Pricing for Bargaining?

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Abstract

The seller can discriminate among heterogenous consumers through costly bargaining. This paper investigates when it's profitable for the seller to adopt negotiable pricing strategy through comparing it with the take-it-or-leave-it case when there are/is discount rate and/or transaction cost under the framework of Rubinstein bargaining. We get the conclusion that which mechanism is better for the seller depends on his relative patience and labor costs. More precisely, if the seller is relatively more patient and has lower labor costs, it is beneficial for him adopting bargaining.

Keywords: Pricing, Bargaining, Take-it-or-leave-it, Delay

JEL classification: D420, C780, L110

1 Introduction

A merchandize can be sold in many different ways, and two major selling methods have already become part of our everyday life: bargaining and take-it-or-leave-it. How should sellers set their strategies and price their goods when they face a mass of heterogenous consumers whose valuation are private information? In the bazaar or the store of a developing country, haggling is popular. In most developed nations,

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on the other hand, posted nonnegotiable prices are employed in most cases. In the tour place, souvenirs are always sold through bargaining. While in regular store, goods are sold in posted price. The coexistence of them shows that no one is optimal for the seller in all circumstances. In this paper, we try to compare them by taking into account the different cost structures in the view of the seller and attempt to explain these scenario we meet in the social life.

If the seller chooses to bargain, he is able to discriminate among buyers with different valuations. The consumers of higher valuations would not like to bargain for long time and buy the goods faster and the buyers of lower valuations want to signalling themselves as low valuations so that can get the goods cheaper in the way of haggling for longer time. So, time-consuming is unavoidable (discounting cost) and/or additional employees must be hired to haggle with potential buyers (transaction cost) and it costs. On the other hand, posting a fixed, non-negotiable price is simpler, just the buyers whose valuation is larger than the posted price would buy the good immediately, so the marketing cost for the seller is lower. But discrimination is then impossible. Therefore, the seller faces a trade-off: Bargaining generates more consumers and may get more revenues, but it also costs more.

This paper tries to explain the main question when the seller will choose to bargain with customers and when he will choose simply to post a fixed and take-it-or-leave-it price in the framework of Rubinstein bargaining model. We build a model in which there is a monopoly seller facing a mass of heterogenous buyers. The buyers are different on their valuations about the goods. The seller tries to sell them products for benefits. In this paper, there are two sources of costs: discounting and transaction cost. The discounting rate represents the traders relative patience and affects their bargaining position. The more patient trader the larger share of the pie he can get in the trade. And we use labor costs as the transaction costs. And it is obvious that stores in the developing countries have more employees and one reason is that the wages are relatively low. As we can notice that the bargaining model with the two conditions are different and worth to mention them in one paper. We get the conclusion that bargaining is beneficial for the seller when he is relatively more patient (discounting rate is really small comparing to the buyers'.) in the case of discounting separately or hybridizing case. This result is really intuitive. One can expect that bargaining is better in moderate relative costs in the hybridizing case since the seller could not only discriminate the consumers and also would not sell his good to the potential buyers whose valuation is too low so that he can save cost. When the discounting rate is relatively low, the seller could get large share from each trade. And then the cost saving could cover all the benefit loss.

And as we know, following Rubinstein(1982, 1985), there are many economists (such as Admati and Perry(1987), Cramton(1991), Perry(1986) among them) who exploited the equilibrium of bargaining game with delay theoretically. And they found the role of time, not because of the assumptions. (see the argument of Gul and Sonnenschein(1988).) But few applied this method to explain the pricing strategies of sellers. Riley and Zeckhauser (1983) use optimal search theory and get the main conclusion that if commitment is possible, seller should always use a fixed-price strategy. Wang (1995) uses the bargaining theory (Nash axiom methods) and induces that bargaining is better when bargaining cost is less, or the discounting rate is larger.

The rest of the paper is organized as follows. In section 2, we characterize the different pricing strategies and equilibrium behavior of the seller and buyers in different cost structures. Then, we compare the benefits which the strategy brings to the seller, and get the optimal conditions for the seller's choice. After that, we conclude.

