

**Impacts of Advertising on Price Sensitivity, Market Power
and Social Welfare**

by

Xuefeng Sheng

(2927499)

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Supervisor: Professor Gamal Atallah

ECO 7997

Ottawa, Ontario

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Abstract

Advertising plays an increasingly important role in the management of firms. It is essential for a manager to make proper decisions about how much the firm should spend on advertising and to know how the product price and market power are affected by the advertising policies. This paper discusses the relationship between advertising, price sensitivity, market power and social welfare. We perform an empirical study of the Canadian accommodation industry and compare the results with those found in the literature.

Key words: Advertising, Price Sensitivity, Market Power, Social Welfare

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1. Introduction

Advertising plays an increasingly important role in the management of firms. It is essential for a manager to make proper decisions about how much the firm should spend on advertising and to know how the product price and market power are affected by the advertising policies. Many studies have been conducted to develop a better understanding of the effects of advertising, especially in relation to price sensitivity and market power, e.g. Comanor and Wilson (1979), Stigler (1961) and Kanetkar et al. (1992).

Many discussions on the relationship between market power and social welfare are made by economists, the common wisdom being that market power reduces social welfare. However, recently many economists have challenged this idea. They think that market power does not necessarily lead to efficiency losses, instead they argue that under certain conditions, market power can be beneficial for social welfare, e.g. Hyde and Perloff (1995), Williams and Rosen (1999) and Nevo (2001).

There exists a large literature on advertising and social welfare. Kotowitz and Mathehewson (1979) conduct a study on informative advertising and welfare. Dixit and Norman (1978) apply welfare theoretic methods to study advertising and find that advertising does not necessarily induce losses in welfare. Kwoka (1984) states that advertising will lead to considerable social benefits. Bester and Petrakis (1994) find that advertising has two opposite effects on welfare, positive and negative. These economists base their conclusion on different assumptions such as unchanged marginal cost and shifting demand curves.

This paper analyzes the relation between advertising, market power and social welfare. It is divided into five sections. Section 2 contains three sub-sections: the first sub-section

is about price sensitivity and advertising and in this section, we will discuss advertising and price sensitivity based on other researchers' studies; the second sub-section concerns advertising and market power and the third sub-section discusses the relationship between advertising, market power and social welfare.

In section 3, we will conduct an empirical analysis of the accommodation industry to test how price sensitivity is affected by the different advertising choices. A general demand function will be used to derive the price elasticity of demand, and advertising will be considered to be a factor which will have an impact on the trend of prices. An econometric estimation will be conducted in order to get the estimates of the demand function. We will consider different models with different explanatory variables. After obtaining the results of the estimation, we can then calculate the elasticity of price, with advertising as a factor.

2. Advertising, price sensitivity, market power and social welfare

2.1 Advertising and price sensitivity

Two important economic theories have been developed to understand the effects of advertising on price and consumers' price sensitivity. The first theory states that product differentiation is a consequence of advertising because advertising will increase brand loyalty, reducing price sensitivity. This view was stated by Comanor and Wilson (1979), according to whom the lowered price sensitivity will in turn increase the selling price because people would put more consideration on brand choices rather than on prices. Market power theories also agree that as a method to increase preference for a brand, advertising is associated with decreased price sensitivity and thus higher prices.

The other view, first put forth by Stigler (1961) and Nelson (1974), argues that advertising will cause higher price sensitivity because the information included in advertising will increase the focus on prices and make consumers more aware of the alternatives, hence reducing search costs. This in turn leads to increased price sensitivity and lower prices. Benham (1972) studied the impact of advertising on the price of eyeglasses when the advertising ban was removed and found that advertising causes prices to go down.

Many different methods and measures are used to measure the effect of advertising on price and price sensitivity. Charles, Weinberg and Weiss (1992) use a logit model¹ to derive price sensitivity and the relationship between advertising and price, and concluded that advertising leads to increased brand price sensitivity. Eskin and Baron (1977) also conducted a study which included four products and set advertising and price at two levels and found that advertising had a positive effect on price sensitivity.

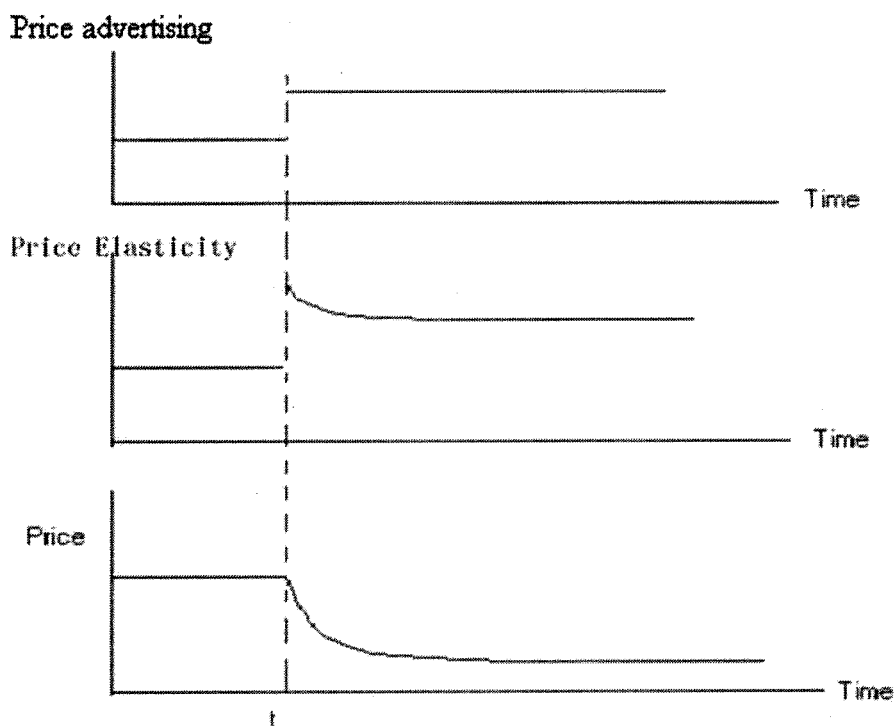
Kaul and Wittink (1995) reconciled the conflicting effects of advertising by distinguishing different types of advertising based on advertising content. The first kind of advertising, referred to as non-price advertising, will primarily lead to brand choice and lower price sensitivity. Most of national advertising belongs to this type. The second kind of advertising is price advertising, which includes price information; most local advertising belongs to this type. As to the two conflicting relationships between advertising and price sensitivity, Kaul and Wittink (1995) make a discussion based on the distinction between the two types of advertising. When advertising contains price information or advertising is local, consumers' price sensitivity increases and the increase

¹ This model is a consumer choice model, and it was also used by Gensch and Recker (1979), Jones and Zufryden (1980) and Guadagni and Little (1983).

in price sensitivity results in a decrease in prices. If advertising is non-price advertising or is national, price sensitivity decreases with advertising and this decrease in price sensitivity leads to price increases. Figures 1 and 2 illustrate these relationships.

For price advertising (see Figure 1), increases in advertising will lead to an increase in price sensitivity, i.e. price elasticity. In a market with incomplete competition, the price will gradually decrease due to the higher price elasticity and the price elasticity will also be lowered by the increasing price to a level which is still higher than the original level. This is shown in Figure 1.

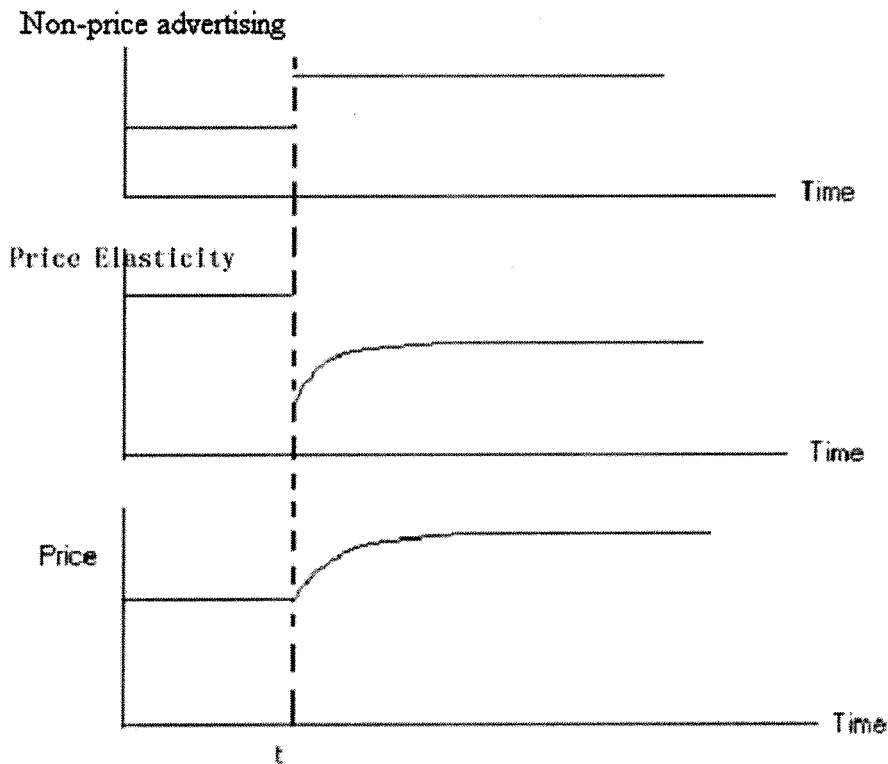
Figure 1: Changes in price elasticity and price as a result of increases in price advertising (measured in dollars)



For non-price advertising (see Figure 2), the increase in advertising will lower the price elasticity immediately and the decreased price elasticity will push the price up gradually.

