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Increasing Price Transparency: Implications of Consumer Price Posting for Consumers' Haggling Behavior and a Seller's Pricing Strategies

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Abstract

In an attempt to gain a better position in haggling, consumers often seek a seller's pricing information (e.g., whether the posted price is negotiable, the discount and transaction prices) before going to that seller. Although traditionally difficult to obtain, such information is becoming increasingly available due to consumer price posting (CPP), whereby consumers post and share their purchase price information on the Internet. In this analytical study, we consider a market in which a seller, who chooses between a fixed price policy and a haggling policy, serves two types of consumers who differ in their willingness to pay and haggling costs. We explore how CPP can affect consumers' behavior and the seller's pricing strategies (i.e., pricing policy and the associated prices). In the absence of CPP, our model features a two-sided uncertainty: the seller does not know individual consumer's type and thus may find it optimal to use a haggling policy to price discriminate consumers, whereas consumers do not readily observe the seller's cost type and pricing policy, and thus are uncertain whether their haggling will be fruitful. In the presence of CPP, consumers' uncertainty about the seller's pricing policy is resolved. Because CPP can improve price transparency, inhibit consumers' acceptance of a posted price and spur price haggling, it seems apparent that it should benefit consumers and hurt the seller. However, our analysis shows that CPP can lead to fewer purchases, higher prices and even a greater seller profit. It further shows that although CPP surely increases information accessibility, it can also reduce the amount of information available to consumers. These results are in sharp contrast to the conventional wisdom in the literature.
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Keywords: Consumer price posting; UGC; Social media; Price haggling; Price discrimination; Information transparency

Introduction

Consumers not only search for but also create and disseminate information on the Internet. Marketing-related user generated content (UGC) is now abundant in online forums and blogs, ranging from promotions and deals to product and store evaluations and comparisons (Bailey 2005). This information, together with other information provided by firms in various social media, is significantly improving information transparency in marketplaces and has important implications for consumer behavior, marketing strategies, and information transparency policies.

In this study, we focus on a particular type of UGC: sellers' pricing policies and historical transaction price information posted and shared by consumers on the Internet, and investigate its impact on consumers' behavior and a seller's pricing strategies. In an attempt to gain a better position in haggling, consumers often seek this information before going to a seller, and such information is becoming increasingly available due to the emerging practice of consumer price posting (CPP). For example, at TripAdvisor.com, where travelers write reviews and advice on hotels, flights and other services, a review titled "Haggle before you book!" makes it known that at Residence du Vieux Port, a hotel in Marseille, France, visitors can haggle to get free buffet breakfasts.[1] At Redflagdeals.com, a Canadian bargain hunting community, one consumer notes that the posted price of a front-load laundry pair is

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[1] http://www.tripadvisor.com/ShowUserReviews-g187253-d195832-r1422352-Residence_du_Vieux_Port-Marseille_Provence.html.

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$3,199.98 at Future Shop, and posts, “I bought these at FS [Future Shop] at the end of last month for $2,657.46… I did have to haggle to get that price though.” [2] At Mymoneyblog.com, a consumer community, consumers are informed of secret promotions offered by local TV/Internet service providers. One consumer says, “I recently followed a similar [haggling] process with my Internet provider (Comcast) and managed to save $12.00 a month for the exact same service I had before I called.”[3]

In these examples, experienced customers reveal the deals they obtained via social media online, and the prospective customers, having accessed the “secret” price information, become less likely to accept the posted price and more likely to bargain with the seller. Such information, however, was often difficult to obtain. In traditional brick-and-mortar markets, it is quite common that consumers do not know where and when they are supposed to haggle. Such ignorance is not limited to cross-region travelers who are unaware of local pricing norms. In North America, for instance, bargaining is considered a “foreign” and marginal practice, and “it would never occur to most people to negotiate prices with their doctors for health care services but it turns out that doctors, hospitals and labs are willing to negotiate.”[4] Likewise, although “a bargaining culture once confined largely to car showrooms and jewelry stores is taking root in major stores like Best Buy, Circuit City and Home Depot, as well as mom-and-pop operations,” plenty of consumers still believe that the prices in these stores are non-negotiable (Richtel 2008).

In markets where haggling is possible, there are many reasons for consumers to lack information about a particular seller’s pricing policy and transaction price(s). Although haggling is a common trading format for a wide variety of products (e.g., automobiles, furniture, consumer electronics, houses, and services such as airline tickets and vacations) and is rapidly spreading to include more product categories, not all retailers adopt a haggling policy. Haggling usually takes place without an audience, and consumers rarely know the prices paid by other consumers. Fear of appearing foolish or looking cheap can hold consumers back from asking. Perhaps more importantly, the information sources have traditionally been limited to consumers’ personal experiences and word of mouth, which are not accessible to all consumers. Sellers tend to conceal their haggling policy and historical transaction prices, for fear that a rise in haggling may make consumers highly price conscious and loyal only to the seller with the least expensive offer. Hence, sellers seldom disclose such information, and when they do it is often not credible. It is commonly observed that sellers try to convince consumers that their costs are high in an attempt to get consumers to pay more (Fudenberg and Tirole 1983). They also insist that their prices are firm and final, yet offer discounts to haggling consumers who are price sensitive. A consumer’s comment on a weblog provides a vivid example:

> “I once bought a $900 couch for $650… He [the salesman] grew very frustrated, ‘Look lady, we don’t do that—go to Mexico if you want to haggle.’ This turned to ‘Well, I could probably give you 15% off’ as I got closer to the door, and to ‘OK, OK, but you are robbing me blind’ out in the parking lot where he chased me down and accepted my offer.”[5]

When sellers’ pricing policy information is not known or trusted by consumers, awkward situations can arise. The sellers that adopt a fixed price policy must work hard to convince their customers that their prices are really non-negotiable, whereas distrustful consumers haggle in the stores, only to find that their haggling has been a waste of time. Theoretically, there are a number of means for a seller to signal a pricing policy to uninformed consumers. For instance, it can use a posted price to signal its pricing policy, or simply post a “no haggling” sign in the store. However, consumers often feel uncertain about sellers’ pricing policies, which suggests that these means may not be as appropriate and effective in practice as they are in theory.

CPP can help resolve the information asymmetry. It has become increasingly popular among online customers who collect, compile and disseminate a seller’s current and historical (transaction) price information. Compared with conventional word of mouth, CPP provides the general public with ease of access and more complete information. Online consumer blogs and communities are considered reliable sources of information by North Americans and Asians (Gu, Park, and Konana 2011), which indicates that CPP is perceived to be more truthful.

CPP is not popular in markets where fixed price policies are the norm, because in these markets a seller charges the same price to all consumers, and this price, whether regular or promotional, is generally advertised both online and offline (Zhang 2009).[6] CPP is more popular when it provides consumers with price information beyond that advertised by sellers; it is particularly inviting when it discloses secret deal information, about which consumers are otherwise uninformed. Equipped with this information, strategic consumers can better predict their shopping outcomes and better determine not only whether, but also how to make a deal with the seller (Evans and Beltramini 1987). For instance, once consumers realize that a product has been sold at a discount off a posted price, they believe that the posted price is negotiable (i.e., that the seller has a haggling policy) and that the discount should be available if they haggle hard enough. In contrast, once consumers realize that no discount was ever given in the past, they believe the posted price to be non-negotiable (i.e., that the seller has a fixed price policy) and thus are discouraged from haggling. The revelation of a seller’s discount

[2] http://forums.redflagdeals.com/washer-dryer-deals-964762.

[3] http://www.mymoneyblog.com/haggle-to-lower-your-directv-bill.html.

[4] http://outofpocket.com/Blog/CategoryView,category,Transparency.aspx.

[5] http://ask.metafilter.com/41785/How-low-can-you-go, posted by madamjujujive on July 9, 2006.

[6] Rao and Syam (2001) examine unadvertised specials. In their model, consumers do not know the price before entering the store. However, once they have entered the store, they get to know and pay the same promotional price. In our model, in contrast, consumers may negotiate and thus pay different prices.

price information on CPP can also affect consumers' willingness to pay (WTP). Empirical studies have suggested that consumers may use a lower past price as a reference and thus become less likely to accept the posted price at point-of-purchase (Rajendran and Tellis 1994; Kalyanaram and Winer 1995).

Because CPP affects consumers' behavior, it may also affect a seller's pricing strategy. A seller can adopt a fixed price policy, under which it posts a price in store and charges this price to every consumer. Alternatively, it can employ a haggling policy, under which it posts a price in store and haggles over this price with consumers who wish to haggle. Haggling enables price discrimination. Price insensitive consumers do not want to haggle and thus pay the posted price; for these consumers, haggling entails too much effort and time lost in the process. However, price sensitive consumers are more likely to tolerate such disutility; they will haggle and thus obtain a discount. From the seller's point of view, which policy is optimal? What are the optimal price(s) under each policy? If a haggling policy is adopted, what level of haggling effort should a consumer exert to obtain a discount from the seller? More importantly, how are these decisions influenced by the presence of CPP?

In this study, we investigate how CPP, by improving the transparency of a seller's historical transaction price(s) and its pricing policy, can affect consumers' haggling behavior and a seller's pricing strategies. Conventional wisdom says that increased price transparency benefits consumers and hurts the seller. CPP is initiated by consumers; it equips them with price information, inhibits their acceptance of a posted price and spurs their price haggling. Hence, it seems apparent that CPP should benefit consumers and hurt the seller. However, using a simple model, we show that the opposite can be true. Compared with cases in which CPP is absent, the presence of CPP can result in consumers paying a higher price and a seller making a greater profit. We then extend to a more realistic, dynamic model in which there are two selling periods and a forward-looking seller considers the effect of its pricing policy in the first period on its performance in the second period. We show that in the presence of CPP, to maximize the profit from both periods, a low-cost seller may opt for a fixed high-price policy in the first period to avoid the adverse effect of discount information on second-period consumers, although a haggling policy could yield a greater profit for the first period alone. This result indicates that the effect of CPP on the level of information transparency may not be as evident as it seems. The presence of CPP surely increases information accessibility, but it can reduce the amount of information available to consumers.

This study makes the following contributions to the literature. First, it contributes to the expanding literature on social media and UGC (Forrest and Cao 2010; Gu, Park, and Konana, 2011; Hinz and Spann 2008). The emergence of the Internet has attracted much research attention, as firms have been using the Internet as a powerful platform to disseminate product and price information (Bakos 1997; Brynjolfsson and Smith 2000; Degeratu, Rangaswamy, and Wu 2000; Ratchford 2009; Soh, Markus, and Goh 2006; Zhang 2009) and the popularity of various search engines online and in mobile devices only makes the information more accessible to consumers (Brown and Goolsbee 2002; Ellison and Ellison 2009; Rangaswamy, Lee Giles, and Seres 2009). However, the literature has focused on information provided by firms. Studies on information provided by consumers (i.e., UGC) are scarce (Hoffman and Novak 2012) and this limited research has been devoted mainly to product information and evaluation (Bailey 2005; Dellarocas 2006). UGC is generally understudied, and yet new forms of social media (e.g., YouTube and microblogging) are emerging as IT advances. This study presents the first study of CPP, which is an emerging phenomenon of UGC and expected to have rich implications for marketing.

Second, this study contributes to the vast literature on price information transparency. The literature has suggested that consumers should be better off equipped with more (useful) price information (Stigler 1961; Bakos 1997; Kaul and Wittink 1995), and that sellers should be worse off with improved price transparency, unless they collude (Campbell, Ray, and Muhanna 2005; Schultz 2005; Overgaard and Mollgaard 2007). However, this study shows that these are not necessarily the case. It presents a novel mechanism for price transparency to increase price and profit: improved price transparency on the consumer side could result in more efficient screening by a seller.

Third, this study also contributes to the literature on price haggling. Haggling is a widespread pricing practice, but the literature is limited, and most price-haggling models assume a seller's pricing policy (i.e., fixed price or haggling) to be known to consumers, despite the fact that consumers are often ignorant or uncertain about it. Our model is the first haggling model in marketing that has incorporated consumers' uncertainty about the seller's pricing policy. It explicitly considers the effect of information transparency, and thus offers a new set of insights into a seller's choice of a pricing policy as consumers' information changes. It elucidates when and why information transparency moderates the profitability of the two pricing policies, and provides useful guidelines for managers' pricing strategies in the era of CPP.

The remainder of this study is organized as follows. The next section reviews the related literature. Basic Model section examines a basic model in which a low-cost seller can employ either a haggling or a fixed price policy. Dynamic Model with Two Selling Periods section examines a dynamic two-period model. Concluding Remarks section concludes the study and suggests areas for future research.

