Monopoly Pricing in Meta-Cycles

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PRELIMINARY

Abstract

If a constant influx of new consumers faces a durable monopoly seller every period, the initial Coase setup of consumers purchasing as soon as they find it affordable to do so - i.e. undoing the recent assumption in the literature that consumers are aware of the dynamic price path and therefore strategically wait to purchase - leads to meta-cycles of prices by the monopolist. The resulting dynamic price path is complex enough to justify consumers' inability to forecast, and earns the seller an expected profit per period no smaller than the static monopoly expected profit.

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1 Introduction

A vast literature grew in the wake of Coase (1972) that showed for a durable good market given a constant set of patient consumers, that a monopolist manufacturer/seller would have the incentive to reduce successive prices till it served the competitive level of output, and if consumers could foresee this easy to predict future price path, none would buy at any price higher. As a result the monopolist would be forced to sell immediately at this price and earn normal (zero) profit.

The earliest papers either validate and formalize (Stokey, 1981; Bulow, 1982; Gul et al., 1986) Coase's conjecture, or question and refute the result (Stokey, 1979; Ausubel and Deneckere, 1989; Bagnoli et al., 1989;). McAfee and Wiseman, 2008) follows Coase's suggestion and showed how the monopolist seller could avoid the problem by pre-committing to its size of output (with capacity constraints); Bulow (1982) illustrates how a monopolist seller could under-invest in fixed costs to commit to higher future prices to reassure early consumers; and Biehl (2001) points out that Coase's proposition that renting would be profitable to selling in such markets could be challenged with time-stochastic consumer values.

Although Stokey (1979) illustrates that a continuum of consumers with different values but a common discount factor (and utility functions that are separable in value and time) will, foreseeing the declining price path, postpone their purchases to such an extent that the monopolist is left bereft of any incentive for a declining price path; she later (Stokey, 1981) confirmed Coase's conjecture in a perfect rational expectations equilibrium (consumers are rational such that their expectations are fulfilled along the realized path of output sold) if consumers' expectations must also be a continuous function of the current stock of output, and shows that the 1979 result is the limiting result when the length of the period (of each price) grows without bound.

Investigating the requirements for the result in Coase (1972), Guth and Ritzberger (1998) separates the conditions of infinite time horizon, patience of consumers, and negligible delay between successive prices (or supply quantities), and conclude that both an infinite time horizon and negligible delay between successive prices are together sufficient for the Coase conjecture but neither alone is[1]. Ausubel and Deneckere (1989) take a different approach to the delay between successive prices, and find that as this approaches zero,

[1] They find that in the absence of the latter condition, the relative patience of consumers (as compared with that of the monopolist's) decides the split of the surplus; and in the absence of the former condition, the monopolist earns at least one period of absolute monopoly profit.

the monopolist can make the price decline arbitrarily slow, preserving high profits within subgame perfection.

Others question whether the constant number of consumers, despite allowing time to approach an infinite horizon, is the reason for Coase's conjecture, given that a constant pool of consumers leads to the accumulation of low(er) types of consumers (as higher types exit the market each period after purchasing) leading to the incentive to lower price in consecutive periods. Board and Pycia (2014) get around this problem by giving consumers an outside option and thence a chance to drop out of the wait to purchase; others introduce arrival of new consumers with time such that serving accumulated low-value consumers comes at the cost of selling to new consumers with high values at high prices. There has been substantial work on this latter thought, and our paper also fits in here. Sobel (1984) introduces new arrival each period in a multi-seller model, and finds mixed strategy pricing such that sellers offer sales probabilistically whenever enough low value consumers accumulate. More pertinent to the Coase conjecture, Conlisk et al. (1984) and Sobel (1991) both look at monopoly sellers, facing two types of consumers (with private types) and find the monopolist wanting to clear the market every once in a while, such that there are price cycles (Sobel (1991) finds this only in stationary equilibria). [2] A very general model by Board (2008) with a continuum of buyer types with time variation in period demands, finds that the seller can commit to myopic optimal prices with a best price provision.

