Advertising and Market Concentration: the Relationship in Canada-US Context

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Abstract

Advertising is prevalent in our lives, which is also one of the common ways for firms to attract attention and promote sales. Its relationship with market concentration has long been a debate, where Lee (2002) did impressive analyses with Korean manufacturing data. By regressing sector-level Canadian and US manufacturing data in 2007 and 2009, this paper studies the relationship between advertising intensity and market concentration. The regression results are consistent with Lee's (2002) findings on the pattern of the advertising-concentration relationship: an inverted U-shape in the consumer goods industry and a lazy J-shape in the producer goods industry when Herfindahl-Hirschman (HH) is used as $Measure$. To enrich the model, the effects of the 2008 financial crisis are brought into the discussion.

Contents

1 Introduction

Advertising is one of the common ways for firms to attract attention and promote sales, as Colley (1961) defined "Advertising is a mass paid communication, the ultimate purpose of which is to impart information, develop attitudes and induce action beneficial to the advertiser". It is predominant in our modern life, from television, the internet, the press and even on the streets. In the US, the advertising spending in 2020 was estimated to be 240.3 billion dollars according to Zenith Media. Among this huge advertising spending, around 60 percent is from media spending, where the internet and television are the major components. (Adgate)

Nonetheless, the contents of advertising are not limited to the automotive and retail sectors only. Morgan (2007) investigated prescription drugs direct-to-consumer advertising (DTCA) spendings of Canada and the US for the period 1975-2005. The author observed that the prescription drugs DTCA inflation-adjusted per capita spending of Canada doubled from 300 dollars in 1995 to around 600 dollars in 2005. The spending in the US grew at a faster pace, from around 300 dollars in 1995 to about 1000 dollars in 2005.

One may wonder: How does advertising intensity depend on market concentration? Many scholars like Lee (2002), Telser (1964) and Chandra and Weinberg (2018) examined the relationship between advertising and market concentration, either linearly, inversely or even reversely related.

Market concentration, by definition, is the share of products in an industry out of total sales. It is worth noting how the industry responds to a change in market concentration. By studying the change in innovations in the US packaged software markets in the 1990s, Turner, Mitchell, and Bettis (2010) observed that an increase in concentration raises competition on market positions between firms, which will be more dependent on innovative strategies in the industry. Furthermore, De Loecker, Eeckhout, and Unger (2020) investigated the macroeconomic influence of the increasing market concentration. Through a rise in markups, the increasing market concentration negatively affects the economy in several

aspects, namely: the labor and capital shares, low-skill wages and labor force participation, labor market dynamics and migration rates.

In addition, the views on the relationship are classified into persuasive and informative views, where economists hold opposite opinions as discussed by Bagwell (2007). On one hand, the persuasive view suggests that advertising does more harm than good on the market since it creates entry-deterrence, quality-guarantee and concentration effects. With advertising, firms create brand loyalty which guarantees the qualities of their products. However, it also provides firms with the ability to raise the price and earn profits with no new firms entering the market. The quality guarantee effect makes consumers overvalue and overspend on the advertised products, thus creating an inflated price. Besides, the concentration-effect indicates that advertising leads to a skewed distribution of market concentration, where it is beneficial to larger firms as they can dominate the market at the cost of smaller firms. On the other hand, the informative view suggests that advertising is beneficial to the market with its pro-competitive effect. Advertising serves to convey products information and match consumers with firms. As a result, consumers have lower search costs and higher valuations on the advertised products. Thus, price is less dispersed and therefore promoting a competitive market. (Bagwell 2007)

Particularly, Mueller and Rogers (1980) pointed out the importance of the advertising-concentration relationship by researching the role of advertising on market concentration. The authors showed that television advertising has the highest potential in changing market concentration by affecting consumer preferences. It is the most common in consumer goods industries which replaces consumers as the decision-maker in a free market. This significance even raised public policy concerns, whether anti-trust policies are still adequate.

By far, Lee (2002) performed a good analysis of the relationship by regressing data on Korean manufacturing industries. With ordinary least squares (OLS) and two-stage least squares (2SLS), the author found that the relationship is a lazy-J shape in the producer goods industry and an inverted U-shape for the consumer goods industry. Nonetheless, there is

not any focus in the Canadian-US context. Therefore in this paper, the relationship between advertising intensity and market concentration in the Canadian-US context is studied. The regression results follow Lee's (2002) findings on the pattern of the advertising-concentration relationship: an inverted U-shape in the consumer goods industry and a lazy J-shape in the producer goods industry when Herfindahl-Hirschman (HH) is used as $Measure$. The lazy J-shape in the producer goods industry is observed to be inverted when concentration ratio (CR) is used, and the relationship in pooled industry mimics the pattern as in the consumer goods industry rather than a positive significant relationship. Despite the ambiguity of the concentration-advertising relationship, it is found that CR is a better measure of concentration in the consumer goods industry and HH is better in the producer goods industry. To enrich the model, the effects of the 2008 financial crisis are brought into the discussion in the advertising-concentration relationship. Regardless of the choice of $Measure$, the relationship follows an inverted U-shape in the consumer goods industry and an inverted lazy J-shaped in the producer goods industry.

