Fixed vs. Flexible Pricing in a Competitive Market

Cemil Selcuk

Cardiff Business School, Cardiff University, Cardiff CF10 3EU, UK, selcukc@cardiff.ac.uk

Bilal Gokpinar

UCL School of Management, University College London, London E14 5AB, UK, b.gokpinar@ucl.ac.uk

Abstract: We study the selection and dynamics of two popular pricing policies—fixed price and flexible price—in competitive markets. Our paper extends previous work in marketing, e.g. Desai and Purohit (2004) by focusing on decentralized markets with a dynamic and fully competitive framework while also considering possible non-economic aspects of bargaining. We construct and analyze a competitive search model which allows us to endogenize the expected demand depending on pricing rules and posted prices. Our analysis reveals that fixed and flexible pricing policies generally coexist in the same marketplace, and each policy comes with its own list price and customer demographics. More specifically, if customers dislike haggling, then fixed pricing emerges as the unique equilibrium, but if customers get some additional satisfaction from the bargaining process, then both policies are offered, and the unique equilibrium exhibits full segmentation: Haggler customers avoid fixed-price firms and exclusively shop at flexible firms whereas non-haggler customers do the opposite. We also find that prices increase in customer satisfaction, implying that sellers take advantage of the positive utility enjoyed by hagglers in the form of higher prices. Finally, considering the presence of seasonal cycles in most markets, we analyze a scenario where market demand goes through periodic ups and downs and find that equilibrium prices remain mostly stable despite significant fluctuations in demand. This finding suggests a plausible competition-based explanation for the stability of prices.

Keywords: pricing policy, negotiation, competition, competitive search

1 Introduction

In a variety of markets, including houses, used cars, boats or jewelry, fixed and flexible pricing policies often coexist. While some sellers clearly indicate that they are flexible and open to bargaining (e.g., a homeowner putting "OBO" (or best offer) next to the asking price), other sellers point out fixed-prices by using words such as "sharp price" or "no-negotiations". Some popular used car supermarkets in the UK, such as Cargiant, offer only fixed prices and leave no room for negotiation, whereas it is still a common practice to negotiate in most other used-car dealerships. Similarly, many sellers who are well-known for fixed-price selling are reported to allow haggling in

recent years (Richtel, 2008; Agins and Collins, 2001). Some even go one step further and train their employees in the art of bargaining with customers (Stout, 2013). In addition, consumers vary in their bargaining ability and practice in purchasing such items. According to Consumer Report's recent national survey of American adults on their haggling habits, while a notable portion of individuals report negotiating when they purchased appliances (39%), jewelry (32%), furniture (43%), and collectibles and antiques (48%), with 89% of those who haggled obtained discounts at least once, others simply have not tried bargaining at all (Marks, 2013).

Although the practice of both fixed price and flexible price policies are widespread, there are surprisingly few studies in the marketing literature that investigate strategic drivers and implications of these seemingly contrasting pricing policies (see Desai and Purohit (2004) for an exception). Our goal in this paper is to understand the dynamics and consequences of fixed and flexible pricing policies in fully competitive settings. We particularly focus on decentralized markets such as housing, used cars, boats, or high-end jewelry which exhibit the following characteristics. First, the majority of these markets operate via search and matching: it takes time and effort to locate an item or to attract a buyer and depending on the market, a player may have to wait days or even weeks before he buys or sells. Second, sellers typically have limited inventories (which is the case in markets for houses, apartments, used cars or boats, where sellers usually possess a single item, and to a certain extent it is the case in markets for home furniture, jewelry, or antiques); consequently, there may be significant trade frictions in that a product available today may not be available tomorrow. Third, a large number of independent sellers compete with each other in order to attract customers, and in doing so, they use a range of pricing tools and tactics in an effort to appeal to customers.

As hinted above, these characteristics are present in a notable proportion of markets for big ticket items. In addition, markets for other products that may not necessarily be considered as big-ticket e.g. used product markets for electronics, playstations or bicycles, also broadly exhibit the aforementioned characteristics, and therefore are relevant to our study context. In contrast, not all big ticket items demonstrate all the aforementioned traits. For example, markets for some new large appliances such as high-end big screen TV's often exhibit ample product availability, which renders our model less suitable for those settings.

A key feature of the markets we study is that bargaining is arguably as prevalent as fixed pricing, especially if conceivable savings from bargaining are not negligible for customers. Customers, however, are not homogenous in their ability and willingness to negotiate in that some customers

2

are willing to exert effort to obtain a discount (hagglers), whereas others are not (non-hagglers). As such, sellers' pricing policies (fixed or flexible) may have significant consequences in terms of the kind of customers they attract or dispel. Also, the process of bargaining may involve additional psychological dynamics for customers. Specifically, haggling may be discomforting and costly due to additional effort or opportunity cost of time, or due to concerns of being perceived as cheap or unclassy (Evans and Beltramini, 1987; Pruitt, 2013). On the other hand, in addition to tangible benefits of obtaining a lower price, customers may also get secondary non-economic benefits from the bargaining process such as feelings of enjoyment or excitement.

Our modeling approach is based on a competitive search (directed search) framework which takes into account the aforementioned characteristics—that is, we consider a decentralized market with search frictions where sellers have limited product availability and customers may enjoy or dislike bargaining. Extending existing work in marketing on fixed and flexible pricing policies (i.e., Desai and Purohit, 2004), our directed search approach allows us to explicitly incorporate full market competition in a decentralized and dynamic setup, which we believe is the first study doing so in the marketing literature.

The model provides several important insights. First, in our benchmark case where customers are neutral to the bargaining process (i.e. they receive no displeasure or enjoyment from the process itself), we show that a continuum of search equilibria exist, and in any realized equilibrium, partial segmentation of customers takes place. Specifically, non-haggler customers self-select themselves into fixed-price firms, whereas haggler customers are indifferent and may shop anywhere. This is because flexible firms foresee an eventual surplus loss during negotiations, so they strategically inflate the list price. Such inflated prices, however, put off non-haggler customers as they cannot negotiate better deals. Thus, the flexible firms end up attracting haggler customers only. Fixed price firms, on the other hand, announce moderate prices and attract both types of customers.

Second, if customers dislike haggling, then fixed pricing emerges as the unique equilibrium. This is because buyers incur some disutility due to haggling, which, in a competitive setting bleeds into flexible sellers' profit functions, and causes them to earn less. As a result, sellers are better off with fixed pricing.

Third, we find that if customers get some additional pleasure (proxied by a positive ε) from the haggling process, then a unique equilibrium emerges with full segmentation of customers where hagglers avoid fixed-price firms and non-hagglers avoid flexible firms. In addition, we show that the equilibrium list prices increase in ε, implying that sellers take advantage of the positive utility

enjoyed by hagglers in the form of higher prices. Surprisingly, we observe a spillover effect in that fixed price sellers, who do not cater to haggler customers also raise their prices if ε goes up.

Finally, taking into account the fact that most markets follow seasonal trends (Radas and Shugan, 1998), we consider the price dynamics in a long selling period where demand goes through seasonal ups and downs. An interesting finding is that prices do not fluctuate as much as the demand. This observation provides an interesting insight. In explaining the stability of prices, a significant portion of existing literature in marketing highlights price fairness concerns (Xia et al., 2004; Bolton et al., 2003; Anderson and Simester, 2008) which has its origins in the principle of dual entitlement put forward by Kahneman et al. (1986). Our model, on the other hand, provides an additional explanation for price stability that is based on forward looking customers in a competitive and dynamic market.

2 Model

2.1 Description of the Model

Consider a dynamic market that runs for $t = 1, 2, ..., T$ periods and is populated by a continuum of heterogeneous buyers and homogeneous sellers. Each seller has one unit of a product that he is willing to sell above his reservation price, zero, and each buyer wants to purchase one unit and is willing to pay up to his reservation price, one. Buyers are divided into two groups according to their bargaining abilities. Low types (non-hagglers) are not skilled in bargaining and never attempt to negotiate the list price. High types (hagglers) on the other hand are skilled in bargaining and negotiate the price whenever it is worthwhile to do so. (In the Online Appendix 2 we extend the model by considering N types.)

The market is decentralized and operates via competitive search. At the beginning of each period sellers simultaneously and independently announce a list price $r_{m,t} \in [0, 1]$ and a declaration $m \in \{\text{firm } (f), \text{ best offer } (b)\}$ indicating whether they are firm with the price or whether they are flexible to accept a counter offer. If the seller is firm then the transaction takes place at the list price. If he is flexible then the transaction may involve bargaining, but if the buyer does not wish to bargain or if two or more buyers are present at the firm then no bargaining takes place and the item is sold at the initially posted price (more on this below). Before proceeding further, we should acknowledge that our model implicitly assumes that sellers can commit to a pricing rule and implement it without incurring any costs. However, in reality sellers may find it difficult to commit

to a fixed price policy, for instance, in markets where bargaining is prevalent and customers insist upon receiving a deal.

Buyers observe sellers' announcements and then choose to visit a seller. It is possible that multiple customers show up at the same location, so we let $n = 0, 1, 2, \ldots$ denote the realized demand. If $n \geq 2$ then each buyer has an equal chance $1/n$ of being selected. If transaction occurs at price p_t then the seller obtains $\beta^{t-1} p_t$ and the buyer obtains $\beta^{t-1} (1 - p_t)$, where β is the common discount factor.

The decentralized nature of the market, coupled with sellers' limited inventories, creates trade frictions in that no one is guaranteed of an immediate trade and players may have to try for several periods before they can actually buy or sell. Indeed, if multiple customers show up at the same firm, then some of them walk out empty-handed because of the limited inventory. Similarly, due to the decentralized matching process a seller may well end up with no customer at all. In either case players need to wait for the subsequent period to try again. Waiting, of course, is costly as future payoffs are discounted at rate β.[1]

The market starts with a measure of s_1 sellers and b_1 buyers, of which a fraction $\eta_1 \in (0, 1)$ are low types. At the end of each period, players who transact exit the market while the remaining ones move to the next period to play the same game. Outgoing players may be fully or partially replaced. Specifically, we assume that at the beginning of each period $t = 2, 3...$ a new cohort of b_t^{new} buyers and s_t^{new} sellers enter the market joining the existing players. The measures of buyers and sellers present in the market at time t, denoted by b_t and s_t, depend on the entering cohorts as well as the existing players who are yet to trade. (In Section 6 we discuss how b_t and s_t evolve over time.)