2 Model

There is a producer who produces and sells goods. For simplicity, we assume the unit cost is 0. The cost of the product is a common knowledge to all the traders. The seller faces and sells the good at price P to a mass of 1 heterogenous consumers whose valuation is distributed on $[0, 1]$. The C.D.F of consumers' valuation distribution is $F(v)$, and its P.D.F is $f(v)$, which is common knowledge. The contemporary utility of the seller is $U = P$, and the consumer's is $V = v - P$. The seller does not know the valuation of each buyer *ex ante* and just knows the distribution. The seller can sell the good to consumers with a fixed price P and not try to distinguish them, or he can set a negotiable price and discriminate them through bargaining. The more patient consumer with lower valuation would delay for the longer time during bargaining. The role of bargaining is to fractionate the buyers and discriminate them and extract more profits. Before we start to characterize the different pricing strategies, we need the following commitment assumption.

Assumption: The seller is able to and going to make a commitment to employ any selling strategy he wishes, and he conveys this commitment to all potential buyers.

This assumption captures some point of the real life. It is common to see that the sign "YiKouJia"(Take it or leave it)posted on the shopwindows or entrance of a shop on the street of China. Although this assumption maybe seem not really happened always, it is a good benchmark to study the cases under it. In the following, I will not argue about the legitimacy of this assumption. Under this assumption, we can describe the whole game completely. There are two stages: in the first stage, the seller chooses his commitment which is public to the buyers and he will insist it in the following times; in the second stage, the selling stage, the seller sells his goods to the consumers by the committed strategies and buyers behave accordingly. The timing and strategies are as follows:

Stage 1, (Commitment) The seller commits to a strategy and sets a price (fixed or flexible) accordingly. In this paper, the seller just choose to sell through take-it-or-leave-it or bargaining, and all the potential buyers knows about his strategy.

Stage 2, (Trading) If the price is fixed, the buyers whose valuation is larger than the posted price would buy the good immediately and the game ends.

If the price is negotiable, when the buyer enters the store and see the listed price, the two traders play a bargaining model.

Step 1, The buyer could reject the listed price, wait for a period of time and counter propose a price, or leave the store. The seller can not propose another price before the buyer makes her decision.

Step 2, If the seller thinks the buyer's valuation should be larger than her revealed valuation, he would reject her offer and counteroffer another price, and then the game goes to step 1. If the seller thinks the buyer's valuation is exactly the value she revealed, accept the counter offer and the game over.

In the following four subsections, we characterize the pricing strategies in different cases in the second stage. Then we compare them, and help the seller to find his optimal strategy.

2.1 Take-It-Or-Leave-It

In the take-it-or-leave-it pricing case, we implicitly assume that all the transactions take place immediately if the buyer is willing to purchase the good, so that there is no direct cost in this case.[1] That is to say, there is no negotiation costs. In this paper, we model the source of those costs being from the timing consuming when bargaining, so that all the trades in the TIOLI case consume no time. But the seller can not distinguish the consumers and may lose some buyers whose valuation is lower than the posted price but higher than the marginal cost. Because there is only one seller, he will play the game as a monopoly. So the optimal take-it-or-leave-it price for the seller can be induced from the following program problem.

$$\max_{P}(1 - F(P))P \tag{1}$$

$$\rightarrow P^M = \frac{1 - F(P^M)}{f(P^M)} \quad (M) \tag{2}$$

The optimal price for the seller is characterized by the above equation, which means the optimal pricing strategy just depends on the distribution of the consumers. The gain the seller can get from the trade is $U^M = (1 - F(P^M))P^M$.

Proposition 1 *Under take it or leave it pricing condition, (i)The seller sets the price as a monopoly given by (M); (ii)The consumers whose valuation* $v \geq P^M$ *purchase the good at price* P^M *without waiting or delay, if the valuation* $v < P^M$ *would just exit and do not buy the good.*

[1] This is not as in Wang (1995) where it assumes that there is displaying cost in every case, but it is redundant and plays no role in our framework.

As we know, that all the buyers whose valuation is lower than the posted price have willingness to buy the product and it is social optimum for the seller to sell to all the consumers. In the monopoly posted pricing, these low valuation consumers are excluded in the market.

2.2 Negotiable Pricing[2]

The game we analysis is similar to the one in Rubinstein(1985), except that each player can delay his response for as long as he wishes when it is his turn to respond to an offer. Actions taken to delay making or receiving an offer now serve as a signalling device, used by buyers to communicate their relative valuation. Time delay acts as a screen.

