

The Propensity to Advertise Prices Online: Evidence from Shopper.com*

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Abstract

Price dispersion in online markets is well documented. However, an open empirical question is how frequently do firms advertise prices in online markets? The current paper addresses this question by examining the frequency with which firms advertise price information at one of the leading Internet price comparison sites, Shopper.com. The results are consistent with many of the predictions in Baye-Morgan (2001). Specifically, the empirical results suggest that firms advertise price information about 69 percent of the time. In addition, firms are 13 percent less likely to advertise price information in markets with few consumers. While these results are supportive of the Baye-Morgan model, I find little empirical evidence supporting the prediction that firms' propensity to advertise prices varies inversely with market structure. I speculate that this result is mainly driven by asymmetries in firms' advertising propensity. This suggests that Baye-Morgan has provided a very good starting point, but that additional theoretical models are needed to see if relaxing the assumption that firms' propensity to advertise is symmetric leads to equilibrium outcomes more consistent with the data.

1 Introduction

Online markets have revolutionized the way consumers gather price information.

With a few "clicks" of a mouse, a consumer can obtain a list of advertised prices

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for a homogenous product. The benefits are that consumers can avoid incurring a search cost for acquiring each advertised price and can easily purchase from the low-price firm. Some argue that these benefits are not mutually shared by firms. According to this view, better informed consumers will lead to greater price competition among firms until profits are competed away and the “law of one price” prevails. To date, there is little empirical evidence supporting this view.

Instead, price dispersion is frequently observed in online markets. This paper is, to the best of my knowledge, the first to empirically examine firms’ advertising behavior in online markets controlled by a “gatekeeper”. Baye and Morgan (2001) show that when it is costly for firms to advertise prices at a “gatekeeper’s” site, firms randomly advertise prices and the level of advertised prices. When firms randomly select the frequency of advertising price information in a costly environment and randomize prices, the resultant equilibrium is dispersed prices. The main force driving equilibrium price dispersion in this environment is that if all firms advertised prices at the gatekeeper’s site everyday, Bertrand competition ensues resulting in zero profits. However, when *all* firms randomly advertise prices with the same probability, as in the Baye-Morgan model, firms can earn positive expected profits.

This paper builds on the previous empirical literature exploring the nature of price dispersion at an Internet price comparison site owned by the “gatekeeper”, Shopper.com. Contrary to many pundits’ predictions, the idealized environment at Internet price comparison sites – like Shopper.com – has not led to the “law of one

price.” For instance, Baye, Morgan, and Scholten (2002) find no empirical evidence that the level of price dispersion is declining over their eight-month sample. Instead, price dispersion remains remarkably stable at about 10 percent. Moreover, they find evidence that the nature of price dispersion at Shopper.com is consistent with the class of theoretical “clearinghouse” models, including Baye-Morgan (2001), predicting equilibrium price dispersion.¹ While the underlying assumptions leading to equilibrium price dispersion in these clearinghouse models are different, there is one common prediction: the level of price dispersion varies with the number of competitors. The empirical evidence in Baye, Morgan and Scholten (2002) is consistent with this prediction: average price dispersion is high in markets with few firms and low in markets with many firms. Their results suggest that further research is needed to discriminate among the various clearinghouse models.

Baye-Morgan is the only clearinghouse model where firms endogenously make decisions to advertise prices, so their model provides an interesting dimension and starting point for attempting to distinguish between clearinghouse models. To examine firms’ advertising strategies and the implications of the Baye-Morgan model, I assemble a dataset consisting of over 500,000 observations from the price comparison site, Shopper.com. Figure 1 provides a snapshot of the Shopper.com environment. A consumer wanting to purchase a Samsung SyncMaster 151s flat panel monitor on 01/15/03 would observe 23 firms advertising 17 distinct prices. Notice that these

¹Other’s that have modelled clearinghouse type environments include Shilony (1979); Varian (1980); Rosenthal (1980); and Narasimhan (1988).

firms are advertising prices for a homogenous product: products with an identical manufacturer part number. With a “click of the mouse” advertised prices for this flat panel monitor can be sorted from lowest to highest, as in Figure 1. The lowest price for this monitor is \$289.50, while the highest price is \$499 – a difference of over 72 percent of the lowest advertised price. While the price dispersion predicted by the Baye-Morgan model has been confirmed by a host of empirical studies, several additional testable implications remain.²

This paper examines three additional testable implications of the Baye-Morgan model. I first test the prediction that firms’ propensities to advertise prices are less than unity – that is, firms only intermittently advertise prices over any given period. For example, would a consumer visiting the Shopper.com site to obtain price information for the flat panel monitor in Figure 1 always observe the same set of 23 firms advertising prices, or would consumers observe a random subset of these (and possibly other) firms? Econometric results, based on a probit specification, suggest that firms do not always actively advertise price information. For a given product, firms’ propensity to advertise prices is about 69 percent. That is, firms advertise prices about seven of 10 days. This provides some support for one prediction, that $\alpha < 1$, in Baye-Morgan. In addition, the econometric evidence tends to support a second

²For studies on price dispersion in retail Internet markets see Baye, Morgan and Scholten (2001, 2002, 2003); Bryjolfsson and Smith (2001); Ellison and Ellison (2001); Ratchford, Pan and Shankar (2002); Baylis and Perloff (2002); Brown and Goolsbee (2002); Clay, Krishana, Wolff (2001); and Clemons, Hann and Hitt (2000).

prediction of the Baye-Morgan model: that firms advertise prices less frequently in markets where the fraction of consumers using the gatekeeper’s site is relatively small.

While the data provide some support for the Baye-Morgan model, the econometric analysis suggests that the model does not capture some features of firms’ decisions to advertise prices at Shopper.com. Specifically, Baye-Morgan predict that firms advertise prices more frequently in markets with few competitors than in markets with many competitors. The econometric evidence presented in the current paper, however, reveals no systematic relationship between firms’ advertising propensities and the number of competitors. This finding is robust to a variety of controls for potential heterogeneities in the data not modeled in Baye-Morgan. For instance, since Baye-Morgan assume that firms sell a single homogenous product it is important to control for cross-section variation among products that may influence the frequency with which firms advertise price information. This is done by introducing product-specific fixed effects. Also, Baye-Morgan model an environment where firms’ costs are symmetric and that no firm has a reputation or brand advantage. These potential variations in the data are controlled for by introducing variables capturing observable differences between firms, as well as unobservable heterogeneities by introducing firm-specific fixed effects. Finally, to capture any dynamic changes and the potential “weekend” effect observed in other retail markets I introduce date-specific fixed effects.³

³See Warner and Barsky (1995).

The main implication of my findings is that, even controlling for potential heterogeneities among firms selling identical products, firms' advertising propensities are quite asymmetric. Although the average firm advertises its price on about seven out of every 10 days, some firms rarely advertise while others advertise on almost everyday. These differences cannot be explained by observable differences in firms' characteristics.⁴ This suggests that a potentially useful line of future research is to relax the symmetry assumption of the Baye-Morgan model to see if this leads to predictions more consistent with the data.

The remainder of the paper is organized as follows. Section 2 provides a description of the Baye-Morgan model and derives some testable implications about firms' advertising behavior. Section 3 begins by providing an overview of the Shopper.com environment and the data. Then, continues by providing a preliminary look at some of the testable implications of Baye-Morgan. Section 4 describes the econometric model. Section 5 concludes.

2 Theoretical Foundations and Predictions