Our paper fits into the branch of literature with new incoming consumers. However, unlike the above papers that model consumers as correctly anticipating future prices and the seller as optimizing in each period its expected present value of future profits, a la Gul et al. (1986), we prefer starting where Coase himself did - with consumers on the other extreme end of the spectrum such that they only wait for an affordable price to purchase, and a seller that myopically optimizes profit each period. Moreover, we include a continuum of types of consumers, by value, and it is this assumption rather than the bounded rationality of consumers that gives us meta-cycles of prices versus the simpler price cycles that Conlisk et al. (1984) find despite arrival of new consumers as in our paper. We propose that a reasonable extension of this result would be imperfect foresight on the part of consumers, while the seller optimizes its current period expected profit in each period.

Potential consumers arrive randomly over time, forever; where one pe-

[2] Garrett (2016) also finds price cycles but as a result of time-stochastic values of consumers.

riod is defined by the arrival of n new consumers. We investigate how the monopolist seller would price, and therefore how much it would sell, in each time period. Our approach allows instantaneous changes in price, for each arriving buyer, if we use $n = 1$; and because our results do not depend on n, the length of time periods is irrelevant . In trying to keep our base model comparable with Coase's original thought model, we keep it free of any time discounting; but include it in the extension where we deal with imperfect consumer foresight because without it, it is infeasible to discuss a consumer's preference for a prices across periods.

In contrast with the dual-types models above, we find that a continuum of consumer types limits the monopolist's incentive to clear the market; and in no finite time period will the monopolist desire to serve the lowest value consumers. Moreover, unlike the dual consumer types model that led to simpler price cyles, we find meta-cyles of price. The intuition is as follows. With just two types of consumers, whenever price falls to a level affordable to the low value consumers, all of them purchase, and in the period after, it is therefore profitable for the seller to ignore low value consumers thus leading the price to hike up to its peak again. In contrast, the presence of multi-types in the consumer pool leads to sales of different degrees because any positive sale price excludes some even lower consumer types such that after multiple iterations of a particular sale price, it becomes profitable to lower the price further to cater to the accumulated lower value consumers, while after any instance of a substantial sale the incentive is to raise price to its peak value - leading to meta-cycles of prices.

Although our results are for a uniform distribution of buyer types, any continuous distribution should be expected to give the same result. The determinant of meta-cycles of prices - such that the smaller period-length price cycles are subsumed within the largest period-length cycles - is the infusion of new demand into the market every period that consists of a continuum of types of consumers. As a result, the monopolist earns an expected profit per period no smaller than its static monopoly profit. We therefore, show that arrival of new consumers invalidates the continuous pattern of price decline postulated by Coase if consumers purchase as soon as they find an affordable price. Fuchs and Skrzypacz (2010) also attribute new arrival of consumers for delay in trade such that the informed party (strategically waiting consumers) does not get away with full surplus. And Besbes and Lobel (2015) also find non-monotonic cycles of prices in their model with arrival of new consumers, but not an infinitely increasing series of cycles within cycles as we do.

2 The Model and Timing of Choices/Decisions

Let consumers differ in their private value, b, they place on the item that the monopolist sells, such that $b \sim U[0,1]$ and the monopolist's marginal cost be 0. The distribution of b is common knowledge, and so is the monopolist's marginal cost. The uniformity of distribution is the only strong assumption here as the bounds of the distribution are simply normalized and can easily be generalized to $[c, v]$, where the monopolist's marginal cost is c and consumers' value is capped at v. The setup therefore depicts what is popularly known as the "no-gap" case in the literature; in contrast to the "gap" case wherein the lower bound of consumers' values remains strictly above the monopolist's marginal cost. Our model so far resembles Guth and Ritzberger (1998); the only difference being the arrival of new consumers as described below; [3] and also a special case of Board (2008) in which the number of new consumers each period is constant. Consumers in our model also differ from those in the above, such that they are not aware of the seller's price path, and therefore cannot strategically postpone purchase.

