermediaries cater to consumers’ misperceptions in order to receive high commissions. Section 3 sets up a basic model and discusses its key assumptions. Two firms sell their products to a unit mass of homogenous consumers. One firm produces a deceptive product that has a hidden attribute such as an additional fee, a hidden quality, or a misperceived risk, whereas the other firm produces a transparent product that has no hidden attribute. Firms can sell their products only through profit-maximizing common-agent intermediaries, to whom they can pay commissions for sales. Each intermediary chooses one product to promote and whether to educate consumers about the hidden attribute. Each consumer visits a fixed number of intermediaries to buy at most one item. Consumers are initially unaware of the hidden attribute, as in Gabaix and Laibson (2006) and Heidhues, Köszegi and Murooka (2012c). Each consumer takes the hidden attribute into account in their purchase decisions if and only if she is educated by some intermediary. I investigate subgame-perfect Nash equilibria played by firms and intermediaries, and

\(^1\) In the US mutual-fund industry, Investment Company Institute reports that 53 percent of households owns funds purchased through investment professionals among those who hold mutual funds including pension plans, and 82 percent of household does so excluding pension plans (Profile of Mutual Fund Shareholders, 2012).

\(^2\) In the mortgage industry, Gurun, Matvos and Seru (2013) report that consumers are less sensitive to post-introductory interest rates than to initial interest rates of option adjustable-rate mortgages (option ARMs) because mortgage lenders employ “deceptive advertisements.” In the mutual-fund industry, Anagol and Kim (2012) find that investors are less sensitive to shrouded and amortized fees.

\(^3\) Due to such a concern, a regulation for mortgage compensation is published in the US mortgage market: compensation of mortgage brokers based on the terms and conditions of the loan, except for size, is prohibited. (Loan Originator Compensation and Steering 12 CFR 226, Regulation Z, Federal Reserve System, 2010).
focus on identifying conditions for equilibria in which intermediaries promote a deceptive product with employing deception (i.e., not educating consumers about the hidden attribute).

Section 4 analyzes the basic model. To compare equilibrium outcomes across market structures, I present two benchmark models before the analysis of the basic model. I first show that if firms can unshroud the hidden attribute—markets in which intermediaries are not necessary to help consumers—then a non-deceptive firm always reveals the hidden attribute a deceptive firm has. I next show that if consumers are sophisticated in that they either know which firm has the hidden attribute or anticipate that some firm has the hidden attribute, then a product with lower social surplus is never sold and commissions are driven down to a competitive level. I then investigate the basic model in which firms market through intermediaries and consumers are naive. In this case, the deceptive firm can prevent intermediaries from educating consumers by paying high commissions that the transparent firms cannot compete with. I identify a condition under which this mechanism leads intermediaries to earn positive profits from deception. The condition hinges on an intermediary’s trade-off between market share and the level of commissions: the more intermediaries consumers visit, the larger the market share each intermediary can gain by educating consumers and attracting them from other deceiving intermediaries; but the larger the hidden attribute, the higher the commissions financed from deception. Hence, deception occurs if and only if the profits from the hidden attribute allow the deceptive firm to finance sufficiently high commissions which prevent intermediaries from educating consumers. Moreover, because the deceptive firm has to give a high commission to each intermediary in order to maintain deception, having competition among intermediaries does not lower the level of commissions under deception.

Under deception in which intermediaries earn high commissions, welfare is severely distorted. Intermediaries may profitably sell a product with lower social surplus or even one with negative social surplus. Furthermore, in Section 4.4 I show that consumer welfare becomes lower in the basic model where intermediaries can educate consumers about the hidden attribute than an alternative model where intermediaries cannot educate. This is because high commissions increase the total prices of the products. Although the intermediaries’ role is to help consumers and they could do so in principle, they instead make consumers worse off. I also show that under deception the ex-post utility of consumers is the same under a monopoly intermediary and multiple intermediaries—introducing competition among intermediaries may not increase consumer or social welfare at all.
In Section 5, I discuss various kinds of policy regulations and their limits. I especially focus on the effects of commission regulations. I demonstrate that prohibiting large discrepancies in commissions earned from different products or caps on commissions can facilitate unshrouding and hence can increase consumer and social welfare. Unlike regulations that attempt to restrict hidden attributes directly, the regulation of commissions does not require a policymaker to know which attribute is hidden.\textsuperscript{4} I also discuss policies decreasing the maximum additional payment, letting each consumer reach more intermediaries, and making intermediaries disclose their commission structure.

Section 6 analyzes competition among deceptive firms in which each type of product is provided by multiple firms. Since no firm has monopoly power on product valuations or consumer-exploiting technologies, all firms earn zero profits. In this case, the effect on the profits of intermediaries depends on the relative social surplus of products. If the deceptive product is superior to the transparent product, then no intermediary earns positive profits, consumers’ ex-post utility is positive, and social welfare is maximized. In this case, deceptive firms can compete down prices and commissions without the threat of educating consumers and selling a non-deceptive product because the non-deceptive product is socially inferior. On the other hand, if the deceptive product is inferior to the transparent products—which seems more likely to be the case in practice—then the same trade-off between commissions and market share arises as described in Section 4. If the incentive for earning high commissions outweighs the incentive for expanding market share, then the level of commissions is kept at high levels, intermediaries earn positive profits, and naive consumers receive ex-post negative utility. Nevertheless, competition among deceptive firms increases consumer welfare because the profits of deceptive firms are passed to consumers. Furthermore, under deception increasing the social surplus of transparent products or increasing the consumers’ search intensity decreases consumer welfare because it forces firms to pay higher commissions to maintain deception. Hence, encouraging competition among intermediaries can have a perverse effect on naive consumers.

Section 7 investigates models under consumer heterogeneity: a fraction of consumers is “informed” in the sense that they know which products have hidden attributes. I first show that

\textsuperscript{4} Further, this policy has a positive effect on a relevant issue: preventing firms from inventing new hidden attributes. If the commissions are regulated, then deceptive firms do not have incentives to innovate new hidden attributes because competition among intermediaries leads to detect and unshroud any of them. Hence, intermediaries can work as monitoring institutions once commissions do not distort their incentives.
profitable deception can still occur if each intermediary is able to sell only one product at a time, though the condition for deception becomes more stringent as the fraction of informed consumers increases. I next examine a model in which each intermediary can screen consumers by offering a menu that contains one promoted product and other non-promoted products. In this case, informed consumers always buy a product with higher social surplus at a marginal cost. Importantly, if intermediaries can shroud the existence of non-promoted products as well as the hidden attributes of deceptive products to naive consumers, then the intermediaries can completely segregate the market for naive consumers from the market for informed consumers by such shrouding. As a result, intermediaries promote inferior deceptive products to naive consumers and earn positive profits from them.

Section 8 examines further extensions of the model. Section 9 reviews related theoretical literatures. Section 10 concludes. Proofs and other extensions are provided in the Appendix.

2 Empirical Evidence on Deception and Commissions

This section summarizes empirical evidence on deception and commissions: intermediaries earn high commissions from promoting “worse” products. The evidence indicates the importance and relevance of this paper’s analysis: how commissions affect the incentives of intermediaries for helping consumers choose products.

In order to earn high commissions, intermediaries often steer consumers to worse products. Chalmers and Reuter (2012) study the Oregon University retirement plan and find that customers who consulted with brokers allocate their money more to funds with higher broker fees, though on average these broker-recommended funds underperform a default investment option. Anagol, Cole and Sarkar (2012) report that in the Indian life-insurance market, 60-80% of salespeople recommend strictly-dominated insurance plans associated with high commissions. In the mutual-fund industry, Empirical evidence by Hackethal, Haliassos and Jappelli (2012) and Del Guercio and Reuter (2012) suggests that financial advisors often promote high-fee funds with worse returns than available alternatives. An audit study conducted by Mullainathan, Nöth and Schoar (2010)

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5 Agarwal and Ben-David (2012) study a field experiment conducted by “one of the largest U.S. commercial banks.” In the experiment, each mortgage loan officer is assigned either a fixed-wage scheme or a commission-based compensation scheme. Although the commission-based scheme increases the number of approved loans and observable credit quality and rating, such loans are 28% more likely to default than those originated by fixed-wage loan officers.
shows that most financial advisors cater to their customers’ biases and promote high-fee funds. Bergstresser, Chalmers and Tufano (2009) report that funds sold by intermediaries deliver lower risk-adjusted returns than funds directly sold to consumers. The relation between commissions and fund performance is extensively investigated by Christoffersen, Evans and Musto (2013). The authors report that a 1% point increase in commissions leads to a 0.4464% increase in annual fund flows, whereas the increase in commissions predicts a 0.34% decrease in future performance net of fees—suggesting that high commissions lead intermediaries to promote unattractive products.

3 Basic Model

This section introduces a basic model. Section 3.1 sets up the model. Section 3.2 discusses three key assumptions throughout this paper: consumers have misperceptions about certain product attributes, intermediaries can educate consumers about the attributes, and firms cannot directly educate consumers about the attributes other firms have.

3.1 Setup

Consider a market with two product providers and a unit mass of homogenous consumers. Firm \( x \in \{D, T\} \) sells product \( x \) with valuation \( v_x > 0 \) and production cost \( c_x > 0 \). Firm \( D \) is a deceptive firm that charges a hidden fee \( \pi \geq 0 \), whereas firm \( T \) is a non-deceptive firm that produces a transparent product with no hidden fee. Each consumer buys at most one item. Consumers are naive but teachable as in Gabaix and Laibson (2006) and Heidhues et al. (2012c): when they make purchase decisions, they ignore \( \pi \) if and only if \( \pi \) is shrouded (i.e. not revealed) to them. For simplicity, assume that \( \pi \) is exogenous and consumers cannot avoid it after purchase.\(^6\) I assume that firm \( T \)'s product is socially valuable \((v_T - c_T > 0)\); otherwise the product is never profitably sold in the market. On the other hand, firm \( D \)'s product may be socially wasteful \((v_D \) may be smaller than \( c_D \)). Note that in this setting firm \( D \) has monopoly power for potentially exploiting consumers by \( \pi \); Section 6 analyzes a model with many firms in which no firm has monopoly power over a product valuation or a shrouded attribute.

A key feature of the model is that firms must delegate their sales to common-agent intermediaries.