The increased price will also push the price elasticity to a higher level, a level that is still lower than the original level.

Figure 2: Changes in price elasticity and price as a result of increases in non-price advertising (measured in dollars)



In practice, the change in price is affected by the two types of advertising (price and non-price) together because a firm is always conducting both in parallel. Whether the price tends to increase or decrease depends on the relative importance of the two types of advertising. If firms focus more on price advertising than non-price advertising, the price should decrease.

In Kanetkar et al. (1992), advertising is measured by the number of ads that a consumer is exposed to during a time period, and they found that advertising will lead to

higher price elasticity and lower price in the Dog Food industry. But the conclusion of Kanetkar et al. (1992) conflicts with the generalization drawn by Kaul and Wittink (1995) which says that price advertising increases price advertising. So we believe the advertising Kanetkar et al. (1992) used may include price and non-price advertising and what Kanetkar et al. (1992) observed is the combined effect of the two types of advertising.

2.2 Advertising and market power

Market power is related directly to advertising. Hyde and Perloff (1995) concluded the market power could be estimated via structural models. While Boyer (1996) argued that Hyde and Perloff (1995) oversimplified the diversity and complexity of oligopoly pricing, and that the structural model does not have a solid basis because they just assumed it. Nevo (2001) measured market power in the ready-to-eat cereal industry, using the Price Cost Margin. In Wolfram (1999), Price Cost Margin was used as the index of market power.

In this sub-section, we analyze the relation between advertising and market power. The most commonly used indices of market power include the Hirschman-Herfindahl Index (HHI), the Concentration Ratio (CR, generally CR₄ or CR₈) and the Lerner Index (Price Cost Margin, PCM).

The HHI is calculated based on the market share of all firms in the industry. The formula is

$$HHI = \sum S_i^2 \quad (1)$$

where S_i represents the market share of firm i . $HHI=10000$ when there is only one firm in the market. According to the Federal Energy Regulatory Commission (FERC), a market is “unconcentrated” if its HHI is less than 1000, “moderately concentrated” if its HHI lies between 1000 and 1800, and “highly concentrated” if its HHI is greater than 1800.

The CR is another common measure of market power. In practice, we use CR_4 or CR_8 , which is defined as the fraction of the total market share hold by the 4 or 8 largest firms in the market:

$$CR_4 = \sum_{i=1}^4 S_i \quad \text{or} \quad CR_8 = \sum_{i=1}^8 S_i \quad (2)$$

Another popular measure of market power is the Price Cost Margin:

$$PCM = \frac{P - C}{P} \quad (3)$$

where P is the price and C is marginal cost. Some researchers made some small changes to the PCM formula. Wolfram (1999) uses the following formula of θ as the index of market power.

$$\theta = \frac{P - C}{P} \eta \quad (4)$$

where η refers to the price elasticity. Williams and Rosen (1999) defined PCM as

$$PCM = \frac{AP - PCP}{PCP} \quad (5)$$

where AP refers to the actual price and PCP refers to the perfectly competitive price, a proxy for marginal cost.

We are going to pay particular attention to PCM when explaining the changes in market power. The first reason for this is that we will base our discussion about the

relationship between advertising and market power on our previous analysis of the relationship between advertising and price. So it will be more convenient to use PCM, because it incorporates price as a component of the index of market power. The second reason is that HHI and CR_4/CR_8 are far too simple to capture the dynamic nature of market behaviour. Moreover, they have little relations with the analysis before. Williams and Rosen (1999) compared HHI and PCM using the electricity market as an example and they concluded that market power was far more complicated than simple measures of market concentration such as HHI and CR_4 could lead one to believe.

Market power can be affected by many factors such as industry type, the legal framework and historical considerations. In some industries, market power is necessary in order to ensure the industries are viable, e.g. the electricity industry requires monopolization of the transmission network to avoid electricity duplication and instability in transmission. The law can also be an important factor for market power. For example, the Antitrust Bill in the U.S. prevents excessive monopolization of most industries. The history of an industry is also a determinant factor, insofar as large firms tend to be long-lived.

Advertising is an important factor which can affect market power through its effect on price and price sensitivity. Nevo (2001) chooses advertising as a main explanatory variable in an econometric study which measured market power in the ready-to-eat cereal industry and found that advertising had a positive effect on market power. Kanetkar et al. (1992) report that high enough advertising will always lead to increased market power because with high enough advertising, price elasticity declines and price increases.

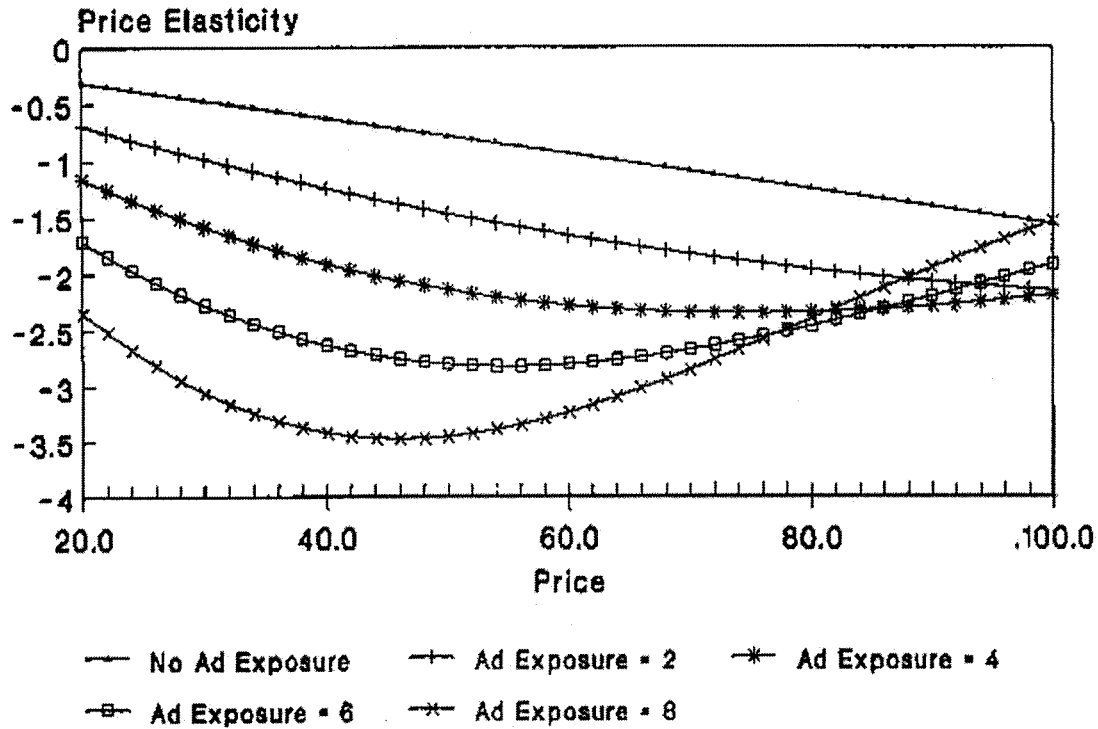
By conducting more non-price advertising to increase product differentiation, firms will be able to charge a higher price on their products, leaving demand unchanged or almost unchanged and gaining market power.

In this paper, we focus on advertising as a determinant of market power. Let us turn to the index of market power we have chosen, PCM. From the formula of PCM, we know that if C remains unchanged, PCM increases with P, price advertising causes higher price sensitivity and lowers the price while non-price advertising has the opposite effect. Therefore price advertising will have a negative effect on market power, while non-price advertising will have a positive effect.

Comanor and Wilson (1974) concluded that heavy advertising led to a high price-cost margin based on empirical work. This advertising would act as an important barrier to new entrants in these industries and favour large firms relative to small firms. Many industries were chosen for the econometric study, including the food, drink, clothing and drug industries. But no thorough discussion of advertising and price sensitivity was made. The conclusion that heavy advertising led to a high PCM was based on the discussion of advertising as a barrier to other competitors, not on the profit rate. Moreover they failed to separate advertising into price and non-price advertising.

Let us turn to Karnetkar et al. (1992). As discussed before, we believe the effect of advertising found in Kanetkar et al. (1992) that advertising has a positive effect on price sensitivity and decreases price was a mixed effect. To simplify the problem, we assume that advertising in their research is price advertising, according to our discussion above.

Figure 3: Market Power Effect of Advertising



* Source: Kanetkar et al. (1992)

* The number behind "Ad Exposure" refers to the times, e.g. "Ad Exposure * 2" means advertising expenditure is doubled

As Figure 3 illustrates, when advertising is low, increases in advertising lead to an increase in price sensitivity with a negative effect on market power. When advertising increases, the price will decrease because of the increase in price sensitivity. Thus the PCM will decrease with the increase in price advertising.