The monopolist sets a single price each period at which it wants to sell. Consumers arrive randomly, one by one, each considers buying at the price at which the monopolist is selling and does so if and only if the price is no greater than her value, till a total of n number of consumers have arrived, at which one period ends. This is repeated all over again, indefinitely. In each period, after the first, there are also leftover consumers from the previous period(s), who refused purchase then, who can reconsider purchase at the current price. Each period the seller maximizes current profit and cannot price discriminate. And consumers do not leave the market until they have purchased, and their outside option gives them zero utility.

3 Pricing to Include Leftover Buyers

Coase's conjecture of durable monopoly implies in our setting that in each period the monopolist should benefit from including past leftover consumers (who refused purchase earlier), and therefore should lower its price each period; eventually, its price should tend toward its marginal cost given enough price adjustments, and foreseeing this, no patient buyer would agree to purchase at any higher price. Just like in Coase (1972), we ignore any discount-

[3](Guth and Ritzberger (1998) use a constant number of consumers at the start of the game as in Coase (1972), and have no new consumers coming into the market.

ing of the future, thinking of perfectly patient consumers; but our model differs because of the influx of new consumers each period.

Ignoring its impact on future prices, the monopolist's profit maximizing price in the **first period** is $p_1^m = argmax\, p_1(1-p_1)n$; i.e. $p_1^m = \frac{1}{2}$ which is independent of the number of consumers, n. Therefore, it sells $q_1^m = \frac{n}{2}$ units, and exactly $r_1^m = q_1^m = \frac{n}{2}$ of them refuse purchase at this price; the values of these leftover consumers is $b \sim U[0, \frac{1}{2}]$.

In the **second period** then, to include leftover consumers from the previous period, it must lower its price. Therefore, conditional on $p_2 < p_1^m$ it maximizes second period profit with the price, $p_2^m = argmax\, p_2(1-p_2)n + p_2[1 - \frac{p_2}{p_1^m}]r_1^m$, giving $p_2^m = \frac{3}{8}$. Thus, $\frac{5n}{8}$ new consumers purchase, and $\frac{n}{8}$ old consumers purchase, giving $q_2^m = \frac{6}{8}n = \frac{3}{4}n$. Consumers who refuse purchase are $r_2^m = n + r_1^m - q_2^m = \frac{3}{4}n$, and their value is $b \sim U[0, \frac{3}{8}]$.

In the **third period** then again, to serve leftover consumers, conditional on $p_3 < p_2^m$ the monopolist would maximize $p_3(1-p_3)n + p_3(1-\frac{p_3}{p_2^m})r_2^m$, which gives $p_3^m = \frac{7}{24}$. The number of new consumers who buy is $(1-p_3)n = \frac{17}{24}n$, and $(1 - \frac{p_3}{3/8})\frac{3}{4}n = \frac{1}{6}n$ old consumers buy, which gives $q_3^m = \frac{21}{24}n = \frac{7}{8}n$; and $r_3^m = r_2^m + n - q_3^m = \frac{3}{4}n + n - \frac{7}{8}n = \frac{7}{8}n$ consumers refuse purchase.

Generalizing, if the monopolist keeps lowering its price each period to serve leftover consumers from previous periods, then for any given period, t, it maximizes

$$\pi_t = p_t(1-p_t)n + p_t(1 - \frac{p_t}{p_{t-1}^m})r_{t-1}^m;$$

which gives

$$p_t^m = \frac{n + r_{t-1}^m}{2(n + \frac{r_{t-1}^m}{p_{t-1}^m})}. \qquad (1)$$

Using this in $q_t^m = (1-p_t^m)n + (1 - \frac{p_t^m}{p_{t-1}^m})r_{t-1}^m$, and simplifying, gives

$$q_t^m = \frac{n + r_{t-1}^m}{2}. \qquad (2)$$

Claim 1. *Price in every finite period will exceed marginal cost.*

Proof. Because $r_t^m = n + r_{t-1}^m - q_t^m$, equation 2 implies $r_t^m = \frac{n + r_{t-1}^m}{2} = q_t^m$. But this implies that $r_t^m > 0, \forall t < \infty$, and therefore $p_t^m > 0, \forall t < \infty$. □