\(^6\) If instead the hidden fee is avoidable and endogenously chosen by firm \( D \), then the firm sets the hidden fee equal to a monopoly price after consumers are locked-in.
by paying commissions. Denote the total number of intermediaries in the market by $J \geq 2$. Each consumer visits an exogenously given number $N(\leq J)$ of intermediaries randomly. I assume that $N \geq 2$ for analyzing competitive environments among intermediaries.\(^7\) Each intermediary chooses which product to promote and whether to unshroud (i.e. educate about) the hidden attribute $a$ to the consumers who visit.\(^8\) If no intermediary unshrouds $a$, then a consumer ignores $a$ in her purchase decision; but if at least one intermediary unshrouds, then she takes $a$ into account. All parties are risk neutral. To highlight results and intuitions in a simple manner, I assume that each intermediary can educate all consumers who visit and that the cost of unshrouding is zero.\(^9\)

The timing of the game is as follows. First, firm $x \in \{D, T\}$ simultaneously proposes a product price $p_{xi}$ and a commission per sale $f_{xi}$ to intermediary $i \in \{1, \ldots, J\}$. After observing all of these contracts, each intermediary chooses one product to promote and whether to unshroud the hidden fee. Then, each consumer randomly reaches $N$ intermediaries and makes a purchase decision; if they weakly prefer buying and are indifferent among a subset of intermediaries, these intermediaries split the demand equally. Finally, all transactions are implemented. I investigate pure-strategy subgame-perfect Nash equilibria played by firms and intermediaries. I assume that no party sets its total price below its total cost; any of such strategies is weakly dominated.\(^{10}\)

In the analysis, I focus on identifying conditions for and properties of shrouding equilibria: equilibria in which $a$ is shrouded to some consumer. To avoid coordination problems of shrouding decisions among intermediaries, I impose an equilibrium-selection assumption: if intermediaries shroud $a$ in some subgame, then they shroud $a$ whenever doing so comprises an equilibrium in a subgame. Since no intermediary has an incentive to shroud if other intermediaries unshroud, an unshrouding equilibrium—an equilibrium in which all consumers are educated—always exists. Whenever a shrouding equilibrium exists, however, it is more plausible to be played among intermediaries than the unshrouding equilibrium in the following reasons. First, no intermediary can earn positive profits in the unshrouding equilibrium. Second, intermediaries play a weakly-dominated

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\(^7\) In the US mortgage industry, Woodward and Hall (2012) suggest that most consumers visit two brokers for their loan originations. Section 8.2 examines a model with incorporating heterogeneity in the number of intermediaries each consumer visits and some consumers visiting only one intermediary.

\(^8\) Since consumers’ taste is homogenous in the basic model, without loss of generality each intermediary promotes only one product. In Section 7, I incorporate consumer heterogeneity in naivete and analyze how intermediaries screen consumers by a menu offer.

\(^9\) In later sections, I investigate further extensions of the basic model. Section 8.1 discusses the case when intermediaries can also charge advising fees to consumers directly. In the Appendix, I analyze a model with incorporating limited unshrouding and the positive cost for unshrouding.

\(^{10}\) This can be shown by the same logic with Kartik (2011).
3.2 Discussion of Key Assumptions

The model in Section 3.1 has three key assumptions: (i) consumers have misperceptions about a product attribute, (ii) intermediaries can educate consumers about the attribute, and (iii) firms cannot directly educate consumers about the attribute other firms have. This subsection discusses these assumptions in turn.

(i) In the model, $\bar{\alpha}$ represents the amount by which a consumer misperceives the attributes of the product that can be hidden fees, qualities or risks. As examples of hidden fees, Gurun et al. (2013) report that post-introductory interest rates of option ARMs are not salient due to “deceptive advertisements” and the advertisements lead consumers to choose worse mortgages. Woodward and Hall (2012) find that some consumers originating mortgage loans pay high broker fees because of a confusing payment scheme.\(^\text{11}\) By examining a natural experiment in the Indian mutual-fund industry, Anagol and Kim (2012) show that consumers tend to pay higher fees to mutual funds when the fees are amortized and shrouded.

If $\bar{\alpha}$ is a hidden quality or risk rather than a hidden fee, the model is translated to which naive consumers perceive the valuation of product $D$ to be $v_D + \bar{\alpha}$ while the actual valuation is $v_D$. As examples, individual investors may misperceive the future returns or volatilities of actively-managed funds relative to index funds, though studies by Malkiel (1995), Gruber (1996), and French (2008) report that actively-managed funds underperform index funds after fees taking into account. Patients may think the efficacy of a brand-name drug is much better than that of generic drugs with exactly the same ingredients. Customers looking to buy real estate can be inattentive to bad qualities a real-estate agency knows. People buying insurance might over-estimate the likelihood of the accident or disaster. Consumers buy fancy HDMI (high-definition multimedia interface) cables that cost more than $500 even though tests by engineers indicate that its quality is exactly the same as a $5 cable. In these cases, deceptive firms set high product prices instead of charging additional fees. All of the following results hold under this alternative setting after modifying the product price of a deceptive firm from $p_D$ to $p_D + \bar{\alpha}$.

\(^{11}\) Specifically, Woodward and Hall (2012) report that consumers who compensate a mortgage broker with both a direct cash payment and a commission from a mortgage lender pay twice as much as similar consumers who pay with cash alone or with a commission alone.
Notice that naive consumers do not infer the amount of $\bar{\tau}$ from the levels of commissions and prices. Indeed, evidence summarized in Section 2 suggests that consumers are often inattentive to the incentives of intermediaries.\textsuperscript{12} Related to this issue, Section 5.4 discusses policies on mandatory disclosure of commissions structures.

(ii) Experts often educate consumers about how to choose products. Indeed, helping consumers choose products is thought to be a central role of intermediaries. Doctors teach consumers which treatment is better for them, real-estate agents can tell defects of a building, and financial advisors and mortgage brokers can reveal shrouded costs of their products. Experts in these industries are often indispensable because consumers cannot figure out the actual value of products without the help of experts.

In addition to above, the experts can provide certified information or clear analysis to modify consumers’ misperceptions, whereas providing such information is either costly or often impossible to non-experts. One motivation of this paper is to explain why intermediaries in some industries do not seem to give consumers correct information even when they compete for market share. The main logic of the basic model holds so long as experts can change consumers’ purchase behavior through education.

(iii) This paper focuses on markets in which the help of intermediaries is indispensable for some consumers. Note that if firms can educate most consumers about an attribute other firms have without going through intermediaries, then non-deceptive firms would unshroud the attribute as analyzed in Section 4.1. For the industries illustrated above, however, it is natural to think that intermediaries as experts are necessary and direct education by firms is harder than unshrouding through the intermediaries. For example, in the pharmaceutical industry, a doctor’s advice is much more trusted than a drug company’s advertisement, and doctors also have much precise information about their patients. In the mutual-fund or mortgage industry, consumers visit intermediaries exactly because they want to get advice from experts. Since intermediaries as experts can give direct advice customized to each consumer, education by experts are often easier than that by product providers.\textsuperscript{13}

\textsuperscript{12} Also, Malmendier and Shanthikumar (2007) report that small investors literally follow the stock recommendations of security analysts, though the recommendations of the analysts have an upward bias.

\textsuperscript{13} Beyond the basic model, it is possible that non-deceptive firms can use mass advertisements for unshrouding. In that case, however, deceptive firms and intermediaries can also use “counter-advertisements.” Furthermore, if profitable shrouding can occur, then deceptive firms and intermediaries have much more resources and incentives to make naive consumers confused. Hence, unshrouding can be difficult without a direct consultation with an expert.
To focus on an explicit agency problem of intermediaries, I assume away the situations that intermediaries are vertically integrated with firms a priori and that intermediaries can buy out products and set product prices by themselves. In my model, these market structures are none other than those in retail markets as in Section 4.1. I also discuss the case in which firms can buy out intermediaries in Section 4.3.

4 Analysis of the Basic Model

This section analyzes the basic model. I first describe two benchmark models. Section 4.1 shows that there is no shrouding equilibrium if firms can directly unshroud a hidden attribute other firms have.\(^{14}\) Section 4.2 shows that if all consumers either know which firm has the hidden attribute or anticipate that some firm has the hidden attribute, then intermediaries never get positive commissions. These two benchmarks demonstrate that both a common-agency information structure and consumer naivete are necessary for profitable deception. Section 4.3 investigates the basic model presented in Section 3.1, establish a condition under which a shrouding equilibrium exists, and discuss the implications on comparative statics. Section 4.4 presents welfare analysis on the educational role of intermediaries and on the effect of competition among intermediaries.

4.1 Benchmark 1: Equilibrium When Intermediaries Are Not Necessary

This subsection analyzes a benchmark model in which consumers are naive and firms directly market to the consumers. Firm \(x \in \{D, T\}\) simultaneously chooses its price \(p_x\) and whether to unshroud the hidden attribute firm \(D\) has. Notice that there always exists a Nash equilibrium played by firms in which firm \(T\) unshrouds and a firm providing a lower social-surplus product chooses marginal-cost pricing.\(^{15}\)

Suppose there exists a shrouding equilibrium. Since the firms are facing Bertrand-type price competition, in equilibrium each consumer is indifferent between buying product \(D\) and \(T\) without

\(^{14}\) In the Appendix, I analyze other variants of models with direct unshrouding: firms choose unshrouding after observing their pricing decisions, and firms choose pricing after observing their unshrouding decisions. In each of these timings, no shrouding equilibrium exists.

\(^{15}\) This comes from the fact that once the hidden attribute is unshrouded, the game becomes classical Bertrand-type price competition in a vertically-differentiated market. Precisely, there exists an unshrouding equilibrium such that \(p_D^* = c_D, p_T^* = \min\{v_T, v_T - (v_D - c_D)\}\) and all consumers buy firm \(T's\) product if \(v_D - c_D \leq v_T - c_T\), whereas \(p_D^* = v_D - (v_T - c_T), p_T^* = c_T\) and all consumers buy firm \(D's\) product if \(v_D - c_D > v_T - c_T\).
taking \( \bar{a} \) into account:

\[
v_D - p_D^* = v_T - p_T^*.
\]

In addition, either \( p_D^* = c_D - \bar{a}, p_T^* = v_T - (v_D - c_D) - \bar{a} \) or \( p_D^* = v_D - (v_T - c_T), p_T^* = c_T \)
holds in such an equilibrium; otherwise some firm will undercut the other firm. In either case, by unshrouding firm \( T \) can charge a higher price and still attract all consumers. In other words, the non-deceptive firm can always increase its relative market power by unshrouding. The following result is a variant of Proposition 6 in Heidhues et al. (2012c):

**Proposition 1** (Equilibrium in the Absence of Intermediaries). Suppose firms directly market to consumers, and choose pricing and unshrouding decisions at the same time. Then, there exists a unique equilibrium in which the hidden attribute is unshrouded.