Related Literature

Although UGC has attracted much attention, academic research remains limited (Hoffman and Novak, 2012). As social media offer an unparalleled platform for consumers to publicize their personal opinions (Chen, Fayb, and Wang 2011), most existing studies on UGC have examined firms' adoption of social media for marketing research (Balagué and de Valck, 2013) and the implications of consumers' product reviews and recommendations (Bailey 2005; Forrest and Cao 2010; Gu, Park, and Konana 2011). Studies on other forms of UGC are increasing but few. Tirunillai and Tellis (2012) investigate whether and how UGC affects stock market performance. Hinz and Spann (2008) show that information sharing among consumers, both person-to-person and via communities, can change their bidding behavior and thus have important implications for buyers and sellers in secret reserve price auctions.

The theme of this study is closely related to a vast literature on price information transparency in marketing, economics, information system, operations, and finance. A general consensus in this literature has been that price transparency leads to higher consumer price sensitivity and lower prices, to the benefit of consumers. Numerous theoretical models have shown that market prices drop as consumers' search costs decrease (Anderson and Renault 1999; Bakos 1997; Stigler 1961) and the proportion of informed consumers in the market increases (Varian 1980; Baye and Morgan 2001). The theoretical prediction is supported by empirical studies of the effects of price advertising. For example, Milyo and Waldfogel (1999) find that in the liquor market, whereas advertising stores substantially cut the prices of the products they advertise, the prices of the other products in both advertising and non-advertising stores do not change. Based on the results obtained from dozens of marketing studies, Kaul and Wittink (1995) make the empirical generalization that an increase in price advertising leads to both higher price sensitivity among consumers and lower prices. More recently, Ellison and Ellison (2009) show that prices in electronic markets are more elastic and lower than those in traditional markets due to increased market transparency and competition. Online prices have been found to be lower for insurance products (Brown and Goolsbee 2002), books and CDs (Brynjolfsson and Smith, 2000) and automobiles (Zettelmeyer, Morton, and Silva-Risso 2006), to name a few.

However, some analytical studies have argued for a positive effect of information transparency on price. In general, there are three types of arguments. The first involves collusion and looks at information transparency on the firms' side. It has been well established in the economics literature that when firms are uncertain about their competitors' prices, price undercutting is harder to detect and thus tacit collusion is harder to maintain (Stigler 1964; Tirole 1989). Because high transparency allows firms' quick and easy access to information about each other's actions, it facilitates collusion and leads to high prices (Campbell, Ray, and Muhanna 2005; Schultz 2005; Overgaard and Mollgaard 2007). The second argument involves increased demand. For instance, Samuelson and Zhang (1992) and Cachon, Terwiesch, and Xu (2007) show that while a decreased search cost increases consumers' ability to sample firms and look for an alternative, which reduces prices, it also increases the number of consumers that sample a firm's products, which raises prices. The latter effect can override the former. The third argument involves information transparency about products (e.g., product attributes and availability) and cost, in addition to price. The marketing literature has long established that non-price advertising enhances product differentiation and thus reduces consumers' price sensitivity (Kaul and Wittink 1995). In the online context, price and product information have been empirically shown to have different implications: to the extent that the Internet allows consumers to search more easily for product information than for price information, it can increase prices (Lynch and Ariely 2000; Degeratu et al. 2000; Viswanathan et al. 2007). In line with this argument, several analytical models have shown that information transparency can increase prices. For instance, in Lal and Sarvary's (1999) model, consumers need to gather information on products' digital and non-digital attributes, and the Internet can induce high prices by discouraging consumers' search for products' non-digital attributes. Zhou and Zhu (2010) show that cost information transparency at the upstream level can increase prices for consumers when the downstream industry engages in Bertrand competition. Boone and Pottersz (2006) model captures both product information and increased demand effects. They show that if consumers have more information about product availability and prices, they will increase their demand for imperfect substitute products, and the effect of this on prices can override the competition enhancing the effect of transparency.

Our model also shows that increased information transparency can increase price, but there are important differences between our model and the aforementioned models. First, we focus on a monopoly market; there is no collusion effect. The market in our model is fixed; there is no increased demand effect. We focus on price information, and product information is not involved. Second, whereas the firms in the aforementioned models are confined to a fixed price policy, the seller in our model can strategically choose between a fixed price policy and a haggling policy, in accordance with consumers' price knowledge. Thus, we contribute to the literature by providing a novel mechanism that price transparency induces a higher price.

There is a stream of literature that explores firms' online pricing strategies (Brynjolfsson and Smith 2000; Ratchford 2009) and price dispersion (Clay, Krishnan, and Wolff 2001; Xing, Yang, and Tang 2006). Although it is well accepted that consumers' incomplete information, firms' differentiation and their price discrimination practices can all result in price dispersion, the evidence is largely inconclusive (Ratchford 2009, p. 87). Our study involves price discrimination and different (transaction) prices, but focuses on the implication of online information for an offline seller's pricing strategies. In our model, CPP is an exogenous event and in its presence the revelation of a seller's pricing policy and price(s) is automatic, whereas in other models, whether to reveal price information is a seller's strategic decision (Zhang 2009; Hinz, Hann, and Spann 2011).

Our work is related to the literature that addresses a seller's choice between haggling and fixed price policies. Wang (1995) finds that if a seller has a considerable bargaining ability and the two price policies involve the same cost, then a haggling policy is always better than a fixed price policy because it enables price discrimination. Riley and Zeckhauser (1983) demonstrate that in a market with a single seller who serves buyers sequentially, a haggling policy is suboptimal because its advantage of enabling price discrimination is more than offset by the losses it generates by encouraging buyers to refuse purchases at high prices. Desai and Purohit (2004) show that in a competitive market, a seller's pricing policy also depends on its rival's policy. Although this stream of research has generally indicated the importance of information in a seller's choice in pricing policy, our study is the first to explicitly model the effects of information transparency. Moreover, in contrast with the aforementioned models, in which a seller's pricing policy is readily observed by consumers, we assume that it may not be so in the absence of CPP. Hence, in addition to the uncertainty faced by the seller, our model also features an uncertainty faced by consumers. Bester (1994) also assumes that consumers do not readily observe a seller's pricing policy, but his model abstracts from consumer heterogeneity and the seller's uncertainty, and haggling is cost free for both consumers and the seller. In our model, consumer segments and their differences in haggling costs are key drivers of the results.

Finally, our study is also related to bargaining models under asymmetric information (Chatterjee and Samuelson 1987). In particular, our model resembles, to some extent, the ones that allow privately owned information to be (credibly) revealed during the bargaining process. Three papers examine this interesting dynamic in repeated-transactions bargaining. Hart and Tirole (1988) and Schmidt (1993) consider a one-sided uncertainty model in which a seller's cost is known, but the seller is uncertain about a buyer's valuation. Compared with a single-transaction interaction, a buyer with private information tries even harder to convince the seller that his valuation is lower than the seller believes. Banks, Hutchinson, and Meyer (2002) examine a two-sided uncertainty model in which bargaining parties can learn about each other's reservation price in their first transaction, and then use the information in their second transaction. Whereas they consider business-to-business settings in which bargaining takes place between one seller and one buyer, we look at haggling in a retail market in which a seller faces heterogenous consumers. In our model consumers buy the product only once, so the seller does not learn about individual consumer's type. This assumption is plausible in infrequently purchased product categories in retail markets or in tourist areas, where the number of consumers is large, the cost of acquiring consumers' individual information is high, and its benefit is low.

Basic Model

Consider a market in which a single seller markets a product to consumers who arrive sequentially and thus do not communicate with each other. The consumers are of two types. A proportion q of consumers are "high types" and have a high WTP, v_h, for the product. The other consumers, with a proportion $1 - q$, are "low types" with a low WTP, v_l, where $v_h > v_l > 0$.

Both types of consumers have the option to buy at the price posted in the store, but they can also choose to haggle over the price for a discount. Haggling entails consumer effort and thus is costly. Many consumers suffer psychological distress when haggling because they either lack the skill to haggle or think that haggling makes them look cheap. Moreover, haggling is time consuming and consumers have opportunity costs of time. Because consumers with higher incomes tend to be less price sensitive, more time constrained, and more inclined to save face, there is a positive correlation between haggling cost and WTP; that is, consumers with a higher WTP have a higher haggling cost (Chiang and Spatt 1982; Desai and Purohit 2004). In our model, it is the existence of this correlation that motivates the seller to use haggling as a way of price discriminating consumers (as in Desai and Purohit 2004). We acknowledge that there may be markets in which consumers with lower opportunity time costs or higher price sensitivity have a higher haggling cost. Our results do not hold in such markets, as haggling would not be a useful discrimination device in such conditions.

As emphasized earlier, we examine a market in which consumers do not readily observe the seller's pricing policy in the absence of CPP. In other words, we assume that the seller does not signal its pricing policy through a posted product price or advertising. Therefore, consumers face uncertainty about the seller's pricing policy. They can only learn through haggling. This important feature of our model (as in Bester 1994) is in sharp contrast to other models in which a seller's pricing policy is assumed to be known (as in Desai and Purohit 2004; Wang 1995).

In the absence of CPP, we assume that a consumer's haggling process is as follows. First, a consumer inquires about the seller's pricing policy: "Will you sell this for \$50?" (when the tag says \$75); or "Can anything be done about the price?"; or simply "Is the price negotiable?" A seller that adopts a haggling policy may try to convince the consumer that the price is final and firm, but after a couple of rounds of inquiry and response, the consumer is able to "feel out" the seller and correctly determine its pricing policy. Then, based on the updated information, the consumer determines what to do next. If the consumer realizes that the posted price is really non-negotiable, then haggling will be halted because the effort would be wasted. In this case, if the posted price is prohibitively high, the consumer will quit the market. Otherwise, the consumer must buy at the posted price. In contrast, if the price is determined to be negotiable, then the consumer can continue haggling for a price discount until the seller obliges it.

So we assume that consumer haggling comprises two consecutive processes: *policy inquiry* and *price haggling*. A haggler must have known that the price is negotiable before he or she actually engages in price haggling. This assumption is plausible, particularly in the U.S., where consumers are gentle and nonconfrontational and try not to be rude or obnoxious (Sharma and Krishnan 2001). We realize that in practice the two processes may overlap by and large, but for theoretical purposes it makes sense to present a sharp distinction.

Both policy inquiry and price haggling are costly to consumers. Asking whether a posted price is negotiable in the store may prove a very difficult task. For many consumers, bargaining is a degrading activity; haggling implies that one is "cheap" (Tauber 1972, p. 48) and "Americans tend to look down on people who haggle" (Hall 1959, p. 101). However, for more price sensitive consumers, "It doesn't hurt to ask." Based on these observations, we assume that high-type consumers incur a cost of f_h in policy inquiry, whereas low-type consumers incur a cost of f_l, where $f_h > f_l > 0$. In addition to the fixed cost incurred in the policy inquiry process, a consumer also incurs a variable cost in the price haggling process, which represents the consumer's effort and time cost when haggling for a price discount. We denote the high- and low-type consumers' variable costs as $K_h(t)$ and $K_l(t)$, respectively, where $K_h(t) > K_l(t) > 0$ and t refers to the extent to which a consumer engages in price haggling, which is assumed to be observable to the seller and is operationalized as the haggling time. The variable cost component in consumers' haggling cost structure is plausible. In practice, a consumer who wishes to obtain a greater discount must put more effort and time into haggling. We further assume that the variable cost is linear with $K_i(t) = k_i t$, $i = h, l$, which is reasonable if the amount of the time is not too large (Chiang and Spatt 1982). The insights in this study are robust to other cost functions, such as a quadratic function. In a word, whereas a consumer will incur a haggling cost of f_i to inquire and learn about a seller's pricing policy, the cost will be $f_i + k_i t$ if the consumer makes the inquiry and then haggles for a discount over a period t.[7]

In the presence of CPP, the seller's pricing policy becomes known to consumers. Specifically, we assume that all consumers have access to CPP, which truthfully reveals the seller's (historical) transaction price(s) and pricing policy.[8] Hence, consumers will realize that the seller adopts a haggling policy if it has ever offered discounts, or that it adopts a fixed price policy if no discount has ever been offered. Naturally, in the presence of CPP, there is no "real" policy inquiry; consumers may double check the policy in store, but in this case the inquiry is assumed to be cost free. If a consumer chooses to haggle—only with a seller with a haggling policy, of course—then the haggling cost will only be $k_i t$. Compared with a case in which CPP is absent, note that the presence of CPP saves a haggling consumer's policy inquiry cost f_i.

We assume that consumers' haggling costs, WTP and proportions are common knowledge. However, the seller faces an uncertainty: it does not readily observe each individual consumer's type. The seller can adopt a fixed price policy, posting a price in the store and charging it to all consumers. Alternatively, it can adopt a haggling policy to price discriminate consumers.

We define (p, t, b) as a "price scheme" designed by the seller, whereby a transaction price p is offered if the consumer has haggled for a period of time no less than t. The parameter b refers to whether the consumer has made an inquiry about the seller's pricing policy, with $b = 1$ if "yes" and $b = 0$ if "no." Note that t and b are the minimal haggling effort requirements for price p, and no consumer will expend more than those efforts in equilibrium.