If the seller wants to discriminate the consumers through bargaining, he can sell it to more consumers. But this process is time-consuming and it would cost him. The bargaining game starts at time zero, the consumer facing the shelves, and the seller firstly makes his offer which is just the negotiable listed price (which is normal in many stores in developing countries and tourism place). Subsequently, buyer and seller make alternating offers until they reach an agreement, namely a price at which the buyer purchases the object from the seller. A response to an offer involves either an acceptance or a rejection and than maybe a delay and counteroffer, and the lag between an offer and a response is made within no shorter than a given length of time t^0, which we normalize to 0. So the first action of the buyer facing the listed price is to buy the good immediately or waiting and asking the seller about the characters of the goods to wasting a mount of time and then propose an alternating offer.

[2]The setting in this part is standard in the sense of Admati and Perry (1987), Cramton (1991, 1992) and Perry (1986). The existence of the equilibrium is guaranteed and we do not give any explicit proof.

2.2.1 Negotiable Pricing with Discounting

In the discounting cases, the seller and the buyer would discount the future utility by a discount rate r_S, r_B respectively[3]. So, if the deal is taking place at time t.Then both the seller and consumer's utility would become as: $U = e^{-r_S t}P$, and $V = e^{-r_B t}(v - P)$. The traders seek to maximize their expected payoffs and neither risk aversion nor wealth effect is present.

The traders alternate making offers with a minimum time of t^0 between offers. And in the results, to avoid the offering time effect we just need to consider the case that t^0 goes to 0. Before starting to analyze the equilibrium, we first define several functions that determine the equilibrium prices, the purchasing decision, the time-consuming decision, and the termination decision as a function of current beliefs.

If it is common knowledge that sell's valuation is 0 and buyer's valuation is v, the seller gets the Rubinstein share x of the gains v from trade if seller makes the first offer or the share y if buyer makes the first offer:

$y = e^{-r_S t^0}x$, $1 - x = e^{-r_B t^0}(1 - y)$

Solving these two equations for x and y yields $x = \frac{e^{r_S t^0} - e^{(r_S - r_B)t^0}}{e^{r_S t^0} - e^{-r_B t^0}}$, $y = \frac{1 - e^{-r_B t^0}}{e^{r_S t^0} - e^{-r_B t^0}}$, as t^0 goes to 0, the seller and the buyer shares $x = \frac{r_B}{r_S + r_B}$, $1 - x = \frac{r_S}{r_S + r_B}$ of the gain. Here, x measures the relative patience of the seller, the more patience the seller is the larger the x is.[4]

Now, turn to the case where consumers' value is still uncertain to the seller. Then buyer's purchasing decision reveals information to seller: a less patient (with higher valuation) buyer accepts the offer, whereas a more patient (with low valuation) buyer rejects the offer. Following Cramton(1991)'s notation, let $v(P^D)$ be the buyer's type that is indifferent between accepting or rejecting the offer P^D which is the listed price. We can show that buyer's best alternative is to counter immediately with the offer $p(v) = xv$, which seller accepts. Therefore, buyer must be indifferent between

[3]We exclude the mechanism where the buyers can consume the good today and pay in the future or they pay today and receive the good in the future.

[4]In fact, we usually use the ratio r_B/r_S to measure seller's relative patience: the larger the ratio is, the more patient the seller is. And we know x is strictly increasing with this ratio, so it is equivalent to use x as the measurement of the relative patience of the seller.

P^Dtoday and $p(v)$ tomorrow: $v - P^D = e^{-r_B t^0}(1-x)v$,when t^0 goes to 0, we can get that $v(P^D) = \frac{P^D}{x}$. So, all the consumers whose valuation is larger than $\frac{P^D}{x}$ will buy the good immediately. All the other consumers will wait to make her own alternative offer or just quit. All consumers could buy the good, because no matter how large the discounting rate and how lower the valuation is , the gain to him would always positive. We will soon see this clearly. And the valuation of the consumers who buy the product immediately is larger than the posted price. To avoid the high valuation buyers mimic the low valuation type, the seller needs to give some rent to those buyers.