In the Appendix, I examine the different specifications of timing between pricing and unshrouding, and shows that for any specification shrouding never happens in equilibrium if firms can directly unshroud. This is because the non-deceptive firm can always increase its competitive advantage by unshrouding.

### 4.2 Benchmark 2: Equilibrium without Naivete

As another benchmark, suppose firms sell their products through intermediaries but all consumers are informed about the hidden attribute. These informed consumers observe which product has \( \bar{a} \). Proposition 2 summarizes the equilibrium outcomes in that case:

**Proposition 2** (Equilibrium without Naivete). Suppose firms market through intermediaries and all consumers are informed. Then, in any equilibrium only a product with the highest social surplus is sold and all intermediaries earn zero profits. The consumers’ ex-post utility is non-negative and is positive if \( v_D - c_D > 0 \).

If all consumers know about the hidden attribute, then competition among intermediaries lowers the level of commissions to zero. Also, consumer welfare is positive if and only if the social surplus of product \( D \) is positive; otherwise firm \( T \) sets its monopoly price and hence consumers’ utility is non-negative.

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16 Note that the proposition is stated in terms of utility and profits rather than what intermediaries actually do. There is a non-essential multiplicity of equilibria due to the fact that some firm makes zero profits. This multiplicity affects neither firms’ and intermediaries’ profits nor consumer welfare.
zero. Social welfare is maximized because a firm with a superior product serves entire market in equilibrium.

Notice that the result remains the same if instead consumers are attentive to the existence of a hidden attribute but do not know which product has the hidden attribute. Intuitively, in this case unshrouding increases consumers’ willingness to pay to a transparent product and hence the non-deceptive firm always leads an intermediary to unshroud and promote own product. Then, a standard Bertrand-competition argument is applied.17

4.3 Equilibrium in the Basic Model

Now I investigate the model presented in Section 3: firms sell their products through intermediaries and consumers are inattentive to hidden attributes.

I first derive conditions for equilibria in which all intermediaries promote the deceptive product with shrouding. Suppose such an equilibrium exists. Let $h$ be an intermediary who is proposed the lowest product price of firm $T$: $p_{Th} = \min_s p_{Ts}$. I first show that $p^*_T \leq v_T$. Suppose not. Then, consumers do not buy product $T$ from intermediary $h$ even when the attribute is unshrouded, and hence firm $D$ would set $p_{Di} = v_D$ and $f_{Di} = 0$ for all $i$. But then firm $T$ can profitably deviate by proposing $p^T_h = v_T - \epsilon$, $f^T_h = \epsilon$ for small $\epsilon > 0$. Also, $v_D - p^*_D \leq v_T - p^*_T$ for all $i$; otherwise firm $D$ would increase its product prices. The above two inequalities imply that if intermediary $h$ unshrouds and promotes product $T$, then all consumers strictly prefer to buy it. Hence, $f^*_D h \geq N f^*_T h$; otherwise intermediary $h$ would unshroud and sell product $T$. Also, $f^*_D h \leq N f^*_T h$; otherwise firm $D$ can profitably decrease its commissions without changing intermediaries’ actions. Thus,

$$f^*_D h = N f^*_T h.$$  

Given the inequality, firm $T$ cannot profitably increase $f^*_T h$ in equilibrium; otherwise firm $T$ would increase $f^*_T$ by a bit and let intermediaries promote own product. Hence,

$$f^*_T h = p^*_T h - c_T.$$  

Also, $p^*_T \geq v_T$ holds because otherwise firm $T$ can increase $p^*_T h$ by $2\epsilon$ and $f^*_T h$ by $\epsilon$ for some $\epsilon > 0$, let intermediary $h$ unshroud and promote product $T$, and earn positive profits. Hence,

$$p^*_T h = v_T.$$  

17 See the Appendix for details.
Combining the inequalities $v_D - p^*_D i \leq v_T - p^*_T h$ for all $i$ and $p^*_T h = v_T$ yields $p^*_D i \geq v_D$ for all $i$. Since consumers buy product $D$, their perceived utility of buying it must be non-negative. Hence,

$$p^*_D h = v_D.$$ 

The above four equalities uniquely pin down the contracts to intermediary $h$: $p^*_T h = v_T, f^*_T h = v_T - c_T, p^*_D h = v_D, f^*_D h = N(v_T - c_T)$. Since $p^*_T h$ is the lowest product price of firm $T, p^*_D i = v_D$ and $f^*_D i = N(v_T - c_T)$ hold for all $i$; otherwise firm $T$ can profitably deviate by letting $i$ deviate and unshroud. Hence, if the equilibria exist, then the equilibrium outcome is unique in which all consumers buy product $D$ with $p^*_D i = v_D, f^*_D i = N(v_T - c_T)$.

Notice that neither firm $T$ nor intermediaries have incentives to deviate. I now investigate when firm $D$ has an incentive to follow the above strategy. Firm $D$ earns non-negative profits given the above strategies if and only if $p^*_D i + \bar{\alpha} - c_D - f^*_D i \geq 0$. Also, firm $D$ prefers to follow the above strategy rather than to set $p'_D i = v_D - \bar{\alpha} - \epsilon, f'_D i = f^*_T i + \epsilon$ for some $\epsilon > 0$ and to let intermediaries unshroud and promote own products if and only if $\bar{\alpha} \geq f^*_D i - f^*_T i$. Intuitively, the difference of commissions should not be larger than the profits from deception. By combining these two inequalities, I obtain the following “Shrouding Condition”:

$$\min\{v_D - c_D, v_T - c_T\} + \bar{\alpha} \geq N(v_T - c_T).$$ (SC)

The shrouding equilibrium exists if and only if Condition (SC) holds. Notice that in this equilibrium naive consumers’ ex-post utility is $-\bar{\alpha} < 0$, firm $D$ earns positive profits if Condition (SC) holds with strict inequality, firm $T$ has no market share, and each intermediary has $1/J$ of the market share and earns $N(v_T - c_T)/J > 0$ of total profits.

In the Appendix, I show that in any shrouding equilibrium all intermediaries promote the deceptive product with shrouding. Also, if $\bar{\alpha}$ is unshrouded to all consumers, then commissions are competed away as in Proposition 2. These considerations lead to Proposition 3:

**Proposition 3** (Main Proposition). Suppose firms market through intermediaries and all consumers are naive.

(i) A shrouding equilibrium exists if and only if Condition (SC) holds. In any shrouding equilibrium, the equilibrium outcomes are the same. In the equilibrium, all consumers receive ex-post negative utility. Each intermediary promotes the deceptive product with shrouding and earns posi-
tive profits. The deceptive firm earns positive profits if Condition (SC) holds with strict inequality. The non-deceptive firm earns zero profits.

(ii) If Condition (SC) does not hold, then the hidden attribute is unshrouded to all consumers, intermediaries earn zero profits, and social welfare is maximized.

Condition (SC) illustrates the key trade-off throughout this paper: the larger the hidden attributes ($\bar{a}$) are, the higher commissions the deceptive firm can give to each intermediary; but the more intermediaries each consumer visits ($N$), the larger market share each intermediary can gain from unshrouding. As a result, deception occurs if the profits from deception allow the deceptive firm to give much higher commissions to intermediaries than the non-deceptive firm.

Proposition 3 (i) highlights that competition among intermediaries may not lower the equilibrium level of commissions. This is because deceptive firm needs to give each intermediary a high commission for maintaining deception. This result brings a new insight for the relation between commissions and the role of intermediaries: although high commissions often implies that intermediaries are valuable in classical models, Proposition 3 (i) implies that disproportionately high commissions may indicate that intermediaries promote products in a socially-inefficient way. This result could help explain why actively-managed mutual funds and option adjustable-rate mortgages are able to charge much higher fees than alternative products such as index funds and traditional fixed-rate mortgages. Furthermore, so long as Condition (SC) is satisfied, the increase of the number of intermediaries consumers reach raises the level of commissions intermediaries earn. Intuitively, as the consumers’ search intensity $N$ increases, unshrouding becomes more attractive to each intermediary. Hence, the deceptive firm needs to set a higher commission per sale to maintain deception. Similarly, so long as Condition (SC) holds, the level of commissions is increasing in the social surplus of the transparent product. As an alternative product becomes more attractive, a deceptive firm needs to give higher commissions in order to maintain shrouding.

Deception can severely harm welfare. Proposition 3 (i) shows that if Condition (SC) holds, then the deceptive firm can profitably sell an inferior product (i.e., $v_D - c_D < v_T - c_T$), leading to suboptimal social and consumer welfare. Worse, the deceptive firm can profitably sell its product even when the product is socially wasteful (i.e., $v_D - c_D < 0$): deception may enable products to survive that should not exist in the market.

Proposition 3 (ii) shows that deception is a concern only when it is substantial. Notice that
Condition (SC) holds only when \( \bar{a} > v_T - c_T \): the misperceived value of a product is larger than the social surplus of the alternative product—the lack of “minor” deception. Furthermore, this implies that the more important the educational role of intermediaries is (the higher \( \bar{a} \) is), the less likely the intermediaries serve their role (educating consumers about \( \bar{a} \)).