Under a fixed price policy, the seller offers a single price scheme $(p, 0, 0)$; that is, the seller posts and charges a price p, regardless of consumers' haggling efforts. In equilibrium, the price p is either v_h or v_l. A price higher than v_h is not acceptable to consumers. Any price between v_h and v_l is strictly dominated by v_h. And any price lower than v_l is strictly dominated by v_l.

If the seller adopts a *fixed high-price policy*, it offers a single price scheme $(p, 0, 0)$ with $p = v_h$. In this case, the seller only wishes to serve high-type consumers. However, in the absence of CPP, uninformed low-type consumers may make a policy inquiry when searching for a discount. Because the seller must spend time (or hire sales clerks) to deal with consumers' inquiries, we assume that the seller incurs a cost of f_s for each consumer inquiry, where $f_s > 0$. Hence, the (high-cost) seller that adopts a fixed high-price policy makes a profit of $q(v_h - c) - (1 - q) f_s$, where c is the seller's marginal cost for the product. In the presence of CPP, in contrast, its profit is $q(v_h - c)$ because its price is known to be firm and no consumer makes the inquiry.

If the seller adopts a *fixed low-price policy*, it offers a single price scheme $(p, 0, 0)$ with $p = v_l$. Realizing that the price is already the best offer, no consumer will haggle. Hence, the seller serves all of the consumers and makes a profit of $\pi^{L} = v_l - c$, regardless of CPP.

If the seller adopts a *haggling policy*, it posts a price in the store, but it is also willing to haggle over the price with consumers who wish to do so. In this case, the seller prescribes two price schemes (p_h, t_h, b_h) and (p_l, t_l, b_l). That is, a price p_i is offered if the consumer has made a policy inquiry—or not, depending on the value of b_i—and haggled for a discount for time t_i. Because the two schemes serve to price discriminate the two consumer segments, they are set such that high-type consumers prefer the former and low-type consumers prefer the latter.

The seller's haggling costs parallel those of the consumers; that is, in addition to the fixed cost f_s in dealing with a consumer inquiry about pricing policy, the seller also incurs a variable haggling cost, which depends on the haggling time t and is assumed to be $k_s t$.

We assume that the seller comes endowed with a marginal cost c of the product, which is either high, c_h, or low, c_l. To focus on interesting cases, we only examine those in which $c_l < v_l < c_h < v_h$ (as in Banks, Hutchinson, and Meyer (2002).[9] This assumption implies that a fixed high-price policy is the unique equilibrium strategy if the seller is high cost. In contrast, a fixed high-price policy, a fixed low-price policy and a haggling policy can all be optimal if the seller is low cost.

Consumers are rational. If they know the cost type of the seller, then they can anticipate the seller's optimal pricing policy and scheme(s) and behave accordingly. For instance, they expect that a high-cost seller serves only high-type consumers and does not budge on price, whereas a low-cost seller that adopts a haggling policy does not offer a discount unless they have haggled (i.e., either policy inquiry only, or

[7] For ease of exposition, we assume that high-type consumers incur greater haggling costs than their low-type counterparts, as in Desai and Purohit (2004). We could assume a stochastic relationship between consumers' WTP and haggling cost, but the qualitative nature of our results would not change as long as the expected haggling cost of high-type consumers is higher than that of low-type consumers. The condition for the (separating) haggling equilibrium is that high-type consumers' haggling costs are relatively large compared with those of low-type consumers, whether they are deterministic or stochastic. In the real world, a fraction of the consumers with a high WTP may be as good at haggling as those with a low WTP. Capturing this in our model is unlikely to change the qualitative nature of our results, although it would shrink the parametric space for the haggling equilibrium.

[8] Sellers may feed manipulative information (Dellarocas 2006), but this is beyond the scope of this study.

[9] Other cases are trivial. If $v_l < c_l < c_h < v_h$, then the seller, regardless of its cost, only serves high-type consumers and charges a fixed price of $p = v_h$. Low-type consumers will not participate in the market. If $c_l < v_l < v_h < c_h$, then a high-cost seller would not sell at all and there would be no uncertainty from the consumers' perspective. If $c_l < c_h < v_l < v_h$, then the high- and low-cost sellers always behave exactly the same and there is no point in assuming the seller's cost to be high or low.

both policy inquiry and price haggling for a certain time). In equilibrium, these expectations are fulfilled and the consumers are not surprised by the outcome.

Consumers know the values of c_h and c_l. However, they do not know the seller's cost type a priori. A seller's cost may vary because its upstream producer occasionally offers trade promotions or because the seller may procure the product from various sources at various prices. Hence, in the absence of CPP, consumers do not know the seller's pricing policy, and thus they must take a chance in haggling. Haggling may lead to a discounted price, but only if the seller is low cost and adopts a haggling policy; otherwise, it will be in vain. We assume that consumers have a prior belief that the probability of the seller being high cost is r, and that of it being low cost is $1 - r$, where $r \in [0, 1]$.

Two points are important to note. First, we assume that the seller commits to its decisions. This assumption is plausible. Once a pricing policy is determined, stores rarely change it. Moreover, given the size and organizational structure of today's stores, many retailers rely on sales clerks to interact with customers and provide them with detailed instructions on how to negotiate prices with customers. This practice means that sales clerks must follow some haggling prescription. Second, we assume that the seller holds the cards in the game. In general, "individual customers have very little bargaining power with retail stores" (The Industry Handbook: The Retailing Industry). This occurs probably because firms differentiate in product offerings (e.g., private labels; national brands but "bundled" with different locations or different levels of store service) and thus enjoy certain monopoly power in the market. We therefore assume that the seller makes a take-it-or-leave-it offer. This approach greatly simplifies the analysis and has been widely implemented in bargaining models (Banks, Hutchinson, and Meyer (2002); Bester 1994; Gill and Thanassoulis 2009). We discuss the implications of this assumption later.

In the Absence of CPP

Let us have a look at a high-cost seller first. Given that $c_l < v_l < c_h < v_h$, a high-cost seller only serves high-type consumers, and thus its equilibrium strategy is to adopt a fixed high-price policy and offer a price scheme $(v_h,0,0)$. Its profit, however, depends on a low-cost seller's equilibrium strategy. It is $q(v_h - c_h) - (1 - q)f_s$ if a low-cost seller's equilibrium strategy is haggling, because in this case the uninformed low-type consumers cannot discern the seller's cost type and thus make policy inquiries. However, it is $q(v_h - c_h)$ if a low-cost seller's equilibrium strategy is a fixed price policy, because in this case consumers rationally expect that no seller adopts a haggling policy and thus no one haggles. Our analysis hereafter focuses on a low-cost seller.

In the absence of CPP, if a low-cost seller adopts a fixed high-price policy, it offers a price scheme $(v_h,0,0)$, making a profit of $\pi^H = q(v_h - c_l)$. In this case, there is no haggling policy in the market and thus no consumer haggles. If it adopts a fixed low-price policy, it offers $(v_l,0,0)$, making a profit of $\pi^L = v_l - c_l$. In this case, consumers realize that the posted price is already the best offer and thus make no policy inquiry. If the seller adopts a haggling policy, it offers two price schemes (p_h,t_h,b_h) and (p_l,t_l,b_l). Its problem is

$$
\begin{aligned}
\max_{p_h,p_l,t_h,t_l,b_h,b_l} \pi^G &= q(p_h - k_s t_h) + (1-q)(p_l - k_s t_l) - c_l \\
&\quad - (b_h q + b_l(1-q))f_s, \\
&\quad s.t. (1)\, v_h - p_h - k_h t_h - b_h f_h \geq 0; \\
&\quad (2)\, (1-r)(v_l - p_l - k_l t_l \geq 0;) \\
&\quad (3)\, (1-r)(v_h - p_l - k_h t_l) - b_l f_h \leq v_h \\
&\quad - p_h - k_h t_h - b_h f_h; \\
&\quad (4)\, (1-r)(v_l - p_l - k_l t_l) - b_l f_l \geq v_l \\
&\quad - p_h - k_l t_h - b_h f_l; \text{ and} \\
&\quad (5)\, t_i = 0 \text{ if } b_i = 0,
\end{aligned}
$$

where $i = h, l$ and the superscript G on profit denotes that it is under the haggling case (we use G to avoid the abuse of the notation H.). Constraints (1) and (2) are respectively the high- and low-type consumers' incentive constraints, and (3) and (4) their compatibility constraints. Constraint (5) follows from our assumption about the sequence of the two haggling processes.

In the Appendix A, we first prove that $t_h^* = 0$, $b_h^* = 0$ and $b_l^* = 1$ in equilibrium (all the proofs are available in the Appendix A.). This result makes intuitive sense. To price discriminate most cost-effectively, the seller must set the two price schemes such that the high-type consumers do not haggle at all and the low-type consumers are at least induced to make the policy inquiry. Noting that $p_h^* > v_l$ and thus Constraint (4) is always satisfied when Constraint (2) is satisfied, we can then simplify the seller's problem as

$$
\begin{aligned}
\max_{p_h,p_l,t_l} \pi^G &= q p_h + (1-q)(p_l - k_s t_l) - c_l - (1-q) f_s, \\
&\quad s.t. (1)\, v_h - p_h \geq 0; \\
&\quad (2)\, (1-r)(v_l - p_l - k_l t_l) - f_l \geq 0; \\
&\quad (3)\, (1-r)(v_h - p_l - k_h t_l) - f_h \leq v_h - p_h.
\end{aligned}
$$

Constraints (2) and (3) imply that $v_l - k_l t_l^* - f_l/(1 - r) \geq p_l \geq v_h - k_h t_l^* - (v_h - p_h^* + f_h)/(1 - r)$, which implicitly requires that $t_l^* \geq ((v_h - v_l)(1 - r) - (v_h - p_h^* + f_h - f_l))/((k_h - k_l)(1 - r))$. Among all of the pairs of t_l and p_l that satisfy the constraints, the seller wants the price to be as high as possible and the time to be as minimal as possible. Thus, it sets $p_l^* = v_l - k_l t_l^* - f_l/(1 - r)$ and $t_l^* = max\{(v_h - v_l - (v_h - p_h^* + f_h - f_l)/(1 - r))/(k_h - k_l), 0\}$.

Note that $(f_h - f_l)/(1 - r) \geq v_h - v_l$ is a sufficient condition for $t_l^* = 0$. This implies that if the condition holds (i.e., if the high-type consumers' policy inquiry cost is sufficiently large relative to that of the low-type consumers), the policy inquiry alone enables the screening of the two types of consumers. In this case, the seller optimally offers $(p_h^* = v_h, t_h^* = 0, b_h^* = 0)$ and $(p_l^* = v_l - f_l/(1 - r), t_l^* = 0, b_l^* = 1)$. Whereas high-type consumers do not haggle due to their high policy inquiry costs and thus pay at the posted price, low-type consumers haggle—

only making an inquiry about the seller's pricing policy—and thus obtain a discounted price of $v_l - f_l/(1-r)$. The seller makes a profit of $\pi^{G1} = qv_h + (1-q)(v_l - f_l/(1-r)) - c_l - (1-q)f_s$.

If $(f_h - f_l)/(1-r) < v_h - v_l$, i.e., if the high-type consumers' policy inquiry cost is not very large relative to that of the low-type consumers, the cost of policy inquiry alone cannot prevent the high-type consumers from haggling. The seller has to employ both policy inquiry and a positive price haggling time to deter the high-type consumers. In this case, the seller optimally offers $(v_h,0,0)$ and $(p_l^* = v_l - k_l t_l^* - f_l/(1-r),\ t_l^*,\ 1)$, where $t_l^* = (v_h - v_l - (f_h - f_l)/(1-r))/(k_h - k_l)$, making a profit of $\pi^{G2} = qv_h + (1-q)(v_l - f_l/(1-r) - (k_l + k_s)(v_h - v_l - (f_h - f_l)/(1-r))/(k_h - k_l)) - c_l - (1-q)f_s$. Note that this equilibrium only exists when the high-type consumers' time cost is sufficiently larger than that of the low-type consumers (i.e., $k_h > k_l + (1-q)(k_l + k_s)/(q(1-r))$). Otherwise, because of its excessive and overly costly prescribed haggling time, the haggling policy will be dominated by a fixed low-price policy.

We show in the Appendix A that the two aforementioned solutions constitute the haggling equilibria in which consumers face uncertainty in haggling.[10] In these equilibria, the posted price is high-type consumers' WTP, the same as a seller that adopts a fixed high-price policy. Because consumers cannot determine the seller's pricing policy based on the posted price, they are uncertain about their haggling outcomes. In equilibrium, high-type consumers reveal their type to the seller: they choose not to haggle and thus pay the posted price. Low-type consumers also reveal their type: they choose to engage in a certain level of haggling effort (i.e., policy inquiry only, or both policy inquiry and price haggling) and thus obtain a discount off the posted price. Screening is enabled because of the positive correlation between consumers' WTP and their haggling costs. Even if high-type consumers knew that a discounted price was obtainable, they would choose not to haggle due to their high haggling costs.