That is, in each finite numbered period, the monopolist chooses to sell to exactly the same number of consumers as it chooses to decline purchase to! It must be pointed out that this equality of consumers sold to and refused is strictly a function of the uniform distribution of consumers' values. However, in general, $r_t^m > 0$ with any distribution, as long as t is finite, because the monopolist maximizes its profit from choosing to sell to a subset of the pool of consumers available.

This should not be surprising because Guth and Ritzberger (1998) stated this even for a market with no new consumers entering every period; the entry of new consumers would only be expected to lengthen the number of periods needed for the price to fall to competitive level.

4 Price Cycles

Notice that $p_1^m = \frac{1}{2} > p_2^m = \frac{3}{8} > p_3^m = \frac{7}{24} > ...$, i.e. prices decrease continuously if the monopolist wants to keep including leftover consumers in its profit function. However, period profits do not follow a continuous trend: $\pi_1^m = \frac{n}{4} < \pi_2^m = n\frac{9}{32}$ but $\pi_2^m = n\frac{9}{32} > \pi_3^m = n\frac{49}{192}$, although repeating p_2^m in the third period would earn it an even smaller expected profit $(\pi_3(p_2^m) = \frac{15}{64}n < \pi_3^m)$, because unlike last period, the leftover consumers in period 3 have lower values.

The above makes it imperative to understand the complete trend of period profits and thereby to question the incentives of the monopolist. In general,

$$q_t^m = r_t^m = \frac{(2^t - 1)}{2^t}n. \tag{3}$$

Moreover, using 1, and 2 we have $\frac{r_t^m}{p_t^m} = n + \frac{r_{t-1}^m}{p_{t-1}^m} = ... = n(t-1) + \frac{r_1^m}{p_1^m}$, which gives $\frac{r_{t-1}^m}{p_{t-1}^m} = n(t-2) + \frac{r_1^m}{p_1^m}$. Using this and 3 back in 1, we have which simplifies to

$$p_t^m = \frac{(2^t - 1)n}{2^t[n(t-1) + \frac{r_1^m}{p_1^m}]}. \tag{4}$$

The profit per period then is

$$\pi_t^m = p_t^m q_t^m = \frac{(2^t - 1)^2 n^2}{2^{2t}[n(t-1) + \frac{r_1^m}{p_1^m}]} \tag{5}$$

Proposition 1. *(a)* $\exists t < \infty$*; such that* $\pi_t^m < \pi_1^m$*.*

(b) Let $\underline{t} = \{\min\{t\} : \pi_t^m < \pi_1^m\}$*;* $\underline{t} - 1$ *then is the maximum length of the (downward) price cycle of order one, and in time period* $\underline{t}$ *the monopolist will charge the price* p_1^m *again and ignore leftover consumers from past periods.*

Proof. Notice that $\frac{dp_t^m}{dt} < 0$;[4] $\frac{dq_t^m}{dt} > 0$;[5] and $\frac{d\pi_t^m}{dt} = p_t^m \frac{dq_t^m}{dt} + q_t^m \frac{dp_t^m}{dt}$. Using 4 and 3, we have $p_t^m = \frac{q_t^m}{n(t-1)+\frac{r_1^m}{p_1^m}} = \frac{q_t^m}{nt}$; which gives $\frac{dp_t^m}{dt} = \frac{nt\frac{dq_t^m}{dt} - nq_t^m}{n^2t^2} = \frac{\frac{dq_t^m}{dt}}{nt} - \frac{q_t^m}{nt^2}$. Using these then, $\frac{d\pi_t^m}{dt} = \frac{q_t^m}{nt}\frac{dq_t^m}{dt} + q_t^m[\frac{\frac{dq_t^m}{dt}}{nt} - \frac{q_t^m}{nt^2}] = \frac{q_t^m}{nt}[2\frac{dq_t^m}{dt} - \frac{q_t^m}{t}] = \frac{q_t^m}{t2^t}[2ln(2) - \frac{2^t-1}{t}]$, i.e.

$$\frac{d\pi_t^m}{dt} = \begin{cases} > 0, & if\, t = 1; \\ < 0, & \forall t > 1 : t \in N; \end{cases} \tag{6}$$

where N symbolizes the set of natural numbers.