Dorfman and Steiner (1954) provide a good explanation for the market power effect of advertising in Kanetkar et al. (1992). Price advertising would attract consumers with high price sensitivity to the advertised products. And with the increase in advertising, competition becomes tougher, leading to a further decrease in price. However, from

Figure 3, it is also clear that high enough advertising will cause lower price sensitivity, a positive effect on PCM, which means an increase in market power.² Scale economies may explain these results because with excessive advertising, scale diseconomies appear and then advertising will present an effect which is opposite to its original effect. But here we are going to ignore this phenomenon, because too much advertising expenditures are impossible to a firm and to the whole industry, advertising expenditure won't change too much in a short time period.

2.3 Advertising, market power and social welfare

Market power is an important factor which can affect social welfare. Most competition policies are based on a presumed negative relation between market power and social welfare. Throughout history, there has been opposition to big corporations and monopoly power. Adam Smith (1776) criticized monopolies because he thought they resulted in losses in social welfare. Bhuyan and Lopez (1995) find that market concentration leads to welfare losses in the food and tobacco manufacturing industries. Peterson and Connor (1995) reached similar conclusions. But all of them ignored the possible welfare gains of market power. Although consumers pay a higher price, producers may realize efficiency gains through cost reductions, and it is possible for the producers' gains to offset the consumers' losses.

Recently, the conventional wisdom that market power necessarily leads to losses in social welfare was challenged. Lopez and Liron-Espana (2003) conducted research on the food industry, finding that increases in market power do not necessarily lead to welfare

² "Assuming, that the direct effects of advertising are stronger than the indirect effects and then high enough advertising will always lead to increased market power, ceteris paribus..." (Kanetkar et al. 1992,

losses³. When market power concentration increases, some industries realized social welfare gains, such as meat packing plants and the fluid milk industry, some suffered welfare losses, such as net corn milling and flavoring extracts & symps industries. Some realized gains in consumer surplus, such as meat packing plants and the fluid milk industry, and some have seen gains in producer surplus, such as meat packing plants and the canned specialties industry. Their results conflict with the conventional wisdom that market power leads to welfare losses. Other studies support Lopez and Liron-Espana (2003)'s conclusions. For instance, Azzam and Schroeter (1995) analyzed the tradeoff between market power and cost efficiency in the beef packing industry and found that advertising can increase the social welfare.

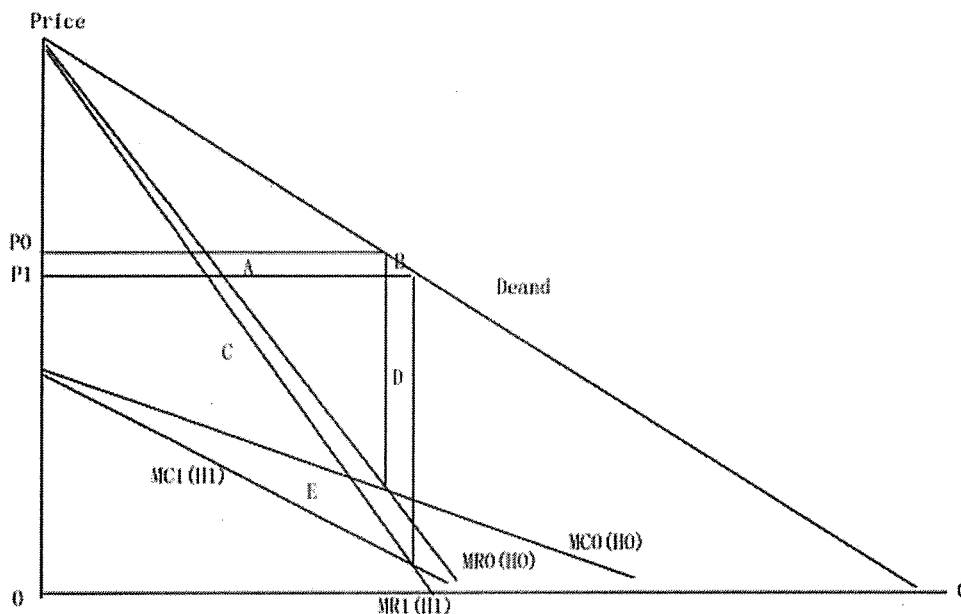
Before we address why increases in market power can lead to different results in different industries, let us explain first how the increased market power leads to efficiency gains using the example in Lopez and Liron-Espana (2003)'s work.

We use the common definition of social welfare: social welfare (SW) = consumer surplus (CS) + producer surplus (PS). In Figure 4, the demand curve does not change throughout our analysis. At first the market concentration is H_0 , marginal cost is MC_0 (H_0) and marginal revenue is MR_0 (H_0). The price is P_0 . Now market power increases, causing marginal cost and marginal revenue to shift to MC_1 (H_1) and MR_1 (H_1). The new price is P_1 , which is lower than the original price. The change in total welfare, $B+E+D$, is positive. This is an illustration of how market power can increase social welfare when it is accompanied by efficiency gains.

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³ Lopez and Liron-Espana studied 35 food industries in their paper. 30 out of 35 industries indicate that higher market concentration leads to efficiency gain and 5 out of 35 industries showed a negative relation between concentration and efficiency.

Figure 4: Illustration of a possible increase in welfare from concentration



Source: Lopez and Liron-Espana (2003)

Let us turn to the market power measure, the Lerner index (PCM). When P increases while C remains unchanged or almost unchanged, PCM will increase too. This is the common wisdom that a higher price means higher market power. But from the formula we can see that if cost and price decrease at the same time and the decrease in cost is important relative to the decrease in price so that the ratio of C and P will decrease, PCM will increase too. Hence a lower price may be associated with an increase in market power. That is why decreased price and increased market power may occur simultaneously.

We now discuss the relationship between market power and social welfare based on different combination of marginal cost (MC) and marginal revenue (MR) curves. In each

case, we will study the impact of advertising on social welfare based on the analysis of market power and social welfare.

First, let us assume that the demand function is unchanged to simplify the problem. In practice, the demand function is derived from data of a certain period, and it is reasonable to think that the demand function will not change during the period of analysis. And we will consider the case with changing demand function later in this paper. Second, we will assume the marginal cost curve is horizontal.

2.3.1 Case 1: MC curve does not change

Figure 5 shows the relation between market power and social welfare under the conditions of case 1. In Figure 5, the market power effect is represented by the price increase from P_0 to P_1 . The change in consumer surplus, is $dCS = -(A+B)$. The change in producer surplus is $dPS = (A+C)-(C+D) = A-D$. Thus total change in social welfare is $dSW = dCS + dPS = -B-D < 0$. So the conclusion is that higher market power will lead to losses in social welfare if the marginal cost curve does not change.

Figure 5: MC curve does not change

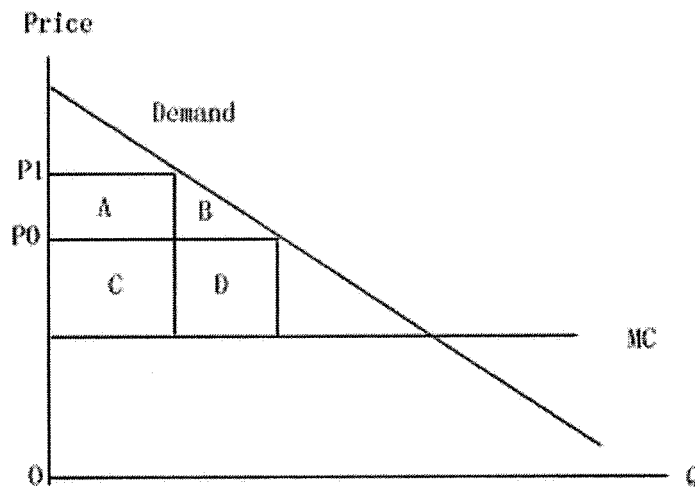
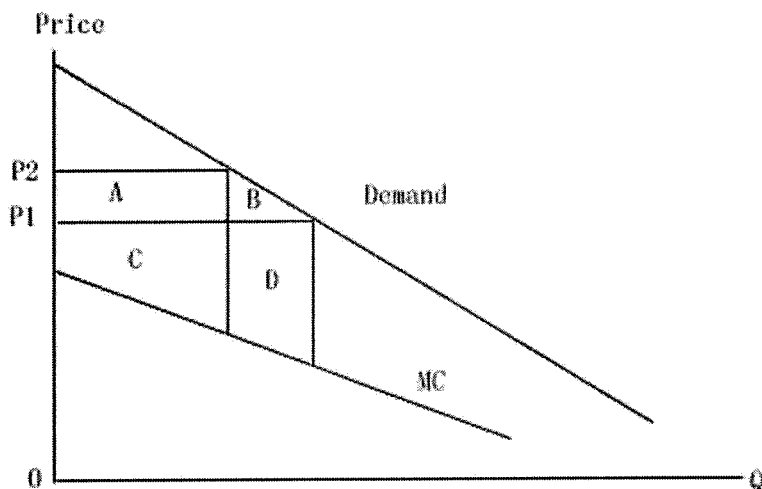


Figure 6: Non-horizontal MC curve



The assumption of horizontal marginal cost curve was made only to simplify the problem. This assumption is relaxed in Figure 6. Let the price increase from P_1 to P_2 , then:

$$dCS = -(A+B), \text{ and } dPS = (A+C)-(C+D)=A-D. \text{ Thus } dSW = -(B+D) < 0$$

This is the easiest case, and in this case, price advertising will lead to welfare gains based on previous analysis that price advertising decreases price. Non-price advertising will decrease social welfare since it increases the product price.