Lemma 1. *In the absence of CPP, under a haggling policy in which consumers face uncertainty in haggling, a (low-cost) seller's optimal price schemes are:*

- *$(v_h, 0, 0)$ and $(v_l - \frac{f_l}{1-r}, 0, 1)$ if $v_h - v_l \le \frac{f_h - f_l}{1-r}$. In this case, policy inquiry alone suffices to screen the consumers. The seller makes a profit of π^{G1}.*
- *$(v_h, 0, 0)$ and $(\frac{k_h(v_l - f_l/(1-r))}{k_h - k_l} - \frac{k_l(v_h - f_h/(1-r))}{k_h - k_l}, \frac{v_h - v_l - (f_h - f_l)/(1-r)}{k_h - k_l}, 1)$ if $v_h - v_l > \frac{f_h - f_l}{1-r}$ and $k_h \ge k_l + \frac{1-q}{q(1-r)}(k_l + k_s)$. In this case, the seller uses both policy inquiry and a non-zero haggling time to screen the consumers. The seller makes a profit of π^{G2}.*

Lemma 1 indicates the effect of consumers' perceived possibility of the seller being high cost, r, on the haggling equilibria. It is evident that the greater r is, the more likely it is that the consumers' haggling will be in vain. When high-type consumers have a greater policy inquiry cost (i.e., when $f_h > f_l$), then the greater r is, the less incentive they have to inquire about policy. Therefore, if r is sufficiently large (i.e., if $r \ge 1 - (f_h - f_l)/(v_h - v_l)$), policy inquiry alone can serve to screen the two consumer segments. Note that a large r also discourages low-type consumers from haggling. When r is large, the greater its value, the greater the discount the seller must offer to attract low-type consumers to haggle and, as a result, the smaller the seller's profit (i.e., $\partial \pi^{G1}/\partial r < 0$).

If r is small (i.e., if $r < 1 - (f_h - f_l)/(v_h - v_l)$), a policy inquiry alone cannot screen the two consumer segments; the seller must use a non-zero haggling time in addition to policy inquiry to deter high-type consumers from haggling. In this case, to attract low-type consumers to haggle, the discount off the posted price should compensate not only their policy inquiry cost, but also their haggling time cost. Recall that $p_l^* = v_l - k_l t_l^* - f_l/(1-r)$. Thus, the greater r is, the greater discount is needed to motivate low-type consumers to make a policy inquiry. This implies that a greater r results in a greater discount and thus a smaller seller profit. However, also note that the greater r is, the shorter the haggling time (i.e., t_l^*) needed to deter high-type consumers from haggling, which implies that a greater r can also result in a smaller discount and thus a greater seller profit. Noting that f_h and f_l are consumers' policy inquiry costs and that k_h and k_l are their opportunity costs of haggling time, respectively, we show in the Appendix A that when $f_h/f_l > (k_h + k_s)/(k_l + k_s)$, i.e., when the two segments' cost difference in policy inquiry is large relative to that in price haggling, policy inquiry is more efficient in screening than price haggling and as a result, the positive effect of r on profit dominates (i.e., $\partial \pi^{G2}/\partial r > 0$). In contrast, when $f_h/f_l < (k_h + k_s)/(k_l + k_s)$, i.e., when the two segments' cost difference in policy inquiry is relatively small, price haggling becomes more efficient in screening than policy inquiry and as a result, the negative effect of r on profit dominates (i.e., $\partial \pi^{G2}/\partial r < 0$).

The above finding that the effect of r on profit can be either positive or negative is interesting. It indicates that CPP, by resolving consumers' uncertainty in haggling, may have various effects on the seller's profit, depending on the relative cost differences between the two consumer segments' inquiring and haggling time costs as well as those of the seller.

Proposition 1. *In the absence of CPP, the haggling policy, as specified in Lemma 1, is the equilibrium policy (i.e., $\pi^G > \max\{\pi^H, \pi^L\}$) if f_s is sufficiently small. The fixed high-price policy is the equilibrium policy (i.e., $\pi^H > \max\{\pi^G, \pi^L\}$) if c_l is sufficiently large. The fixed low-price policy is the equilibrium policy (i.e., $\pi^L > \max\{\pi^H, \pi^G\}$) if c_l is sufficiently small and if f_s is sufficiently large.*

[10] The aim of this study is to investigate the implications of increased information transparency due to CPP. To highlight the informational role of CPP, we focus on the comparison between a two-sided uncertainty model in the absence of CPP and a one-sided uncertainty model in the presence of CPP. Therefore, in the absence of CPP, we concentrate on the equilibria in which a low-cost seller adopting a haggling policy posts the same price (i.e., $p_h = v_h$) as a (high-cost) seller adopting a fixed high-price policy. The seller can set the post price lower than v_h to screen two consumer segments. In this case, however, there is no uncertainty faced by consumers, as consumers can determine a seller's pricing policy according to its posted price (i.e., fixed high-price policy if the posted price is v_h, or haggling policy if the posted price is lower than that). In the appendix, we derive this solution and establish some conditions to suppress it to focus on cases of consumer uncertainty.

Proposition 1 compares the low-cost seller's profits under the haggling policy (i.e., π^{G1} or π^{G2}) with those under the fixed high- and low-price policies. In the Appendix A, we show 1) that a haggling policy outperforms the two fixed price policies if the seller's marginal cost in dealing with consumers' policy inquiry, f_s, is sufficiently small; 2) that the fixed high-price policy outperforms other policies if the seller's marginal cost of the product, c_l, is sufficiently large; and 3) that the fixed low-price policy outperforms the other policies if c_l is sufficiently small and f_s is sufficiently large. These results are intuitive, and driven by two trade-offs. First, a haggling policy enables the seller to price discriminate consumers. However, this advantage is outweighed if the seller's haggling costs (i.e., f_s) are sufficiently large. Second, whereas both types of consumers are served under the haggling and fixed low-price policies, only high-type consumers are served under the fixed high-price policy. Thus, naturally, when c_l is sufficiently large, the seller would rather serve high-type consumers only.

Note that in the absence of CPP, there are wasted haggling costs for both haggling consumers and the seller, if the seller happens to be high cost. This is consistent with real world observations, and highlights the informational role played by CPP as we analyze in the following.

In the Presence of CPP

For CPP to be operative, there must be consumers who have made a purchase and posted their purchase price information on CPP, in addition to consumers who are planning to make a purchase and thus access CPP. The time sequence involved implies that a dynamic model may be more appropriate. In this section, however, we consider only one selling period and assume that a seller's transaction prices and pricing policy are readily observable in the presence of CPP. We assume that a seller is myopic; it will adopt a haggling policy if it yields a greater profit than the fixed price policies, i.e., if $\pi^{G}_{CPP} > max(\pi^{H},\pi^{L})$, where the subscript *CPP* denotes the presence of CPP. We consider a more realistic dynamic model later.

We assume that all of the consumers have access to CPP. Because we are interested in the potential implications of CPP rather than its institution, we model CPP as an automatic and truthful revelation of the seller's historical transaction prices and pricing policy. Hence, the two-sided uncertainty model in the absence of CPP degenerates into a one-sided uncertainty model in the presence of CPP. Because consumers no longer engage in the policy inquiry process (or equivalently, $f_h = f_l = f_s = 0$), the consumers' and the seller's haggling costs depend only on their time costs incurred in the price haggling process.

In the presence of CPP, the seller's fixed price policy remains either $(v_h,0)$ or $(v_l,0)$ (we reduce the price schemes to two dimensions now that the policy inquiry process is no longer engaged). Thus, the respective profits are unchanged, with $\pi^{L}_{CPP} = \pi^{L} = v_l - c_l$ and $\pi^{H}_{CPP} = \pi^{H} = q(v_h - c_l)$. To derive the low-cost seller's optimal haggling policy, we note that all of the consumers are informed about its pricing policy and thus the seller can only use consumers' haggling time to screen. Substituting $f_h = 0$, $f_l = 0$, $f_s = 0$ and $r = 0$ into our previous results, we obtain the optimal haggling schemes in Proposition 2.

Proposition 2. *In the presence of CPP, under a haggling policy, a (low-cost) seller's optimal price schemes are* $(v_{h,}\ 0)$ *and* $\left(\frac{v_l k_h - v_h k_l}{k_h - k_l}, \frac{v_h - v_l}{k_h - k_l}\right)$. *There is no policy inquiry, but the haggling time is longer than that in the absence of CPP.*

Proposition 2 addresses two interesting results related to the optimal haggling policy that stand in contrast with those in the absence of CPP. First, the required haggling time for a discount becomes longer. In the presence of CPP, consumers know that a discount is available and thus have a greater incentive to haggle. Anticipating this, the seller must extend the haggling time to deter the high-type consumers from haggling. Moreover, in the absence of CPP, high-type consumers' greater policy inquiry cost, compared with that of low-type consumers, facilitates screening. In the presence of CPP, however, this facilitation vanishes and the seller must rely on a prolonged haggling time to screen.

The second interesting result is that the discount obtained by haggling consumers in the presence of CPP can be either greater or smaller than that obtained in the absence of CPP. We show that CPP results in a smaller discount if k_h is sufficiently large relative to k_l and/or f_h is not too large relative to f_l. To understand this, recall that in the absence of CPP, haggling involves two processes, i.e., policy inquiry and price haggling, and that f_h and f_l are the two consumer segments' policy inquiry costs, and k_h and k_l are their opportunity costs of haggling time, respectively. When the two segments' difference in opportunity cost of haggling time is larger than their cost difference in policy inquiry, price haggling is a more effective screening instrument. Hence, in the presence of CPP, when only price haggling is used to screen, the seller can use a smaller discount to attract low-type consumers to haggle, and in the meantime to prevent high-type consumers from haggling.

Therefore, surprisingly, in the presence of CPP, although consumers have greater incentives to haggle (due to the resolved uncertainty) and become more aggressive in haggling (i.e., a longer haggling time), the seller does not necessarily reduce its discounted price, which gives rise to the possibility that CPP increases the profit. In fact, we can show that when low-type consumers' policy inquiry cost is sufficiently large and their opportunity cost of haggling time is sufficiently small, in the absence of CPP, the seller must offer a large discount as a compensation to encourage low-type consumers to haggle. In the presence of CPP, however, this large compensation becomes unnecessary, enabling the seller to reduce the discount and improve profitability.

Because CPP affects the seller's haggling profit, the parameter spaces for the three pricing policies change. This implies that there are situations where haggling is equilibrium in the absence of CPP, whereas a fixed price policy becomes equilibrium in the presence of CPP, and vice versa. The effects of CPP on the seller's equilibrium pricing policy and profit are summarized in Proposition 3 as follows.

Proposition 3. *When compared with the two-sided uncertainty model in the absence of CPP, the presence of CPP has the following effects for the (low-cost) seller:*

- *If $f_s > \hat{f}_s$ and $k_s > \hat{k}_s$, the seller always adopts a fixed price policy, as $max(\pi^H, \pi^L) > max(\pi^G, \pi^G_{CPP})$. CPP has no effect.*
- *If $\underline{f_s} < f_s < \hat{f}_s$, a haggling policy is always optimal, but with different price schemes and a longer haggling time. The seller's profit is increased, as $\pi^G_{CPP} > \pi^G > max(\pi^H, \pi^L)$.*
- *If $f_s < \underline{f_s}$ and $k_s < \hat{k}_s$, a haggling policy is always optimal, but with different price schemes and a longer haggling time. The seller's profit is decreased, as $\pi^G > \pi^G_{CPP} > max(\pi^H, \pi^L)$.*
- *If $f_s > \hat{f}_s$ and $k_s < \hat{k}_s$, CPP results in a change from a fixed price policy to a haggling policy. The seller's profit is increased, as $\pi^G_{CPP} > max(\pi^H, \pi^L) > \pi^G$.*
- *If $f_s < \hat{f}_s$ and $k_s > \hat{k}_s$, CPP results in a change from a haggling policy to a fixed price policy. The seller's profit is decreased, as $\pi^G > max(\pi^H, \pi^L) > \pi^G_{CPP}$. $\hat{f}_s$, $\underline{f_s}$, $\hat{k}_s$ are defined in the Appendix A.*

Fig. 1 graphically illustrates the changes due to the presence of CPP (note that $\underline{f_s}$ is a function of k_s and that $\hat{f}_s$ may or may not be a function of k_s). To understand the seller's choice of haggling as an equilibrium policy, note that the seller benefits from price discrimination enabled by haggling, but suffers its associated cost. Hence, when the costs in dealing with consumer inquiry (i.e., f_s) and price haggling (i.e., k_s) are both sufficiently high, i.e., $f_s > \hat{f}_s$ and $k_s > \hat{k}_s$, the cost outweighs the benefit and thus a fixed price policy is preferred to a haggling policy. In this case, the presence of CPP affects neither the seller's equilibrium pricing policy nor the price and profit.