Finally, our model considers possible additional psychological utility (or disutility) associated with the bargaining experience. In order to examine such non-economic considerations, we introduce a parameter, ε, which can be positive, negative or zero depending on how customers perceive the bargaining experience and we explore how this parameter affects the selection of equilibrium pricing rules. The parameter ε enters into a buyer's utility function as an additive separable term, which captures the idea that in addition to and independent of the utility derived from the consumption of the good (proxied by the price of the item), customers derive some additional utility or disutility from bargaining. This is also consistent with the previous literature in which consumers' bargaining

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[1] In the Online Appendix 2 we explore a variation where unmatched buyers and sellers get to meet for a second time during the same trading period and show that the results remain robust, upto a modification in outside options.

cost is incorporated in additive separable form (Rubinstein, 1982; Desai and Purohit, 2004). Finally, the parameter ε is relevant for haggler customers only. It is inapplicable for non-hagglers, as they always pay the list price due to their lack of bargaining skills.

2.2   Discussion of the Modeling Approach

A number of models in marketing and pricing literatures examine strategic implications of different pricing policies, however, most of these studies do not consider competition, and instead focus on a monopolist seller who receives customers exogenously (Riley and Zeckhauser, 1983; Wang, 1995; Kuo et al., 2011, 2013).[2] Other studies incorporate competition using Hotelling or Cournot frameworks.[3] In a closer work to ours, Desai and Purohit (2004) consider a duopoly setting and use a Hotelling framework to examine the implications of haggling and fixed price policy decisions by two retailers. They show that depending on the parameters, there may exist equilibria in which both firms choose fixed prices, both firms offer haggling, or where one firm offers haggling and the other charges fixed prices. An important finding of theirs is that the benefits of price discrimination in a monopoly setting do not necessarily transfer over to a competitive environment. The Hotelling framework captures competition between (typically two) major retailers without inventory constraints in an effective way, however our study, which focuses on competition between a large number of sellers, who have limited inventories and who operate in a market with trade frictions calls for a different modeling approach. To that end, our directed search approach is a natural fit in capturing the aforementioned market characteristics and modelling them in an analytically tractable way.

Our model also differs from the existing directed search models (Eeckhout and Kircher, 2010; Virag, 2011) with several new features. First, we explicitly incorporate customer heterogeneity in terms of bargaining skills (hagglers vs. non-hagglers). Second, we introduce a dynamic setup which enables us to examine strategic implications of fixed and flexible pricing policies over multiple

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[2]Riley and Zeckhauser (1983) examine a monopolist seller facing risk neutral customers, and suggest that fixed pricing is optimal in comparison to negotiations. This is because while haggling may be advantageous in terms of price discrimination, the gains from haggling are more than offset when buyers refuse purchasing at higher prices. Wang (1995) creates a dynamic model with a monopolist seller, and concludes that bargaining is preferable if it costs the same as fixed pricing, or if the common costs are high enough. Focusing on operations-related questions in a monopoly setting, Kuo et al. (2011) characterize the optimal posted price and the resulting negotiation outcome as a function of inventory and time, and Kuo et al. (2013) focus on pricing policy in a supply chain.

[3]For instance, Wernerfelt (1994) finds that in a duopoly bargaining may be profit maximizing for sellers as it helps them avoid the costly Bertrand competition. Using a Hotelling framework, Gill and Thanassoulis (2016) study strategically chosen stochastic discounts in markets with prior list-price-setting competition. Kuksov (2004) considers a duopoly model of competition with search costs, and demonstrates that lower search costs may actually result in higher prices since product differentiation can also increase with decreased search costs.

periods and in seasonal markets.

As mentioned earlier, our model considers possible non-economic utility (or disutility) associated with the bargaining experience, proxied by the parameter ε. A negative value for ε indicates disutility associated with haggling, which has been highlighted in a number of studies as buyers' bargaining disutility (Morton et al., 2011) or haggling costs (Desai and Purohit, 2004). A negative ε suggests that customers may have the ability to bargain down the list price, but nevertheless, they may dislike the bargaining process, say, for the fear of being seen as cheap or unclassy, or due to opportunity cost of time.

A positive ε on the other hand, refers to possible non-economic factors such as additional excitement, enjoyment or thrill from the bargaining experience. We must admit, however, that a positive ε does not have a very clear justification, which is a major limitation for the following reasons. First, the benefit or enjoyment of bargaining could be first and foremost due to the tangible benefit of getting a lower price. While there may exist additional psychological benefits of bargaining[4] beyond obtaining a lower price, these are likely to be of secondary order for customers. Second, in our model we treat the positive ε as an exogenous parameter, without explicitly accounting for factors, psychological or otherwise, that may give rise to it. If such factors are explicitly included in the model, then they may have important interactions with other components of the model, which we do not consider here. In sum, while our findings with the positive ε are intriguing, one should take note of these caveats in interpreting the corresponding results.

2.3 Bargaining and the Sale Price

We move backwards in the analysis, starting with the determination of the bargained price in a meeting. We, then, turn to buyers' search decisions and explain how the expected demand at each firm is pinned down. Finally, we turn to the sellers' problem and explore how they select prices and pricing rules.

The list price at a flexible firm may be negotiated if the firm has a single customer. If two or more customers are present then no bargaining takes place and the item is sold at the posted price.[5] Let θ denote the bargaining power of high type buyers relative to the seller. The bargaining

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[4]Bargaining process may possibly provide additional excitement and sensory involvement (Babin et al., 1994), as well as an additional satisfaction by feeling victorious, proud and smart from obtaining a deal (Holbrook et al., 1984; Schindler, 1998; Jones et al., 1997). These feelings for bargaining may "transcend the satisfaction of mere economic gain" (Sherry, 1990)

[5]The assumption that haggling is possible only if there is a single customer in store ($n = 1$) is without loss in generality. One can recast the model where haggling may be possible for $n > 1$; however this modification does not add any additional insight.

power of low types is normalized to zero. Similarly, let $u_{h,t+1}$ and π_{t+1} denote, respectively, a high type buyer's and a seller's expected payoff ("value of search") in period $t+1$. These payoffs serve as outside options during negotiations, i.e. in case of disagreement the buyer walks out with payoff $\beta u_{h,t+1}$ and the seller with $\beta\pi_{t+1}$. The negotiated price, y_t, can be found as the solution to the following maximization problem:

$$\max_{y_t \in [0,1]} \left(1 - y_t + \varepsilon - \beta u_{h,t+1}\right)^{\theta} \left(y_t - \beta\pi_{t+1}\right)^{1-\theta}.$$

The solution yields

$$y_t = 1 - \beta u_{h,t+1} - \theta\left(1 - \beta u_{h,t+1} - \beta\pi_{t+1}\right) + \varepsilon\left(1 - \theta\right). \tag{1}$$

The bargained price y_t falls with θ, i.e. the higher the buyer's negotiation skills, the lower the price. To see why, note that $u_{h,t+1} + \pi_{t+1} \leq 1$ because the total payoff in a transaction cannot exceed the maximum surplus, one. Therefore the expression $1 - \beta\left(u_{h,t+1} + \pi_{t+1}\right)$ is positive; hence y_t falls in θ. In addition y_t rises with π_{t+1} and falls with $u_{h,t+1}$ i.e. the stronger the seller's outside option the higher the price and the stronger the buyer's outside option the lower the price. As it turns out, outside options depend on how competitive the market is expected to be in the next period, in the period after, and so on. Even though bargaining is bilateral and takes place between two players in private, it is still driven by market competition, which filters into the negotiation process via outside options.

Whether or not buyers attempt to renegotiate depends on how y_t compares with the list price $r_{b,t}$ as well as the parameter ε. The case $\varepsilon = 0$ is straightforward: buyers opt for bargaining if they can negotiate a better deal than the list price, i.e. if $y_t \leq r_{b,t}$. If, however, $\varepsilon < 0$ then buyers attempt to renegotiate only if the deal they end up getting warrants incurring the negative ε, i.e. if $y_t \leq r_{b,t} + \varepsilon$. We assume that buyers' bargaining power is sufficiently large to ensure that, even after accounting for the negative ε, they would still prefer bargaining over purchasing at the posted price. (The other scenario where they would not even attempt negotiating trivially yields a fixed price equilibrium.) Finally, if $\varepsilon > 0$ then buyers opt for bargaining if $y_t \leq r_{b,t}$. The parameter ε is absent from this condition because the psychological satisfaction from bargaining (proxied by a positive ε) kicks in only if the item is purchased below the list price.

These conditions require the bargaining power θ to be sufficiently high, which we assume to be the case for now. (Subsequently we will provide the necessary thresholds.) The opposite case

where even high types are unable to negotiate a better deal is trivial as the availability of bargaining becomes immaterial and the model collapses to a fixed price setting.

2.4 Buyer's Problem

Demand Distribution. In the tradition of the competitive search literature we focus on visiting strategies that are symmetric and anonymous (Burdett et al., 2001; Shimer, 2005; Eeckhout and Kircher, 2010). Symmetry requires buyers of the same type use the same visiting strategies. Anonymity, on the other hand, means that visiting strategies ought to depend on what sellers post but not on sellers' identities i.e. sellers posting the same list price $r_{m,t}$ and trading with the same pricing rule m ought to be visited with the same probability.[6]

Given symmetry and anonymity, the number of applications at a firm follows a Poisson distribution. To see why, and to get some intuition on how the matching process works, consider a finite setting with B buyers and S sellers, where the buyer seller ratio equals to $\lambda = B/S$. For a moment ignore the haggler-price taker distinction and suppose that all buyers are price takers. Also suppose that all sellers use fixed pricing and post the same list price, say, $r = 0.5$. Since all sellers compete with the same rule and post the same price, symmetry and anonymity in buyers' visiting strategies imply that the probability that a buyer visits a particular seller is $1/S$. Consequently, the probability that the seller gets n customers equals to

$$\Pr[n] = \binom{B}{n} (1/S)^n (1 - 1/S)^{B-n},$$

i.e. the seller receives customers according to a binomial distribution with parameters B and $1/S$. The expected number of customers, therefore, equals to $B \times 1/S = \lambda$. Now fix λ and let B and S tend to infinity (recall that we have a continuum of buyers and sellers). As the market gets large, the binomial distribution converges to the Poisson distribution with arrival rate λ, that is

$$\Pr[n] = \frac{e^{-\lambda}\lambda^n}{n!}.$$

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[6]Imposing symmetry and anonymity on visiting strategies is a restriction; however these assumptions facilitate the characterization of the equilibrium and lead to outcomes which are analytically tractable. As such, with few exceptions the vast majority of the directed search literature restricts attention to such strategies. A notable exception is an extension in Burdett et al. (2001) where they consider a simple 2 by 2 setup with only two buyers and two sellers and construct equilibria supported by non symmetric strategies; however such equilibria require coordination among buyers on who goes where. In a small market with few buyers such coordination may be possible, but in a large market with multiple buyers and sellers such coordination is not feasible. The symmetric equilibrium requires no coordination.