Now we investigate how long the consumers whose valuation $v < \frac{P^D}{x}$would wait before making the revealing offer $p(v) = xv$. Suppose seller infers buyer's value is $V(\Delta, v)$ if buyer waits time Δ before making the offer $p(v)$. The length of delay should credibly reveal the consumers valuation, so it would satisfy the following constraint: the waiting time would maximize the consumer's utility which is as follows[5]:

$$V(v,\Delta) = \max_{\Delta'} V(v,\Delta') = \max_{\Delta'} e^{-r_B(t^0+\Delta')}[v - xV(\Delta', v)] \tag{3}$$

F.O.C. :

$$-r_B e^{-r_B(t^0+\Delta')}[v - xV(\Delta', v)] - e^{-r_B(t^0+\Delta')} x \frac{dV(\Delta', v)}{d\Delta'} = 0 \tag{4}$$

It is easy to see that the second order condition is satisfied.

So the optimal waiting time would satisfy the following differential equation: $\frac{dv}{d\Delta} = -\frac{r_B(1-x)}{x}v$,with the initial condition $V(0, v^D) = v^D$, where $v^D = \frac{P^D}{x}$. Solving this differential equation, we get the optimal waiting time by integration:

$$\Delta(v, v^D) = \int_{v^D}^{v} -\frac{x}{r_B(1-x)v}dv = -\frac{x}{r_B(1-x)}\log\frac{v}{v^D} \quad (W) \tag{5}$$

The buyer with valuation v makes an offer after waiting time Δ, though the waiting time function and get the inverse function of the valuation that the seller can induce about the buyer is: $v = v^D e^{-\frac{r_B(1-x)}{x}\Delta}$

[5] $V(v,\Delta)$ is the consumer's utility, while $V(\Delta', v)$ is the consumer's revealed valuation when his true valuation is v and delays for Δ. Some readers may be confused by the notations.

We can see that now with discounting, all the consumers can purchase one good from the seller and share part of the total gain: $V(v,\Delta) = e^{-r_B[-\frac{x}{r_B(1-x)}\log\frac{v}{v^D}]}(1-x)v = (\frac{v}{v^D})^{\frac{x}{(1-x)}}v > 0$.

Now, we turn to seller's choice of the listed price P^D. This pricing should be optimal given the buyers' response. By offering $P^D = xv^D$, the buyers whose $v \geq v^D$would purchase the good immediately, but the buyers whose $v < v^D$ would wait and counter with $p(v)$. Thus, seller chooses P^D and hence v^D to solve the following program:

$$\max_v (1 - F(v))xv + \int_0^v [e^{-r_S[-\frac{x}{r_B(1-x)}\log\frac{X}{v}]}xX]dF(X) \tag{6}$$

$$= \max_v x\left[(1 - F(v))v + \int_0^v \frac{X^2}{v}dF(X)\right] \tag{7}$$

F.O.C.:

$$1 - F(v^D) = v^{D-2}\int_0^{v^D} X^2 dF(X) \quad (D) \tag{8}$$

From the first order condition, we can see that the marginal valuation of the consumers does not depend on the relative patience of the traders. And the seller's gain from trade through bargaining is strictly increasing with his relative patience. And the first part in the brackets of the seller's program is the same as the fixed price case. So, the maximum of the items in the brackets is larger than the gains the seller can get in the fixed price case, and let's name the maximum of the brackets as U^{BD}. And the relative patience of the seller,x, is valued from $(0,1)$. That is to say, there is a critical value of $x^d = \frac{U^M}{U^{BD}}$, and if the relative patience of the seller is larger than that, the seller is better off by choosing bargaining to sell his goods.

The above arguments can be summarized as the following propositions:

Proposition 2 *(Equilibrium Strategies and Beliefs) (i) The seller's listed price is $P^D = \frac{r_B}{r_S+r_B}v^D$ where v^D solves (D); (ii) The buyers whose $v \geq v^D$ purchase the good at price P^D without waiting or delay, if $v < v^D$ would wait and counter with $p(v) = \frac{r_B}{r_S+r_B}v$ after waiting $\Delta(v, v^D)$ given by (W).*

Claim 3 *If the relative patience of the seller is larger than $\frac{U^M}{U^{BD}}$, it is beneficial for the seller to choose bargaining to sell his goods. Otherwise, selling his good at fixed price.*

The above proposition is very realistic and intuitive. We can always buy souvenirs from tourist spot, like the beautiful masks in Venice. In the tour point, time is much more valuable for the tourists and relatively give much more power to the seller who then adopts bargaining. [6]

2.2.2 Negotiable Pricing with Transaction Costs

In this section, we associate with each trader a cost of waiting. Specifically, there are marginal cost of time for seller and buyers, c_S and c_B, accordingly, and the cost to all buyers are the same. We need to notice that the case here doesn't satisfy some of the four standard Rubinstein's assumptions. Now, any agreement today is better than the same agreement tomorrow, and there is no pair of agreements satisfying that each trader is indifferent between trading at the other's offer immediately or trading at his own offer after a one-period delay if the two costs are different. Following Perry (1986), we can get the following proposition.