When the two costs associated with haggling are sufficiently small (i.e., when $\underline{f_s} < f_s < \hat{f}_s$ or when $f_s < \underline{f_s}$ and $k_s < \hat{k}_s$), the benefit from price discrimination outweighs the cost, and thus a haggling policy is always preferred to a fixed price policy. In the presence of CPP, although there is no need for the seller to take effort to deal with consumers' inquiry about its pricing policy, the seller must employ a longer haggling time before offering a discount to a haggler. Depending on the differences between the two types of consumers' haggling costs as well as the seller's own time cost relative to its cost in dealing with consumers' inquiry, CPP could either decrease or increase the seller's profit. When the seller's cost in dealing with consumer inquiry is moderate (i.e., when $\underline{f_s} < f_s < \hat{f}_s$), the seller's profit increases, as the presence of CPP removes the policy inquiry process and thus makes screening more cost effective. In contrast, when this cost is sufficiently low (i.e., when $f_s < \underline{f_s}$), the seller's profit decreases, as the effect of the cost due to prolonged haggling time dominates.

The cost of haggling and its benefit is more balanced when f_s is high and k_s is low (i.e., when $f_s > \hat{f}_s$ and $k_s < \hat{k}_s$), or when f_s is low and k_s is high (i.e., when $f_s < \hat{f}_s$ and $k_s > \hat{k}_s$). In the former case, the presence of CPP induces the seller to change from a fixed price policy to a haggling policy. Haggling becomes optimal, as the seller's high cost of f_s is gone and its haggling time cost k_s is low. The profit is increased since price discrimination is enabled.

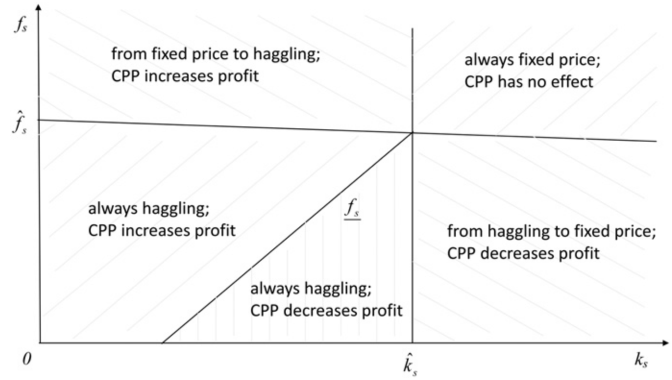

Fig. 1. Effect of CPP on pricing policy and profit.

When $f_s < \hat{f}_s$ and $k_s > \hat{k}_s$, in contrast, CPP results in a change from a haggling policy to a fixed price policy. Haggling becomes inferior to a fixed price policy due to its associated high marginal cost of time k_s and a prolonged haggling time. Then the seller chooses a fixed high-price policy if its marginal cost of product c_l is large. In this case, CPP results in a higher transaction price, as the discounted price is no longer available. Low-type consumers do not make a purchase; consumer participation is reduced. High-type consumers make purchases, but earn zero consumer surplus since $p = v_h$. If c_l is small, however, the seller chooses a fixed low-price policy. In this case, all consumers purchase at the price of $p = v_l$. Consumers' surplus is increased, as high-type consumers obtain some positive surplus. Therefore, although CPP can resolve consumers' uncertainty and enhance their incentives to haggle, it does not necessarily benefit consumers.

From the seller's point of view, price transparency does not automatically mean a decreased profit. Proposition 3 indicates that CPP can affect a seller's pricing policy in three ways. First, the seller maintains a haggling policy but adjusts the price schemes. In this case, the increased price transparency can either increase or decrease the seller's profit, depending on the relative haggling cost differences among the two consumer segments and the seller. As discussed earlier, the seller may benefit from improved price transparency on the consumers' side, as CPP can enable more efficient screening schemes. Second, the seller changes from a fixed price policy to haggling. This somewhat surprising transition occurs when, in the absence of CPP, the cost of dealing with consumers' policy inquiries severely affects the seller's profitability, whereas in the presence of CPP, haggling becomes viable because that cost is gone. In this case, the seller's profit is increased. Third, the seller sheds its haggling policy and adopts a fixed price policy instead. In such a case, unless the marginal cost of its product is sufficiently low, it switches to a fixed high-price policy, thereby eliminating the discounted price otherwise available to haggling consumers and ruling out these consumers' participations in the market such that the seller's profit is decreased.

Although not frequent, retailers' pricing policies are hardly cast in stone; they are changed over time. For instance, a Home Depot store was reported to empower its salespeople to negotiate prices with customers, and similarly, customers have negotiated successfully at other primarily take-it-or-leave-it pricing stores such as Best Buy and Nordstrom (Richtel 2008). These changes are consistent with our theoretical prediction and expected to improve the stores' profitability. Conversely, Lithia Motors, the eighth-largest auto dealer chain in the U.S., announced in September 2007 that it would convert all of its 108 stores to haggle-free pricing within 3 years (Welch 2007). Based on our theory, this move might not be profitable. We note that the rationale for Lithia's decision must go beyond the scope of our model; it may be driven by other factors such as competitive pressure.

Discussion

To facilitate the development of the aforementioned insights, we assume a fixed market size. In some markets, however, the increased demand effect due to price transparency can be substantial. In such markets, our results that CPP can increase price and profit should be strengthened, based on the argument made by Samuelson and Zhang (1992) and Cachon, Terwiesch, and Xu (2007).

We also assume that all consumers have access to CPP. We can assume more realistically that only a proportion of consumers have such access. In such a model, for ease of derivation and exposition, we also assume that there is no policy inquiry process and thus consumers must haggle for a certain period to obtain a discount (if available) and to realize the seller's pricing policy. All of the other assumptions are maintained. Analysis shows that our major insights are robust. In addition, it shows that haggling consumers with access to CPP enjoy advantages over those without access. First, because they are informed, they only haggle with a seller that adopts a haggling policy, and their haggling effort is always fruitful. In contrast, consumers without access may haggle in vain if they run into a seller with a fixed price. Second, when dealing with a haggling seller, haggling consumers with access to CPP may obtain greater consumer surplus than those without access. To understand this result, note that the seller may have to offer the same price scheme to both types of haggling consumers. Because the discount must compensate for consumers' policy inquiry cost, it must produce a positive surplus for the informed consumers who do not make the inquiry (the details and proof of this model are available from the authors upon request).

We assume that there are two consumer segments. We acknowledge that an ideal model should allow consumers' WTP and haggling costs to follow some continuous distribution. In such a model, a seller is expected to offer more than two price schemes in equilibrium, and consumers who haggle for a longer time can obtain a greater discount than consumers who haggle for only a limited time. We choose not to adopt such a model in the main context because it would greatly complicate the analysis without providing much additional insight. Similar approach has been taken in the literature, and for the same reasons (e.g., Varian 1980; Bagwell and Riordan 1991; Tellis and Wernerfelt 1987; Iyer 1998; Zhang 2009). Having said that, in the Appendix A we extend our model and allow for a fraction of "medium-type" consumers whose WTP and haggling costs fall between those of high- and low-type consumers. We assume that there is no policy inquiry process, and maintain all of the other assumptions. Then we derive a more realistic equilibrium in which both medium- and low-type consumers haggle, with low-type consumers haggling longer and obtaining a greater discount than medium-type consumers, whereas high-type consumers do not haggle at all and thus pay the listed price.

In our model, once the seller determines its pricing scheme(s), it is assumed to stick to it. In practice, however, because a seller often employs salespeople who may have various experiences and motives, the pricing schemes may not be implemented as prescribed by management. In particular, there is a possibility that salespeople do not offer a discount to hagglers even after they have haggled for a prescribed haggling time. To consider the possible effect of such behavior, we assume that the salespeople in a haggling store follow the pricing schemes in a stochastic manner: they conform to the prescription with a probability of $1-\rho$ and with a probability of ρ, they do not offer a price discount even if the store adopts a haggling policy and a haggler has haggled for the prescribed time. In such a model, from the consumers' point of view, the probability that they obtain a discount is $(1-r)(1-\rho)$ instead of $1-r$. The equilibrium results, including the prescribed haggling time and profit, naturally depend on the value of ρ. However, the qualitative nature of our results should not change. We realize that principal–agent problems are widespread and can significantly compromise a seller's profit. We call for future research to model the agency problems more carefully and address the issues.

Using a monopoly model, we show that increased price transparency can lead to a higher price and a higher seller profit. What if there are multiple sellers? We have reason to believe that incorporating competition does not necessarily affect the qualitative nature of our results. First, according to Diamond (1971), sellers are able to charge monopoly prices as long as consumers incur positive search or switching costs, even if those costs are minimal. This famous "monopoly price paradox" indicates that sellers may enjoy considerable monopoly power even in a seemingly competitive market. Second, by increasing price transparency, CPP informs competing sellers about each other's (transaction) prices, and thus may facilitate collusion. In fact, sellers may prefer transparent electronic markets that allow them to tacitly collude and avoid losses from price competition (Campbell, Ray, and Muhanna 2005; Overgaard and Mollgaard 2007). Hence, if we develop a duopoly model as per Campbell, Ray, and Muhanna (2005) and Schultz (2005), we could obtain the result that collusion is impossible in the absence of CPP, but it is sustained along with higher prices in the presence of CPP.

We note that in a competitive market, the price information available in CPP can provide consumers with some bargaining power over a seller once their outside option becomes more attractive due to the resolved uncertainty (for example, a haggling consumer can threaten to leave for another seller whose prices are known to be discounted). Intuition suggests that in such a case, CPP should result in decreased prices. However, it is important to note that a seller's price and pricing policy depend not only on consumers' behavior, but also on competitors' price and pricing policies (Desai and Purohit, 2004). In an abstract from the collusion effect, Desai and Purohit (2004) show that both sellers adopting a haggling policy, both sellers adopting a fixed price policy, and asymmetric adoption of the two pricing policies are all possible equilibria. We conjecture that the presence of CPP in a duopoly model, as per the study by Desai and Purohit (2004), should affect the sellers' profit in the three equilibria and thus the parametric spaces of those equilibria. This suggests that it is possible for the presence of CPP to induce firms to change their equilibrium pricing policies in various ways. Thus, the effect of CPP on competing sellers' pricing decisions may not be as straightforward as initially thought. It certainly deserves formal investigation.

Dynamic Model with Two Selling Periods

In the real world, when choosing a pricing policy, a seller considers not only the maximization of the current profit, but also its effect on future profitability. To explore the implications of this fact, in this section we study CPP in a more realistic dynamic model. We assume that there are two selling periods, and that the seller tries to maximize the total profit. More specifically, we assume that there are two identical batches of consumers entering the market in the two periods. The two batches of consumers are one period live and communicate only through CPP. The first-period consumers post their transaction prices in CPP, which is then accessed by the second-period consumers. We also assume that CPP, if revealing that a seller has offered discounted prices, can adversely affect the second-period consumers' WTP. Behavioral research has shown that consumers' purchase decisions are affected by both current and past prices, and that consumers may use the prices that other consumers have paid to infer the value of a product. In general, consumers are found to be less likely to accept a price once they realize that other consumers have paid a lower price (Kahneman and Tversky 1979; Kalyanaram and Winer 1995). Thus, we assume that a proportion of high-type consumers will reduce their WTP from v_h to v_m once CPP informs consumers about the availability of a discounted price, where $v_h > v_m > v_l$. For ease of exposition, we assume that there is no policy inquiry process; that is, consumers must haggle for a certain period to obtain a discount (if available) and realize the seller's pricing policy. We maintain all of the other assumptions of the basic model.