Along this example every firm competes with fixed pricing and posts the same list price, and therefore, the expected demand at each firm equals to λ. (Even though the ex-ante expected demand at each firm is λ, the ex-post realized demand is uncertain. A firm may well end up getting no customer at all, or it may get more customers than it can serve.) If sellers were to post different prices, or pick different pricing rules, then, again because of symmetry and anonymity, the demand distribution at each firm would be still Poisson, but each with a different arrival rate that depends on what the seller posts and how it compares with the rest of the market (Galenianos and Kircher, 2012). For instance, if a seller posts a lower price, say 0.4, while everyone else still posts 0.5, then his expected demand q would be higher than λ (more on this below).

In the full-fledged model the expected demand q depends not only on the list price r, but also on the pricing rule m, the date t and buyers' type i. Specifically, the probability that a firm with the terms $(r_{m,t}, m)$ meets $n = 0, 1, 2...$ customers of type $i = h, l$ is given by

$$\Pr[n] = \frac{e^{-q_{i,m,t}(r_{m,t})} q_{i,m,t}^n (r_{m,t})}{n!} \equiv z_n (q_{i,m,t}). \tag{2}$$

The fact that q is indexed by i indicates that, when thinking about the total demand at a firm, one has to consider arrivals from high types $q_{h,m,t}$ as well as low types $q_{l,m,t}$.

Firms post their prices and pricing rules, and buyers direct their search depending on how attractive these terms are. All else equal, cheaper firms attract more customers and expensive firms attract fewer customers; however price is not the only concern for a buyer when deciding where to shop. Each seller has a limited inventory, so buyers must also take into account the likelihood of not being able to purchase today and having to try again in the next period. In that respect it is easier to purchase at expensive firms as they tend to be less crowded; thus, customers do not necessarily head straight to the cheapest firm. In equilibrium, the expected demands adjust to ensure that buyers are indifferent across all firms posting different prices or pricing rules.[7]

Expected Utilities. Let $U_{i,m,t}$ denote a type $i = h, l$ buyer's expected utility at a firm trading with rule $m \in \{f, b\}$. Consider a fixed price firm with price $r_{f,t}$. We have

$$U_{i,f,t} = \sum_{n=0}^{\infty} \frac{z_n(q_{h,f,t} + q_{l,f,t})}{n+1} (1 - r_{f,t}) + \left[1 - \sum_{n=0}^{\infty} \frac{z_n(q_{h,f,t} + q_{l,f,t})}{n+1} \right] \beta u_{i,t+1}. \tag{3}$$

High types and low types arrive at Poisson rates $q_{h,f,t}$ and $q_{l,f,t}$. The distribution of the total

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[7]Throughout the text we use "expected demand", "arrival rate" and "queue length" interchangeably.

demand, therefore, is also Poisson with arrival rate $q_{h,f,t} + q_{l,f,t}$. So, a buyer who finds himself at the firm finds $n = 0, 1, \ldots$ *other* buyers with probability $z_n (q_{h,f,t} + q_{l,f,t})$. He purchases with probability $1/(n+1)$ and his payoff is $1 - r_{f,t}$. With the complementary probability, given by the expression in square brackets, the buyer fails to transact so he moves to the next period, where he expects to earn $\beta u_{i,t+1}$.

Now consider a flexible firm with list price $r_{b,t}$. A low type buyer always pays the list price $r_{b,t}$; so, his expected utility $U_{l,b,t}$ is similar to above:

$$U_{l,b,t} = \sum_{n=0}^{\infty} \frac{z_n (q_{h,b,t} + q_{l,b,t})}{n+1} (1 - r_{b,t}) + \left[1 - \sum_{n=0}^{\infty} \frac{z_n (q_{h,b,t} + q_{l,b,t})}{n+1} \right] \beta u_{l,t+1}. \tag{4}$$

A high type's expected utility $U_{h,b,t}$, on the other hand, is given by

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\begin{aligned}
U_{h,b,t} = \quad & z_0 (q_{h,b,t} + q_{l,b,t}) (1 + \varepsilon - y_t) + \sum_{n=1}^{\infty} \frac{z_n (q_{h,b,t} + q_{l,b,t})}{n+1} (1 - r_{b,t}) \\
& + \left[1 - \sum_{n=0}^{\infty} \frac{z_n (q_{h,b,t} + q_{l,b,t})}{n+1} \right] \beta u_{h,t+1}.
\end{aligned}
\tag{5}
$$

With probability $z_0 (q_{h,b,t} + q_{l,b,t})$ the high type buyer is alone at the firm, in which case he bargains and obtains the item paying y_t. Since the transaction involves bargaining, the buyer obtains the additional ε. The second part of the expression is similar to above: with probability $z_n (q_{h,b,t} + q_{l,b,t})$ he finds $n = 1, 2 \ldots$ competitors; so he purchases with probability $1/(n+1)$ paying the list price $r_{b,t}$ (recall that if multiple customers are present then no bargaining takes place). Finally with the complementary probability he fails to transact and moves to period $t+1$, where he expects to earn $\beta u_{h,t+1}$.

Lemma 1 *We have $\partial U_{i,m,t}/\partial r_{m,t} < 0$ and $\partial U_{i,m,t}/\partial q_{i,m,t} < 0$, where $i = h, l$ and $m = f, b$.*

The proof is skipped as it is based on straightforward algebra. Put simply, the Lemma says buyers dislike expensive or crowded firms (the ones with a high price r or high demand q). The first claim is self-explanatory; the second claim follows from the fact that customers are less likely to purchase at crowded firms.

Let $\bar{U}_{i,t}$ denote the maximum expected utility ("market utility") a type i customer can obtain in the market at time t. For now we treat $\bar{U}_{i,t}$ as given, subsequently it will be determined endoge-nously.[8] So, consider an individual seller who advertises the price package $(r_{m,t}, m)$ and suppose

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[8] The market utility approach is standard in the directed search literature as it greatly facilitates the characteriza-

high and low type buyers respond to this advertisement with arrival rates $q_{h,m,t} \geq 0$ and $q_{l,m,t} \geq 0$. The rates satisfy

$$q_{i,m,t} > 0 \text{ if } U_{i,m,t}\left(r_{m,t}, q_{h,m,t}, q_{l,m,t}\right) = \bar{U}_{i,t} \text{ else } q_{i,m,t} = 0. \tag{6}$$

The indifference condition (6) says that the price package and the arrival rates must generate an expected utility of at least $\bar{U}_{h,t}$ for high type customers, else they will stay away $(q_{h,m,t} = 0)$ and at least $\bar{U}_{l,t}$ for low type customers, else they will stay away $(q_{l,m,t} = 0)$.

The indifference condition also reveals a law of demand in that the expected demand $q_{i,m,t}$ decreases as the list price $r_{m,t}$ increases. In words, cheaper firms attract more customers and expensive firms attract fewer customers. To see why, apply the Implicit Function Theorem to (6) to obtain

$$\frac{dq_{i,m,t}}{dr_{m,t}} = -\frac{\partial U_{i,m,t}/\partial r_{m,t}}{\partial U_{i,m,t}/\partial q_{i,m,t}}.$$

The numerator and the denominator are both negative (Lemma 1); hence $dq_{i,m,t}/dr_{m,t}$ is negative, indicating that if the seller raises r then buyers respond by decreasing q. From a seller's point of view, raising the price brings in more revenue; however it lowers the expected demand. The seller's problem involves finding a balance between these two opposing effects, which we study next.

2.5 Seller's Problem and Definition of Equilibrium

The expected profit of a fixed price seller is given by

$$\Pi_{f,t} = \left[1 - z_0\left(q_{h,f,t} + q_{l,f,t}\right)\right] r_{f,t} + z_0\left(q_{h,f,t} + q_{l,f,t}\right)\beta\pi_{t+1}. \tag{7}$$

The expression in square brackets is the probability of getting at least a customer, in which case the item is sold at list price $r_{f,t}$. With the complementary probability the seller fails to get a customer and moves to the next period where he expects to earn $\beta\pi_{t+1}$, which represents his discounted value of search in period $t+1$. The expected profit of a flexible seller is similar:

$$\Pi_{b,t} = z_0\left(q_{l,b,t}\right) z_1\left(q_{h,b,t}\right) y_t + \left[z_0\left(q_{h,b,t}\right) z_1\left(q_{l,b,t}\right) + \sum_{n=2}^{\infty} z_n\left(q_{l,b,t} + q_{h,b,t}\right)\right] r_{b,t}$$

$$+ z_0\left(q_{l,b,t} + q_{h,b,t}\right)\beta\pi_{t+1}. \tag{8}$$

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tion of equilibrium, e.g. see Burdett et al. (2001). Galenianos and Kircher (2012) provide game theoretic foundations for the use of the market utility paradigm in a variety of directed search setups.

With probability $z_0\left(q_{l,b,t}\right)z_1\left(q_{h,b,t}\right)$ the seller gets a single high type customer, who haggles and obtains the item at price y_t. The expression in square brackets is the probability of getting either a single low type customer or getting multiple customers. In either case list price $r_{b,t}$ is charged. The last bit, as above, deals with the possibility of not getting any customer at all. A seller's objective is to maximize the profit subject to the fact that he must provide buyers with their market utilities. Specifically each seller solves

$$\max_{m\in\{f,b\},r_{m,t}\in[0,1],\left(q_{h,m,t},q_{l,m,t}\right)\in\mathbb{R}_+^2}\Pi_{m,t}\quad\text{subject to (6)}. \tag{9}$$

Indifference constraints in (6) determine expected demands $q_{h,m,t}$ and $q_{l,m,t}$ as functions of the pricing rule m and the list price $r_{m,t}$. Note that the seller faces two indifference constraints, one for high type customers and one for low type customers. If both constraints bind, then the seller is able to attract both types of customers. If a single constraint binds then he attracts one type only. (The case where neither constraint binds, of course, can be ruled out as it implies that the seller gets no customer at all.)