Moreover, using L'Hospitale's Rule, we have $\lim_{t\to\infty} \pi_t^m = 0$. It is inevitable then that (a) is true. Also, (b) follows because $\forall t : \pi_t^m < \pi_1^m$, 6 implies that $\pi_{t+1}^m < \pi_t^m < \pi_1^m$; therefore in $\underline{t}$, the monopolist benefits from serving only new consumers, giving $p_{\underline{t}}^m = p_1^m$, thus re-starting a downward price cycle. □

In fact, $\underline{t} = 4$ because $p_4^m = \frac{15}{64} < p_3^m$; $q_4^m = \frac{15}{16}n = r_4^m$ give $\pi_4^m = \frac{225}{1024}n$, such that $\pi_4^m < \pi_1^m$, i.e. the monopolist would be better off serving only new consumers in period 4. Price therefore rebounds back such that $p_4^m = p_1^m = \frac{1}{2}$, and would do so every fourth period. For reasons that will become

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[4] $\frac{dp_t^m}{dt} = \frac{2^t[n(t-1)+\frac{r_1^m}{p_1^m}]n2^t ln(2) - n(2^t-1)[2^t ln(2)\{n(t-1)+\frac{r_1^m}{p_1^m}\}+n2^t]}{2^{2t}[n(t-1)+\frac{r_1^m}{p_1^m}]^2}$, the numerator of which determines its sign, and is equal to $n2^t[ln(2)\{n(t-1) + \frac{r_1^m}{p_1^m}\} - n(2^t - 1)] = ntln(2) - n(2^t - 1) < 0$, because $ln(2^t) < 2^t - 1$.

[5] $\frac{dq_t^m}{dt} = \frac{2^t n2^t ln(2) - (2^t-1)n2^t ln(2)}{2^{2t}} = \frac{n2^t ln(2) - (2^t-1)nln(2)}{2^t} = \frac{nln(2)}{2^t} > 0$.

clear in what follows, we call this the first order price cycle. Buyers with $b < p_3^m = \frac{7}{24}$ don't get to purchase the good for prices within this cycle.

It is worth pointing out that despite arrival of new consumers each period, if the monopolist continued to include all leftover consumers each period in setting its price to maximize profit, price would eventually decline to marginal cost level because $\lim_{t\to\infty} p_t^m = 0$. However, the monopolist does better by reverting back to its full monopoly price every $\underline{t}th$ period.

5 Price Meta-Cycles

Claim 2. *There will be higher order cycles of prices that will subsume the first order price cycle.*

Instead of a formal proof, we argue this as follows. After a few of the above described price cycles, consumers with values $b < p_3^m = \frac{7}{24}$ who have so far been unable to purchase will accumulate to the extent that they become profitable to serve with an even lower price. The monopolist's period profit to be maximized then is:

$$\pi_t = p_t(1 - p_t)n + p_t(1 - \frac{p_t}{p_3^m})k_1 r_3^m;$$

where k_1 is the number of cycles of order 1 (as above) over which consumers with values $b < p_3^m = \frac{7}{24}$ have accumulated. Using the values of p_3^m and r_3^m, the profit-maximizing price in such a period is $p_t^* = \frac{1+\frac{7}{8}k_1}{6k_1+2}$, and therefore $q_t^* = n\frac{(1+\frac{31}{8}k_1+\frac{21}{8}k_1^2)}{6k_1+2}$, and $\pi_t^* = \frac{(1+\frac{7}{8}k_1)}{6k_1+2}n\frac{(1+\frac{31}{8}k_1+\frac{21}{8}k_1^2)}{6k_1+2}$.