In this model, the seller must consider the effect of its first-period price policy on its second-period profit. If the seller adopts a fixed price policy in the first period, then its maximum total profit, denoted as π^{TF}, is $max(\pi^H,\pi^L) + \delta max(\pi^H,\pi^L,\pi^G)$, where δ is the discount factor. If the seller adopts a haggling policy in the first period, then its cost type is revealed in the second period and a proportion of high-type consumers will reduce their WTP. If the seller adopts a fixed price policy in the second period, it can adopt a fixed-high, fixed-middle, or fixed-low price policy. In a fixed-middle price policy, the seller charges a fixed price of v_m, and serves both high- and middle-type consumers. The seller's profits under these three fixed price policies are denoted as π_D^H, π_D^M, and π_D^L, respectively, where subscript D represents the dynamic case. We can show that $\pi_D^H = q(1-\beta)(v_h - c_l)$, $\pi_D^M = q(v_m - c_l)$, and $\pi_D^L = v_l - c_l$. When the seller adopts a haggling policy in the second period, the optimal price schemes are either $(v_h, 0)$ and $\left(v_l - \frac{v_h - v_l}{k_h - k_l}k_l, \frac{v_h - v_l}{k_h - k_l}\right)$, or $(v_m, 0)$ and $\left(v_l - \frac{v_h - v_l}{k_h - k_l}k_l, \frac{v_h - v_l}{k_h - k_l}\right)$. Its profit is denoted as π_{CPP}^{GD}, where superscript D represents the dynamic case. Thus, the seller's total profit to adopt a haggling policy in the first period, denoted as π^{TG}, is $\pi^G + \delta max(\pi_D^H,\pi_D^M,\pi_D^L,\pi_{CPP}^{GD})$.

In the absence of CPP consumers in the two periods are two independent markets. Hence, the results are virtually the same as those obtained in the previous one-period model. However, changes can arise in the presence of CPP, as the second-period consumers' price knowledge can be updated by the first-period consumers. In some cases, although a haggling policy is lucrative for the first period, i.e., $max(\pi^H,\pi^L) < \pi^G$, the seller is better off not adopting it to conceal its low-cost type and ensure the benefits from the second period, i.e., $max(\pi^H,\pi^L,\pi^G) > max(\pi_D^H,\pi_D^M,\pi_D^L,\pi_{CPP}^{GD})$. Analysis shows that such a strategy is indeed optimal (i.e., $\pi^{TF} > \pi^{TG}$), if the adverse effect of discount information on second-period consumers' WTP is sufficiently strong (i.e., $max(\pi^H,\pi^L,\pi^G) - max(\pi_D^H,\pi_D^M,\pi_D^L,\pi_{CPP}^{GD})$ is sufficiently large) and if the seller highly cares about the future (i.e., if the discount factor δ is sufficiently large).

Proposition 4. *In the presence of CPP, a (low-cost) seller may adopt a fixed high-price policy although a haggling policy is more lucrative for the first period. Such a strategy is optimal if the adverse effect of discount information on consumers' WTP is sufficiently strong and if the seller's discount factor is sufficiently large.*

Proposition 4 indicates that although a haggling policy may yield a greater profit in the short term, there are conditions under which a long-term oriented seller finds it suboptimal in the presence of CPP. This suggests that the presence of CPP can bring about different consequences under different situations. Specifically, it is possible for CPP to only change a haggling seller's pricing schemes, similar to our results in the basic model. However, there are also situations where the presence of CPP eliminates the discounted price that would otherwise be available to low-type haggling consumers. In such cases, because fixed price policy is the only equilibrium strategy and there are no "secret" deals provided to hagglers, CPP becomes useless to consumers and thus may die out in the long term.[11]

Information transparency has been defined by some researchers as the *availability* and *accessibility* of market information to its participants (Zhu 2004; Granados, Gupta, and Kauffman 2010). When information accessibility is low (i.e., in the absence of CPP), a low-cost seller may optimally adopt a haggling pricing strategy, thereby revealing its cost type to (haggling) consumers. In contrast, when information accessibility is high (i.e., in the presence of CPP), the seller may optimally choose to adopt a fixed high-price policy (as a high-cost seller) and conceal its low-cost nature. Although CPP improves information accessibility, it can

[11] We thank an anonymous reviewer for offering this insight.

actually reduce the amount of information available to consumers. This finding is consistent with the insight that in repeated transactions, a seller with private information about its cost tries harder to convince the buyer that its cost is high (Banks, Hutchinson, and Meyer 2002; Hart and Tirole 1988; Schmidt 1993).

Concluding Remarks

The vast literature has suggested that consumers should benefit from increased price transparency. Informed consumers can then buy at the best price, which in turn intensifies price competition and hurts sellers (Bakos 1997). In contrast to this conventional wisdom, we show that increased transparency does not always benefit consumers and hurt the seller. Rather, it can lead to fewer purchases, a higher transaction price and a greater seller profit, despite that consumers' uncertainty is resolved and their haggling becomes more aggressive.

The first driver of these interesting results is that a strategic firm can respond to changes in consumers' price information and adjust its pricing policy and the associated prices. For instance, whereas in the absence of CPP a low-cost seller may optimally adopt a haggling policy, offering both a regular (posted) price and a discounted price to serve both consumer segments, in the presence of CPP the same seller sticks to a fixed high-price policy and leaves low-type consumers unserved. Hence, in this case, CPP removes the discounted price and results in fewer purchases and a lower seller profit. CPP can even lead to a higher haggling price and a higher seller profit. Haggling is often considered embarrassing and unsavory, which prevents consumers from asking whether the posted price is negotiable. This implies that a haggling seller must set its discount sufficiently large (as compensation) to encourage consumers to make an inquiry and haggle. Once the uncertainty is resolved by CPP, however, the compensation becomes unnecessary, enabling the seller to charge a higher discounted price and improve profitability.

The second driver of an increased seller profit is more subtle. In the presence of CPP, although there is no need for the seller to take effort to deal with consumers' inquiry about its pricing policy, the seller must employ a longer haggling time before offering a discount to a haggler. Note that the removal of the policy inquiry process due to the presence of CPP changes the seller's instruments of and efficiency in screening. Depending on the differences between the two consumer segments' two haggling costs as well as the seller's two haggling costs, CPP can either increase or decrease the efficiency and thus the seller's profit.

With a more realistic, two-selling-period dynamic model, we show that in the presence of CPP, a low-cost seller may opt for a fixed high-price policy in the first period to maximize the total profit from both periods and avoid the adverse effect of revelation of discount information on second-period consumers, although a haggling policy could yield a greater profit for the first period alone. This result indicates that the effect of CPP on the level of information transparency may not be as evident as it seems. CPP surely increases information accessibility. Information that was once conventionally scattered among individual consumers is now shared online, where price searching is as easy as clicking a mouse. However, in the presence of CPP, a strategic seller may optimally choose to conceal information that could be revealed in the absence of CPP. This indicates that CPP may reduce the amount of information available to consumers.

Our results have the following managerial implications. First, retailers should take caution when generalizing conventional wisdom on information transparency in a contemporary social media context. In this regard, Proposition 3 provides a useful guideline for how a firm should revise its pricing strategy in accordance with consumers' improved price knowledge. Second, in practice sellers that adopt a haggling policy rarely advertise their transaction prices. Rather, they seem to try to keep their deals a secret and regard consumer price haggling as something that ought to be forestalled to secure a higher margin. Our analysis, however, suggests that when consumers suffer significantly from the uncertainty in haggling, disclosing historical prices may improve their profitability. Hence, retailers should explore online consumer communities as a platform to provide interactive services to consumers (Berrya et al. 2010) and even sponsor social media such as CPP to capitalize on the potential of market transparency. Our findings have strong managerial implications for firms that hope to use social media to build competitive advantages and expand their businesses in the era of UGC.

Our results also have implications for Internet policy makers. Consumerists passionately advocate price transparency, with the belief that it only increases consumers' welfare. They have even suggested that the government subsidize the gathering, processing and dissemination of information to consumers, setting up government-sponsored information transmission mechanisms to improve transparency. However, as this study shows, greater price transparency does not necessarily result in lower prices or increased consumer surplus. In the Internet era, the informational features of markets can definitely and significantly affect market performance (Soh, Markus, and Goh 2006; Porter 2001; Granados, Gupta, and Kauffman 2010), and the decision to support CPP and other information institutions should be made on a case-by-case basis.

This study has limitations and suggests many interesting areas for future research. First, we use a monopoly model and focus on situations in which haggling is used by the seller to price discriminate consumers who have no bargaining power. As noted earlier, new sets of insights could be obtained if future research explores situations in which consumers have some bargaining power (due to the presence of CPP) in a competitive setting. In this vein, one could follow Desai and Purohit's (2004) duopoly model and assume that sellers' pricing policies are unobservable in the absence of CPP. Second, price- and product-related information are the two basic types of information that consumers seek in their purchase process. Although this study focuses on the effects of improved transparency on price information, product and price transparency are often inseparable in practice, as buyers typically demand to see the prices associated with product offers. Because these two types of information can have different implications for consumer behavior, it would be of great interest to see a model that captures their interdependencies. Finally, this study is theoretical, and we realize that systematic empirical studies of the effects of increased information transparency on firm behavior have been extremely scant. Such necessary research should prove to be of great interest when it eventually appears.

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Appendix A

A.1. Price Schemes under a Haggling Policy

We first derive the optimal price schemes in the presence of CPP and then in its absence.

(i) In the presence of CPP, the seller's type and thus pricing policy are revealed. The seller's problem is $max\pi^G_{CPP} = q(p_h - k_s t_h) + (1 - q)(p_l - k_s t_l) - c_l$ s.t. (1) $v_h - p_h - k_h t_h \geq 0$; (2) $v_l - p_l - k_l t_l \geq 0$; (3) $v_h - p_l - k_h t_l \leq v_h - p_h - k_h t_h$; and (4) $v_l - p_l - k_l t_l \geq v_l - p_h - k_l t_h$. Furthermore, all decision variables must be nonnegative.
This is a maximization problem with several inequality constraints. We first show $p_h^* > v_l$ where the superscript * on the notation denotes the optimal solution of that notation, as otherwise the seller is better off charging a fixed-low posted price. Thus, Constraint (4) is non-binding. We now show $t_h^* = 0$, where t_h^* is the optimal haggling time aimed at high-type consumers. Supposing not, let (p_h^*, t_h^*) denote the price scheme aimed at high-type consumers in the optimal screening price policy, where $t_h^* \neq 0$. Let us define $p_h^{**} = p_h^* + k_h t_h^*$. It can be seen that the scheme $(p_h^{**}, 0)$ increases the seller's profit and still satisfies all of the constraints.
Now, the seller's problem can be rewritten as $max\pi^G_{CPP} = qp_h + (1 - q)(p_l - k_s t_l) - c_l$ s.t. (1) $v_h - p_h \geq 0$; (2) $v_l - p_l - k_l t_l \geq 0$; and (3) $v_h - p_l - k_h t_l \leq v_h - p_h$.
Let us show that the optimal price scheme aimed at low-type consumers, denoted as (p_l^*, t_l^*), is $(v_l - \frac{p_h - v_l}{k_h - k_l} k_l, \frac{p_h^* - v_l}{k_h - k_l})$, where $v_l < p_h^* \leq v_h$. Constraint (1) is satisfied. From Constraint (2), $p_l \leq v_l - k_l t_l^*$. From Constraint (3), $p_l \geq p_h^* - k_h t_l^*$. For the solution to exist, it requires $p_h^* - k_h t_l^* \leq v_l - k_l t_l^*$. That is, $t_l^* \geq \frac{p_h^* - v_l}{k_h - k_l}$. Among all pairs of (t_l, p_l) that satisfy the constraints, the seller wants to set a pair such that the price is as high as possible while the time is as minimal as possible. Thus, $p_l^* = v_l - k_l t_l^*$ and $t_l^* = \frac{p_h^* - v_l}{k_h - k_l}$. We are now ready to show that $p_h^* = v_h$ if the optimal haggling policy exists. Further, $\pi^G_{CPP} = qp_h^* - (1-q)\frac{k_l + k_s}{k_h - k_l} p_h^* + (1-q)\frac{k_h + k_s}{k_h - k_l} v_l - c_l$. It can be seen that $\frac{\partial \pi^G_{CPP}}{\partial p_h^*} < 0$ if $qk_h < k_l + (1 - q)k_s$. Thus $p_h = v_l$ dominates any solution in $p_h \in (v_l, v_h]$. However, if $p_h^* = v_l$, the seller is better off with a fixed-low price policy.
It can also be seen that $\frac{\partial \pi^G_{CPP}}{\partial p_h^*} > 0$ if $qk_h > k_l + (1 - q)k_s$. Thus, $p_h^* = v_h$. Therefore, $p_h^* = v_h$, $t_h^* = 0$, $p_l^* = \frac{v_l k_h - v_h k_l}{k_h - k_l}$, and $t_l^* = \frac{v_h - v_l}{k_h - k_l}$ if the optimal haggling policy exists (we assume $v_l k_h > v_h k_l$ to ensure a positive sale price.).

(ii) In the absence of CPP, there exists two-sided uncertainty. The seller's problem is $\underset{p_h, p_l, t_h, t_l, b_h, b_l}{max\pi^G} = q(p_h - k_s t_h) + (1-q)(p_l - k_s t_l) - c_l - (b_h q + b_l(1-q))f_s$ s.t. (1) $v_h - p_h - k_h t_h - b_h f_h \geq 0$; (2) $(1-r)(v_l - p_l - k_l t_l) - b_l f_l \geq 0$; (3) $(1-r)(v_h - p_l - k_h t_l) - b_l f_h \leq v_h - p_h - k_h t_h - b_h f_h$; (4) $(1-r)(v_l - p_l - k_l t_l) - b_l f_l \geq v_l - p_h - k_l t_h - b_h f_l$. (5) $t_i = 0$ if $b_i = 0$, where $i = h, l$.