Sellers are free to post any price and they are also free to be fixed or flexible with what they post. Letting $\alpha_{m,t}\left(r_{m,t}\right)$ denote the fraction of sellers posting $r_{m,t}$ we have

$$\alpha_{m,t}(r_{m,t})>0\text{ only if }\Pi_{m,t}(r_{m,t},q_{h,m,t},q_{l,m,t})=\bar{\Pi}_{m,t}\text{ else }\alpha_{m,t}\left(r_{m,t}\right)=0, \tag{10}$$

where

$$\bar{\Pi}_{m,t}\equiv\max_{r'_{m,t}\in[0,1],(q'_{h,m,t},q'_{l,m,t})\in\mathbb{R}_+^2}\Pi_{m,t}(r'_{m,t},q'_{h,m,t},q'_{l,m,t}).$$

Similarly letting $\varphi_{m,t}$ denote the fraction of sellers opting for rule m, we have

$$\varphi_{m,t}>0\text{ only if }\bar{\Pi}_{m,t}=\max_{\tilde{m}\in\{f,b\}}\bar{\Pi}_{\tilde{m},t},\text{ else }\varphi_{m,t}=0, \tag{11}$$

i.e. rule m is selected only if it delivers the highest expected profit. This does not mean that a unique pricing rule will prevail in equilibrium. It is possible that, and indeed it is the case that, both rules emerge in equilibrium delivering equal profits.

Finally, to close down the model, we need two feasibility conditions to ensure that the weighted sum of expected demands (per seller) consisting of type i buyers equals to the market wide buyer-seller ratio for that particular type. Recall that λ_t is the total buyer-seller ratio in period t and

13

that η_t is the fraction of low type buyers. Letting $\lambda_{l,t} \equiv \eta_t \lambda_t$ and $\lambda_{h,t} \equiv (1 - \eta_t) \lambda_t$ we have

$$\varphi_{b,t} \int_0^1 \alpha_{b,t}(r_{b,t})q_{i,b,t}(r_{b,t})dr_{b,t} + \varphi_{f,t} \int_0^1 \alpha_{f,t}(r_{f,t})q_{i,f,t}(r_{f,t})dr_{f,t} = \lambda_{i,t} \text{ for } i = h, l. \tag{12}$$

There are two equations in (12), one for high types and one for low types, and the equations are designed to take into account the possibility of each seller posting a different price. In Lemma 2, however, we prove that sellers competing with the same rule m end up posting the same list price $r_{m,t}$; so, borrowing that result, and noting that $\varphi_{f,t} + \varphi_{b,t} = 1$, the equations in (12) become

$$\varphi_{f,t} q_{i,f,t} + (1 - \varphi_{f,t})q_{i,b,t} = \lambda_{i,t} \text{ for } i = h, l. \tag{13}$$

We can now define the equilibrium.

Definition 1 *A competitive search equilibrium ("equilibrium") consists of prices $\mathbf{r}_{m,t}^*$, expected demands $\mathbf{q}_{h,m,t}^*$, $\mathbf{q}_{l,m,t}^*$ and fractions $\boldsymbol{\alpha}_{m,t}^*$, $\boldsymbol{\varphi}_{m,t}^*$ satisfying the demand distribution (2), buyer's indifference (6), profit maximization (9), equal profits (10)-(11) and feasibility (12).*

The evolution of the buyer seller ratio λ_t and the fraction of non-hagglers η_t, also part of the equilibrium, is discussed in Section 6.

3   Characterization of Equilibria: The Benchmark Case

The parameter ε plays an important role in determining the nature of the equilibria. We start with the case where $\varepsilon = 0$, i.e. where customers are neutral to the bargaining process, i.e. they have no displeasure or enjoyment from the bargaining process itself.

Proposition 1 *Suppose $\varepsilon = 0$. Depending on how large θ is, the model exhibits two types of equilibria:*

- **Partial Segmentation Equilibrium (Eq-PS):** *If $\theta \geq \bar{\theta}_t \equiv z_1(\lambda_t) / [1 - z_0(\lambda_t)]$ then there exists a continuum of payoff-equivalent equilibria, where an indeterminate fraction $\varphi_{f,t}^* \geq \eta_t$ of firms trade via fixed pricing and remaining firms trade via flexible pricing. Fixed and flexible*

firms post

$$r_{f,t}^* = 1 - \beta u_{t+1} - \frac{z_1\left(\lambda_t\right)}{1 - z_0\left(\lambda_t\right)}\left(1 - \beta u_{t+1} - \beta \pi_{t+1}\right) \ and \tag{14}$$

$$r_{b,t}^* = 1 - \beta u_{t+1} - \frac{z_1\left(\lambda_t\right)\left(1 - \theta\right)}{1 - z_0\left(\lambda_t\right) - z_1\left(\lambda_t\right)}\left(1 - \beta u_{t+1} - \beta \pi_{t+1}\right), \tag{15}$$

and if negotiations ensue the transaction occurs at price

$$y_t^* = 1 - \beta u_{t+1} - \theta\left(1 - \beta u_{t+1} - \beta \pi_{t+1}\right). \tag{16}$$

Prices satisfy $r_{b,t}^* > r_{f,t}^* > y_t$, i.e. flexible firms post a higher price than what fixed price firms post, which in turn, is greater than the bargained price. The inequality in prices leads to a partial segmentation in customer demographics: non-hagglers shop exclusively at fixed price firms whereas hagglers shop anywhere. In any equilibrium sellers and buyers earn

$$\pi_t = 1 - \beta u_{t+1} - \left[z_0\left(\lambda_t\right) + z_1\left(\lambda_t\right)\right]\left(1 - \beta u_{t+1} - \beta \pi_{t+1}\right), \tag{17}$$

$$u_t = z_0\left(\lambda_t\right)\left[1 - \beta u_{t+1} - \beta \pi_{t+1}\right] + \beta u_{t+1} \tag{18}$$

- **Fixed Price Equilibrium (Eq-FP):** *If $\theta < \overline{\theta}_t$, i.e. if high type buyers are not skilled enough in negotiations, then the availability of bargaining becomes immaterial and fixed pricing emerges as the unique equilibrium, i.e. all sellers adopt fixed pricing and post $r_{f,t}^*$, given by (14). Equilibrium payoffs are the same as above, i.e. sellers and buyers earn π_t and u_t.*

The main message of the Proposition is that fixed and flexible pricing rules can coexist in the same marketplace; however each rule comes with its own list price and customer demographics. Flexible firms announce higher prices and attract high types only. Fixed price firms, on the other hand, announce lower prices and attract both types of customers.

To see why prices are unequal, note that flexible stores factor in the fact that they may end up selling at a discount, so they raise their prices to cover themselves against this contingency. In other words, they strategically inflate the sticker price anticipating the eventual surplus loss during negotiations. Fixed price firms, on the other hand, are committed to charge what they post, so they post moderate prices. While the relationship between flexible pricing and inflated sticker prices may sound intuitive, to our knowledge, this is the first study providing a competition based explanation to such phenomenon with a decentralized market equilibrium approach.

The inequality of prices raises the question of whether buyers or sellers may want to pass a potential trading opportunity in the hope of getting a better deal in subsequent periods, and the answer is no. In the proof of the Proposition we show that players in a match are better off transacting immediately instead of walking away. There are two reasons for this. First, waiting is costly (the discount factor is less than one), so players have a strong incentive to settle a deal as early as possible. And more importantly, second, the market operates via search and matching, so no-one is guaranteed to find a suitable match in subsequent periods. A seller may not get a customer at all, whereas a buyer may well end up in a crowded firm and walk out empty handed as a result. Therefore, a sure transaction today, even under the worst case scenario—buying at the highest price $r_{b,t}^*$ for a buyer, selling at the lowest price y_t^* for a seller—is still better than walking away and facing the prospect of not being able to buy or sell tomorrow.

4 Characterization of Equilibria when Customers Dislike Bargaining

The discussion so far revolved around the case $\varepsilon = 0$. If, on the other hand, customers dislike the bargaining experience then the result is remarkably simple.

Proposition 2 *If $\varepsilon < 0$ then fixed pricing emerges as the unique equilibrium. For characterization see item Eq-FP in Proposition 1.*

Recall that if $\varepsilon = 0$ then fixed and flexible pricing are payoff equivalent in equilibrium and sellers are indifferent to select either pricing rule. If ε falls below zero then this indifference no longer holds because the negative ε filters into flexible sellers' profits causing them to earn less than their fixed price competitors. Sellers can avoid the negative impact of ε by switching to fixed pricing, which explains why the fixed price outcome emerges as the unique equilibrium.

It is worth pointing out that the fixed price equilibrium arises not because buyers would not bargain anyway (because of the negative ε), but because offering flexible pricing causes sellers to lose on profits, and therefore, in equilibrium no venue offers this option in the first place. Indeed in the proof of the Proposition we consider the out of equilibrium scenario where a firm offers flexible pricing and we assume that high types' bargaining power is sufficiently large to ensure that, even after accounting for the negative ε, they would still prefer bargaining over purchasing at the posted price. (The other scenario where they would not even attempt negotiating trivially yields a fixed

price outcome.) We show that along this scenario the negative ε filters into the flexible firm's profit, and the firm is better off by unilaterally switching to fixed pricing.

This finding suggests that from a seller's point of view the flexible pricing strategy is not a viable option if potential customers indeed dislike the haggling process. More specifically, if sellers realize that even potential hagglers might dislike bargaining for their products (e.g. due to the fear of being seen unclassy) and they can not effectively reduce or eliminate such displeasure, perhaps due to product characteristics, then they have an incentive to practice fixed pricing.

Finally, we turn the case where customers get a psychological satisfaction if they manage to purchase the item below the posted price.

