Consumer uncertainty and price discrimination through online coupons: An empirical study of restaurants in Shanghai☆

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A B S T R A C T

We use data from restaurants in Shanghai, China to conduct a new empirical analysis of prices and coupons. Our results show a positive relationship between prices and online coupons. Moreover, the price premium from couponing is higher for restaurants about which consumer values appear to be more uncertain. When consumer uncertainty is high, restaurants that offer coupons have an average price that is about 60 percent higher than similar restaurants that do not issue coupons. When uncertainty is low, restaurants that offer coupons have an average price that is about 10 percent higher. These findings are consistent with online couponing in the restaurant industry being used for price discrimination and as a promotional device in the presence of higher uncertainty in consumer valuations.

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1. Introduction

Why do firms issue coupons? In an influential empirical study, Nevo and Wolfram (2002) explore the relationship between grocery store shelf prices and manufacturers' coupons for ready-to-eat breakfast cereals. They find that prices become lower when coupons are issued, a result that is inconsistent with the standard monopoly price discrimination theory of couponing but can be consistent with models of price discrimination in oligopoly settings (oligopoly models are perhaps more appropriate for the breakfast cereals market). This leaves largely open the question of whether there are other market settings where the price-coupon relationship supports the standard monopoly price discrimination theory.

In this paper, we use data from restaurants in Shanghai, China to conduct a new empirical analysis of prices and coupons. This market has two important characteristics that differ from breakfast cereals. First, many consumers are uncertain about their values for various restaurants, which differ both in qualities and in horizontal attributes. Even for restaurants at a specific quality level, consumer values still vary greatly due to preference diversity and may often be uncertain, especially since many consumers are short-term residents and tourists. Second, for a city with more than 48,000 restaurants, the market may be more properly viewed as one of monopolistic competition: each firm, facing its residual demand, chooses its own price optimally like a monopolist, without considering the effects of its actions on the market price. This market environment thus potentially provides a

setting to test the standard monopoly price discrimination role of coupons.

Interestingly, there is a website, www.dianping.com, which provides restaurant information, customer evaluations, customer reviews, and online coupons for almost 40,000 restaurants in Shanghai. Due to possible search costs, uncertain consumers are more likely to visit the Dianping website to gather information about a restaurant. The restaurant may then use online coupons for price discrimination, charging a high price for informed (loyal) consumers who are less likely to visit the website but a lower price to attract uncertain consumers who download the online coupon.

We use these data to estimate a descriptive model that relates the average expenditure per customer ("prices") to online couponing, uncertainty in consumer valuations for the restaurant, restaurant quality, and demand and cost factors. Our results show a positive relationship between prices and coupons. Moreover, the price premium from couponing is higher for restaurants about which consumer values appear to be more uncertain. When consumer uncertainty is high, restaurants that offer coupons have an average price that is about 60 percent higher than similar restaurants that do not issue coupons. When uncertainty is low, restaurants that offer coupons have an average price that is about 10 percent higher. These findings are consistent with online couponing in the restaurant industry being used for price discrimination and as a promotional device in the presence of higher uncertainty in consumer valuations.

Several other papers have examined empirically the price effects from couponing. Narasimhan (1984) finds a positive correlation between prices and coupons for 20 consumer products, while Levedahl (1986) finds a positive correlation between paper towel prices and coupons. In contrast, Nevo and Wolfram (2002) find that shelf prices for breakfast cereal are lower during periods when coupons are available. Similarly, Anderson and Song (2004) show a negative correlation between the shelf price of packaged goods and coupons when the coupon has a relatively small discount value.[1] Our paper contributes to this literature by offering new evidence from the restaurant market, an environment where consumer uncertainty is important and promotions are through online coupons.[2] Our finding that firms may use the Internet to price discriminate in favor of value-uncertain consumers through online coupons is interesting – it differs from the usual assumption in the literature that the informed consumers receive lower prices and the uninformed consumers are discriminated against (e.g., Varian, 1980).

The rest of the paper is organized as follows. Section 2 discusses the theoretical motivation for our empirical analysis. Section 3 outlines the empirical model and Section 4 describes the data. Results are reported in Section 5, and Section 6 concludes.

2. Theoretical motivation

2.1. Restaurant market

The restaurant market in Shanghai provides an interesting setting to study why firms issue coupons. Shanghai is the largest city in China, with many tourists and short-term visitors. As of December 2010, it has more than 48,000 restaurants at various quality levels. For restaurants at a certain quality level, consumer valuations still vary greatly due to preference diversity. To extract surplus from consumers who happen to have high valuations, a restaurant has the incentive to charge a high price. But to attract consumers whose valuations are low or are uncertain, a restaurant may need to lower its price. Thus restaurants have incentives to practice price discrimination.

The Internet provides a useful tool both for consumers to learn about restaurants and for restaurants to engage in price discrimination. One popular website for consumers to gather information is www.dianping.com. Dianping is a comprehensive online and physical platform that collects reviews of restaurants, shops, hotels and other establishments. Potential customers can go through the reviews to get information about a restaurant, including its average expenditure per customer, number of reviews, and average customer evaluations in three dimensions: taste, environment, and service. The website also has information about whether a restaurant offers coupons and, if it does, information about the coupon. Consumers can either print these online coupons or download them to their cellular telephones. They can then redeem their coupon when dining at the restaurant. We assume that consumers who are ex ante uncertain about their valuations are more likely to search online for restaurants information and to find the online coupons. For example, these consumers may need general information about restaurants or about other information from the website, possibly because they are new residents or are visitors to the city. On the other hand, consumers who already know their valuations for the restaurants of interests are less likely to visit the website for restaurants information, possibly due to search costs. Restaurants may thus have both the incentive and a mechanism to price discriminate through www.dianping.com using online coupons.

2.2. Simple model

We outline a simple theoretical model that examines optimal restaurant prices with and without coupons. The model is illustrative and is used to provide motivation for the empirical analysis in Section 3. Suppose that consumer valuation for a restaurant is $V = k + \varepsilon$, where $\varepsilon = -\delta$ or δ, each with probability 1/2, and $\delta > 0$. The realizations of ε are independent for each consumer. We consider the restaurant market in Shanghai as a differentiated market with many firms, where each firm, facing the residual demand of a unit

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[1] Related empirical research is sparse and focuses on non-price effects. Sethuraman and Mittelstaedt (1992) and Neslin (1990) examine the relationship between coupons and market share, while Neslin and Clarke (1987), Neslin, Henderson, and Quelch (1985), and Blattberg and Neslin (1990) examine the purchase behavior of consumers. Vilcassim and Wittink (1987) examine the share of consumers who use coupons to buy high-price brands. Oliver and Shor (2003), and Shor and Oliver (2006) examine how online couponing impacts consumer satisfaction and their likelihood of purchase, respectively.

[2] Our research is also related to the theoretical literature on price discrimination, for example, Anderson and Dana (2009), Holmes (1989), Nahata, Ostaszewski and Sahoo (1990), and Varian (1980).