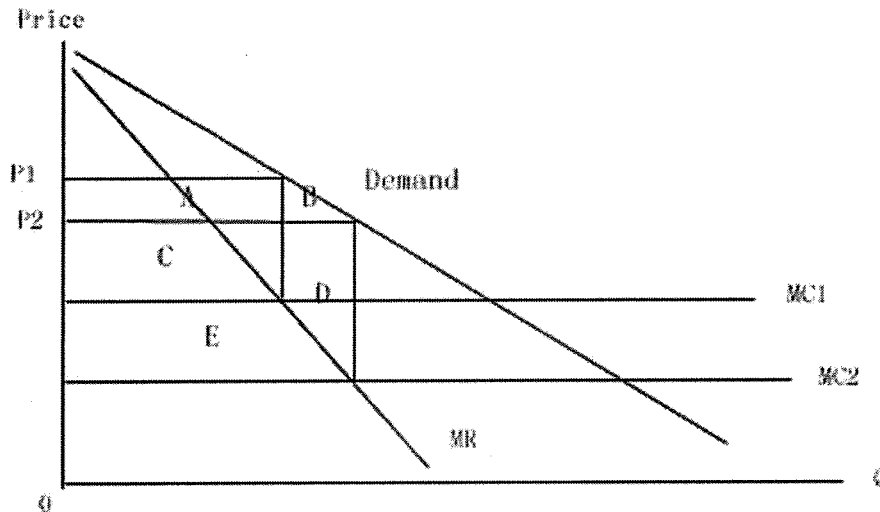
2.3.2 Case 2: MC decreases

From case 1, we know that higher market power leads to welfare losses with a static MC curve. In case 2, we allow the MC to decrease.

We did not mention MR in case 1 because how the MR curve changes would not affect our conclusion, but now we have to consider changes in MR. We consider these

situations: unchanged MR curve, downward shift in MR curve and upward shift in MR curve.

Figure 7: Decreased MC curve and unchanged MR curve

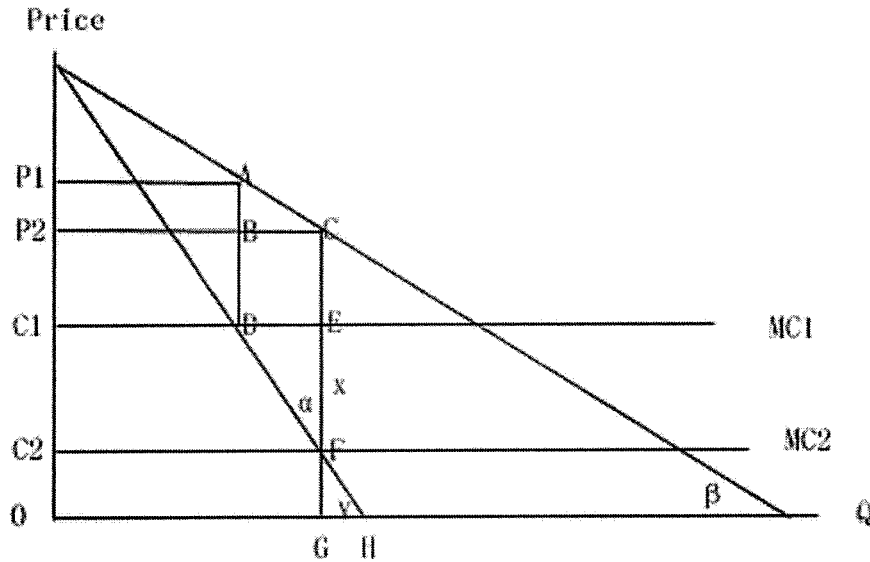


In Figure 7, the MC decreases from MC1 to MC2, causing the price to decrease from P1 to P2. $dCS = A+B$, $dPS = (C+D+E)-(A+C)=D+E-A$ and $dSW = B+D+E$. It may seem difficult to predict the effect on market power, because both cost and price decrease. But actually, market power will decline if MC decreases and MR curve remains unchanged. The proof is presented below (Figure 8).

Assume that the marginal cost declines from MC1 to MC2 such that $C1+X=C2$. Assume that the slope of the demand curve is β while the slope of the MR curve is α .

In the figure, since $EF=X$, we know that $DE=Xtg\alpha$ and $AB=Xtg\beta$. Consider the triangle FGH, it is obvious that $\gamma > \beta$ and $\alpha+\gamma = (1/2)\pi$. So we know $\alpha < (1/2)\pi - \beta$. Thus $0 < Xtg\alpha < Xtg\beta < 1$.

Figure 8: Proof of increase in market power



Now

$$PCM(1) = 1 - \frac{C1}{P1} \quad PCM(2) = 1 - \frac{C2}{P2} \quad (6)$$

We can transform $PCM(2)$ to $1 - \frac{C1 - X}{P1 - X * tg\alpha * tg\beta}$. Since $0 < X * tg\alpha * tg\beta < 1$, we can get

$1 - \frac{C1}{P1} < 1 - \frac{C2}{P2}$, i.e. market power increases when MC decreases and MR remains unchanged.

Based on our analysis of advertising and market power, it is easy to derive the relationship between non-price advertising and social welfare in this case. With a decreased MC, non-price advertising will lead to higher market power and then higher social welfare. But for price advertising, we cannot determine the direction of change in market power since both price and MC decrease and we cannot tell if market power increases or decreases.

When the MR declines along with the decrease in MC, different results can be obtained. First let us assume a downward shift in the MR curve from MR1 to MR2, with a shift in MC from MC1 to MC2. A large decrease in MR will induce $P_2 > P_1$, while a small decrease makes $P_2 < P_1$. Figure 9 shows the case with a large decrease in MR.

From Figure 9, changes of consumer surplus (dCS) and producer surplus (dPS) are easy to compute. $DCS = -(A+B)$, and $DPS = (A+C+E) - (C+D) = A+E-D$. So the change in social welfare is $DSW = E - B - D$, which may be greater or less than zero. Market power will increase in this case because the lower MC and the higher price increase PCM. We get a different result if we allow a small decrease in MR, which reduces price, as shown in Figure 10.

Figure 9: Decreased MC and decreased MR, with large change

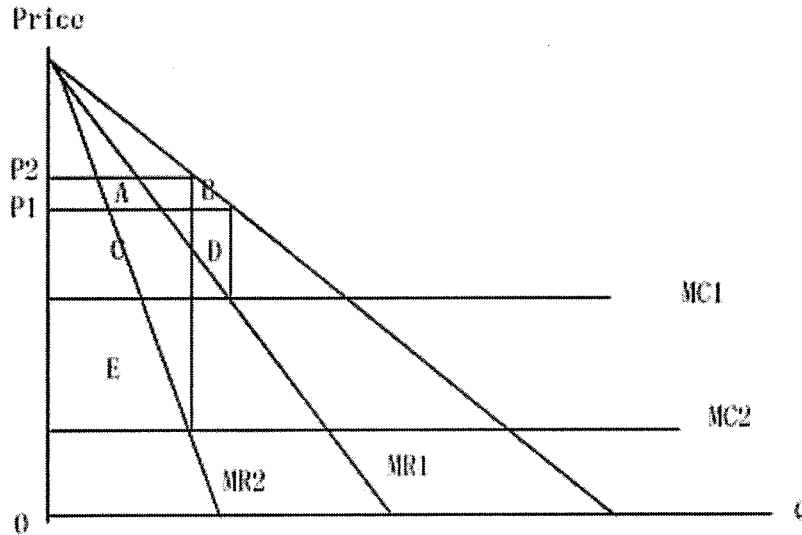
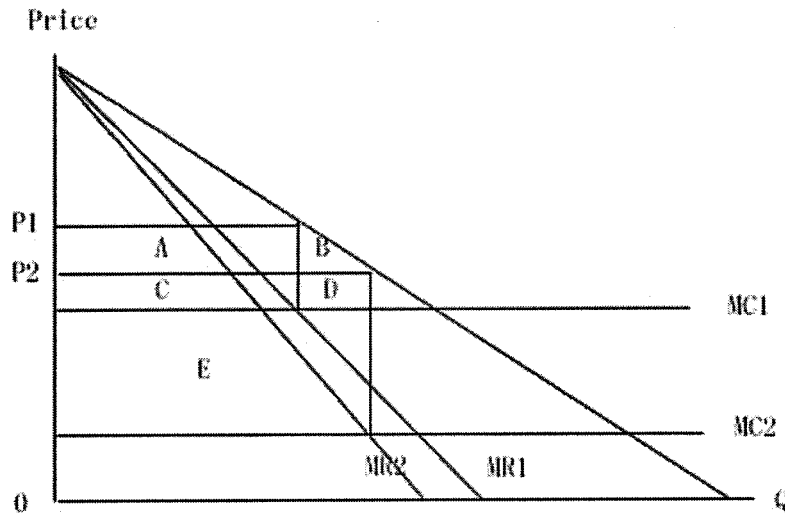


Figure 10: Decreased MC and small decrease in MR



In this case, market power will increase when MC changes from MC1 to MC2 and MR changes from MR1 to MR2 (based on the proof in Figure 8). The social welfare change is $B+D+E > 0$, i.e. in this case, the increased market power leads to an increase in social welfare.