5 Characterization of Equilibria when Customers Enjoy Bargaining

Proposition 3 *Suppose ε is positive but sufficiently small.*

- **Full Segmentation Equilibrium (Eq-FS):** *If $\theta \geq \tilde{\theta}_t$, where*

$$\tilde{\theta}_t \equiv \frac{z_1(q_{h,b,t}^*)}{1-z_0(q_{h,b,t}^*)} - \frac{\varepsilon z_1(q_{h,b,t}^*)q_{h,b,t}^*}{[1-z_0(q_{h,b,t}^*)]\left[1-\beta u_{h,t+1}-\beta\pi_{t+1}+\varepsilon\right]} \tag{19}$$

then there exists a unique equilibrium where a fraction $\varphi_{f,t}^* < \eta_t$ of firms choose fixed pricing while the rest opt for flexible pricing. Equilibrium prices are given by

$$r_{f,t}^* = 1 - \beta u_{l,t+1} - \frac{z_1(q_{l,f,t}^*)}{1-z_0(q_{l,f,t}^*)}\left(1-\beta u_{l,t+1}-\beta\pi_{t+1}\right) \tag{20}$$

$$r_{b,t}^* = 1 - \beta u_{h,t+1} - \frac{z_1(q_{h,b,t}^*)(1-\theta)}{1-z_0(q_{h,b,t}^*)-z_1(q_{h,b,t}^*)}\left[1-\beta u_{h,t+1}-\beta\pi_{t+1}+\varepsilon - \frac{q_{h,b,t}^*\varepsilon}{1-\theta}\right] \tag{21}$$

$$y_t^* = 1 - \beta u_{h,t+1} - \theta\left(1-\beta u_{h,t+1}-\beta\pi_{t+1}\right) + \varepsilon\left(1-\theta\right). \tag{22}$$

The equilibrium is characterized by full segmentation of customers: low types avoid flexible firms and high types avoid fixed price firms. Expected demands satisfy $q_{h,b,t}^* < \lambda < q_{l,f,t}^*$, i.e. flexible firms attract fewer customers than fixed price firms. Equilibrium payoffs are as follows

$$\pi_t = 1 - \beta u_{l,t+1} - [z_0(q_{l,f,t}^*) + z_1(q_{l,f,t}^*)]\left(1-\beta u_{l,t+1}-\beta\pi_{t+1}\right) \tag{23}$$

$$u_{h,t} = z_0(q_{h,b,t}^*)\left(1-\beta u_{h,t+1}-\beta\pi_{t+1}\right) + [z_0(q_{h,b,t}^*)-z_1(q_{h,b,t}^*)]\varepsilon + \beta u_{h,t+1} \tag{24}$$

$$u_{l,t} = z_0(q_{l,f,t}^*)[1-\beta u_{l,t+1}-\beta\pi_{t+1}] + \beta u_{l,t+1} \tag{25}$$

17

- **Fixed Price Equilibrium (Eq-FP):** *If $\theta < \tilde{\theta}_t$ then fixed pricing emerges as the unique equilibrium. For characterization see item Eq-FP in Proposition 1.*

When compared to the benchmark case $\varepsilon = 0$, the introduction of a positive ε leads to two important results: uniqueness of the equilibrium, instead of a continuum of equilibria, and full segmentation of customers, instead of partial segmentation. The multiplicity of equilibria in the benchmark case is disturbing for two reasons. First, the model loses predictive power as one cannot know how many firms are firm with the price and how many are flexible. Second, and perhaps more worrisome, is the presence of an equilibrium where the fraction of fixed price sellers $\varphi^*_{f,t}$ may, in fact, be equal to 1, i.e. a fixed price outcome where no seller offers flexible pricing, despite the availability of bargaining and despite the fact that high types are sufficiently skilled in negotiations. The introduction of a positive ε eliminates the continuum of equilibria, and instead, yields a unique equilibrium. To understand why, notice that in the benchmark if sufficiently many sellers pick fixed pricing, then the marginal seller is indifferent between picking either pricing rule, which is why there is a continuum of equilibria where $\varphi^*_{f,t}$ can be anywhere between η_t and 1. But if $\varepsilon > 0$ then the marginal seller is strictly better off picking flexible pricing, because, compared to the benchmark, buyers have a larger appetite for flexible deals, yet there are not sufficiently many sellers offering such deals. The marginal seller can earn more if he deviates to flexible pricing, which explains why the introduction of a positive ε unsettles the aforementioned indifference and leads to a unique equilibrium.

The equilibrium is characterized by full segmentation of customers: low types avoid flexible firms whereas high types avoid fixed price firms. The reason behind the first relationship is the same as in the benchmark: flexible firms post negotiable but high prices, but non-hagglers cannot negotiate; hence they avoid these firms. The second relationship is due to the positive ε. In the benchmark model high types were indifferent between fixed and flexible firms, so they would shop anywhere. The introduction of ε unsettles this indifference in favor of flexible venues because in this setting high types not only are able to bargain down the list price but also get some additional satisfaction from doing so.[9]

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[9] Proposition 3 requires ε to be positive but small. If ε is large, then there exists a corner equilibrium, where all sellers choose flexible pricing and low type buyers have no choice but to shop at these stores and pay inflated list prices. We do not focus on this outcome, because ε is assumed to be a small psychological factor, whereas this outcome requires ε to be so large to convince all sellers to ignore low types in order to lure the more lucrative high types.

In our model we a-priori classify buyers as hagglers and non-hagglers, and then, obtain the segmentation result along those lines (hagglers to flexible stores vs. non-hagglers to fixed price stores). Thus, it may seem that the exogenous classification of buyers in terms of their bargaining abilities is necessary for the segmentation result; but this is not the case. Consider a scenario where buyers are identical in terms of their bargaining skills but differ in terms of their enjoyment for the bargaining experience, proxied by the parameter ε. Imagine that ε varies in an interval $[\varepsilon_1, \varepsilon_N]$, where $\varepsilon_1 < 0$ and $\varepsilon_N > 0$, and that buyers are divided into N separate groups, where group 1 has the lowest ε and group N has the highest, that is $\varepsilon_1 < \varepsilon_2 < ... < \varepsilon_N$. We show that if the gap between ε_N and ε_{N-1} is sufficiently large, then there exists an equilibrium, where bargaining deals are designated for the most enthusiastic type only—that is, in equilibrium type N customers hunt for bargaining deals and shop at flexible stores, while everyone else shops at fixed price stores. This outcome is similar to Eq-FS in that it generates segmentation among customers. In addition, along this variation the division of hagglers vs. non-hagglers emerges as an endogenous phenomenon, in that type N customers turn into hagglers whereas remaining customers do not haggle at all. (The proof of this result can be found in the Online Appendix 2.)

The result on self selection and segmentation is indeed important as it shows that the type of demand a firm gets strategically depends on the pricing rule it selects at the first place. As indicated in the Introduction, most of the existing literature in pricing strategies assume a non-competitive environment, typically a monopolist seller, where heterogenous customers (myopic, strategic etc.) are assumed to arrive at an exogenous rate and irrespective of the pricing rule in place. Our result, however, suggests that if the exogenous demand assumption is relaxed then due to self-selection some customers may not visit certain firms in the first place.

Anecdotal evidence suggests that customers indeed love the feeling of purchasing the item below the posted price and that they inevitably gravitate towards outlets offering such deals. Retail giant JC Penney made a bold move in January 2012 by ridding their stores of all discounts, sales and bargains in an effort to establish "fair and square" pricing. Unfortunately, for JC Penney, this strategy did not work as its core consumers, who were accustomed to sales and bargains, began leaving the retailer in droves. At the end, the now ousted CEO Ron Johnson had to confess this (Tuttle, 2013):

> "I thought people were just tired of coupons and all this stuff. The reality is all of
> the couponing we did, there were a certain part of the customers that loved that. They
> gravitated to stores that competed that way. So our core customer, I think was much

more dependent, and enjoyed coupons more than I understood."

While this example illustrates how customers' enjoyment of the selling institution itself may have significant implications, we note that enjoyment of coupons is not the same as enjoyment of bargaining. There are apparent differences between the two cases including the rules, deadlines, contexts and specific processes associated with coupons. However despite these differences, one can identify broad similarities between coupons and bargaining. First, in both cases, customers who are willing to exert effort (either by engaging in haggling or by being diligent enough to monitor deals from Hi/Lo retailers) may get rewarded with lower prices. Second, in both cases, even with additional effort, obtaining a deal is not guaranteed with limited availability items (as demand may rise endogenously depending on the appeal of the pricing/promotion policy). Third, customers may possibly gain additional non-economic pleasure with feelings of excitement, mastery and competence from getting discounts via coupons or bargaining.

To understand how equilibrium objects change with respect to ε we simulate prices and the fraction of firms adopting flexible pricing against ε and calendar time t. The simulations are based on a stationary environment where outgoing agents are assumed to be replaced with clones; thus η_t, b_t and s_t remain constant throughout all market activity. The stationarity of the environment ensures that the observed dynamics do not stem from fluctuations in the number or composition of buyers and sellers.[10]

Price trajectories in $1a$ and $1b$ reveal that for any given t, the equilibrium fixed price and the flexible list price both increase in ε, implying that sellers take advantage of the positive utility enjoyed by hagglers in the form of higher prices. Remarkably fixed price sellers, who do not even cater to hagglers, also raise their prices if ε goes up. The mechanism behind this *spillover effect* is this. As ε goes up, more firms offer flexible pricing (see panel $1c$) and fewer firms offer fixed pricing. Since fixed price firms are the only outlets where non-hagglers can shop, the expected demand at fixed price firms goes up. The rising demand, naturally, leads to higher prices. The fact that fixed price firms get more crowded and charge higher prices points to another interesting spillover effect in that non-bargaining customers, who shop only at fixed price firms, end up receiving less utility

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[10]The simulations are based on the following parametrization: $b_1 = s_1 = 1$, $\eta_1 = 0.5$, $\theta = 0.6$, $T = 25$ and $\beta = 0.9$. The terminal payoffs, u_{T+1} and π_{T+1}, are both assumed to be zero. The parameter ε ranges from 0 to 0.05.

when haggling customers enjoy bargaining.[11]

1a: Flexible List Price   1b: Fixed Price   1c: Fraction of Flexible Stores
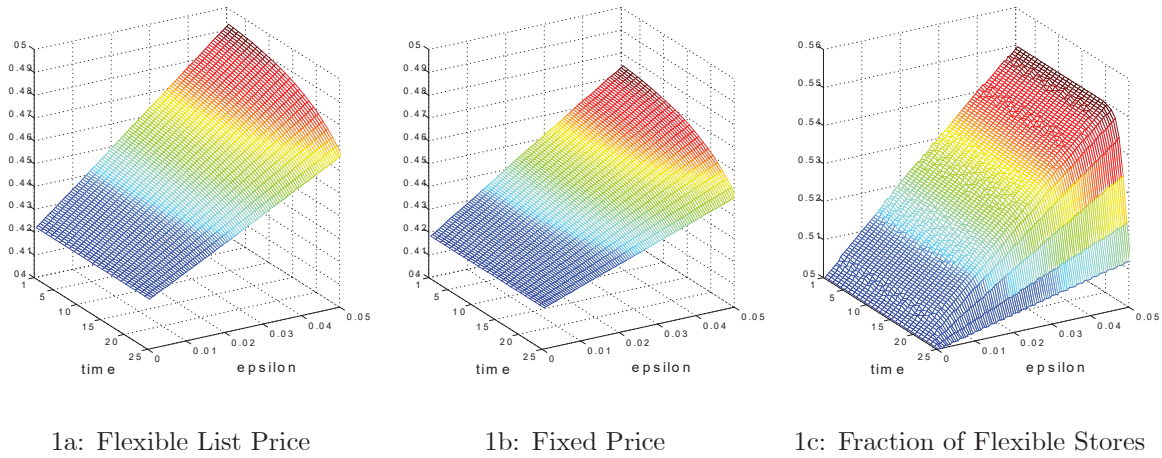
Figure 1: Equilibrium Market Dynamics against t and ε