If Condition (SC) is satisfied, then the non-deceptive firm cannot vertically integrate with an intermediary. This is because the firm has to pay more than its social surplus, \( v_T - c_T \), to buy out the intermediary. One can also think that some intermediaries care about honesty as well as their profits. There are two natural extensions to incorporate such honesty. As a first extension, consider a fraction of intermediaries whose are totally honest and sell only non-deceptive products.\(^{18}\) So long as the fraction of consumers who reach such totally-honest intermediaries is not large, shrouding can still occur in equilibrium: non-totally-honest intermediaries focus only on attracting the rest of uneducated consumers. Since the market share of the fee-only advisors—who do not receive any commission—in the mutual-fund industry is only 1-2 percent and that of discount brokerage is less than 10 percent, it looks reasonable to think that most of naive consumers do not reach any non-deceptive firms/intermediaries in financial markets. As a second extension, consider intermediaries incur a cost \( \rho > 0 \) from deception, where \( \rho \) represents the cost of losing reputation or a dishonesty cost. In this case, in order to maintain deception a deceptive firm needs to give a commission of \( N(v_B - c_B) + \rho \) to each intermediary. Hence, if intermediaries are a little bit honest, then under deception it further raises the level of commissions. Intuitively, if intermediaries incur disutility from deception, then deceptive firms need to compensate more. Indeed, in Section 6 I show that the honesty concern of intermediaries can decrease consumer welfare if it is not sufficient to generate transparency in the market.

Going slightly beyond the basic model, a caveat for deception through intermediation is that a non-deceptive firm has an incentive to create in-house intermediaries for unshrouding. This practice is equivalent to directly marketing with unshrouding, and if the cost of creating such in-house intermediaries is small, then the hidden attribute would be unshrouded. In some industries, however, this kind of practice is prohibited. As a prominent example, doctors cannot sign prescription

\(^{18}\) Relatedly, a non-deceptive firm selling its product through own sales agency with exclusive-dealing contracts can also be regarded as such a totally-honest intermediary in my setting. In the Appendix, I discuss the case in which a non-deceptive firm with being able to unshroud can reach a fraction of consumers as well as intermediaries, and shows that intermediaries do not unshroud in equilibrium as long as the fraction of consumers the non-deceptive firm can reach is not large.
agreements with any company. Moreover, as the market grows competition among each type of firm is likely to happen, as analyzed in Section 6. Because no firm earns positive profits in that case, the incentive to create in-house intermediaries is limited in an established market.

4.4 Welfare Analysis on Intermediaries

This subsection analyzes two welfare effects on intermediaries. Note again that if Condition (SC) does not hold, then intermediaries educate all consumers in the basic model. Hence, in this case consumer are not exploited and commissions are competed down to zero. When Condition (SC) holds, however, there are perverse welfare effects on intermediaries.

I first examine the effect on having intermediaries which can educate consumers. To investigate the effect by comparing different market structures, consider an alternative model in that all consumers are naive and intermediaries cannot unshroud the hidden attribute. When Condition (SC) is satisfied, all consumers buy the deceptive product. Unlike the basic model, however, intermediaries earn zero profits in any equilibrium because the deceptive firm can profitably undercut its commissions if the intermediaries cannot unshroud \( \bar{a} \). Consumers’ ex-post utility in this case is the social surplus of the alternative product minus the hidden cost: \( (v_T - c_T) - \bar{a} < 0 \). Notice that it is larger than \( -\bar{a} \): the ex-post utility under the shrouding equilibrium in the basic model.

**Proposition 4** (Welfare Comparison on the Educational Role of Intermediaries). Suppose Condition (SC) holds. Then, consumer welfare is lower when intermediaries can unshroud the hidden attribute than when they cannot.

Proposition 4 demonstrates that the existence of intermediaries which can educate consumers may decrease consumer welfare. To see the intuition, commissions are bid down to zero when intermediaries cannot unshroud. In contrast, for maintaining deception high commissions are paid to intermediaries in the basic model. Consumers buy the deceptive product in both cases and they ultimately bear the cost of commissions a firm pays to an intermediary. Therefore, the total prices of products become higher and hence the consumer welfare becomes lower in the basic model than the alternative model where intermediaries cannot educate consumers—when deception is an issue, having intermediaries as experts makes the consumers worse off.

I next discuss the effect on having competition among intermediaries. Suppose a modified model in which there is only one intermediaries in the market \( N = 1 \). Under consumer naivete,
the intermediary promotes a product which brings higher profits, and hence it promotes product \( D \) if and only if \( v_D - c_D + \bar{a} \geq v_T - c_T \). If the inequality holds, then the equilibrium is \( p_D = v_D, f_D = v_T - c_T, p_T = v_T, f_T = v_T - c_T \) and the monopoly intermediary promotes the deceptive product with shrouding. Consumers’ ex-post utility in this case is \( -\bar{a} < 0 \). On the other hand, if \( v_D - c_D + \bar{a} < v_T - c_T \), then the monopoly intermediary promotes the transparent product and consumers’ ex-post utility is zero.

**Proposition 5** (Welfare Comparison on Having Competition among Intermediaries). Suppose Condition (SC) holds. Then, the ex-post utility of consumers is the same under a monopoly intermediary and under multiple intermediaries.

Proposition 5 sharply contrasts with the model with rational consumers in which they get zero utility under a monopoly intermediary but (if \( v_D - c_D > 0 \)) they get positive utility under competition among intermediaries. Under profitable deception, competition among intermediaries does not increase naive consumers’ ex-post utility at all. Notice that, however, the condition for profitable deception becomes stringent as \( N \) increases. Hence, in the basic model, the increase of competitiveness among intermediaries either makes the market clean or does not affect consumer welfare at all.

## 5 Policy Analysis

This section discusses various policy interventions. Section 5.1 analyzes policies that regulate commissions. Section 5.2 discusses direct regulations on the hidden attributes. Section 5.3 examines policies that lead consumers to reach more intermediaries. Section 5.4 discusses mandatory disclosure of commissions structures.

### 5.1 Regulations on Commissions

This subsection, discusses regulations on commissions. In the basic model, a simple intervention can ensure unshrouding. Suppose a policymaker enacts a policy in which the commissions are capped. Under this regulation, intermediaries alway unshroud and try to attract competitors’ demand because the firms’ ability to manipulate intermediaries’ incentives is limited:
Proposition 6 (Regulating Commissions). Suppose commissions are restricted to $f_{ni} < N(v_T - c_T)$ for all $n, i$. Then, in any equilibrium the hidden attribute is unshrouded to all consumers, intermediaries earn zero commissions, and social welfare is maximized.

Proposition 6 shows that a direct price control in a competitive market may increase welfare. Intuitively, information externalities about hidden attributes makes the commission regulation help consumers. Once the difference of the level of commissions is restricted, intermediaries cannot get higher commissions from deception, and hence choose to unshroud in order to increase their market share. If Condition (SC) holds in the basic model, then the ex-post utility of naive consumers who reach the regulated intermediary increases from $\bar{\pi}$ to 0 if the market still remains shrouded and to $\min\{\max\{0, v_D - c_D\}, v_T - c_T\}$ if the market becomes clear by the regulation. Social welfare also increases when $v_D - c_D < v_T - c_T$, because naive consumers always buy a superior product under the regulation.

In some industries, firms cannot charge different commissions across products. For example, in September 2010 the Board of Governors of the Federal Reserve System published a final rule amending Regulation Z (Loan Originator Compensation and Steering 12 CFR 226) in that compensations to mortgage brokers based on the terms and conditions (other than size) of the loan is prohibited. Doctors are prohibited to get direct commissions from pharmaceutical companies in many countries. Further, there are various kinds of caps on commissions and fees in many industries.

An alternative regulation along with the mortgage industry is to set a uniform commission across products: $f_{Di} = f_{Ti}$ for intermediary $i$. Then, intermediary $i$ has no incentive to shroud the hidden attribute. Note that the policy does not regulate the “level” of commissions, because the intent of this policy is to disallow price discrimination to firms by commissions.

As a potential advantage, regulation on commissions does not require that policy makers have detailed knowledge about hidden attributes. Unlike policies that need to figure out which attributes firms use to exploit consumers, policy makers do not need to know how firms exactly deceive consumers as long as they know industry-wide deception is an issue in that market.

The policy works even when firms can invent a new exploiting technology. Suppose before the price-setting stage, the deceptive firm can engage in an “exploitative innovation” with a positive innovation cost $I_a > 0$ which increases the maximum hidden payment by $\Delta a > 0$. Assume that the
innovation is appropriable.\textsuperscript{19} The next corollary highlights the positive role of intermediaries when the commissions are regulated:

**Corollary 1** (Exploitative Innovations). Suppose Condition (SC) holds in the basic model. Consider prior to the price-setting stage, firm D has an opportunity to increase the hidden payment from $\pi$ to $\pi + \Delta a$ by paying investment cost $I_a > 0$.

(i) If there is no regulation, then firm D invests on the innovation if and only if $I_a \leq \Delta a$. Consumers’ ex-post utility is $-\pi - \Delta a$ if the investment takes place and is $-\pi$ if not. Social welfare is not maximized if the investment takes place.

(ii) If commissions are regulated to $f_{ni} < N(v_T - c_T)$ for all $n, i$, then firm D never invests on the innovation. Consumers’ ex-post utility is $\min\{\max\{0, v_D - c_D\}, v_T - c_T\}$. Social welfare is always maximized.

Corollary 1 (i) implies that the welfare-harming innovation can occur under no regulation. Since the increase of $\pi$ enables one-to-one money transfer from naive consumers to deceptive firms, the deceptive firms have strong incentives to invent a new exploiting technology. Such an investment is a pure waste from a social perspective. Moreover, it implies a vicious cycle of deception: once the hidden attribute is large enough, then deception takes place, and the deception leads to incentive to invent new hidden payment, and so on.

In contrast, Corollary 1 (ii) shows that deceptive firms never invest on exploitative innovations because intermediaries would detect and unshroud new hidden attributes under commission regulations. Comparison between Corollary 1 (i) and (ii) brings an important message: a policy maker may want intermediaries because of the problem of shrouded attributes—the existence of intermediaries as information providers can improve welfare once the commissions do not distort the intermediaries’ incentives.

To my best knowledge, this is the first policy identified in the economics literature that can prevent the innovation of new hidden attribute. The innovation of new hidden fees seems to occur in the recent credit-card market, mutual-fund, and non-traditional mortgage markets. Notice that, however, intermediation does not seem to play a central role in the credit-card market and

\textsuperscript{19} Heidhues, K˝ oszegi and Murooka (2012b) investigate innovation incentives of deceptive firms in a market with no intermediary. By focusing on the appropriability of the innovation, Heidhues et al. (2012b) highlight perverse effects of innovation incentives when the up-front prices of the products are binding from below.
hence a policymaker needs some other interventions to prevent deception in that market. Hence, this kind of policies works only when intermediation is necessary for consumers.