In the case of a large decrease in MR, it is difficult to determine the effect of advertising on social welfare because we do not know the exact relationship between market power and social welfare. But we can say that different advertising budgets and portfolio will lead to different impacts on social welfare in this case. And in practice, we can use econometric method to analyze the exact effect of advertising on social welfare.

If MR decreases slightly, non-price advertising will cause higher social welfare according to the positive relationship between market power and social welfare in this case.

We now consider an increase in MR. The direction of change in market power depends on how much the MC and MR change. In this case, the change in social welfare is also greater than 0. The relationship between advertising and social welfare in this case is similar to that of the last case. With different changes in MR and MC, both price and non-price advertising show different effects on social welfare.

It is very similar to case 2 (where MC decreased) if MC increases. When MR remains unchanged, market power is reduced. Actually, we can explain it using the same figures in case 2 by assuming that MC increases from MC2 to MC1 and a similar analysis can then be conducted. A summary of the comparisons of all three cases is made in Table 1.

Table 1: Summary of the relations between market power and social welfare under different conditions

		MC ↑	MC ↓	MC unchanged
MR unchanged		PA → M ↓, SW ↓	NPA → M ↑, SW ↑	N/A
		NPA —	PA —	
MR ↑	Large change	PA → M ↓, SW —	NPA → M —, SW ↑	PA → M ↓, SW ↑ NPA → M ↑, SW ↓
		NPA —		
	Small change	PA → M ↓, SW ↓		
		NPA —		
MR ↓	Large change	PA → M —, SW ↓	NPA → M ↑, SW —	NPA → M ↑, SW ↓ PA → M ↓, SW ↑
			PA —	
	Small change		NPA → M ↑, SW ↑	
			PA —	

MR – marginal revenue MC – marginal cost

M – Market power SW – social welfare

— means we cannot determine the direction of the change

PA – price advertising

NPA - non-price advertising

In the above analysis, we assume an unchanged demand curve, but advertising can change the taste of consumers, which will lead to change in the demand curve in the long run. Dixit and Norman (1978) studied advertising with a changing demand curve. They impose the condition that all advertising necessarily decreases demand elasticity. And they find that the market equilibrium level of advertising is socially excessive for a wide of parameters. When the demand curve can shift, the relationship between advertising and social welfare is similar to that we concluded in last two cases and it will depend on the way and magnitude the MR curve shifts.

3. Empirical work on Canadian accommodation industry

Advertising has two opposing effects on price sensitivity and thus price. One effect is to increase price sensitivity and decrease the price, while the other is to decrease price sensitivity and increase price. We will discuss the exact relationship between advertising and price sensitivity based on an empirical study of the accommodation industry. We do not separate advertising into two types, instead we combine them together because we have no access to separated advertising data and we are interested in the combined effect of the two types of advertising.

3.1 Data

We now turn to the definition and source of variables. The data we use are monthly

data from January 1996 to December 1997 and they are from Canadian accommodation industry. Monthly Room Occupancy Rate data (*OCCP*) are provided in *Traveler Accommodation Statistics*, from January 1996 to December 1997 as percentage style. Advertising cost (*A*, millions of dollars) can also be found in this *Traveler Accommodation Statistics*. Advertising expenditure (millions of dollars) is calculated from total revenue because the *Traveler Accommodation Statistics* supplies only the percentage of advertising expenditure in relation to total revenues of the accommodation industry. As to the price (*P*), we adopt the monthly price index in the accommodation industry from the CANSIM database. Monthly *GDP* (millions of dollars) from January 1996 to December 1997 is also from CANSIM.

Some dummy variables (*DUM1*, *DUM2*, *DUM3*, *DUM4*) are considered to adjust for seasonality. The accommodation industry is an industry that is greatly affected by seasons. *DUM1* is set to 1 for spring, *DUM2* is set to 1 for summer, *DUM3* is set to 1 for autumn and *DUM4* is set to 1 for winter. An interaction variable (*LnALnP*) with price and advertising is added for the purpose of studying the interaction between price and advertising. A list containing all the variables is presented below.

Table 2: Main variables

Name	Description	Type	Mean	Unit
<i>OCCP</i>	Room occupancy rate	Monthly	65.7	%
<i>A</i>	Advertising	Monthly	26.4	Millions of dollars
<i>GDP</i>	Gross domestic product	Monthly	686419	Millions of dollars
<i>P</i>	Price index	Monthly	117.1	N/A

Since the data we use are time series, we may have a problem with unit roots. Now let us test our data to see if this is the case. In Eviews, we use the Dickey-Fuller test to examine if the data have unit roots. Under 5%, we get that the logarithm of *OCCP* (*LNOCPP*), the logarithm of price (*LnP*) and the logarithm of advertising (*LnA*) do not have unit roots, while the logarithm of GDP (*LnGDP*) has a unit root. Here we use the Hodrick-Prescott filter to deal with the unit roots problem and then we can get a new *LnGDP* which does not have a unit root. The results are presented in Table 3.

Table 3: Unit roots test

Variable	T-statistics	Critical value At 5%
<i>LnOCPP</i>	-2.40	-1.95
<i>LnP</i>	-2.59	-1.95
<i>LnA</i>	-2.01	-1.95
<i>LnGDP</i>	-1.21	-1.96
<i>HPLnGDP</i>	3.24	-3.19

* *HPLnGDP* means new *LnGDP* after using Hodrick-Prescott filter

3.2 Econometric methodology

A general demand function will be used to derive the price elasticity of demand and advertising will be considered to be a factor that will affect the trend of prices. An econometric estimation will be conducted in order to obtain estimates of the demand function. We will consider different models with different explanatory variables. After

obtaining the results of the estimation, we can then calculate the price elasticity, with advertising as a factor.

Unlike Kanetkar et al. (1992), who used a logit brand choice model to explain the effect of advertising on price sensitivity, we will use a demand function to carry out our estimation, which is a very common method to calculate the price elasticity. The demand function is:

$$D = D(P, A, \dots) \quad (7)$$

We will choose an exponential demand function rather than a linear one because exponential form demand function is more common in industry studies. We can take logarithms on both sides to get a linear form and use OLS.

In the estimation, we will consider different variables to find a better model. Price (P) and advertising (A) will be included in the model. GDP also plays a role in the demand function because travel and tourism are procyclical activities. As to the dependent variable, we choose the Room Occupancy Rate as the dependent variable, and we use monthly data in order to have more observations in the estimation.

In this part, we will use five models of demand functions, and choose the best one to calculate the price elasticity of demand. The models are listed below:

$$\text{LnOCCP}_t = a + b_1 \text{LnP}_t + b_2 \text{LnA}_t + b_3 \text{HPLnGDP}_t + b_4 \text{LnALnP}_t + \varepsilon_t \quad (8)$$

$$\begin{aligned} \text{LnOCCP}_t = & a + b_1 \text{LnP}_t + b_2 \text{LnA}_t + b_3 \text{HPLnGDP}_t + b_4 \text{LnALnP}_t + \\ & c_1 \text{DUM1}_t + c_2 \text{DUM2}_t + c_3 \text{DUM3}_t + \varepsilon_t \end{aligned} \quad (9)$$

$$\begin{aligned} \text{LnOCCP}_t = & a + b_1 \text{LnP}_t + b_2 \text{LnA}_t + b_3 \text{HPLnGDP}_t + b_4 \text{LnALnP}_t \\ & + b_5 \text{LnOCCP}_{t-1} + c_1 \text{DUM1}_t + c_2 \text{DUM2}_t + c_3 \text{DUM3}_t + \varepsilon_t \end{aligned} \quad (10)$$

$$\text{LnOCCP}_t = a + b_1 \text{LnP}_t + b_2 \text{LnA}_t + b_3 \text{HPLnGDP}_t + b_4 \text{LnALnP}_t + b_5 (\text{LnP})^2$$

$$+ b_5 \text{LnOCCP}_{t-1} + c_1 \text{DUM1}_t + c_2 \text{DUM2}_t + c_3 \text{DUM3}_t + \varepsilon_t \quad (11)$$

$$\text{LnOCCP}_t = a + b_1 \text{LnP}_t + b_2 \text{LnA}_t + b_3 \text{HPLnGDP}_t + b_4 \text{LnALnP}_t + b_5 (\text{LnP})^2$$

$$+ b_5 \text{LnOCCP}_{t-1} + c_1 \text{DUM1}_t + c_2 \text{DUM2}_t + c_3 \text{DUM3}_t + dT + \varepsilon_t \quad (12)$$

In model 2, we add 3 dummy variables in order to account for seasonal effects. In model 3, in addition to the seasonal dummy variables, another interaction variable LnALnP is added, which is the product of LnA and LnP . In Model 4, $(\text{LnP})^2$ is added to account for nonlinearities. In Model 5, trend variable T is added.