A variety of markets operate on implicit or explicit deadlines, and those deadlines inevitably have a bearing on price dynamics. In our model, the simulations are based on a setting with a finite T, which allows us to study such deadline effects on prices and the percentage of sellers adopting each pricing rule. Price trajectories with respect to the calendar time t reveal that if the deadline is sufficiently far away (i.e. when t is small) then sellers list higher prices. As the deadline nears, however, prices start to fall. The pattern is more visible for larger values of ε. Indeed, if $\varepsilon \approx 0$ then prices remain rather flat over time, however if $\varepsilon \approx 0.05$ then they clearly exhibit a falling pattern. The reason is this. When t is small, sellers are not worried about not being able to trade as they know the market will remain active for a long while. So, they list higher prices in order to take advantage of the presence of high type buyers and benefit from the positive ε they bring with. Towards the end of the market however, the fear of not being able to sell and walking out empty handed kicks in, as such, prices start to fall.[12] Notice that, the drop in prices is only gradual and it does not warrant buyers to delay their purchase. As discussed earlier, in equilibrium, players

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[11] We thank an anonymous referee for pointing out the second relationship between ε and its impact on the non-bargaining customers' utility.

[12] In Figure 1a, taking $\varepsilon = 0$ as a benchmark, we observe that flexible sellers add a premium to their prices as ε goes up and during the initial periods this premium can exceed ε. To see why, recall that customers pay this full price only with some positive probability. With the remainder probability, they negotiate and pay a lower price plus they enjoy ε on top. Thus, on expected terms they are still better off compared to the benchmark even though the premium may exceed ε. The premium is highest during the initial periods, because, early on, many stores offer flexible pricing, and the higher the number of such stores, the less crowded they are. This, in turn, means that their customers are very likely to negotiate a discount. To cover themselves against such likely discounts, the stores raise the aforementioned premium. As the deadline approaches the number of flexible stores decreases; thus, the premium starts to shrink.

are better off trading immediately rather than waiting. The deadline effect can be augmented by considering imbalances in terminal payoffs of buyers and sellers. Suppose, for instance, that sellers have the option to liquidate unsold items in a secondary market that starts at the end of the first market, i.e. suppose that $\pi_{T+1} > 0$ (buyers' terminal payoff is still $u_{T+1} = 0$). Along this scenario, the payoff π_{T+1} filters into the prices and prevents them from falling too much even when the deadline is near.

Another observation is that the equilibrium percentage of sellers adopting flexible pricing falls in t (panel 1c). To see why, notice that along Eq-FS flexible stores attract, on average, fewer customers than fixed price stores; thus, they are less likely to make a sale. Initially sellers are not too worried about not being able to trade, so a large number of them remain flexible in an effort to trade with high type customers. But as t grows large, sellers start to switch to fixed pricing to maximize their likelihood of making a sale.

Panel 1c further reveals that the percentage of sellers adopting flexible pricing rises in ε. The intuition is that flexible sellers are able to convert a larger ε into higher prices, and thereby, into higher profits. The market is competitive; so, if ε rises then more sellers become flexible in an effort to take advantage of this opportunity. The next proposition summarizes the discussion above analytically. (The proof is in the Online Appendix 1.)

Proposition 4 *The equilibrium profit π_t rises in ε.*

In order to prove the proposition, we start by establishing that the expected utility of low types, $u_{l,t}$, falls in ε. In words, low type (non-bargaining) customers, who shop only at fixed price firms, end up receiving less utility when haggling customers' ε increases. Recall that we have seen this spillover effect in the simulations above. In the proof of the proposition, we establish this result analytically. Next, we show that sellers' profit increases as $u_{l,t}$ decreases, thus the result in the proposition follows.

The proposition suggests that sellers may convert a positive ε into higher prices and profits. This, then, indicates that firms' attempt to raise customers' enjoyment of the bargaining process (e.g. through such actions as better training of the salesforce to be highly courteous during bargaining, providing a relaxing environment for price negotiation, among others) may be a profitable strategy.

6 Price Dynamics

In this section we explore how equilibrium prices respond to fluctuations in expected demand. We proxy the expected demand by the buyer-seller ratio $\lambda_t = b_t/s_t$ since along Eq-PS and Eq-FP the expected demand at each store is equal to λ_t, whereas along Eq-FS expected demands $q_{h,b,t}^*$ and $q_{l,f,t}^*$ are proportional to it (they increase if λ_t increases and they fall if it falls).

To determine the trajectory of λ_t one needs to focus on how the measures of buyers and sellers evolve over time. Recall that the market starts with a measure of s_1 sellers and b_1 buyers, of which a fraction η_1 are low types. At the end of each period, trading players leave the market and the ones who could not trade move to the next period to play the same game. In addition, at the beginning of each period $t = 2, 3...$ a new cohort of s_t^{new} sellers and b_t^{new} buyers, of which a fraction η_t^{new} are low types, enter the market joining the existing players. The proposition below pins down how these measures evolve over time.

Proposition 5 *Along Eq-PS and Eq-FP the measures of buyers and sellers evolve according to*

$$b_t = b_t^{new} + b_{t-1} - s_{t-1}(1 - z_0\left(\lambda_{t-1}\right)) \text{ and } s_t = s_t^{new} + s_{t-1}z_0\left(\lambda_{t-1}\right) \text{ for } t \geq 2. \qquad (26)$$

The fraction of non-hagglers, on the other hand, evolves according to

$$\eta_t = [b_t^{new}\eta_t^{new} + b_{t-1}\eta_{t-1} - \eta_{t-1}s_{t-1}(1 - z_0\left(\lambda_t\right))]/b_t. \qquad (27)$$

Specifically if $\eta_t^{new} = \eta_1$ then $\eta_t = \eta_1$ for all $t \geq 2$. Along Eq-FS we have

$$b_t = b_t^{new} + b_{t-1} - (l_{t-1} + h_{t-1}) \quad and \quad s_t = s_t^{new} + s_{t-1} - (l_{t-1} + h_{t-1})$$

where $l_{t-1} \equiv s_{t-1}\varphi_{f,t-1}^*[1 - z_0(q_{f,t-1}^*)]$ and $h_{t-1} \equiv s_{t-1}(1 - \varphi_{f,t-1}^*)[1 - z_0(q_{h,t-1}^*)]$. The fraction of non-hagglers evolves according to $\eta_t = [b_{t-1}\eta_{t-1} - l_{t-1} + \eta_t^{new}b_t^{new}]/b_t$.

Given the equations governing b_t and s_t, one can pin down how λ_t evolves over time and then, via reverse engineering, one can impose specific trajectories on λ_t. To see how, note that along Eq-PS or Eq-FP we have

$$\lambda_t = \frac{b_t^{new} + b_{t-1} - s_{t-1}(1 - e^{-\lambda_{t-1}})}{s_t^{new} + s_{t-1}e^{-\lambda_t-1}} \text{ for } t \geq 2. \qquad (28)$$

The trajectory is endogenous but it is partly driven by the measures of incoming cohorts b_t^{new} and s_t^{new}, which are exogenous. This means that one can reverse engineer and pick the exogenous numbers in such a way that the trajectory follows a particular pattern one may have in mind. Specifically, we consider seasonal cycles where λ_t starts low in the beginning of the cycle, peaks in the middle of the cycle and subsides towards the end of the cycle and each such cycle lasts, say, k periods, that is $\lambda_t = \lambda_{t+k}$, for some integer k. For instance consider a case with $k = 2$, where the market alternates between episodes of high and low demand. Suppose in odd periods we want to have $\lambda_{odd} = 0.5$ and in even periods $\lambda_{even} = 1$. One can produce such cycles by picking starting values, say, $b_1 = 1$ and $s_1 = 2$ and the new entrants as $b_{t=even}^{new} = 1.7$, $s_{t=even}^{new} = 0.7$, $b_{t=odd}^{new} = 0.3$ and $s_{t=odd}^{new} = 1.3$.[13]
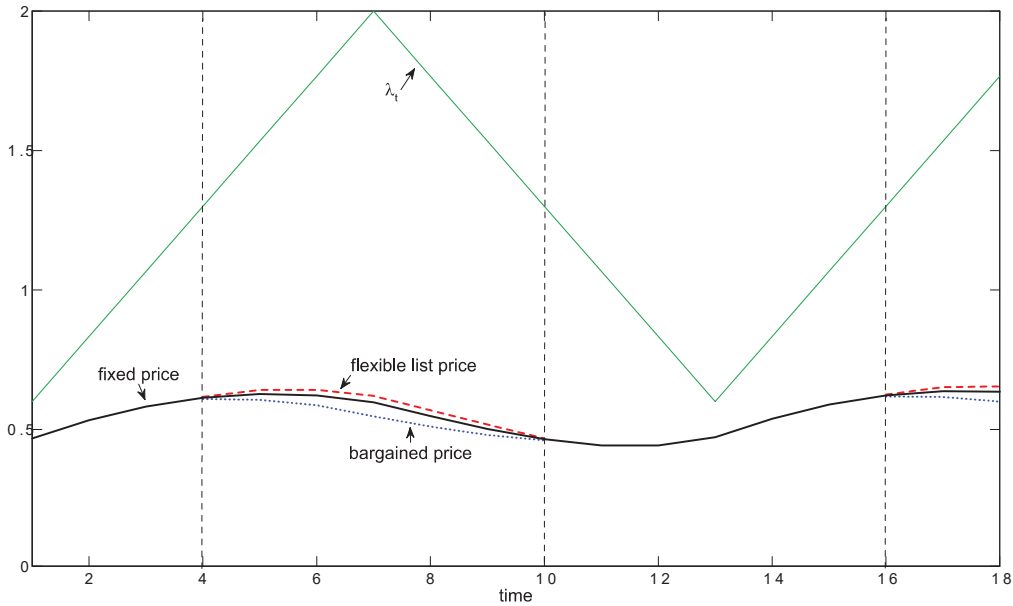