Simulating this profit function for values of k, we get that $\pi_t^*(k_1 = 2)$ exceeds π_1^m, and therefore after two cycles of consumers with values less than p_3^m being ignored, the monopolist lowers price further to sell to some of these consumers; after which there is a re-start effect to their accumulation. This then gives rise to a parallel second order price cycle that subsumes the price cycle of order one.

But again, in prices so far, consumers with values, $b < p_t^*(k_1 = 2)$ have been left without purchase opportunities. At some time period far enough, these consumers will accumulate in numbers large enough for the monopolist

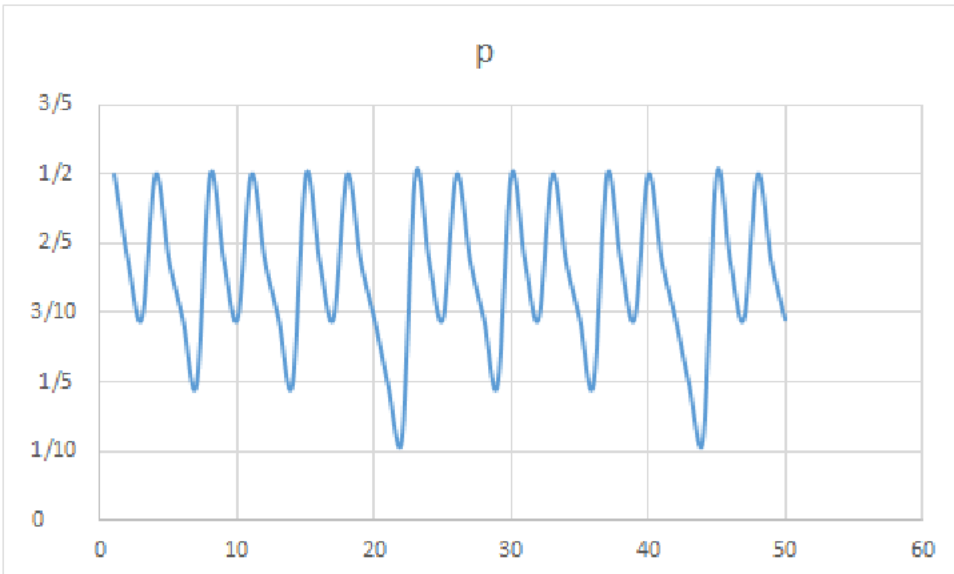

Figure 1: Price Path

to serve some of them, and thus re-start their accumulation. This would be the third order price cycle.

A number of price cycles of different orders thus manifest themselves simultaneously and parallelly. More importantly, in any period when the monopolist's period profit falls down below π_1^m, its optimal next period price is $p_1^m = \frac{1}{2}$ such that what results is not a monotonically falling (or rising) price over time periods, but rather a seemingly haphazard pattern of well maintained cycles within cycles; the time series begins with an average just under p_1^m and only very slowly trends downward. As a result, the monopolist earns an expected profit no less than $\frac{n}{4}$ each period. The basic difference in our model as compared with Conlisk et al. (1984) that gives these differences in results is the presence of a continuum of consumer types such that different (lower) types accumulate over time at different rates as the monopolist uses price to screen off high(er) type consumers.

Figure 1 depicts the price path for a small finite number of time periods, which would continue with the deepest troughs getting deeper, such that the visible cycles in this picture become subsets of larger cycles.

6 Consumers Can Imperfectly Foresee Price Cycles

Notice that in the price path pictured above, the highest price ever is $\frac{1}{2}$. Even if consumers are not perfect computers and forecasters of the entire price path, this suggests that they should at least be able to guess that the price if often at its highest point, $\frac{1}{2}$; and is often below that at different degrees of discounts/sales.