3.3 Results and discussion

3.3.1 Results

First we will estimate Model 1. Here only four variables, LnA , LnP , HPLnGDP and LnALnP are considered to account for the changes in the dependent variable, LnOCCP . The interaction variable, LnALnP , is added to see the effect of advertising on price sensitivity. The estimation results are presented in Table 4.

Because the interaction variable LnALnP is included in the model, the problem of multicollinearity is expected to be severe. As expected, the coefficient of LnA is positive, which means advertising increases demand. The coefficient of the interaction variable, LnALnP , is negative.

All the explanatory variables have a very high p-value which means that the independent variables seem to have an insignificant coefficient in the test with the null hypothesis that the coefficient of the variable is zero and thus have little explanatory power. However, the F-statistic, 18.9, tells us that we can reject the joint hypothesis whose null is that all the coefficients equal zero at the same time. This means that the

variables we chose do have a joint explanatory power. Also the high R^2 demonstrates this point. This is a typical feature indicating the existence of multicollinearity.

Table 4: Model 1

Variables	Coefficient	P-value	
C	13	0.9	
LnP_t	3.5	0.89	
LnA_t	5.7	0.9	
$HPLnGDP_t$	-2.9	0.1	
$LnALnP_t$	-0.6	0.9	
R-squared	0.8	F-statistic	18.9
Adjusted- R^2	0.76	P-value	0.000
S.E. of Regression	0.09	Durbin-Watson stat	1.54
Log likelihood	25.7		

*24 observations

*Method: Ordinary Least Square

* Dependent variable: $LnOCCP$

The results we get are very different from the results of Kanetkar et al. (1992) where the interaction variable, $Price*Advertising$ has the same effect on the dependent variable as the price. While here we find that the interaction variable $LnALnP$ has an opposite impact on demand compared with price. Thus the result as to the effect of advertising on price sensitivity may be different from Kanetkar et al. (1992) and we will discuss it later in this section.

Table 5: Model 2

Variables	Coefficient	P-value	
C	10.7	0.92	
LnP_t	6.1	0.78	
LnA_t	11.7	0.72	
$HPLnGDP_t$	-4	0.02	
$LnALnP_t$	-1.6	0.82	
$DUM1$	-0.20	0.002	
$DUM2$	-0.05	0.38	
$DUM3$	0.003	0.92	
R-squared	0.91	F-statistic	24
Adjusted-R ²	0.87	P-value	0.000
S.E. of Regression	0.067	Durbin-Watson stat	2.53
Log likelihood	35.8		

*24 observations

*Method: Ordinary Least Square

* Dependent variable: $LnOCCP$

Model 2 includes 3 dummy variables according to the different seasons in addition to variables in Model 1. The estimation results are presented in Table 5. The results of Model 2 are slightly better than those of Model 1, although many of them are similar. The signs of the independent variables LnP_t , LnA_t , and $LnALnP_t$ are the same as in Model 1, positive for LnP_t and LnA_t and negative for $LnALnP_t$.

Unfortunately in Model 2 the problem of multicollinearity still exists. The high p-value for the individual independent variables and the low p-value for the joint hypothesis (F

test) indicate the presence of multicollinearity. The Durbin-Watson statistics is 2.48 in Model 2 and it is also not very close to 2 which means we are not better off on the problem of autocorrelation after we add the seasonal dummy variables. And we are not very sure if there is problem autocorrelation. Lagged variables will be used later to address this problem. From the Adjusted-R², we can see that Model 2 is somewhat superior to the Model 1.

Table 6: Model 3

Variables	Coefficient	P-value	
<i>C</i>	130.14	0.25	
<i>LnP_t</i>	-9.6	0.64	
<i>LnA_t</i>	-6.56	0.82	
<i>HPLnGDP_t</i>	-8.35	0.02	
<i>LnALnP_t</i>	3.15	0.62	
<i>LnOCCP_{t-1}</i>	0.49	0.28	
<i>DUM1</i>	-0.09	0.39	
<i>DUM2</i>	-0.04	0.39	
<i>DUM3</i>	-0.01	0.82	
R-squared	0.93	F-statistic	23.8
Adjusted-R ²	0.89	P-value	0.000
S.E. of Regression	0.06	Durbin-Watson stat	2.35
Log likelihood	38.1		

*23 observations

*Method: Ordinary Least Square

* Dependent variable: *LnOCCP*

Now let us turn to Model 3, in which we add another variable $LnOCCP_{t-1}$ to deal with the problem of autocorrelation that is not handled in the previous two models. With everything else as in Model 2, another independent variable $LnOCCP_{t-1}$, the lagged dependent variable, is added. This is a common way to handle the problem of autocorrelation. The estimation results are presented in Table 6.

The common variables in Model 2 and 3 have the different signs. In Model 3, $LnALnP_t$ has a positive coefficient estimate and the coefficients of LnP_t and LnA_t are negative. The variable $LnOCCP_{t-1}$ (lagged dependent variable) has a positive effect on the current dependent variable. As for autocorrelation, the Durbin-Watson statistic is 2.35, which is close to 2. But we need further test to see if autocorrelation exists.

Although Model 3 gives us relatively better results, we consider another model in which the variable $(LnP)^2$ is added to strengthen the explanatory power of price. Moreover, it will be useful when we discuss the relationship between advertising and price sensitivity when we use price elasticity. The results of Model 4 are presented in Table 7. We can see that the results are even better than those of Model 3.

Table 7: Model 4

Variables	Coefficient	P-value	
<i>C</i>	40	0.67	
<i>LnP_t</i>	35.9	0.12	
<i>LnA_t</i>	-10.9	0.64	
<i>HPLnGDP</i>	-9.3	0.002	
<i>LnALnP_t</i>	4.3	0.4	
<i>(LnP)²</i>	-5.1	0.008	
<i>LnOCCPT_{t-1}</i>	0.67	0.07	
<i>DUM1</i>	0.02	0.86	
<i>DUM2</i>	-0.01	0.80	
<i>DUM3</i>	0.06	0.16	
R-squared	0.96	F-statistic	35
Adjusted-R ²	0.93	P-value	0.000
Log likelihood	44.5	Durbin-Watson stat	2.58

*23 observations

*Method: Ordinary Least Square

* Dependent variable: *LnOCCP*

Model 5 includes a trend variable T and the estimation results are presented in Table 8.

It seems we do not have a better result with Model 5 which includes a trend variable.

Table 8: Model 5

Variables	Coefficient	P-value	
C	-1284	0.42	
LnP_t	40.7	0.10	
LnA_t	-3.5	0.89	
$HPLnGDP$	80.7	0.46	
$LnALnP_t$	2.7	0.62	
$(LnP)^2$	-5.1	0.01	
$LnOCCPT_{t-1}$	-0.6	0.11	
T	-0.3	0.41	
$DUM1$	0.002	0.97	
$DUM2$	-0.02	0.72	
$DUM3$	0.06	0.18	
R-squared	0.96	F-statistic	31.2
Adjusted-R ²	0.93	P-value	0.000
Log likelihood	45.2	Durbin-Watson stat	2.75

*23 observations

*Method: Ordinary Least Square

* Dependent variable: $LnOCCP$

From the results of the four models considered, we get the same relationship between price and demand and between price and advertising, which we can draw from the signs of the coefficients of the related variables we considered in the models. But due to the

higher R^2 , we choose Model 4 as the best model and focus on this model in the discussion in the next sections.

Now let us come to two problems of our estimation results, autocorrelation and multicollinearity. As to autocorrelation, although we have got Durbin-Watson statistics, we will do further test to make sure if this problem exists. We use Q-statistics to test it. In Eviews, we can get results of Q-statistics for the first four models we conducted and the Q-statistics show high p-value which means no autocorrelation exists. But for Model 5, Q-statistics shows low p-value which means autocorrelation. The results of Q-statistics are presented in Table 9.

Table 9: Q-statistics

Model	1 lag	2 lags	3 lags	4 lags	5 lags
Model 1	0.24 (0.622)	1.31 (0.519)	1.90 (0.593)	3.95 (0.413)	4.04 (0.543)
Model 2	2.98 (0.085)	3.56 (0.168)	4.23 (0.238)	4.28 (0.369)	8.39 (0.136)
Model 3	1.016 (0.313)	3.01 (0.222)	4.04 (0.257)	4.04 (0.400)	5.47 (0.362)
Model 4	2.55 (0.111)	3.58 (0.167)	6.61 (0.085)	8.98 (0.062)	9.49 (0.091)
Model 5	4.02 (0.045)	5.43 (0.066)	7.76 (0.051)	10.26 (0.036)	10.48 (0.063)

* The value in the brackets is p-value

Multicollinearity exists in all the four models, but since we have high F-statistic which means the models do have explanatory power, we will do nothing on this problem because other changes in the models may induce more severe problems. And we will use the results to make discussion in the next sub-section.