One caveat of such commission regulations is that—as Inderst and Ottaviani (2012c) and others have pointed out—such regulations may create moral-hazard problems of intermediaries. For example, the regulation may distort intermediaries’ incentives to search better products for each customer.\(^\text{20}\) Nevertheless, the prevalence of such policies, as well as the empirical evidence in Section 2, suggest that such commission regulations could be beneficial when deception is a concern.

### 5.2 Regulations on Hidden Attributes

Consider a regulation that directly decreases the maximum amount of hidden payment \(\bar{\pi}\).\(^\text{21}\) Note that in the shrouding equilibrium, the ex-post profits of the deceptive firm and each intermediary are \((v_D - c_D) - N(v_T - c_T) + \bar{\pi}\) and \(v_T - c_T\), and the ex-post utility of a naive consumer is \(-\bar{\pi}\). Hence, the decrease in \(\bar{\pi}\) benefits consumers one-to-one. Akin to Heidhues and K˝oszegi (2010) and Heidhues et al. (2012c), this insight provides a counter-example to a popular argument against the Credit CARD Act and many other consumer-protection regulations that its costs to firms will be passed on to consumers. Furthermore, a decrease in \(\bar{\pi}\) makes Condition (SC) harder to hold. In that case, the market becomes non-deceptive, the level commissions discontinuously decreases, and social welfare increases.

In contrast to the commission regulations described in the previous subsection, a policy decreasing \(\bar{\pi}\) is effective even when deceptive firms can give secret bribing to intermediaries. There are some potential drawbacks, however. It might be hard for the policy maker to identify which attributes are used to exploit naive consumers. Also, deceptive firms still have strong incentives to invent new hidden attributes that policy makers do not know. In addition, if \(\bar{\pi}\) is not hidden payment but a mis-perceived quality or risk, then policy makers might be hard to regulate it directly.

\(^{20}\) Inderst and Ottaviani (2012c) focuses on the moral-hazard problem of intermediaries’ side. In contrast, the exploitative innovation can be regarded as the moral-hazard problem of deceptive firms’ side. This has not highlighted in the behavioral IO literature compared to the potential huge welfare loss.

\(^{21}\) Although setting such regulations seem difficult in general, it may be possible in some specific cases. For example, the Credit Card Accountability, Responsibility, and Disclosure (Credit CARD) Act of 2009 limits late-payment fees, over-the-limit fees, and other fees. This prevents credit-card companies from charging high additional payments. See Heidhues and K˝oszegi (2010) for detailed discussion.
5.3 Enhancing the Access to Intermediaries

As discussed in Section 4.3, Condition (SC) implies that the increase of $N$ can eliminate deception. Proposition 3 highlights a potential impact on welfare as the number of intermediaries decreases beyond a critical threshold. On the other hand, the increase of $N$ does not affect consumer and social welfare as long as Condition (SC) holds.

It is worth mentioning that this kind of policy is robust to secret bribing and to the detailed knowledge of which attributes are hidden. However, the policy has at least one potential drawback: firms have strong incentives to invent new hidden attributes. Moreover, Section 6 and 7 show that in extended models the increase of $N$ harms naive consumers more as long as Condition (SC) is maintained.

Relatedly, regulations of disallowing exclusive dealings (as in doctors’ market) could be harmful to naive consumers, because non-deceptive firms may not be able to sell their products under common agencies. Hence, in my model allowing exclusive dealing might be beneficial to consumers provided intermediaries affiliated from a non-deceptive firm can reach most consumers.

5.4 Mandatory Disclosure of Commission Structure

In the basic model, naive consumers do not infer the existence of hidden attributes from product prices. If consumers can rationally anticipate the existence of hidden attributes from observing high commissions, then mandatory disclosure of commissions structure is effective to make the market clear. As a potential advantage, this policy is robust to the detailed knowledge about hidden attributes.

Notice that, however, people often do not rationally infer a hidden component from observable characteristics. For example, Malmendier and Shanthikumar (2007) report that small investors are inattentive to the systematic upward bias of stock recommendations of analysts. Moreover, these investors do not utilize the information about affiliations of the analysts that predict the extent of the bias. Moreover, if consumers mis-interpret observable actions, then the disclosure of commissions structure is not enough to make the market transparent. For example, individual investors might naively guess that the high commissions of mutual funds indicate high performances, whereas Christoffersen et al. (2013) report that they actually indicate future low performance. In addition, Section 7.1 shows that such disclosure can decrease consumer and social welfare if the
disclosure is not enough to eliminate deception.

6 Competition among Each Type of Firm

This section analyzes a modification of the basic model in which there are multiple deceptive firms as well as multiple non-deceptive firms in a market. I focus on identifying conditions for shrouding equilibria in which each type of firm chooses the same strategy and consumers buy deceptive products.

Suppose such a shrouding equilibrium exists. Note that in this model, the equilibrium profits of each deceptive firm must be zero: $f^*_D = p^*_D - c_D + \pi$ because otherwise each of them can increase its commission by a bit and increase its market share discontinuously. In the following, I analyze two cases, $f^*_D = 0$ for all $i$ and $f^*_D > 0$ for some $i$, and derive the equilibrium conditions in turn.

Consider a case that $f^*_D = 0$ for all $i$. Then, $p^*_D = c_D - \pi$. In this case, non-deceptive firms can profitably deviate by setting $p^*_T_i = \min\{v_T - (v_D - c_D) + 2\epsilon, v_T\}, f^*_T_i = \epsilon$ for some $\epsilon > 0$ and let intermediaries unshroud if $v_D - c_D < v_T - c_T$. Hence, $f^*_D = 0, p^*_D = c_D - \pi$ constitute a shrouding equilibrium if $v_D - c_D > v_T - c_T$.

Next, consider a case that $f^*_D > 0$ for some $i$. By the similar argument as in Section 4.3, the candidate of such a shrouding equilibrium can be uniquely pinned down to $p^*_T_i = v_T, f^*_T_i = v_T - c_T, p^*_D = c_D + N(v_T - c_T) - \pi, f^*_D = N(v_T - c_T)$. Notice that under these strategies neither non-deceptive firms nor intermediaries have incentives to deviate. A deceptive firm deviates from the above strategy by setting $f'_{D_i} = f^*_D - 2\epsilon, p'_{D_i} = c_D + f'_{D_i} - \epsilon - \pi$ for some $\epsilon > 0$ and let intermediaries unshroud if and only if either Condition (SC) does not hold or $v_D - c_D > v_T - c_T$. Hence, the strategies comprises an equilibrium if and only if Condition (SC) holds and $v_D - c_D \leq v_T - c_T$. In the shrouding equilibrium, no firm earns positive profits, each intermediary earns $N(v_T - c_T) > 0$ per sale, and consumers’ ex-post utility is $(v_D - c_D) - N(v_T - c_T) < 0$. Proposition 7 summarizes these results:

Proposition 7 (Equilibrium under Competition among Each Type of Firm). Suppose multiple firms exist for each type.

(i) Suppose $v_D - c_D > v_T - c_T$. In any equilibrium, consumers’ ex-post utility is positive. All intermediaries and firms earn zero profits. Social welfare is maximized.
(ii) Suppose \( v_D - c_D \leq v_T - c_T \). There exists a shrouding equilibrium in which all intermediaries earn positive profits if Condition (SC) holds. All firms earn zero profits. Consumers receive ex-post negative utility. Social welfare is not maximized if \( v_D - c_D < v_T - c_T \).

Proposition 7 sharply illustrates the relationship between profitable deception and selling inferior products. If deceptive products are superior to transparent products, then neither firms nor intermediaries earn positive profits. Naive consumers get all social surplus, and social welfare is maximized. This is because all consumers buy deceptive products which are socially superior in this case, and competition among deceptive firms forces to bid down prices and commissions. On the other hand, if deceptive products are inferior to transparent products, then the same trade-off between commissions and market share described in Section 4.3 arises. It is worth emphasizing that the high level of commission can be sustained in the equilibrium even when neither intermediaries nor firms have monopoly power. Intuitively, the threat of unshrouding and promoting non-deceptive products prevents deceptive firms from decreasing commissions.

Some empirical studies suggests a link between profitable deception and selling inferior products. In the mutual-fund industry, Gil-Bazo and Ruiz-Verdú (2009) report that mutual funds charging higher fees have worse before-fee risk-adjusted performance—product prices negatively reflect their valuations. Also, Del Guercio and Reuter (2012) find that actively-managed mutual funds recommended by financial advisors are on average significantly underperform available alternative options such as index funds.

Note that consumers’ ex-post utility in Proposition 7 (ii) is negative, but is still larger than that in the shrouding equilibrium in the basic model. Competition among deceptive firms increases naive consumer’s ex-post utility, but still the utility is negative under profitable deception.

The comparative statics discussed in Section 4.3 still holds even under competition among each type of firm. In addition, the consumers’ ex-post utility is decreasing in the social surplus of transparent products so long as Condition (SC) holds: as the alternative product becomes better, consumers are more harmed ex-post. This is because in order to maintain shrouding, each of deceptive firms needs to give more commissions to intermediaries as the social surplus of non-deceptive products increases. This leads to the increase of level of commissions, and naive consumers ultimately bear the cost of commissions through the increase of product prices. Similarly, the consumers’ ex-post utility is decreasing in \( N \) as long as Condition (SC) is satisfied. It implies that
policies encouraging more access to intermediaries may hurt naive consumers through the increase of commissions. This leads to a potentially testable implication that firms deceiving consumers pay higher commissions as the search intensity of consumers increases.

7 Heterogenous Consumers

This section analyzes a market with consumer heterogeneity in naivete. Suppose for each product there are multiple firms producing the product as in Section 6. Assume that a fraction $\sigma \in (0, 1)$ of consumers is informed as defined in Section 4.2: they know which products have the hidden attributes. A remaining fraction $1 - \sigma$ of consumers is naive.

Under heterogenous consumers, it turns out that equilibrium outcomes depend on how intermediaries can market products. I call an intermediary offers a product when the product is available to consumers, and an intermediary promotes a product when the product is explicitly shown to consumers. Section 7.1 discusses a model in which each intermediary can offer only one product at a time. Section 7.2 analyzes a model in which each intermediary can offer multiple products to consumers at a time and can sort the consumers by shrouding non-deceptive products as well as the hidden attributes of deceptive products. Throughout this section I assume that $v_D - c_D \leq v_T - c_T$; if instead a deceptive product is superior, there exists an equilibrium with the same equilibrium outcome with Proposition 7 (i) in each of the following cases, and both naive and informed consumers buy deceptive products in the equilibrium.