Figure 2: Price Dynamics in a Market with Seasonal Cycles

In the simulation we pick $k = 12$ and select the entering cohorts in such a way that the expected

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[13] In period 1 the buyer seller ratio equals to $\lambda_1 = b_1/s_1 = 0.5$. At the end of the period $s_1 \left(1 - e^{-\lambda_1}\right) = 0.8$ buyers and sellers trade and exit, which means that a measure of 1.2 sellers and 0.2 buyers are unable to trade so they move to the next period. At the beginning of period 2, $b_{t=even}^{new} = 1.7$, $s_{t=even}^{new} = 0.7$ enter the market; thus $b_2 = s_2 = 1.9$ and therefore $\lambda_2 = 1$. At the end of period 2, $s_2 \left(1 - e^{-\lambda_2}\right) = 1.2$ buyers and sellers trade and exit; hence a measure 0.7 sellers and 0.7 buyers move to period 3. At the beggining of period 3, $b_{t=odd}^{new} = 0.3$, $s_{t=odd}^{new} = 1.3$ join them; thus $b_3 = 1$ and $s_3 = 2$ and therefore $\lambda_3 = 0.5$. And so on.

demand follows a zigzag trajectory: the cycle starts when lambda is at its lowest value 0.6, then it peaks at 2 in the middle of the season, then it declines back to 0.6 and then it starts again (see Figure 2). In addition, for the sake of simplicity we assume that $\eta_t^{new} = \eta_1 = 0.5$ so that η_t remains constant at 0.5 at all times.[14]

There are a few observations that stand out. First, prices seem to follow the same trajectory as the expected demand λ_t: they rise as λ_t rises and they fall as it falls. The intuition is simple. If λ_t goes up then sellers face less competition to attract customers, so they post higher prices. If λ_t falls then they face stiffer competition and cut their prices.

Second, the simulation confirms that the flexible list price is indeed higher than the fixed price. As discussed earlier, flexible sellers understand that they may well end up selling at a lower price than what they initially post, so they inflate the list price up-front to cover themselves against this contingency.

Third, there is a time lag between prices and the expected demand—prices seem to front-run the expected demand by about two periods. Indeed, prices peak around $t = 5$, whereas the expected demand peaks at $t = 7$. Similarly, prices dip at around $t = 11$, which, again, is well before λ_t reaches its own minimum at $t = 13$. To understand why, note that prices depend not only on the current demand, but on the entire sequence $\{\lambda_{t+j}\}_{j=0}^{T}$, as such, if the general outlook of future demand turns negative, then prices start to fall even if demand keeps rising for a short while. For instance at $t = 6$ sellers understand that demand will rise only for one more period, after which it will fall for six consecutive periods until $t = 13$; so, they start cutting prices. By the time λ_t peaks at $t = 7$ prices have already started falling. The opposite happens at the end of the cycle. By the time the demand dips at $t = 13$, prices have already started rising. (We remind the reader that players, due to trade frictions, are always willing to transact immediately rather than waiting.)

The final observation is that prices do not fluctuate as much as the expected demand. Even though the demand goes through sharp zigzags, prices follow much smoother trajectories with little fluctuation[15]. The reason is this. Prices depend on the entire demand sequence $\{\lambda_{t+j}\}_{j=0}^{T}$ and if

[14]Note that in Eq-PS if $\eta_t^{new} = \eta_1$ then $\eta_t = \eta_1$ for all t. In words, the fraction of low types remains constant at η_1 throughout all market activity, provided that the fraction in the entrant cohorts is also η_1. (This relationship holds in Eq-FP as well, but this is rather immaterial because no one negotiates in Eq-FP.) To see why note that along Eq-PS the expected demand at all firms is equal to λ_t; thus all buyers trade and exit at the same rate. This means that the ratio of hagglers to non hagglers is not disturbed by how fast different types of buyers exit the market. If this ratio is not disturbed externally either, then η_t remains constant at η_1 for all $t \geq 2$. This relationship does not hold along Eq-FS because in that equilibrium hagglers are more likely to trade than non hagglers, and they exit the market at a faster rate. Simulations suggest that if we fix $\eta_t^{new} = \eta_1$ then η_t converges to a level slightly above η_1.

[15]In the simulation, the maximum value of λ_t is more than three times its minimum value, but for prices this ratio is less than 1.5. Similarly, the coefficient of variation for λ_t is 0.32, whereas for prices it is less than 0.1.

the terminal period T is sufficiently far away then sellers effectively face a market with cyclical demand that goes through periodic ups and downs. (In the simulation we have $T = 360$, which means that the market goes through thirty cycles of twelve periods before it comes to an end.) With cyclical demand, if β is sufficiently large then future total demand is more or less constant because the variation in demand is mostly accounted for; hence prices do not fluctuate as much. Indeed as $\beta \to 1$ price trajectories converge to each other and they start to look like flat lines. On the other hand, as $\beta \to 0$ the impact of any lambda beyond, say, the current period becomes ignorable, which leaves the current demand λ_t as the dominant factor driving the prices. Consequently, price trajectories start to follow the trajectory of the current demand λ_t closely, exhibiting a similar zigzag pattern.[16]

The parameter β (inversely) proxies the severity of trade frictions. A small value of β indicates that players who are unable to buy or sell today incur significant waiting costs before trying again in the subsequent period. The discussion above suggests that fluctuations in prices depend on the degree of trade frictions. If trade frictions are severe (i.e. if waiting is costly) then prices move significantly; else, they remain stable even though the demand goes through sharp ups and downs. In the simulation we have $\beta = 0.8$, which is a moderately high value; hence the stable prices. The following proposition summarizes the discussion so far (the proof is in the Online Appendix 1).[17]

Proposition 6 *Both in Eq-PS an in Eq-FP if T is sufficiently large then for all $1 < t \ll T$ we have*

$$\lim_{\beta \to 1} \Delta y_t^* = \lim_{\beta \to 1} \Delta r_{b,t}^* = \lim_{\beta \to 1} \Delta r_{f,t}^* = 0,$$

where $\Delta y_t^* \equiv y_t^* - y_{t-1}^*$ denotes the difference in prices ($\Delta r_{b,t}^*$ and $\Delta r_{f,t}^*$ are likewise).

In marketing, the phenomenon of stable prices in the presence of fluctuating demand and supply is predominantly explained with fairness concerns, which originates from the principle of dual entitlement put forward by Kahneman et al. (1986). This principle suggests, among others, that customers have perceived fairness levels for both firm profits and retail prices, and it is 'not fair' for retailers to change the price arbitrarily, or just to increase the firm's existing profit, for example, by taking advantage of excess demand (Xia et al., 2004; Bolton et al., 2003; Anderson and Simester, 2008). In addition, the fact that prices are not that responsive to changes in costs or demand has

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[16]We thank the AE for pointing out the interplay between the cyclicality of demand and stable prices.

[17]We restrict the Proposition within Eq-PS and Eq-FP because in the other equilibrium (Eq-FS) expected demands $q_{h,b,t}^*$ and $q_{l,f,t}^*$ have non-trivial closed form solutions rendering an analytic proof elusive. Numerical simulations, however, suggest that along Eq-FS, too, prices tend to remain stable if β and T are large.

also been analyzed in the economics literature by highlighting, inter alia, the role of consumers' loss aversion (Heidhues and Kőszegi, 2008), the risk of antagonizing customers (Anderson and Simester, 2010), or menu costs. While fairness concerns, or the fear of antagonizing customers could be drivers of price stability in many markets, our results suggest that the phenomenon of stable prices can be obtained as a result of market competition with forward looking rational players.

A second distinction of our paper is that, unlike the cited literature, which by default assume fixed pricing, price stability in our model obtains even when the selection of the pricing rule is endogenous, and where the sale price may involve a non-trivial bargaining process. While forward looking agents may facilitate smooth prices, it is not obvious whether (and under what pricing rules) the smooth price phenomenon would emerge if sellers were allowed to trade via alternative pricing rules. Our paper demonstrates that all prices—the fixed price, the flexible list prices and the bargained price—remain stable despite the fluctuating demand.

Admittedly, the phenomenon of stable prices may emerge in alternative settings with forward looking customers and market competition, e.g., the aforecited literature studying pricing mechanism selection (Eeckhout and Kircher, 2010; Virag, 2011). One can potentially obtain stable prices if one constructs dynamic versions of these models, however, their static (one-shot) setups do not allow them to investigate the issue of price stability. In contrast, our paper considers a dynamic framework, which enables us to explore the issue of price stability in detail.

Many real world markets exhibit cyclical or seasonal demand patterns (Radas and Shugan, 1998; Gijsenberg, 2017), where periods of higher demand follow periods of lower demand. Recent empirical research in marketing has documented such demand patterns and also examined the evolution of observed prices along such cycles (Gijsenberg, 2017). A notable finding therein is the relative stability of prices over time and the limited influence of the demand cycles on the observed prices. While their study context (consumer packaged goods) is clearly different than ours, the observation appears to be quite similar to the price stability phenomenon we observe in our study. In addition, anecdotal evidence suggests that markets that are known for significant seasonal/cyclical demand fluctuations, such as the housing market, exhibit surprisingly stable prices, which fall quite slowly during low-demand periods (so the average time of a house on the market substantially increases) and do not increase as swiftly and significantly as one would expect during high-demand periods. Our results may provide a compelling reason for these observations in that the variation in future demand gets to be largely accounted for in current prices, so, prices do not fluctuate much.

7 Concluding Remarks

In this paper we develop economic intuition on the selection and dynamics of two popular pricing rules—fixed price and flexible price—using the competitive search paradigm. Fixed pricing is plain enough; flexible pricing involves bargaining between the buyer and seller. Despite bargaining being a common practice in many buying-selling situations, previous analytical models of bargaining in marketing have mostly focused on business-to-business and channel relationships (Iyer and Villas-Boas, 2003; Dukes et al., 2006; Guo and Iyer, 2013), leaving room for models investigating the practice of bargaining by customers. In addition, non-economic dynamics such as pleasure or displeasure associated with bargaining could play a role during such transactions. As such, our modeling approach attempts to incorporate this additional non-economic element into the model.