Proposition 4 *(Equilibrium Strategies and Beliefs) If $c_S < c_B$, then (i) The seller set the price as in the take-it-or-leave-it case, (ii) The consumers whose $v \geq P^M$ purchase the good at price P^M without waiting or delay, if $v < P^M$ would just exit and don't buy the good. If $c_S > c_B$, then (iii) there is no equilibrium price that the seller can propose profitably.*

Proof. We can deduce the result from Perry (1986) directly. ■

Claim 5 *It is always better for the seller to adopt TIOLI mechanism.*

In the labor cost case, if the cost of the seller is higher, he can only sell his product at marginal costs or not sell. If his cost is lower, any price proposed by the seller would be accepted by the buyers whose valuation is larger than the price and the one whose valuation is lower would just leave the market. That is why it is always better for the seller to commit to a posted price selling.

[6] Another maybe not very proper example. And housewives could buy a product at lower price than men from a negotiable shop. One reason is that housewives are more patient than men. No sexual discrimination in this example.

2.2.3 Negotiable Pricing with Both Costs

Now we hybridize the two sources of costs, and combine them into one model. If there are not only the discounting but also transaction cost as in the previous subsections, following the techniques in the previous sections and Cramton (1991), we can directly get the following proposition(The setting almost the same as in Cramton (1991), so we just list the results here).The difference from Cramton (1991)is that here discounting rate is different from traders which would affect the bargaining power. First, we need to define several functions, such as equilibrium prices, the purchasing decision, the time-consuming decision, and the termination decision as a function of current beliefs.

1. The time-consuming decision:

$$\Delta(v, v^H) = -\frac{x}{r_B(1-x)} \log \frac{v + \frac{(r_s+r_B)c_B}{r_B(r_s+c_S-c_B)}}{v^H + \frac{(r_s+r_B)c_B}{r_B(r_s+c_S-c_B)}} \quad (W'') \tag{9}$$

   Now $x = \frac{r_B-(c_S-c_B)}{r_s+r_B}$, and we need to restrict our argument on the domain that $r_B > c_S - c_B > -r_s$ which means the share of the gain is no more than the whole pie. And now the labor costs also affect the power of the traders.

2. The marginal value of the consumers who would be indifferent with exit immediately:

$$v_0 = (\frac{(r_s+r_B)\,c_B}{r_B\,(r_s+c_S-c_B)})^{1-x}(v^H + \frac{(r_s+r_B)\,c_B}{r_B\,(r_s+c_S-c_B)})^{x} - \frac{(r_s+r_B)\,c_B}{r_B\,(r_s+c_S-c_B)} \tag{10}$$

   Because of the labor cost, it would be beneficial for some really low valuation consumers to not participate in the market. That is to say, the really low consumers could not signalling her type to the seller and get positive utility from this trade.

The listed price strategy (the same as determine the marginal valuation of the consumers who will just buy the good immediately) for the seller is to solve the following program:

$$\max_v (1-F(v))xv + \int_{v_0}^{v} [(\frac{X + \frac{(r_s+r_B)c_B}{r_B(r_s+c_S-c_B)}}{v + \frac{(r_s+r_B)c_B}{r_B(r_s+c_S-c_B)}})^{\frac{r_S x}{r_B(1-x)}}(xX + \frac{c_S}{r_S}) - \frac{c_S}{r_S}]dF(X)(B) \tag{11}$$

As in the previous section, the first part of program above is the buyers who buy the product immediately. And the integral part is the gain from the buyers whose valuation is low and need to delay to signalling minus the labor costs. And as usual, the benefit of the seller is increasing with the bargaining power.