We first show $t_h^* = 0$. Supposing not, we can define p_h^{*+} such that $p_h^{*+} = p_h^* + k_h t_h^*$. The set of schemes $(p_h^{*+}, 0, b_h^*)$ and (p_l^*, t_l^*, b_l^*) increases the seller's profit and yet satisfies all of the constraints. We next show $p_h^* > v_l$, as otherwise the seller is better off charging a single-low posted price. Note that under this condition Constraint (4) is always satisfied when Constraint (2) is satisfied. We further show $b_h^* = 0$ and $b_l^* = 1$. Supposing $b_h^* = 1$, we can define p_h^{*-} such that $p_h^{*-} = p_h^* + b_h^* f_h$. The set of schemes $(p_h^{*-}, 0, 0)$ and (p_l^*, t_l^*, b_l^*) increases the seller's profit and yet satisfies all of the constraints. Supposing $b_l^* = 0$. By assumption $t_l^* = 0$. However, this set of schemes can no longer support a haggling equilibrium.

The seller's problem can now be simplified as $max\pi^G = qp_h + (1 - q)(p_l - k_s t_l) - c_l - (1 - q)f_s$, s.t. (1) $v_h - p_h \geq 0$; (2) $(1 - r)(v_l - p_l - k_l t_l) - f_l \geq 0$; and (3) $(1 - r)(v_h - p_l - k_h t_l) - f_h \leq v_h - p_h$. From Constraint (2), $p_l \leq v_l - k_l t_l^* - \frac{f_l}{1-r}$. From Constraint (3), $p_l \geq v_h - k_h t_l^* - \frac{v_h - p_h^* + f_h}{1-r}$. For the solution to exist, it requires $t_l^* \geq \frac{1}{k_h - k_l}\left(v_h - v_l - \frac{v_h - p_h^* + f_h - f_l}{1-r}\right)$. Among all pairs of (t_l, p_l) that satisfy the constraints, the seller wants to set a pair such that the price is as high as possible while the time is as minimal as possible. Thus, $p_l^* = v_l - k_l t_l^* - \frac{f_l}{1-r}$. $t_l^* = max\left\{\frac{1}{k_h - k_l}\left(v_h - v_l - \frac{v_h - p_h^* + f_h - f_l}{1-r}\right), 0\right\}$ as all variables are non-negative. We now derive the results in three cases.

Case (1). $v_h - v_l \leq \frac{f_h - f_l}{1-r}$

This is a sufficient condition for $t_l^* = 0$ as $v_h - v_l - \frac{v_h - p_h^* + f_h - f_l}{1-r} \leq 0$. It can then be derived that $p_l^* = v_l - \frac{f_l}{1-r}$ and $p_h^* = v_h$. Thus, the optimal haggling schemes are $(v_h, 0, 0)$ and $(v_l - \frac{f_l}{1-r}, 0, 1)$, and the seller's profit in this case is $\pi^{G1} = qv_h + (1-q)(v_l - \frac{f_l}{1-r}) - c_l - (1-q)f_s$.

Case (2). $v_h - v_l > \frac{f_h - f_l}{1-r}$ and $t_l^* = \frac{1}{k_h - k_l}\left(v_h - v_l - \frac{v_h - p_h^* + f_h - f_l}{1-r}\right)$

We can show $p_h^* = v_h$. $\pi^{G2} = qp_h^* + (1-q)\Big(v_l \frac{f_l}{1-r} - \frac{k_l + k_s}{k_h - k_l}\left(v_h - v_l - \frac{v_h - p_h^* + f_h - f_l}{1-r}\right)\Big) - c_l - (1-q)f_s$. It can be seen that $\frac{\partial \pi^G}{\partial p_h^*} < 0$ if $k_h < k_l + \frac{(1-q)(k_l + k_s)}{q(1-r)}$. However, $p_h^* = v_l$ means a haggling policy is dominated by a fixed-low price policy. It can also be seen that $\frac{\partial \pi^G}{\partial p_h^*}>0$ if $k_h \geq k_l + \frac{(1-q)(k_l+k_s)}{q(1-r)}$. Thus, $p_h^* = v_h$, $t_l^* = \frac{1}{k_h-k_l}\left(v_h - v_l - \frac{f_h-f_l}{1-r}\right)$, and $p_l^* = \frac{k_h}{k_h-k_l}\left(v_l - \frac{f_l}{1-r}\right) - \frac{k_l}{k_h-k_l}\left(v_h - \frac{f_h}{1-r}\right)$. To insure a positive solution, $k_h\left(v_l - \frac{f_l}{1-r}\right) > k_l\left(v_h - \frac{f_h}{1-r}\right)$ is assumed. The seller's profit, π^{G2}, equals $qv_h + (1-q)\left(\frac{k_h+k_s}{k_h-k_l}(v_l - \frac{f_l}{1-r}) - \frac{k_l+k_s}{k_h-k_l}\left(v_h - \frac{f_h}{1-r}\right)\right) - c_l - (1-q)f_s$.

Case (3). $v_h - v_l > \frac{f_h-f_l}{1-r}$ and $t_l^* = 0$

It can be seen that $p_l^* = v_l - \frac{f_l}{1-r}$ and $p_h^* = rv_h + (1-r)v_l + (f_h - f_l)$. However, this post price is different from a post price in a fixed-high policy. Thus, consumers can tell from the post price that this is a low-cost seller; as such, there is no uncertainty of the seller's type involved in this case. Therefore, we need to follow the previous analysis to resolve the seller's problem when $r = 0$. The optimal schemes derived are thus $(v_l + (f_h - f_l), 0, 0)$ and $(v_l - f_l, 0, 1)$, and the seller's profit, π^{G3}, equals $q(v_l + (f_h - f_l)) + (1-q)(v_l - f_l) - c_l - (1-q)f_s$. This haggling policy is optimal only if $\pi^{G3} > max\{\pi^L;\pi^H\}$. To ensure $\pi^{G3} > \pi^L$, it must be $q > \frac{f_l}{f_h}$; to ensure $\pi^{G3} > \pi^H$, it must be $q < \frac{v_l-f_l}{v_h-f_h}$. Thus, a necessary condition for this set of haggling schemes to be optimal in equilibrium is that $\frac{f_l}{f_h} < \frac{v_l-f_l}{v_h-f_h}$. Or equivalently, $v_h f_l < v_l f_h$. To suppress this case and focus on the uncertainty involved in the haggling policy, we assume that $v_h f_l \geq v_l f_h$. Note that this is a sufficient but not a necessary condition to suppress this case. Other conditions such as the seller's cost not being too small, $(1-q)c_l \geq v_l - f_l - q(v_h - f_h)$, are also sufficient to suppress this case.

Thus, if haggling is the equilibrium policy, the optimal schemes are $(v_h, 0, 0)$ and $(v_l - \frac{f_l}{1-r}, 0, 1)$ when $v_h - v_l \leq \frac{f_h-f_l}{1-r}$, and $(v_h, 0, 0)$ and $(p_l^*, t_l^*, 1)$ when $v_h - v_l > \frac{f_h-f_l}{1-r}$, where $p_l^* = \frac{k_h}{k_h-k_l}\left(v_l - \frac{f_l}{1-r}\right) - \frac{k_l}{k_h-k_l}\left(v_h - \frac{f_h}{1-r}\right)$ and $t_l^* = \frac{1}{k_h-k_l}\left(v_h - v_l - \frac{f_h-f_l}{1-r}\right)$. In the latter case, regularity conditions $k_h\left(v_l - \frac{f_l}{1-r}\right) > k_l\left(v_h - \frac{f_h}{1-r}\right)$ and $v_h f_l \geq v_l f_h$ are assumed to meet. Furthermore, $\frac{\partial \frac{f_h-f_l}{1-r}}{\partial r} > 0$, $\frac{\partial \pi^{G1}}{\partial r} < 0$; $\frac{\partial t_l^*}{\partial r} < 0$; $sign\left(\frac{\partial \pi^{G2}}{\partial r}\right) = sign((k_l + k_s)f_h - (k_h + k_s)f_l)$, thus $\frac{\partial \pi^{G2}}{\partial r} > 0$ if $\frac{f_h}{f_l} > \frac{k_h+k_s}{k_l+k_s}$, and $\frac{\partial \pi^{G2}}{\partial r} < 0$ if $\frac{f_h}{f_l} < \frac{k_h+k_s}{k_l+k_s}$. $\pi^G = \pi^{G1}$ when $v_h - v_l \leq \frac{f_h-f_l}{1-r}$, and $\pi^G = \pi^{G2}$ when $v_h - v_l > \frac{f_h-f_l}{1-r}$.

A.2. Proof of Proposition 1

$\pi^L = v_l - c_l$; $\pi^H = q(v_h - c_l)$; $\pi^G = \pi^{G1}$ when $v_h - v_l \leq \frac{f_h-f_l}{1-r}$, $\pi^G = \pi^{G2}$ when $v_h - v_l > \frac{f_h-f_l}{1-r}$, where $\pi^{G1} = qv_h + (1-q)(v_l - \frac{f_l}{1-r}) - c_l - (1-q)f_s$, and $\pi^{G2} = qv_h + (1-q)\left(\frac{k_h+k_s}{k_h-} k_l\left(v_l - \frac{f_l}{1-r}\right) - \frac{k_l+k_s}{k_h-k_l}\left(v_h - \frac{f_h}{1-r}\right)\right) - c_l - (1-q)f_s$. $\pi^H > \pi^L$ iff $c_l > \frac{v_l - qv_h}{1-q}$; $\pi^L > \pi^{G1}$ iff $f_s + \frac{f_l}{1-r} > \frac{q(v_h-v_l)}{1-q}$; $\pi^H > \pi^{G1}$ iff $f_s + \frac{f_l}{1-r} > v_l - c_l$; $\pi^L > \pi^{G2}$ iff $f_s > \frac{(qv_h-v_l)}{1-q} + \left(\frac{k_h+k_s}{k_h-k_l}\left(v_l - \frac{f_l}{1-r}\right) - \frac{k_l+k_s}{k_h-k_l}\left(v_h - \frac{f_h}{1-r}\right)\right)$; and $\pi^H > \pi^{G2}$ iff $c_l > \frac{k_h+k_s}{k_h-k_l}\left(v_l - \frac{f_l}{1-r}\right) - \frac{k_l+k_s}{k_h-k_l}\left(v_h - \frac{f_h}{1-r}\right) - f_s$. To simplify the notation, let us define $\kappa = \frac{k_h+k_s}{k_h-k_l}\left(v_l - \frac{f_l}{1-r}\right) - \frac{k_l+k_s}{k_h-k_l}\left(v_h - \frac{f_h}{1-r}\right)$, where κ increases in v_l and f_h and decreases in v_h and f_l.

(i) When $v_h - v_l \leq \frac{f_h-f_l}{1-r}$: $\pi^H \geq max\{\pi^L, \pi^G\}$ if $c_l \geq max\left\{\frac{v_l-qv_h}{1-q}, v_l - f_s - \frac{f_l}{1-r}\right\}$; $\pi^L \geq max\{\pi^H, \pi^G\}$ if $c_l \leq \frac{v_l-qv_h}{1-q}$ and $f_s \geq \frac{q(v_h-v_l)}{1-q} - \frac{f_l}{1-r}$; and $\pi^G \geq max\{\pi^H, \pi^L\}$ if $f_s < min\left\{\frac{q(v_h-v_l)}{1-q} - \frac{f_l}{1-r}, v_l - c_l - \frac{f_l}{1-r}\right\}$.

(ii) When $v_h - v_l > \frac{f_h-f_l}{1-r}$: $\pi^H \geq max\{\pi^L, \pi^G\}$ if $c_l \geq max\left\{\frac{v_l-qv_h}{1-q}, \kappa - f_s\right\}$; $\pi^L \geq max\{\pi^H, \pi^G\}$ if $c_l \leq \frac{v_l-qv_h}{1-q}$ and $f_s > \frac{(qv_h-v_l)}{1-q} + \kappa$; and $\pi^G \geq max\{\pi^H, \pi^L\}$ if $f_s < min\left\{\frac{(qv_h-v_l)}{1-q} + \kappa, \kappa - c_l\right\}$.