This paper is organized as follows: the second section reviews relevant literature; the third and fourth sections review Lee's (2002) model and present the research design of the regressions; the fifth section describes the results; the last section wraps up with a conclusion.

2 Literature Review

There were varieties of literature investigating advertising: the optimal advertising with Dorfman-Steiner model (e.g. Nerlove and Arrow 1962), advertising as a signal on product quality (e.g. Anand and Shachar 2011), or the relationship between advertising and market concentration (e.g. Sutton 1974, Telser 1964, Chandra and Weinberg 2018). Among those topics, the relationship between advertising and market concentration caught more attention as it leads to further implications on the performance of the market such as entry deference. Cubbin (1981) made a good start by modeling the theory of how advertising act as an entry

barrier. He found out that a less favorable demand of the entrant is a necessary condition for the entry barrier effect to exist. He also showed further that advertising intensity is a negative indicator of the magnitude of entry barriers.

To study the relationship between advertising and market concentration, the way to quantify market concentration should be known in the first place. Both Hall and Tideman (1967) and Bailey and Boyle (1971) examined the properties of the measures of concentration, introduced the discrete concentration ratio (CR), which is the percentage of total industrial output, and the cumulative Herfindahl-Hirschman (HH) index. Hall and Tideman (1967) provided six common properties of the measures and introduced the CR and HH indexes. The CR index is the sum of the fraction of industry size held by the largest L firms, where L is usually 4, 8 or 20. The HH index is the sum of the square of the fraction of industry size held by the largest L firms. The HH index uses the relative share of firms as a weighing scale, which solves the size roughness of the CR index. The authors concluded that the two indexes do not differ significantly, but CR gives a better measure in an empirical setting.

Similarly, Bailey and Boyle (1971) discussed the categories of the measures of concentration: discrete or cumulative. The discrete measure, despite being rough and indiscriminate, is generally available in manufacturing industries and is comparable through time. The cumulative measure provides more information by emphasizing the whole distribution of firms. The authors concluded that CR with four firms is the best measure for an invariant variable.

Among all, lots of literature focus on the study of the relationship between advertising and market concentration. However, controversies arise regarding whether the relationship is linearly, inversely or even reversely related. First and foremost, to account for the concerns of the linear relationship, Sutton (1974) conducted an analysis in the UK consumer goods industry. The author found that the quadratic positive relationship between concentration and advertising intensity is significant. He also showed that advertising intensity is maximized in moderately concentrated industries, and the competition in those industries is broadly boosted in the incidence of a fall in advertising or enhancement of the flow of

consumer information. Ornstein (1976) reviewed hypotheses for the positive relationship between concentration and advertising intensity, and suggested new evidence accounting for existing empirical problems. The author concluded that they are significantly related without an obvious quadratic relationship.

Greer (1971) and Telser (1964) investigated the controversies of whether advertising inversely relates to concentration. By considering the influence of advertising in a competitive model, both authors suggested that advertising and concentration have an inverse relationship: a rise in advertising is characterized by a fall in concentration and vice versa. To prove the hypothesis, they conducted several regressions with simultaneous equations on cross-sectional data on major consumption industries. The results are consistent with the hypothesis.

In contrast to the fact that most empirical literature focuses only on how advertising affects market concentration, the way how market power of a firm influences advertising has brought attention to the possible reverse relationship. To derive an implication on the reverse causality, Chandra and Weinberg (2018) used simple panel-data methods to estimate the effect of concentration on advertising within the U.S. brewing industry in 2008. While the authors showed that advertising is increasing with concentration, competitive markets are observed to underinvest in advertising.

Besides studying the relationship between advertising and market concentration, Lee (2002) developed an advertising theory at industrial levels to address the industrial variations of the advertising-market structure relationship by subcategorizing industries into consumer and producer goods industries. While performing OLS and 2SLS regressions on the data of Korean manufacturing industries, the results show that the advertising-market structure relationship is different depending on the level of the covariance between advertising intensity and market share. The relationship is lazy J-shaped in producer goods industries, and an inverted U-shape in consumer goods industries. For producer goods industries, the shape is due to the low-leveled covariance at any concentration level, with only a slight increase at high

concentrations. Thus, advertising is less effective in these industries. For consumer goods industries, the shape is due to a high covariance at low levels of concentration, reaching a peak and has low covariance at high concentrations. Conclusively, an excessive market concentration hinders firms to advertise their products in these industries.