Proposition 6 *(Equilibrium Strategies and Beliefs) (i) The seller's listed price is P^H where v^H solves (B); and (ii) The buyers whose $v \geq v^H$ purchase the good at price P^H without waiting or delay, if $v_0 < v < v^H$ the buyers would wait and counter with $p(v) = xv$ after waiting $\Delta(v, v^H)$ given by (W') and the seller accepts it immediately, if $v \leq v_0$ the consumers would not bargaining with the seller.*

2.3 Rationale for Pricing

The seller's strategy is: first, chooses the pricing methods, then, sets the listed price. In the previous section, we analyze the best listed price when given the pricing methods. Now, we come back to the first step and investigate which method is better for the seller. To do this, we can just compare the seller's surplus in different cases, and the larger one would be better for the seller. For the cases that the negotiation costs are only from discounting or labor costs, we already get results in the previous section. Now, we investigate the hybridizing case and see what we can get.

Let $U^H = \max_v (1 - F(v))xv + \int_{v_0}^{v} [(\frac{X + \frac{(r_s + r_B)c_B}{r_B(r_s + c_S - c_B)}}{v + \frac{(r_s + r_B)c_B}{r_B(r_s + c_S - c_B)}})^{\frac{r_S x}{r_B(1-x)}} (xX + \frac{c_S}{r_S}) - \frac{c_S}{r_S}] dF(X)$, we can see when $\frac{c_S}{r_S}$ is really small and x is really large, the seller's gain from trade through bargaining is $U^H > U^M$. That is to say, the true cost of the labor forces for the seller are cheap and labor costs of buyers are really high, even when the discounting rates are the same for the traders. The advantage in the labor costs can help enhancing the seller's postion in bargaining. This result does not depend on the valuation distribution of the consumers.

Simplifying the process and making it precisely, we just consider the cases where the distribution of the consumers' valuation is uniform. Now, we come to the case where $F(v) \sim U[0, 1]$, then $F(v) = v$ and $f(v) = 1$. So that we can get the numerical solutions for all the equations in the last section. Then pricing and waiting equation (M), (D), (W), (B) become the following:

$P^M = \frac{1}{2}$ and the seller's profit from selling on a take-it-or-leave-it price is: $U = \frac{1}{4}$; and $v^D = \frac{3}{4}$ and $P^D = \frac{3r_B}{4(r_S+r_B)}$. We can see that the marginal valuation of the buyer who would purchase the good immediately is higher than it in the case of the take-it-or-leave-it, while the transaction price is now depending on the relative patience of the traders, which means the seller gains more in the trade the more patience he is relative to the buyers. Now, $U^D = (1-\frac{3}{4})\frac{3r_B}{4(r_S+r_B)} + \frac{r_B}{(r_S+r_B)}\int_0^{\frac{3}{4}} \frac{4X^2}{3} dX = \frac{3r_B}{8(r_S+r_B)}$ and clearly the seller is worse off in the bargaining case if he is relatively less patient and the gains from the lower valuation consumers cannot compensate the loss to the higher valuation consumers; otherwise ($r_S \leq 2r_B$) it is better for the seller to sell through bargaining.

Now we turn to the hybrid case and just check the case when the discounting rate are the same for all traders ($r = r_S = 2r_B$). Then the marginal exit valuation is:

$$v_0 = (\frac{2c_B}{r+c_S-c_B})^{1-x}(v^{list} + \frac{2c_B}{r+c_S-c_B})^x - \frac{2c_B}{r+c_S-c_B} \tag{12}$$

The seller's optimal pricing strategy is determined by the equation (B)

$$\begin{aligned} &(\frac{2c_B}{r+c_S-c_B}(1-x)^2 + x^2 - 2x + v^H)(\frac{2c_B}{r+c_S-c_B} + v^H)^{1-x}(\frac{2c_B}{r+c_S-c_B})^{x-1} \\ = \quad & -\frac{x}{2} + (\frac{2c_B}{r+c_S-c_B} + 1)(1-x)^2 \end{aligned}$$

and

$$\begin{aligned} U \quad = \quad & (1-v)xv^H - \frac{c_S}{r}(xv^H - (\frac{2c_B}{r+c_S-c_B})^{1-x}(v^H + \frac{2c_B}{r+c_S-c_B})^x + \frac{2c_B}{r+c_S-c_B}) \\ & + \frac{x(1-x)}{2-x}[\left(v^H + \frac{2c_B}{r+c_S-c_B}\right)^2 - \left(\frac{2c_B}{r+c_S-c_B}\right)^{2-x}\left(v^H + \frac{2c_B}{r+c_S-c_B}\right)^x] \\ & - x(1-x)\frac{2c_B}{r+c_S-c_B}v^H \end{aligned}$$

And we can see that the transaction costs and discounting can only affect the seller's choice by their relative size and their absolute value does not matter. Next, we consider two special cases to investigate the relative size effect and the (dis)advantage of the relatively smaller seller transaction cost: same transaction cost for both party and fixed the buyers' cost.