3.3.2 Discussion

We now study the relationship between advertising and price sensitivity. The price elasticity of demand will be considered as the indicator of price sensitivity.

The estimation results of Model 4 are:

$$\begin{aligned} LnOCCP_t = & 40 + 35.9LnP_t - 5.1(LnP)^2 - 10.9LnA_t - 9.3HPLnGDP_t + \\ & 4.3LnALnP_t + 0.67LnOCCP_{t-1} + 0.02DUM1_t - 0.01DUM2_t + 0.06DUM3_t \end{aligned} \quad (13)$$

Given the price and the demand, we can compute the price elasticity (indicated by P.E).

$$P.E = \left| \frac{\partial D}{\partial P} * \frac{P}{D} \right| \quad (14)$$

where D means the demand and it is $LnOCCP$ in our case, and P is the price.

Since we use logarithms, we can write the P.E as

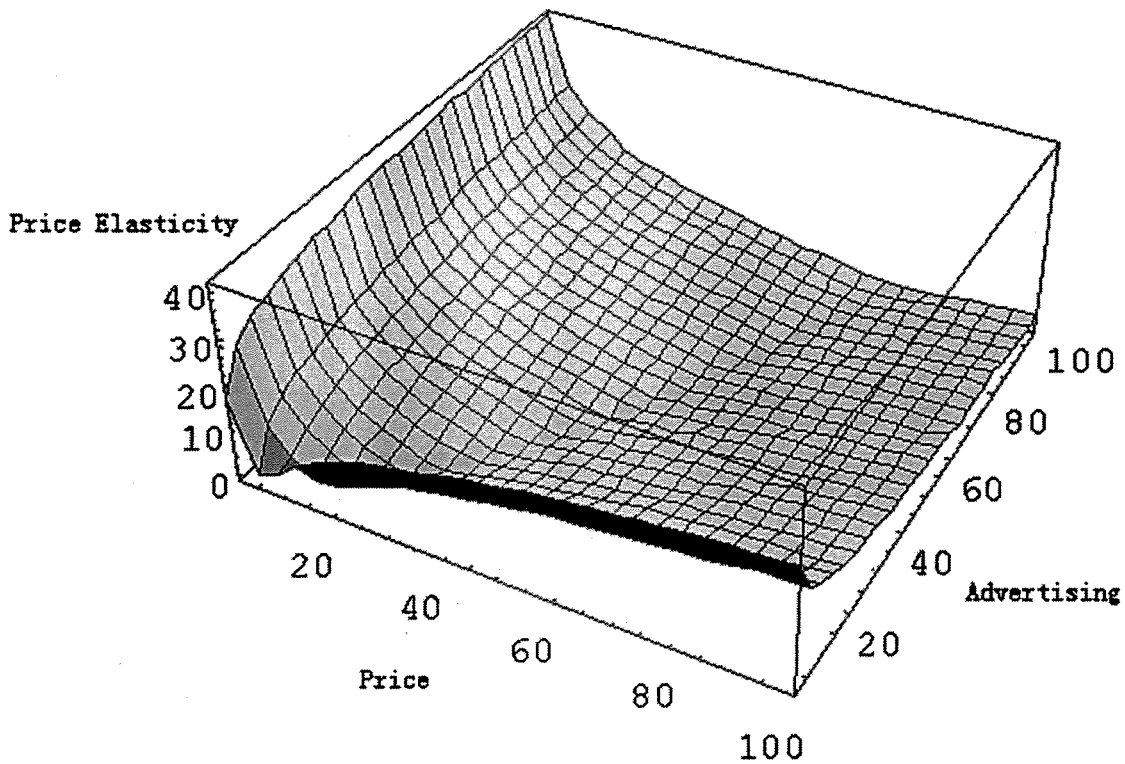
$$P.E = \left| \frac{\partial LnOCCP}{\partial LnP} \right| = |35.9 - 10.2LnP + 4.3LnA| \quad (15)$$

because
$$\frac{\partial LnOCCP}{\partial LnP} = \frac{\partial OCCP}{\partial P} * \frac{P}{OCCP} \quad (16)$$

From the relationship between P.E and advertising discussed above, we know that advertising has two opposite effects on the price elasticity. The first effect is to increase the price elasticity and the other is to decrease it. If adverting expenditures are low, increases in advertising expenditures will push the P.E close to zero, i.e. decrease the price sensitivity. But if adverting is high enough, increases in advertising will also

increase price elasticity. Figure 11 shows the relationship between P.E, Price and Advertising.

Figure 11: Price elasticity, price and advertising

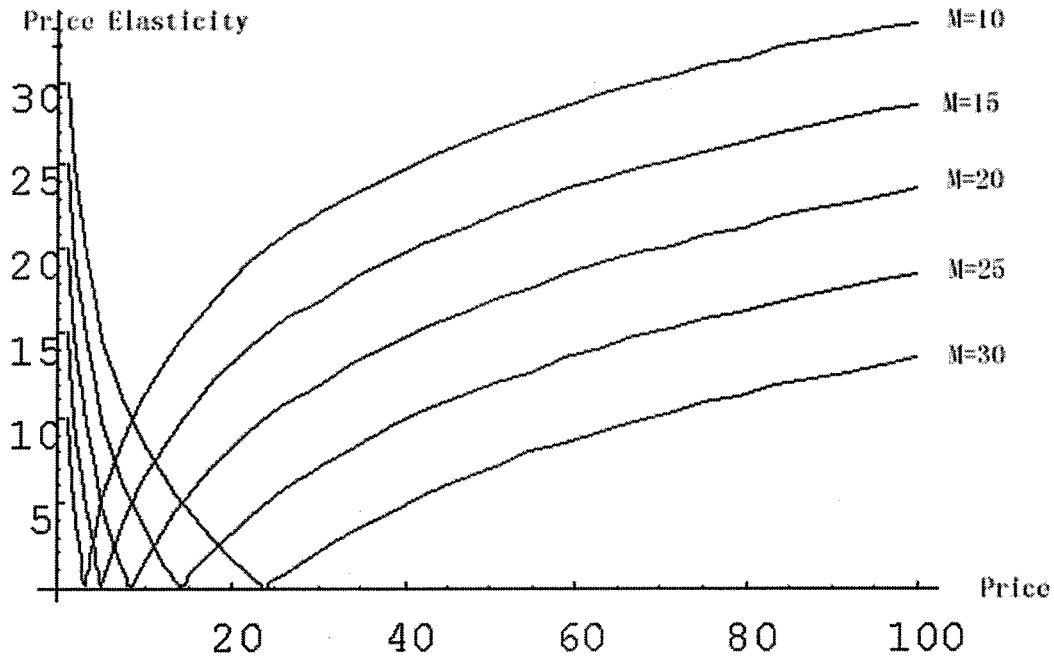


The change in P.E is related to two variables, Price and Advertising. It is difficult to trace the change in P.E when Price and Advertising change at the same time. From the formula of P.E, we know that Advertising and Price have opposite effects on the price elasticity and that is why the P.E is complex. If one of the two variables (price or advertising) is high, while the other is not high, then the P.E will be very high, but if both of them are high, the P.E will be much lower, as shown in Figure 11. This is caused by the opposite effects of price and advertising on price elasticity.

To simplify the presentation, we keep one variable constant and let the others change.

First advertising will be fixed at several levels in order to study the changes in Price elasticity.

Figure 12: Relationship between price and price elasticity



In Figure 12, we set advertising at five levels so that $|35.9 + 4.3LnA|$ (denoted by M) will be equal to the following values: 10, 15, 20, 25 and 30. There are five different P.E curves, each curve corresponding to a different level of advertising. We need only consider the part of the curve where $P > 20$ because the normal price we have is about 100 or above.

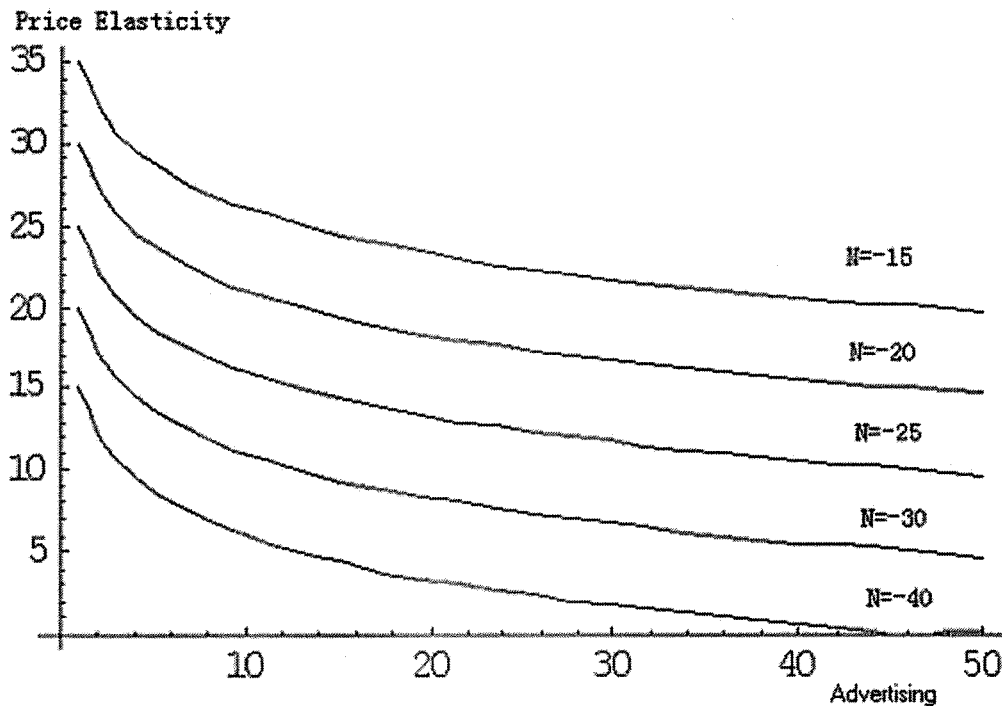
The curve at the top represents the P.E when $M=10$, the lowest level of advertising. The curve at the bottom represents the P.E when $M=30$, the highest level of advertising. It is obvious that higher levels of advertising lead to lower levels of price elasticity, under

the condition that the price changes in the range considered here.