Therefore suppose each consumer viewing the current price can foresee imperfectly the next period price, i.e. the consumer does not know which iteration of the current price it is viewing; and purchases at the current price rather than wait iff her expectation of the next period price presents a worse deal than does the current price. For example the consumer who sees the current price to be 7/24 expects the next period price to be 1/2 or 11/56 with equal probability. Her expected price next period is therefore 39/112 which is greater than the current price she is getting, and so she prefers to purchase right away, given she can afford to purchase at the current price. Similarly, the consumer seeing her current price of 11/56 expects the next period price to be 1/2 with probability 2/3 or 5/43 with probability 1/3, thereby her expected next period price is 16/43 which is greater than her current price leading her to purchase right away as well.

Extending this argument, any consumer viewing a trough price (of a cycle of any order; whether in fact it is a trough price or not for when she views it) as her current price, prefers to purchase right away if she can afford to do so. Intuitively, this is the situation where the consumer purchases at any substantial sale price, even though a deeper sale is possible in the next period because the deeper the next period possible sale the smaller its probability of occurrence. At all other prices, consumers viewing them, would purchase right away if they can afford to do so only if purchase at current price is more attractive than the present value of purchase next period.

The characteristics of such an equilibrium (with bounded rational consumers) price path are as follows:
(1) If the price cycle of order one is of length $\underline{\text{t-1}}$ now, then $\forall p \leq p_{\underline{\text{t-1}}}$ consumers (leftover and new) with value, $b \geq p$ purchase right away.
(2) New and leftover consumers who choose to forgo the current price, p_t, do so iff their value b_i is such that $b_i - p_t < \delta(b_i - E[p_{t+1}])$ where $E[p_{t+1}]$ is consumers' expectation of the next period price and δ is their discount factor.
(3) The length of the downward price cycle of order one, $\underline{\text{t-1}}$, is determined by $\underline{\text{t}} = \{\min\{t\} : \pi_t^m < \pi_1^m\}$.
(4) The price first period price, p_1^*, is also the highest price the seller will ever charge.

7 Conclusion

Coase's conjecture applies much more widely than the durable monopoly situation, to any game of one-sided patient private types of agents where the other side tries to screen them with prices. How such a price path is then affected by arrival of new consumers is an important question that is yet not fully answered.

Although we severely restrain consumers' rationality by restraining them such that they buy as soon as they see a price below or equal to their value, we believe this is an important extreme result in how a continuum of types on the side of the market that's privately informed, arriving continuously, and willing to wait to purchase, affects such dynamic price-screening. The perfectly rational and foresighted consumers as in most of the literature who know the price path of the monopolist and therefore best respond to that in choosing the time period of purchase that maximizes their consumer surplus, is the other extreme result. A more realistic result would no doubt lie between both these extremes, acknowledging that both kinds of consumers exist in any market[6], or could resemble the framework of limited consumer information and strategic behavior as in Ahn et al. (2007).

Moreover, our model and results assume a uniformly distributed consumer population for the value they attribute to the product in question. A generalization of our model to a generic distribution should be expected to result in similar trends of prices.

Lastly, it is useful to note that the optimal purchase behavior by strategic consumers (subject to their beliefs about the strategy adopted by the seller) in Bagnoli et al. (1989) and Board (2008) is to purchase as soon as it is affordable to do so, indicating that this might after all not be such an irrational assumption. Moreover, the best price provision used to implement the optimal dynamic price path in Board (2008) can also be resorted to by the monopolist with our meta-cyles of prices when the composition of consumers strategically waiting for prices is hard to know; purchasing behavior would then be identical to ours for non-strategic consumers, and the strategic consumers could be given rebates as and when they find lower prices.

Also as an afterthought, notice that a common characteristic between the literature cited in this paper that introduces new consumers every period into the model, and our paper, is that in every period that the monopolist raises its price (compared with the price last period), the increase is much more sudden and larger than any price decrease till then. This could possibly be another reason why prices are known to fall slowly (like feathers) and rise sharply.

[6] A realistic view should probably also acknowledge price-elastic period demand because consumers stockpile during low price periods (Hendel and Nevo (2010)).

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