A.3. Comparison of Price Discounts in the Presence and Absence of CPP

In the absence of CPP, $p_l^* = v_l - \frac{f_l}{1-r}$ when $\pi^G = \pi^{G1}$, and $p_l^* = \left(v_l - \frac{f_l}{1-r}\right) - \frac{k_l}{k_h-k_l}\left(v_h - \frac{f_h}{1-r}\right)$ when $\pi^G = \pi^{G2}$. In the presence of CPP, $p_l^* = \frac{v_l k_h - v_h k_l}{k_h-k_l}$. Thus, when $\pi^G = \pi^{G1}$, $p_l^*|_{CPP} > p_l^*$ if $\frac{v_l k_h - v_h k_l}{k_h-k_l} > v_l - \frac{f_l}{1-r}$ (i.e., $\frac{k_h}{k_l} > 1 + \frac{(1-r)(v_h-v_l)}{f_l}$). When $\pi^G = \pi^{G2}$, $p_l^*|_{CPP} > p_l^*$ *if* $\frac{v_l k_h - v_h k_l}{k_h-k_l} > \left(v_l - \frac{f_l}{1-r}\right) - \frac{k_l}{k_h-k_l}\left(v_h - \frac{f_h}{1-r}\right)$ *(i.e.,* $\frac{k_h}{k_l} > 1 + \frac{f_h - (1-r)v_l}{f_l}$*).*

A.4. Proof of Proposition 3

$\pi^L_{CPP} = \pi^L = v_l - c_l$; $\pi^H = q(v_h - c_l)$; $\pi^G_{CPP} = qv_h + (1-q)(v_l - \frac{v_h-v_l}{k_h-k_l}(k_l + k_s)) - c_l$; and $\pi^G = \pi^{G1}$ when $v_h - v_l \leq \frac{f_h-f_l}{1-r}$, $\pi^G = \pi^{G2}$ when $v_h - v_l > \frac{f_h-f_l}{1-r}$, where $\pi^{G1} = qv_h + (1-q)(v_l - \frac{f_l}{1-r}) - c_l - (1-q)f_s$ and $\pi^{G2} = qv_h + (1-q)\kappa - c_l - (1-q)f_s$. $\pi^H > \pi^G_{CPP}$ if $c_l > v_l - \frac{v_h-v_l}{k_h-k_l}(k_l + k_s)$; $\pi^L > \pi^G_{CPP}$ if $qk_h < k_l + (1-q)k_s$. $\pi^G_{CPP} > \pi^{G1}$ if $\frac{(k_l+k_s)(v_h-v_l)}{k_h-k_l} < \frac{f_l}{1-r} + f_s$; $\pi^G_{CPP} > \pi^{G2}$ if $\frac{k_l+k_s}{k_h-k_l} < \frac{f_l + (1-r)f_s}{f_h - f_l}$. Thus, $\pi^G_{CPP} > \pi^G$ if $\frac{k_l+k_s}{k_h-k_l} < \frac{\frac{f_l}{1-r} + f_s}{min\left\{v_h - v_l, \frac{f_h-f_l}{1-r}\right\}}$.

In the presence of CPP, the possible changes in the optimal price policy and price schemes are listed as follows.

- $max(\pi^H, \pi^L) > max(\pi^G, \pi^G_{CPP})$ holds if $f_s > min\left\{\frac{q(v_h-v_l)}{1-q}, v_l - c_l\right\} - \frac{f_l}{1-r}$ when $v_h - v_l \leq \frac{f_h-f_l}{1-r}$, $f_s > min\left\{\frac{(qv_h-v_l)}{1-q} + \kappa, \kappa - c_l\right\}$ when $v_h - v_l > \frac{f_h-f_l}{1-r}$, and $k_s > min\left\{\frac{(v_l-c_l)(k_h-k_l)}{v_h-v_l} - k_l, \frac{qk_h-k_l}{1-q}\right\}$. Define $\hat{f}_s = min\left\{\frac{q(v_h-v_l)}{1-q}, v_l - c_l\right\} - \frac{f_l}{1-r}$ when $v_h - v_l \leq \frac{f_h-f_l}{1-r}$ and $\hat{f}_s = min\left\{\frac{(qv_h-v_l)}{1-q} + \kappa, \kappa - c_l\right\}$ when $v_h - v_l > \frac{f_h-f_l}{1-r}$, and $\hat{k}_s = min\left\{\frac{(v_l-c_l)(k_h-k_l)}{v_h-v_l} - k_l, \frac{qk_h-k_l}{1-q}\right\}$. The conditions can now be rewritten as $f_s > \hat{f}_s$ and $k_s > \hat{k}_s$.
- $\pi^G_{CPP} > \pi^G > max(\pi^H, \pi^L)$ holds if $\underline{f_s} < f_s < \hat{f}_s$, where $\underline{f_s} = \frac{k_l+k_s}{k_h-k_l} * min\left\{(v_h - v_l), \frac{f_h-f_l}{1-r}\right\} - \frac{f_l}{1-r}$.
- $\pi^G > \pi^G_{CPP} > max(\pi^H, \pi^L)$ holds if $f_s < \underline{f_s}$ and $k_s < \hat{k}_s$.

- $\pi^G_{CPP} > max(\pi^H,\pi^L) > \pi^G$ holds if $f_s > \hat{f}_s$ and $k_s < \hat{k}_s$.
- $\pi^G > max(\pi^H,\pi^L) > \pi^G_{CPP}$ holds if $f_s < \hat{f}_s$ and $k_s > \hat{k}_s$.

We now show that it is always the case that $\hat{f}_s\left(k_s = \hat{k}_s\right) = \underline{f_s}\left(k_s = \hat{k}_s\right)$.

(1) When $v_h - v_l \le \frac{f_h - f_l}{1-r}$.
$\hat{f}_s = min\left\{\frac{q(v_h - v_l)}{1-q}, v_l - c_l\right\} - \frac{f_l}{1-r}$, which is not a function of k_s. $\underline{f_s} = \frac{(k_l + k_s)(v_h - v_l)}{k_h - k_l} - \frac{f_l}{1-r}$, which increases in k_s and $\underline{f_s}(k_s = 0) < 0$. $\hat{k}_s = min\left\{\frac{(v_l - c_l)(k_h - k_l)}{v_h - v_l} - k_l, \frac{qk_h - k_l}{1-q}\right\}$. It can be checked when $v_h \ge v_l + \frac{(v_l - c_l)(1-q)}{q}$, $\hat{f}_s = \underline{f_s}\left(k_s = \hat{k}_s\right) = v_l - c_l - \frac{f_l}{1-r}$ and when $v_h < v_l + \frac{(v_l - c_l)(1-q)}{q}$, $\hat{f}_s = \underline{f_s}\left(k_s = \hat{k}_s\right) = \frac{q(v_h - v_l)}{1-q} - \frac{f_l}{1-r}$. Thus, when $v_h - v_l \le \frac{f_h - f_l}{1-r}$, $\hat{f}_s = \underline{f_s}\left(k_s = \hat{k}_s\right)$.

(2) When $v_h - v_l > \frac{f_h - f_l}{1-r}$.
$\hat{f}_s = min\left\{\frac{qv_h - v_l}{1-q} + \kappa, \kappa - c_l\right\}$, where $\kappa = \frac{k_h + k_s}{k_h - k_l}\left(v_l - \frac{f_l}{1-r}\right) - \frac{k_l + k_s}{k_h - k_l}\left(v_h - \frac{f_h}{1-r}\right)$. It can be seen that both $\hat{f}_s$ and κ decrease in k_s. $\underline{f_s} = \frac{k_l + k_s}{k_h - k_l}\frac{f_h - f_l}{1-r} - \frac{f_l}{1-r}$, which increases in k_s and $\underline{f_s}(k_s = 0) < 0$. $\hat{k}_s = min\left\{\frac{(v_l - c_l)(k_h - k_l)}{v_h - v_l} - k_l, \frac{qk_h - k_l}{1-q}\right\}$. It can be checked when $v_h \ge v_l + \frac{(v_l - c_l)(1-q)}{q}$, $\hat{f}_s\left(k_s = \hat{k}_s\right) = \underline{f_s}\left(k_s = \hat{k}_s\right) = \frac{f_h v_l - f_l v_h - c_l(f_h - f_l)}{(v_h - v_l)(1-r)}$; and when $v_h < v_l + \frac{(v_l - c_l)(1-q)}{q}$, $\hat{f}_s\left(k_s = \hat{k}_s\right) = \underline{f_s}\left(k_s = \hat{k}_s\right) = \frac{qf_h - f_l}{(1-q)(1-r)}$. Thus, when $v_h - v_l > \frac{f_h - f_l}{1-r}$, $\hat{f}_s\left(k_s = \hat{k}_s\right) = \underline{f_s}\left(k_s = \hat{k}_s\right)$.

A.5. With Three Types of Consumers

Assume that proportions q_h, q_m, and q_l of consumers are high-, middle-, and low-type consumers, respectively, where $q_h + q_m + q_l = 1$. The three types of consumers have WTP v_h, v_m, and v_l and unit haggling costs k_l, k_m, and k_h, respectively, where $v_h > v_m > v_l$ and $k_h > k_m > k_l$. We further assume that $c_l < v_l < v_m < c_h < v_h$.

By a derivation similar to that in the first appendix, a low cost seller's optimal three-price haggling scheme, i.e., a full separating equilibrium, is that $(v_h, 0)$ for high-type consumers, $\left(\frac{v_m k_h - v_h k_m}{k_h - k_m}, \frac{(1-r_h)(v_h - v_m)}{k_h - k_m}\right)$ for middle-type consumers, and $\left(\frac{v_l k_m - v_m k_l}{k_m - k_l}, \frac{r_l(v_m - v_l)}{k_m - k_l}\right)$ for low-type consumers, under the condition $(v_h - v_m)(k_h - (1 - r_h)k_l) \le (v_m - v_l)(k_h - k_m)$. A high-cost seller is only optimal to serve high-type consumers, just as in our basic model.

A.6. The Two-period Model

Assume that a proportion β, $1 > \beta > 0$, of the high-type consumers will reduce their WTP from v_h to v_m once they are informed of the existence of a discounted price, where $v_h > v_m > v_l$. In the absence of CPP, the optimal haggling price schemes are the same as those in the basic model.

In the presence of CPP, the optimal haggling price schemes are either $(v_h, 0)$ and $\left(v_l - \frac{v_h - v_l}{k_h - k_l}k_l, \frac{v_h - v_l}{k_h - k_l}\right)$, or $(v_m, 0)$ and $\left(v_l - \frac{v_h - v_l}{k_h - k_l}k_l, \frac{v_h - v_l}{k_h - k_l}\right)$. Note that consumers of v_h and v_m have the same unit haggling cost, thus a full screening scheme such as that in the model of 3 types of consumers cannot be supported. Whereas under the former set of schemes the affected consumers are not served, under the latter set of schemes all consumers are served and the unaffected high-type consumers enjoy a positive surplus. The seller's profits are thus $\pi^{G1}_{CPP} = q(1-\beta)v_h + (1-q)\left(v_l - \frac{v_h - v_l}{k_h - k_l}(k_l + k_s)\right) - c_l$ and $\pi^{G2}_{CPP} = qv_m + (1-q)\left(v_l - \frac{v_m - v_l}{k_h - k_l}(k_l + k_s)\right) - c_l$ respectively. Let $\pi^{GD}_{CPP} = max\{\pi^{G1}_{CPP}, \pi^{G2}_{CPP}\}$ where the superscript D in the profit notation denotes the dynamic model. The seller compares π^{G1}_{CPP} and π^{G2}_{CPP}, and decides which set of schemes to adopt. It can be shown that $\pi^{G1}_{CPP} \ge \pi^{G2}_{CPP}$ if $\beta \le \frac{(v_h - v_m)(qk_h - k_l - k_s + qk_s)}{qv_h(k_h - k_l)}$, and $\pi^{G1}_{CPP} < \pi^{G2}_{CPP}$ otherwise. Furthermore, it can be easily shown that $\pi^G > \pi^{GD}_{CPP}$.

Let us now consider a two-period model. If the seller adopts a fixed price policy in the first period, its maximum total profit, denoted as π^{TF}, is $max(\pi^H,\pi^L) + \delta max(\pi^H,\pi^L,\pi^G)$, where δ is the discount factor. If the seller adopts a haggling policy in the first period, its cost type is revealed in the second period and thus a proportion of high-type consumers' WTP is negatively affected. The seller's total profit, denoted as π^{TG}, is $\pi^G + \delta max(\pi^H_D,\pi^M_D,\pi^L_D,\pi^{GD}_{CPP})$, where $\pi^H_D = q(1-\beta)(v_h - c_l)$, $\pi^M_D = q(v_m - c_l)$, and $\pi^L_D = v_l - c_l$. It can be shown that $\pi^G > max(\pi^H,\pi^L)$ and $\pi^{TF} > \pi^{TG}$ can hold simultaneously under certain conditions, such as when $\delta = 1$ and $\pi^G > max(\pi^H,\pi^L) > max(\pi^H_D,\pi^M_D,\pi^L_D,\pi^{GD}_{CPP})$.

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