As fixed and flexible pricing coexist in many modern day markets, it is important to gain a better conceptual understanding of these pricing strategies. In this paper, we provide a theoretical rationale for firms' selection and strategic implications of fixed and flexible pricing in a fully competitive setting by focusing on decentralized markets such as housing or used cars. Fixed and flexible pricing formats, of course, are not exclusive to these markets, and they coexist in a variety of marketplaces. For example in many classified advertisement websites such as Craigslist, one observes indicators for both flexible price selling ("OBO"–or best offer) and fixed price selling (e.g., "sharp price") for seemingly similar items. Similarly, on eBay, in addition to the auction setup, individuals typically have two other options to sell the product: (i) using a fixed price ("Buy It Now") or (ii) using a flexible price option, under which the seller can either accept the offer, decline it, or respond with a counter offer.

Our study has also connections to research on everyday low pricing (EDLP) and promotional (Hi/Lo) pricing strategies employed by retailers (Lal and Rao, 1997; Ho et al., 1998; Ellickson and Misra, 2008). Fixed pricing resembles EDLP, and flexible pricing resembles Hi/Lo pricing in some ways. As such, our setting has some distinctions and similarities with EDLP and promotional pricing. The differences include the focus on buyers shopping for a single item in our case, whereas customers shopping for a set of items or product categories in EDLP and Hi/Lo research. Also, while search and trade frictions play an essential role in our model, these are typically small or negligible for EDLP and Hi/Lo settings.

Despite these differences, there are some noteworthy similarities. First, both in Hi/Lo settings and in our model, there is uncertainty pertaining the price. More specifically, we have ex-ante

28

price uncertainty in our model in that customers do not know whether they will get an opportunity to negotiate with the seller before visiting the stores. (We do not have ex-post price uncertainty, i.e., once customers arrive at stores, there is no uncertainty regarding the sale price). Such ex-ante price uncertainty is somewhat similar to promotions at local Hi/Lo sellers where customers may not be aware of those promotions before actually visiting the stores. A similar ex-ante price uncertainty in Hi/Lo stores is that demand can endogenously rise as a result of the appeal of the coupons/promotions, therefore, as in our model, there is no guarantee for a prospective customer to obtain a deal if the item has limited availability.

Furthermore, there seems to be a broad correspondence between our model of fixed vs. flexible pricing and EDLP vs. Hi/Lo pricing in terms of the role of consumer dynamics. In both cases, consumers' heterogeneity (e.g., some customers put additional effort by engaging in bargaining or by closely monitoring promotions, whereas others do no exert effort) as well as their non-economic aspects (e.g., enjoyment from bargaining) may have significant implications for sellers' choice of pricing policies.

Finally, our article provides an important methodological contribution to the pricing literature in marketing in that, in addition to Bertrand, Cournot, or Hotelling frameworks, our study underlines the competitive search approach as an alternative way of capturing competition. The competitive search approach is particularly suitable to model the pricing problem in decentralized markets where search and trade frictions matter. Overall, we think that incorporating competitive search models into marketing problems could open up a new avenue of research for scholars in this area.

Our paper has several limitations. First, we implicitly assume that sellers can commit to a pricing rule and implement it without any costs. However, sellers may find it difficult to commit to a fixed price policy in markets where bargaining is widespread. A second issue pertains to the enjoyment of bargaining, proxied by a positive ε, which may be difficult to justify. This is because even if there is a non-economic benefit of bargaining beyond the tangible benefit of obtaining a lower price, it is not clear if it is a first order effect. Furthermore, we take the positive ε as given— while remaining agnostic about the factors, psychological or otherwise, generating it—and explore sellers' pricing and buyers' visiting decisions in the presence of such a parameter. If such factors are explicitly accounted for, then they may interact with other components of the model and lead to non-trivial results. Therefore, the results regarding the positive ε should be taken with caution. Overall, while we recognize that our model is stylized and some of our modeling assumptions may not apply to broader markets or product categories, we believe our paper is an important step

towards a better understanding of fixed and flexible selling strategies.

References

Agins, T. and Collins, S. (2001). Retailers hoping to lift holiday sales begin to allow customers to haggle. *The Wall Street Journal.* (November 16), https://www.wsj.com/articles/SB1005869446938486960.

Anderson, E. T. and Simester, D. I. (2008). Does demand fall when customers perceive that prices are unfair? The case of premium pricing for large sizes. *Marketing Science*, 27(3):492–500.

Anderson, E. T. and Simester, D. I. (2010). Price stickiness and customer antagonism. *The Quarterly Journal of Economics*, 125(2):729–765.

Babin, B. J., Darden, W. R., and Griffin, M. (1994). Work and/or fun: Measuring hedonic and utilitarian shopping value. *Journal of Consumer Research*, 20(4):644–656.

Bolton, L. E., Warlop, L., and Alba, J. W. (2003). Consumer perceptions of price (un) fairness. *Journal of Consumer Research*, 29(4):474–491.

Burdett, K., Shi, S., and Wright, R. (2001). Pricing and matching with frictions. *Journal of Political Economy*, 109(5):1060–1085.

Desai, P. S. and Purohit, D. (2004). Let me talk to my manager: Haggling in a competitive environment. *Marketing Science*, 23(2):219–233.

Dukes, A. J., Gal-Or, E., and Srinivasan, K. (2006). Channel bargaining with retailer asymmetry. *Journal of Marketing Research*, 43(1):84–97.

Eeckhout, J. and Kircher, P. (2010). Sorting versus screening: Search frictions and competing mechanisms. *Journal of Economic Theory*, 145(4):1354–1385.

Ellickson, P. B. and Misra, S. (2008). Supermarket pricing strategies. *Marketing Science*, 27(5):811–828.

Evans, K. R. and Beltramini, R. F. (1987). A theoretical model of consumer negotiated pricing: An orientation perspective. *The Journal of Marketing*, 51(2):58–73.

Galenianos, M. and Kircher, P. (2012). On the game-theoretic foundations of competitive search equilibrium. *International Economic Review*, 53(1):1–21.

Gijsenberg, M. J. (2017). Riding the waves: Revealing the impact of intra-year category demand cycles on advertising and pricing effectiveness. *Journal of Marketing Research*, 54(2):171–186.

Gill, D. and Thanassoulis, J. (2016). Competition in posted prices with stochastic discounts. *Economic Journal*, 126(594):1528–1570.

Guo, L. and Iyer, G. (2013). Multilateral bargaining and downstream competition. *Marketing Science*, 32(3):411–430.

Heidhues, P. and Kőszegi, B. (2008). Competition and price variation when consumers are loss averse. *The American Economic Review*, 98(4):1245–1268.

Ho, T.-H., Tang, C. S., and Bell, D. R. (1998). Rational shopping behavior and the option value of variable pricing. *Management Science*, 44(12-part-2):S145–S160.

Holbrook, M. B., Chestnut, R. W., Oliva, T. A., and Greenleaf, E. A. (1984). Play as a consumption experience: The roles of emotions, performance, and personality in the enjoyment of games. *Journal of Consumer Research*, 11(2):728–739.

Iyer, G. and Villas-Boas, J. M. (2003). A bargaining theory of distribution channels. *Journal of Marketing Research*, 40(1):80–100.

Jones, M. A., Trocchia, P. J., and Mothersbaugh, D. L. (1997). Noneconomic motivations for price haggling: An exploratory study. *Advances in Consumer Research*, 24:388–391.

Kahneman, D., Knetsch, J. L., and Thaler, R. (1986). Fairness as a constraint on profit seeking: Entitlements in the market. *The American Economic Review*, 76(4):728–741.

Kuksov, D. (2004). Buyer search costs and endogenous product design. *Marketing Science*, 23(4):490–499.

Kuo, C., Ahn, H., and Aydin, G. (2011). Dynamic pricing of limited inventories when customers negotiate. *Operations Research*, 59(4):882–897.

Kuo, C.-W., Ahn, H.-S., and Aydin, G. (2013). Pricing policy in a supply chain: Negotiation or posted pricing. *Production and Operations Management*, 22(3):626–641.

Lal, R. and Rao, R. (1997). Supermarket competition: The case of every day low pricing. *Marketing Science*, 16(1):60–80.

Marks, T. (2013). Tips on how to bargain and save money. *Consumer Reports Magazine.* (August 2013), http://www.consumerreports.org/cro/magazine/2013/08/how-to-bargain/index.htm.

Morton, F. S., Silva-Risso, J., and Zettelmeyer, F. (2011). What matters in a price negotiation: Evidence from the us auto retailing industry. *Quantitative Marketing and Economics*, 9(4):365–402.

Pruitt, D. G. (2013). *Negotiation behavior.* Academic Press, New York.

Radas, S. and Shugan, S. M. (1998). Seasonal marketing and timing new product introductions. *Journal of Marketing Research*, 35(3):296–315.

Richtel, M. (2008). Even at megastores, hagglers find no price is set in stone. *New York Times.* (March 23), http://www.nytimes.com/2008/03/23/business/23haggle.html.

Riley, J. and Zeckhauser, R. (1983). Optimal Selling Strategies: When to Haggle, When to Hold Firm. *The Quarterly Journal of Economics*, 98(2):267–89.

Rubinstein, A. (1982). Perfect equilibrium in a bargaining model. *Econometrica*, 50(1):97–109.

Schindler, R. M. (1998). Consequences of perceiving oneself as responsible for obtaining a discount: evidence for smart-shopper feelings. *Journal of Consumer Psychology*, 7(4):371–392.

Sherry, J. F. (1990). A sociocultural analysis of a midwestern american flea market. *Journal of Consumer Research*, 17(1):13–30.

Shimer, R. (2005). The assignment of workers to jobs in an economy with coordination frictions. *Journal of Political Economy*, 113(5):996–1025.

Stout, H. (2013). More retailers see haggling as a price of doing business. *New York Times.* (December 15), http://www.nytimes.com/2013/12/16/business/more-retailers-see-haggling-as-a-price-of-doing-business.html.

Tuttle, B. (2013). The 5 big mistakes that led to Ron Johnson ouster at JC Penney. *Time.* (April 09), http://business.time.com/2013/04/09/the-5-big-mistakes-that-led-to-ron-johnsons-ouster-at-jc-penney/.

Virag, G. (2011). High profit equilibria in directed search models. *Games and Economic Behavior*, 71(1):224–234.

Wang, R. (1995). Bargaining versus posted-price selling. *European Economic Review*, 39(9):1747–1764.

Wernerfelt, B. (1994). Selling Formats for Search Goods. *Marketing Science*, 13(3):298–309.

Xia, L., Monroe, K. B., and Cox, J. L. (2004). The price is unfair! A conceptual framework of price fairness perceptions. *Journal of Marketing*, 68(4):1–15.