When $c_S - c_B = 0$, we get $\max U = 0.1694$ when $\frac{c_B}{r} = 0.9256$ and correspondingly $v^H = 0.6974$.

When $\frac{c_B}{r} = 1$, then $0 < \frac{c_S}{r} < 2$, $x = 1 - \frac{1}{2}\frac{c_S}{r}$, we get $\max U = 0.25$ when $\frac{c_S}{r}$goes to 0 and correspondingly $v^H = 0.5$.

Up till now, we can see the expectation that bargaining is better in moderate relative costs in the hybridizing case since the seller could not only discriminate the consumers and also would not sell his good to the potential buyers whose valuation is too low so that he can save cost is impossible. So that we can see that relative patience is really demandable for the seller if he wants to sell through bargaining. The relative cheaper labor costs could only alleviate the need of relative patience a little bit. And we can get the following claim directly from the above analysis.

Claim 7 *(Rationale for pricing) The mechanism choice of the seller depends on his relative patience and labor costs.*

And now we can say that in the bazaar or the store of a developing country, haggling is due to its relative cheaper labor costs and (maybe) seller is relatively more patient than in the developed countries.

In fact, seller's relative patience and labor costs affect his bargaining power. The more patient and cheaper labor costs, the more beneficial for the seller to adopt the bargaining strategy. We all know that in the monopoly fixed pricing case, the seller has the full bargaining power. However, in the bargaining case, the seller gives part of the power to the buyers, which depends on their relative patience and labor costs. And the bargaining power changes is due to the commitment ability of the seller. Then how the commitment ability of the seller affect his bargaining power is a challenge and we do not touch it in this paper and needs future effort.

3 Concluding Remarks

"There are two trends in the theoretical approaches to the optimal selection of selling mechanisms, i.e. the selection of a mechanism that maximizes the seller's profit. The first approach is to use the Revelation Principal and compare all incentive compatible and individually rational mechanisms. Under suitable assumptions, a direct mechanism can be found."(Wang 1995) Riley and Zeckhauser(1983, Q.J.E.)

find an extreme result that a seller encountering risk-neutral buyers one at a time should quote a single TIOLI price to each, if commitments are feasible. This strategy is superior no matter whether there is one object for sale or many. It is a search model and time plays no role (no costs concerning time) in their setting. While in our paper, time plays a key role as a screening device and the costs from time affect the result now.

The second approach is to compare two mechanisms at a time taking into account the different costs structures in different selling mechanisms. Our paper is belonging to this category. Conditions are then derived under which one selling mechanism is better than the other. Wang(1995 E.E.R.) uses Nash bargaining solution comparing fixed price and bargaining. In their setup, the author motivated from the auction literatures assumes that the seller set a reserve price and the traders bargain to share the gain above the reserve price. While in our model, the seller proposes the listed price and it plays like the first offer of the seller in the bargaining. In some sense, our model is more related to the bazaar.

A natural extension is to explore the effect of competition in the sellers' side which is omitted in this paper. What is the optimal selling strategies when there are two or more sellers with different valuations or different costs? Would they just sell to different segment? Now it is not profitable for the sellers to keep their commitment of fixed pricing. Bester (1993) considered the theoretical aspects of the endogenous selection between bargaining and take-it-or-leave-it selling using a model of competition between sellers who can control their product quality. He found that bargaining can be an equilibrium when the discount factor is large enough (which is contradict to our result here) or when the seller's bargaining power is small enough. And Adachi (1999) studied the choice of pricing policies when the sellers have different locations. The second extension is to explore the deadline effect to the selling strategies, and it is applied to putrescible or depreciatory goods. Now the buyers could holdup the seller and just counteroffer the marginal cost as its price at the very end. The third extension is to explore how the optimal selling strategies of the seller change when there is variation of buyers' valuation. If there are more consumers whose valuation are low, it is maybe more profitable for the seller to discriminate the consumers. And then bargaining maybe become the better choice for the seller. Camera and Delacroix (2001) studied the selling strategies when the consumers preferences varied. Another further extension is to apply the results into organizational economics. TIOLI is as a central planning while bargaining is as decentralized decision making.

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