7.1 Single-Product Offer

Suppose each intermediary can offer only one product at a time and no consumer can buy a product that is not offered by intermediaries. This single-product dealing can be regarded as a case in which firms cannot sort consumers. In a retail market, Gabaix and Laibson (2006) consider such a setting in which each firm sells one base-product and hence cannot sort between naive and sophisticated consumers ex-ante by offering a menu contract or a bundled product between the base-product and an add-on.

In this case, by the similar derivations to the above, a candidate of a profitable shrouding equilibrium is derived as $p_T = v_T, f_T = v_T - c_T, p_D = c_D + \frac{N}{1 - \sigma}(v_T - c_T) - \bar{a}, f_D = \frac{N}{1 - \sigma}(v_T - c_T)$. Informed consumers do not buy the product because all intermediaries sell only deceptive products.
that attain negative ex-post utility. Such a shrouding equilibrium exists if the following modified shrouding condition holds:

\[(v_D - c_D) + \sigma \geq \frac{N}{1 - \sigma} (v_T - c_T). \tag{1}\]

Notice that naive consumers’ ex-post utility is \((v_D - c_D) - N(v_T - c_T)/(1 - \sigma) < 0\), which is decreasing in the fraction of informed consumers \((\sigma)\). This is because intermediaries can attract informed consumers as well as naive consumers by unshrouding and selling non-deceptive products, and hence deceptive firms need to give higher commissions to maintain deception as \(\sigma\) increases. This effect may look superficially like the cross-subsidization effect in Gabaix and Laibson (2006), but here the effect arises even though informed consumers do not buy any product nor benefit from the payments of naive consumers. Welfare effect of increasing informed consumers for naive consumers is not monotone, and is discontinuous at the threshold value at which Condition (1) holds with equality. Furthermore, so long as Condition (1) is satisfied, consumer welfare is \((1 - \sigma)(v_D - c_D) - N(v_T - c_T)\) and social welfare is \((1 - \sigma)(v_D - c_D)\); both are increasing in \(\sigma\) if and only if product D is socially wasteful. Intuitively, since the total amount of commissions in the industry to maintain shrouding is independent of \(\sigma\) and informed consumers do not buy deceptive products, only the total number of consumers who take up deceptive products determines the consumer and social welfare. The result imply that educational policies aimed at making consumers sophisticated to the hidden attributes can have a non-monotone effect on welfare.

### 7.2 Multi-Product Offer

I next analyze the case in which each intermediary can offer multiple products at a time. This kind of multiple-product dealing can be regarded as a menu contract or a multi-product marketing; Heidhues et al. (2012c) analyze such a setting in a retail market. In this case, in order to screen consumers intermediaries can shroud the existence of some products as well as the hidden attributes of deceptive products. Assume that each intermediary can offer as many as product at a time but can promote only one type of product.\(^{22}\) Naive consumers can only buy promoted products: they ignore non-promoted products because these products are shrouded. In contrast, informed consumers can buy non-promoted products on an offer. In what follows, I look for a shrouding

\(^{22}\) If the intermediary promotes both deceptive and transparent products, then naive consumers would compare between them and notice the existence of hidden attributes. See Piccione and Spiegler (2012) for a related theoretical literature.
equilibrium in which all intermediaries promote inferior deceptive product.

First, note that informed consumers will buy superior non-deceptive products; otherwise each intermediary can increase its profits by selling these products without promotion. Then, competition among intermediaries leads that informed consumers buy non-deceptive products at $(p_{T_i}^{**}, f_{T_i}^{**}) = (c_T, 0)$.

Second, if all intermediaries promote deceptive products with shrouding the hidden attributes, then for naive consumers each intermediary faces the exact same trade-off as in Section 6. Hence, the equilibrium outcomes for naive consumers become the same with those in Proposition 7. However, in this equilibrium there is dual pricing for the non-deceptive product: non-deceptive firms offer two contracts, $(p_{T_i}^{*}, f_{T_i}^{*}) = (v_T, v_T - c_T)$ and $(p_{T_i}^{**}, f_{T_i}^{**}) = (c_T, 0)$, to intermediaries. In the shrouding equilibrium, intermediaries are indifferent between promoting deceptive products at $(p_{D_i}^{*}, v_{D_i}^{*}) = (v_D + N(v_D - c_D) - \bar{a}, N(v_D - c_D))$ with shrouding and non-deceptive products at $(p_{T_i}^{*}, f_{T_i}^{*}) = (v_T, v_T - c_T)$ with unshrouding. Informed consumers buy non-deceptive products with contract $(p_{T_i}^{**}, v_{T_i}^{**}) = (c_T, 0)$.

**Proposition 8** (Equilibrium under Heterogenous Consumers and Screening). Suppose multiple firms exist for each type of product, a fraction of consumers is informed, $v_D - c_D \leq v_T - c_T$, and intermediaries can offer multiple products at a time. Then, there exists a shrouding equilibrium in which all intermediaries earn positive profits if Condition (SC) holds. All firms earn zero profits. Naive consumers receive ex-post negative utility from buying promoted deceptive products. Informed consumers receive ex-post positive utility from buying non-promoted transparent products. Social welfare is not maximized if $v_D - c_D < v_T - c_T$.

Intuitively, if naive consumers cannot buy products without the help of experts whereas informed consumers can find and buy all products, then the markets are completely segregated. This sheds light on the scope of shrouding technologies: if intermediaries can shroud the existence of superior non-deceptive products as well as hidden attributes of deceptive products to naive consumers, then they can completely screen consumers. The result delivers a practical implication: sophisticated and naive consumers buy products at different markets or prices. Indeed, in the mutual-fund industry, some consumers buy an index fund through intermediaries with paying more than 1% fees whereas others buy the same fund directly with around 0.1% fees. Bergstresser et al. (2009) find that broker-sold funds attain lower risk-adjusted returns than direct-sold funds do. Further, Hackethal
et al. (2012) and Del Guercio and Reuter (2012) find that consumers who buy products through financial advisors make worse off than those who buy products directly due to high commissions and operational costs.

Note that the equilibrium outcomes would change if intermediaries were not able to shroud non-promoted products to naive consumers. In such a case, if an intermediary unshrouds, then all naive consumers buy the same products as informed consumers buy—transparent products at \((p^{**}_{T}, f^{**}_{T}) = (c_T, 0)\). Hence, each of deceptive firms can undercut other firms by setting \((p^{**}_{Di} - \epsilon, f^{**}_{Di} - 2\epsilon)\) for some \(\epsilon > 0\) without the threat of shrouding. As a result, competition drives away the profits of intermediaries in any equilibrium. Notice that, however, a shrouding equilibrium still exists and naive consumers buy inferior deceptive products. This result could help explain, for example, why online search-engine companies such as Orbitz and Expedia sometimes put additional surcharges at a non-salient place though they do not get high commissions from product providers. In contrast, in many financial markets it can be difficult for naive consumers to buy non-promoted products because in order to shroud the hidden attributes intermediaries need to manipulate salience and comparability among products. These considerations highlight the scope of shrouding in markets for advice and resulting market segmentations.

8 Further Extensions

This section discusses further extensions of the model. Section 8.1 analyzes a model in which each intermediary can charge an advising fee to consumers. Section 8.2 examines a model with incorporating heterogeneity in consumers’ search intensity.

8.1 Competition on Advising Fees

So far, I have assumed that intermediaries cannot charge direct advising fees to consumers. Indeed, direct payments for advice are relatively rare in retail financial services (Inderst and Ottaviani 2012a, Inderst and Ottaviani 2012b). Also, policy regulation can prevent intermediaries from setting such fees. For example, in the US life insurance market, acts in many states prohibit agent to charge broker fees.\(^{23}\) Also, few people think doctors giving money to make patients use a particular drug is acceptable or morally correct, and it is actually regulated in many countries.\(^{24}\)

\(^{23}\) See, for example, California Department of Insurance Bulletin No. 80-6.
If intermediaries can charge direct advising fees but they cannot set negative fees, then none of the above outcomes changes. This is because intermediaries compete down the advising fees to attract consumers. Intermediaries would not set negative advising fees, for example, if the negative fees attract not only customers but also “arbitrageurs” who are interested in the perks.\footnote{Heidhues, Kőszegei and Murooka (2012a) provide a formal model of “arbitrageurs” who would take advantage of overly low prices as a microfoundation for the price floor. This model comes from Ellison’s (2005) insight that firms may be reluctant to set very-low prices because these cuts disproportionately attract less profitable consumers. Miao (2010), Ko and Williams (2011), Grubb (2012), and Armstrong and Vickers (2012) also investigate models with some price floor.}

Suppose that intermediaries can effectively set negative advising fees to consumers. In this case, intermediaries bid down the advising fees, so neither deceptive firms nor intermediaries earn positive profits in equilibrium. However, the level of commissions from selling inferior deceptive products are still higher than those from selling superior transparent products. The profits from deception are handed out to naive consumers, but deception through high commissions still occurs in equilibrium and naive consumers make suboptimal purchase decisions.

8.2 A Model with Heterogeneity in Consumers’ Search Intensity

In the basic model, the number of intermediaries each consumer visits, \( N \), is the same across consumers. This subsection analyzes a model with incorporating heterogeneity in \( N \). Let \( \{t_1, \cdots, t_J\} \) denote the type space of consumers with associated probability distribution \( \{q_1, \cdots, q_J\} \). Type-\( t_s \) consumers visit the number of \( s \) intermediaries randomly. Each intermediary have measure \( q_J \) of type-\( J \) consumers, measure \( \frac{J-1}{J} q_{J-1} \) of type-\( J - 1 \) consumers, \( \cdots \), and measure \( \frac{1}{J} q_1 \) of type-1 consumers.

Let \( N = \sum_{s=1}^{J} \frac{s}{J} q_s \). If Condition (SC) holds with the modified \( N \), then there exists a positive-profits shrouding equilibrium with the same equilibrium outcomes in the basis model. Notice that, however, commissions in the unshrouding equilibrium are also positive if \( q_1 > 0 \). Intuitively, \( q_1 \) represents the monopoly power of each intermediary, and if \( q_1 > 0 \) each firm needs to give positive commissions to let the intermediary promote own product.

