Abstract

Durable Goods Monopoly with Quality Improvements Over Time
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We examine a dynamic, durable goods model. A monopolist faces two types of consumers who value the monopolist’s goods differently. The quality of the good improves over time and an improvement is only valuable to consumers if they have previous improvements. In each period, the monopolist can sell any possible bundle of previous improvements along with the current improvement. The firm cannot condition its prices or bundles that it offers an individual consumer. Thus, we are in the anonymous purchasing framework as defined by Fudenberg and Tirole (1998). Furthermore, the firm cannot commit to either future prices or bundles. Our main application is the software market, but the model also addresses issues important in other markets such as those for video games. First, we examine the model when the game lasts a known finite number of periods. For some parameterizations of the model, we find that the unique Perfect Bayesian Equilibrium exhibits non-Coasian properties. In particular, the firm chooses not to sell previous quality improvements to low valuation consumers even when all other consumers already have those versions. The reason that the firm may engage in such a strategy is that not selling to low value consumers today makes it more costly for high value consumers to mimic low value consumer’s behavior and obtain information rents. This allows the firm to charge a higher price for the current improvement to the high value consumers. In other words, the intertemporal incentive compatibility constraint for the high value consumers is relaxed by not selling to low value consumers. We then examine the infinite horizon version of the model. We characterize the two types of equilibria in this model. First, we examine the set of perfect Markov equilibria. A preliminary finding is that, in general, these are Coasian in the sense that the difference between quality levels held by consumers is never greater than a single unit. The reason for the Coasian result is that there is always a conflict between the seller’s constraints of “treading water” by selling a single unit to each type of buyer within a cycle and closing the gap early between buyer types. We then examine equilibria that are non-Markovian, but along the equilibrium path strategies are stationary. We find that these equilibria can be non-Coasian and generate cycles in the sense that the distance between the qualities of goods held by high and low types will grow from an initial level and then the low types will “catch-up” to the quality distance at the beginning of a cycle. We interpret this catching up phase as an introduction of a new generation of software as opposed to an upgrade. We relate our work to the bundling literature where consumers can have many different preference parameters.