Another point we can derive from Figure 12 is that although the increase in advertising has a negative effect on price elasticity, the effect is decreasing, i.e. for a certain increase in advertising, it will lead to more decrease in price elasticity when total advertising is low than when it is high.

Another method is to fix the price level, and check the relationship between P.E and advertising. But the conclusion should be similar. According to the regular price level, we can set the price around 100 or slightly above and let $35.9 - 10.2 \ln P$ (denoted by N) equal -15, -20, -25, -30 and -40, which represent the price levels from lowest to highest. Figure 13 shows this relationship.

Figure 13: Relationship between price elasticity and advertising with static price



The figure tells us that for any price level (in the range considered here), increases in

advertising expenditures lead to decreases in price elasticity, which is a similar conclusion to what we get by fixing the level of advertising.

Thus we can conclude that in the accommodation industry, advertising has a negative effect on price elasticity. Hence the price level will be pushed up by advertising. Recall that we consider only total advertising expenditures, rather than to separate advertising into price and non-price advertising. All what we can say is that in the accommodation industry, the combined effect of the two types of advertising on price is positive. This may result from the high ratio of non-price advertising in the total advertising expenditure.

However, Kanetkar et al. (1992) drew a totally different conclusion. They found that increases in advertising would lead to higher price elasticity and lower price in the Dog Food and Aluminum Foil industries. It is not a surprising result because our case is different from that of Kanetkar et al. (1992) and they chose the Dog Food and Aluminum industries while we chose the accommodation industry. They used cross-section data while we use time series data.

As Kaul and Wittink (1995) argued in their paper, different types of advertising have different impacts on price and price sensitivity: price advertising pushes up price sensitivity and decreases the price. Although the above discussion always concerns only long term advertising (advertising of two years in the accommodation industry), we can use the same econometric method and procedures for the short term or distinct advertising types.

In the real world, changes in prices result from the combined effect of all the types of advertising a firm conducts. If price advertising has more strength than non-price

advertising, price sensitivity will be pushed up and the price will decline. If non-price advertising has more strength, price sensitivity will be lowered and the price will increase. Unfortunately, the data does not distinguish between the two types of advertising. There is, however, a ratio at which price advertising and non-price advertising have equal opposite effects so that the price is unchanged. But we believe such a ratio is difficult to define and it may change across firms, industries and time.

Using the empirical results above, we can also see the impact of advertising on market power. Figure 12 shows the relationship between price sensitivity and advertising with the advertising set at 4 different levels. If we connect the exact points in Figure 12 according to the exact levels of advertising, price and price elasticity, we will find that it is an upward curve, which indicates the positive relationship between advertising and price. Figure 14 illustrates this result.

Figure 14: Upward curve in price-price elasticity space

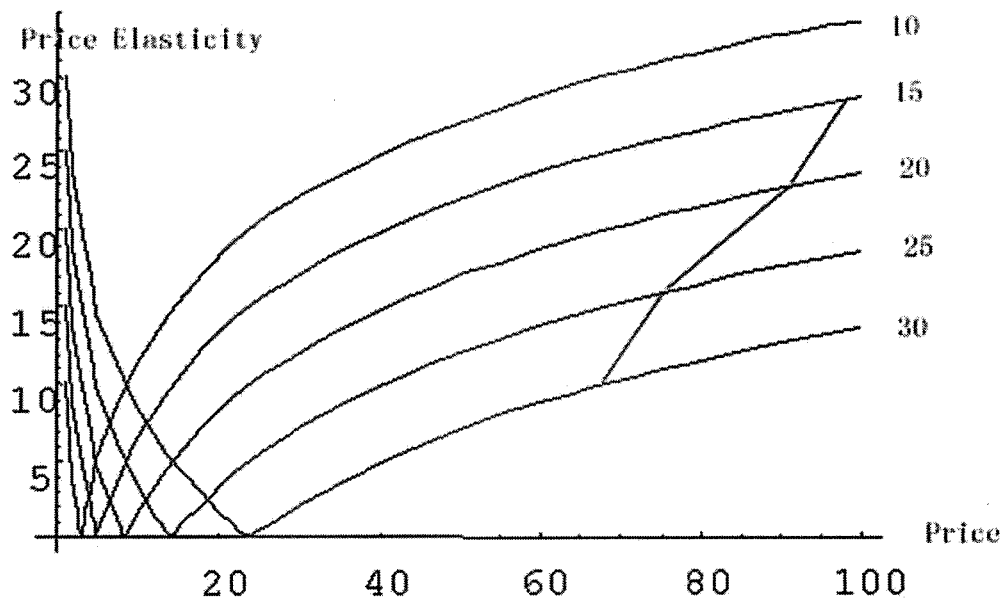
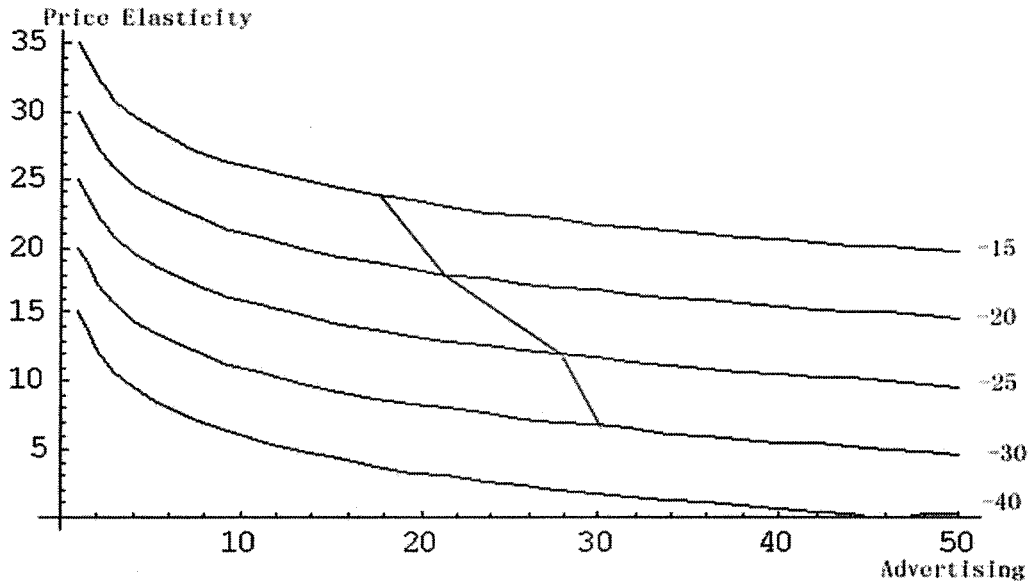


Figure 15: Downward curve in the price-price elasticity space



The same thing can be done using Figure 13. Connecting the exact points according to our data, we obtain a downward curve (Figure 15), which is consistent with the above analysis. The two figures suggest that non-price advertising has a positive effect on market power.

As we have known in section 2.3, the relationship between advertising and social welfare is very complex. Because now we do not have data of market power, we cannot tell the exact relationship between advertising and social welfare.

4. Conclusion

In this paper, we conducted a detailed discussion of the relations between advertising, price sensitivity, market power and social welfare. We separated advertising into two types, price advertising and non-price advertising and found that price advertising generally leads to higher price sensitivity and lower price, while non-price advertising

will generally induce lower price sensitivity and a higher price. But in practice, the effects of advertising are mixed. Whether advertising will cause prices to increase or decrease depends on the relative importance of different types of advertising.

Higher price and higher concentration generally mean higher market power. Based on an analysis of the Lerner Index, we concluded that price advertising will increase market power because of the effect on price when marginal cost remains unchanged. We considered the impact of changes in marginal cost in section 3.

Conventional wisdom is that higher market power leads to welfare losses. But in our study, we found that increases in market power do not necessarily reduce social welfare. Whether increases in market power will lead to welfare losses depends on the demand curve and on the relative changes in MC and MR. Under different constraints, advertising will also have different effects on social welfare. What effect advertising will have on social welfare depends on many factors, such as advertising type (price and non-price advertising), and changes in MR and MC.

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