9 Related Theoretical Literature

This paper builds on two theoretical literatures: price competition under consumer naivete, and information provision by intermediaries. After summarizing them, I discuss a growing literature.
that combines both of these two features, as this paper does. The main contributions of this paper relative to these literatures analyzing deception under competing intermediaries, identifying a connection between deception and high commissions, and deriving welfare and policy implications of such deception.

Gabaix and Laibson (2006) analyze a model in which each firm sells a base product and a shrouded add-on. Sophisticated consumers who are aware of the add-on can substitute away it by paying a cost when they purchase the product, whereas naive consumers are inattentive to a shrouded add-on and cannot substitute away it. The main result of Gabaix and Laibson (2006) is that unshrouding can decrease the demand for the add-on of naive consumers and hence may not be profitable. This is because naive consumers who realize the add-on by unshrouding would substitute away. Building upon their insight, Heidhues et al. (2012c) analyze competitive retail markets with a price floor on a base-product price, focus on a screening problem between sophisticated and naive consumers by offering multiple products, and identify the role of socially-inferior products for maintaining profitable deception. Heidhues et al. (2012b) highlight a perverse effect that deceptive firms have strong incentives to invest in exploitative innovation—a technology that enables firms to exploit naive consumers more—and to share the innovation with competitors.

There are literatures in behavioral industrial organization where consumers are not fully attentive to some attribute of a product or mispredict their own behavior. Many studies predict that the profits from exploiting naive consumers are competed away in competitive markets. Other studies analyze markets in that firms have monopoly power due to consumers’ psychological bias that makes products seemingly-differentiated.

The models of information provision by intermediaries without consumer naivete have been actively investigated. Lizzeri (1999) investigates an information-disclosure problem of a monopolistic quality-certification intermediary. Lizzeri (1999) also shows that competition among intermediaries can lead to full information disclosure. Inderst and Ottaviani (2009) analyze how the quality of advice can be distorted from the socially optimal level when a monopoly interme-

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26 See Spiegler (2006a, 2006b), Piccione and Spiegler (2012), and Gabaix, Laibson, Li, Li, Resnick and de Vries (2012). Relatedly, Gennaioli, Shleifer and Vishny (2012) analyze a retail fund-market such that investors perceive the variance of a risky asset is smaller as they trust a fund manager more. The distribution of trust makes the managers horizontally-differentiated and enables them to set a fee above marginal cost. The trusted managers tend to charge higher fees for risker assets.

27 See Gorton and Winton (2003), Dranove and Jin (2010), and Inderst and Ottaviani (2012b) for summary.
diary incurs some cost to improve the quality. Inderst and Ottaviani (2012a) investigate, in a market with a monopolistic intermediary and horizontally-differentiated product providers, how disclosure of hidden commission to sophisticated customers can distort the efficient provision of the products and hence can decrease social welfare. Prat and Rustichini (2003) investigate a general model of common agency; this paper’s setup can be regarded as a modification of their model with incorporating consumer naivete.

Now I discuss the literature most closely related to this paper: markets with intermediaries under consumer naivete. Stoughton, Wu and Zechner (2011) investigate a model with a monopolistic financial intermediary, and show that depending on the degree of investor naivete, how commissions are used either for price discrimination across individual wealth levels or for welfare-decreasing marketing. Bolton, Freixas and Shapiro (2012) analyze competition between credit-rating agencies with naive investors, and show that social welfare under duopoly credit-rating agencies can be lower than that under monopoly credit-rating agency. This is because the existence of multiple credit-rating agencies may facilitate firms’ ratings shopping and the firms purchase only the most favorable rating to attract naive investors. Inderst and Ottaviani (2012c) analyze a market with a monopolistic intermediary and horizontally-differentiated product providers, and show that the intermediary sets zero direct advising fee and get high commissions from product providers when consumers are naive. This payment structure leads to seriously biased advice to naive consumers. In contrast to them, I show how profitable deception can be maintained through disproportionately high commissions under competitive intermediation, highlight the connection between profitable deception and selling inferior products, and shed light on a new positive aspect of regulating commissions.

10 Concluding Remarks

This paper focuses on the case in which intermediaries as experts can costlessly educate naive consumers’ misperceptions. This assumption is useful to analyze the educational role of intermediaries clearly. In practice, however, educating naive consumers can be costly. Beshears, Choi, Laibson and Madrian (2011) conduct a lab experiment on fund purchase and find that a non-negligible fraction of consumers does not take up the lowest-cost fund even when they receive all relevant information. Bhattacharya, Hackethal, Kaesler, Loos and Meyer (2012) report that mere avail-
ability of unbiased advice is not sufficient for consumers to make a best decision. These results suggest that just providing unbiased information might not be enough to educate consumers, and education can be costly or insufficient even with direct consultations with experts. How to educate naive consumers effectively is an important future topic.

References


Appendix

A Proofs

Proof of Proposition 1. In the text.

Proof of Proposition 2.

First of all, suppose \( v_D - c_D \leq 0 \). In this case, informed consumers never buy product \( D \). In the equilibrium, \( p_{Di}^* = v_B, f_{Ti}^* = 0 \) for all \( i \), and all consumers buy product \( T \).

Suppose \( v_D - c_D > 0 \). Consider the case of \( v_D - c_D \geq v_T - c_T \); The case of \( 0 < v_D - c_D < v_T - c_T \) can be shown by the same logic. I first show that the equilibrium profits of firm \( D \), \( p_{Di}^* + \bar{a} - f_{Di}^* - c_D \), is equal to \( (v_D - c_D) - (v_T - c_T) \). Because firm \( T \) never sets its price below its total cost, \( p_{Ti}^* \geq c_T + f_{Ti}^* \) holds. Hence, if an intermediary \( i \) is selling product \( T \) and has positive market share, then firm \( D \) can make intermediary \( i \) promote product \( D \) by setting \( p_{Di}^* = v_D + \bar{a} + v_D - v_T - \epsilon, f_{Di}^* = f_{Ti}^* + \epsilon \) for sufficiently small \( \epsilon > 0 \)—this ensures firm \( D \)'s profits \( (v_D - c_D) - (v_T - c_T) - 2\epsilon \). By the same logic, the equilibrium profits of firm \( D \) is at most \( (v_D - c_D) - (v_T - c_T) \) because otherwise firm \( T \) would make intermediaries promote product \( T \) by setting \( p_{Ti}^* = v_T - v_D + p_{Di}^* + \bar{a} - \epsilon, f_{Ti}^* = f_{Di}^* + \epsilon \) for sufficiently small \( \epsilon > 0 \).

I next show that \( f_{Di}^* = 0 \) and hence \( p_{Di}^* = v_D - (v_T - c_T) - \bar{a} \) for any intermediary \( i \) with positive market share. Suppose not. Because of the previous paragraph, \( f_{Di}^* = p_{Di}^* - \{v_D - (v_T - c_T) - \bar{a}\} > 0 \). Notice that intermediary \( i \)'s market share is less than \( N/J \)—otherwise, firm \( D \) could increase its profits by increasing \( p_{Di} \) a bit. Consider firm \( T \)'s contract \( p_{Ti}^* = c_T + (1 - \epsilon)f_{Di}^*, f_{Ti}^* = (1 - 2\epsilon)f_{Di}^* \). For sufficiently small \( \epsilon > 0 \), intermediary \( i \) promotes product \( T \) because \( i \) can expand its market share—a contradiction.

Proof of Proposition 3.

If the hidden attribute is unshrouded to all consumers, then no intermediary earns positive profits and social welfare is maximized as shown in the proof of Proposition 2. Also, the condition for the existence of the equilibria in which all intermediaries promote product \( D \) with shrouding is shown in the main text.

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28 Note that if \( v_D - p_{Di} - \bar{a} > v_T - p_T \) and \( f_{Di} > f_{Ti} \), then intermediary \( i \) never sells product \( T \).
I now prove that if \( \overline{\alpha} \) is shrouded to some consumer, then all intermediaries promote product \( D \) and \( \overline{\alpha} \) is shrouded to all consumers. This leads to the uniqueness of the outcomes among shrouding equilibria.\(^{29}\) Suppose otherwise. Note that in this case at least \( N \) number of intermediaries shroud \( \overline{\alpha} \) on the equilibrium path. The proof has six steps.

(i): *Each intermediary is indifferent between promoting product \( D \) and promoting product \( T \).* Suppose there is an intermediary who strictly prefers to promote some product. Note that the intermediary must earn positive profits. Then, a firm providing that product can decrease its commission by a bit to the intermediary—a contradiction.

(ii): *Some shrouding intermediary earns positive profits.* Suppose all intermediaries earn zero profits. Since at least \( N \) number of intermediaries shroud \( \overline{\alpha} \), some shrouding intermediary gets positive market share. Let \( h \) denote such an intermediary. Note that intermediary \( h \) promotes a product with zero commission.

Suppose intermediary \( h \) promotes product \( D \). If \( p_{Dh} > \max\{c_D - \overline{\alpha}, v_D - (v_T - c_T) - \overline{\alpha}\} \), then firm \( T \) can propose \( \overline{p}_{Th} = p_{Dh} + v_T - v_D + \overline{\alpha}, \overline{f}_{Th} = \epsilon \) for sufficiently small \( \epsilon > 0 \), let \( h \) unshroud and promote product \( T \), and increase its profits. On the other hand, if \( p_{Dh} \leq \max\{c_D - \overline{\alpha}, v_D - (v_T - c_T) - \overline{\alpha}\} \) for all such \( h \), then firm \( D \) can propose \( \overline{p}_D = \max\{c_D - \overline{\alpha} + 2\epsilon, v_D - (v_T - c_T) - \overline{\alpha} + 2\epsilon\}, \overline{f}_D = \epsilon \) to all shrouding intermediaries. Because at least \( N \) number of intermediaries shroud \( \overline{\alpha} \) on the equilibrium path, all of them can earn positive profits by promoting product \( D \) with the new contract. Also, for sufficiently small \( \epsilon > 0 \), all such intermediaries prefer to promoting product \( D \). Therefore, firm \( D \) can increase its profits—a contradiction.

Next, suppose intermediary \( h \) promotes product \( T \). If \( p_{Th} \geq \max\{c_T, v_T - \min\{0, v_D - c_D\}\} \), then firm \( D \) can propose \( \overline{p}_{Di} = p_{Th} + v_D - v_T, \overline{f}_{Di} = \epsilon \) to all shrouding intermediaries. Because at least \( N \) number of intermediaries shroud \( \overline{\alpha} \) on the equilibrium path, all of them can earn positive profits by promoting product \( D \) with the new contract. For sufficiently small \( \epsilon > 0 \), firm \( D \) increases its profits because \( p_{Dh} + \overline{\alpha} - c_D - \overline{p}_{Dh} \geq \overline{\alpha} - \epsilon \). On the other hand, if \( p_{Th} < \max\{c_T, v_T - \min\{0, v_D - c_D\}\} \), then firm \( T \) can propose \( \overline{p}_{Th} = p_{Th} + 2\epsilon, \overline{f}_{Th} = \epsilon \) for sufficiently small \( \epsilon > 0 \), let \( i \) unshroud, and

\(^{29}\) This uniqueness result relies on the equilibrium-selection assumption in which if intermediaries shroud \( \overline{\alpha} \) in some subgame, then they keep shrouding whenever doing so comprises a Nash equilibrium in a subgame. Without this assumption, other shrouding-equilibrium outcomes can exist due to the coordination problems of intermediaries’ shrouding decisions. For example, if \( v_D - c_D \geq v_T - c_T \), then there is a shrouding equilibrium in which consumers buy a deceptive product at \( \overline{p}_{Di} = v_D - (v_T - c_T) - \overline{\alpha}, \overline{f}_{Di} = 0 \). However, the shrouding-equilibrium outcomes stated in Proposition 3 (i) is more plausible than any other outcomes. In particular, if I incorporate a positive cost for unshrouding, then—no matter how small the cost is—all shrouding equilibria have the same outcomes as those in Proposition 3 (i).
increase its profits—a contradiction.

(iii): All intermediaries promote product D. Suppose otherwise. First, suppose all intermediaries promote product T. Note that \( p_{Ti} - f_{Ti} \geq \max\{c_T, v_T - \min\{0, v_D - c_D\}\} \) for any shrouding intermediary \( i \); otherwise firm \( T \) can propose \( p'_{Ti} = p_{Ti} + 2\epsilon, f'_{Ti} = f_{Ti} + \epsilon \) for sufficiently small \( \epsilon > 0 \), let \( i \) unshroud, and increase its profits. Since intermediary \( h \) shrouds by (ii), firm \( D \) can profitably deviate by setting \( p'_{Dh} = p_{Th} + v_D - v_T, f'_{Dh} = f_{Th} + \epsilon \) and let \( h \) promote own product with shrouding—a contradiction.

Second, suppose some intermediary promotes product D. Let \( k \) be an intermediary who promotes product \( T \) with the lowest product price of product \( T \) conditional on promotion. Then, \( v_T - p'_{Tk} = v_D - p'_{Dk} - \overline{\alpha} \) holds; otherwise firm \( T \) can profitably increase its price and commission with letting intermediary \( k \) unshroud. If \( f'_{Tk} > 0 \), then firm \( D \) can propose \( p'_{Dk} = p^*_{Dk} - \epsilon, f'_{Dk} = f'_{Dk} - 2\epsilon \). Since \( k \) is indifferent between promoting product \( D \) and promoting product \( T \) by (i) and the alternative contract increases \( k \)'s market share, for sufficiently small \( \epsilon > 0 \) there is a profitable deviation. On the other hand, if \( f^*_{Tk} = 0 \), then firm \( D \) can propose the same product price and a slightly lower commission as it proposes to intermediary \( h \) defined in (ii). Since \( k \) can earn positive profits by promoting the new contract and by shrouding, it is a profitable deviation—a contradiction.

(iv): All intermediaries earn positive profits. Suppose intermediary \( i \) earns zero profits. Note that firm \( T \) earns zero profits by (iii). Note also that \( p_{Dh} + f_{Dh} \geq v_D - (v_T - c_T) - \overline{\alpha} \) because otherwise firm \( D \) can profitably increase \( p_{Dh} \). Since \( f_{Dh} > 0 \), \( p_{Dh} > v_D - (v_T - c_T) - \overline{\alpha} \). Then, firm \( T \) can set \( p'_{Ti} = p_{Dh} + v_T - v_D + \overline{\alpha}, f'_{Ti} = \epsilon \) for sufficiently small \( \epsilon > 0 \), let \( i \) unshroud and promote product \( T \), and increase its profits—a contradiction.

(v): There are no contracts that satisfy \( v_D - p_{Di} = v_T - p_{Tj} + \overline{\alpha} \) for any \( i, j \). Suppose not. Note that by (i) and (iv), both firms set positive commissions to all intermediaries. If intermediary \( i \) promotes product \( D \), then firm \( T \) can propose \( p'_{Tj} = p^*_{Tj} - \epsilon, f'_{Tj} = f^*_{Tj} - 2\epsilon \) to intermediary \( j \) and let \( j \) deviate with unshrouding. If intermediary \( i \) promotes product \( T \), then firm \( D \) can propose \( p'_{Dj} = p^*_{Dj} - \epsilon, f'_{Dj} = f^*_{Dj} - 2\epsilon \) to intermediary \( j \) and let \( j \) deviate with shrouding—a contradiction.

(vi): \( \overline{\alpha} \) is shrouded to all consumers. I first show that \( p_{Ti} = v_T \) for all \( i \). Suppose not. Then, firm \( T \) could propose \( p'_{Ti} = p^*_{Ti} + 2\epsilon, f'_{Ti} = f^*_{Ti} + \epsilon \) and let \( i \) deviate due to (v). Furthermore, if \( p_{Ti} = v_T \) for all \( i \), and \( p_{Dj} < v_D \) for some \( j \), then firm \( D \) can profitably increase \( p_{xj} \) by a bit.
Hence, \( p_{Di} = v_D \) for all \( i \). Since no intermediary can sell product \( D \) once \( \pi \) is unshrouded, \( \pi \) is shrouded to all consumers.

**Proof of Proposition 4.**

The case that intermediaries can unshroud \( \pi \) is derived in Proposition 3. When no party can unshroud \( \pi \), firms and intermediaries compete as in Proposition 2 except that consumers do not take \( \pi \) into account in their purchase decisions. Hence, in any equilibrium all consumers buy product \( D \) with a price \( p_{Di}^* = v_D - (v_T - c_T) \), all intermediaries earn zero profits, and firm \( D \) earns profits \( v_D - c_D - (v_T - c_T) + \pi \).

**Proof of Proposition 5.**

The case of multiple intermediaries is analyzed in Proposition 3. Consider a model where there is only one intermediary in the market and all consumers visit it. First, if Condition (SC) holds, then in any equilibrium the intermediary promotes product \( D \); otherwise, firm \( D \) can propose \( p_D' = v_D - \epsilon \), \( f_D' = (v_T - c_T) + \epsilon \) and let the intermediary shroud and promote product \( D \). Second, firm \( D \) sets \( p_D^* = v_D \) because otherwise firm \( D \) can profitably increase its product price and commission at the same time. Therefore, the ex-post utility of consumers under monopoly intermediary is \( -\pi \).

**Proof of Proposition 6.**

I show that if commissions are regulated to \( f_{xi} < N(v_T - c_T) \) for all \( x \) and \( i \), then the hidden attribute is unshrouded to all consumer. I prove it by contradiction. Suppose there exists an equilibrium in which the hidden attribute is not revealed to some consumers. Even under the commission regulation, the proof of Proposition 3 still holds until the end of (iv). Note also that if some intermediary \( i \) promotes product \( D \), then \( p_{Di} = v_D \) and \( p_{Ti} = v_T \) by (v). Given this, all intermediaries promoting product \( D \) have to shroud \( \pi \). By (iv), some intermediary unshrouds \( \pi \). Because a fraction of consumers visits one unshrouding intermediary and \( N - 1 \) shrouding intermediaries, all intermediaries promoting product \( T \) unshroud \( \pi \). Then, each shrouding intermediary can attract consumers who visit only intermediaries promoting product \( D \). However, firm \( T \) can propose \( p_{Ti}' = v_T \), \( f_{Ti}' = v_T - c_T - \epsilon \) to some shrouding intermediary \( i \), let \( i \) unshroud and promote product \( T \), and increase its profits for sufficiently small \( \epsilon > 0 \)—a contradiction.

**Proof of Corollary 1.**

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(i): Note that if Condition (SC) holds in the basic model, then all intermediaries shroud $\bar{a}$ and all consumers buy product $D$. Hence, firm $D$ pays the innovation cost if and only if $I_a \leq \Delta a$.

(ii): Immediate from Proposition 6.

**Proof of Proposition 7.**

(i): First of all, in any equilibrium all firms earn zero profits; otherwise some firm could get that profits by increasing its commissions a bit. Also, because $v_D - c_D > v_T - c_T$ all consumers buy product $D$ on the equilibrium path. Suppose intermediary $i$ earns positive profits—let $(p_{T_i}^*, f_{T_i}^*)$ be the contract $i$ takes up. Also, $i$ splits its market share with some intermediary—otherwise the type-$D$ firm with $(p_{T_i}^*, f_{T_i}^*)$ can profitably deviate by increasing its product price and commission.

Consider a case that $i$ is indifferent between promoting product $D$ and promoting product $T$ with commission $f_{T_i}^* > 0$. Since $v_D - c_D > v_T - c_T$, then $i$ would deviate by taking up a contract from some type-$D$ firm where $f_{Di}^* = f_{Ti}^* - 2\epsilon, p_{Di}^* = c_D + f_{Ti}^* + \epsilon - \bar{a}$ for sufficiently small $\epsilon > 0$—a contradiction. Next, consider a case that $i$ strictly prefers to promote product $D$. But then, a deceptive firm can profitably deviate by letting $i$ deviate and take up an contract $f_{Di}^* = f_{Di}^* - 2\epsilon, p_{Di}^* = p_{Di}^* - \epsilon$ for sufficiently small $\epsilon > 0$—a contradiction. Therefore, no intermediary earns positive profits if $v_D - c_D > v_T - c_T$.

(ii): In the text.

**Proof of Proposition 8.**

In the text.