While Lee (2002) performed a good study by regressing data on Korean manufacturing industries, there is not any focus in the Canadian-US context. The following sections will present Lee's (2002) model, after which are the research design and findings of the advertising-concentration relationship in the Canadian-US context.

3 Model

The Dorfman-Steiner condition states that: the advertising intensity (Ω^I) should be equal to the ratio of advertising elasticity of demand over price elasticity of demand (Belleflamme and Peitz 2015, p.140). Following Lee (2002), the industrial advertising intensity is defined as:

$$\begin{aligned} \Omega^I &= \frac{\sum_{i=1}^{N} a_i}{\sum_{j=1}^{N} S_j} \\ &= \frac{\delta \sum_{i=1}^{N} \sigma_i S_i}{\sum_{j=1}^{N} S_j} \\ &= \delta \sum_{i=1}^{N} \sigma_i s_i \\ &= \sum_{i=1}^{N} \Omega_i s_i \end{aligned} \tag{1}$$

where δ denotes the ratio of brand-image to price elasticity of consumer value ($\delta = \frac{\delta^B}{\delta^P}$), Ω_i denotes advertising intensity ($\Omega_i = (\frac{\delta^B}{\delta^P})\sigma_i$), σ_i denotes advertising competence, a_i denotes advertising expenditure, S_i denotes sales, s_i denotes market share in terms of sales for firm i ($s_i = \frac{S_i}{\sum_{j=1}^{N} S_j}$). Advertising competence (σ_i) is the difference in firm's productivity or the effectiveness firms advertise their products (Lee 2002). Since seller's concentration is

observed to have diverse effect across industries, Lee (2002) used s_i to explain the relationship of advertising with market structure.

As derived in (1), Lee (2002) proposed further a new market structure measure L to reflect the structural characteristics of market shares and advertising competence levels. From the term $\sum_{i=1}^{N} \sigma_i s_i$,

$$\begin{aligned} L &= \sum_{i=1}^{N} \sigma_i s_i \\ &= \sum_{i=1}^{N} [(s_i - \frac{1}{N})\sigma_i + \frac{1}{N}\sigma_i] \\ &= N\frac{1}{N}\sum_{i=1}^{N} [(s_i - \frac{1}{N})\sigma_i] + \frac{1}{N}\sum_{i=1}^{N} \sigma_i \\ &= N\rho + \overline{\sigma}, \end{aligned} \tag{2}$$

where N denotes the number of firms in the industry, ρ denotes the covariance of advertising competence and market share ($\rho = \frac{1}{N}\sum_{i=1}^{N} [(s_i - \frac{1}{N})\sigma_i]$), $\overline{\sigma}$ denotes the average of advertising competence ($\overline{\sigma} = (1/N)\sum_{i=1}^{N} \sigma_i$). With (2), Lee (2002) showed that:

$$\Omega^I = \delta L = \delta(N\rho + \overline{\sigma}). \tag{3}$$

Thus, Lee (2002) observed that the covariance of advertising competence and market share (ρ) has a positive relationship with advertising intensity (Ω^I). From (3), the advertising intensity (Ω^I) can be rewritten as follows:

$$\Omega^I = \sum_{i=1}^{N} \sigma_i s_i = N\mu + \overline{\Omega}, \tag{4}$$

where $\overline{\Omega}$ denotes the average of advertising intensities and μ denotes the covariance of advertising intensity and market share. μ signifies the new market structure measure, that is to reflect structural characteristics which are absent in single-dimensional measures.

To study the effect of an increase in the number of firms, Lee (2002) took the first derivative of Ω^I in (4) with respect to N:

$$\Omega_N^I = \mu(1 + \epsilon^{N\mu}) + \overline{\Omega_N}, \tag{5}$$

where $\epsilon^{N\mu}$ denotes the elasticity of μ with respect to the number of firms. Note that (5) provides important insights to the advertising-concentration relationship as proposed by Lee (2002). With the assumption that $\overline{\Omega_N}$ decreases with the number of firms ($\overline{\Omega_N} < 0$), the following are observed:

1. A positive relationship when μ is small, which is insufficient to counteract the negative value of $\overline{\Omega_N}$.

2. A negative relationship when μ is large to overcome the magnitude of $\overline{\Omega_N}$.

3. An inverted U-shaped relationship when μ is in between the lower and upper bounds of $|\overline{\Omega_N}|$.

Upon empirical tests with Korean manufacturing industry data, Lee (2002) showed that the advertising-concentration relationship has an inverted U-shape for the consumer goods industry and a lazy J-shape for the producer goods industry. A figure for each of these shapes is included in the appendix (Figures 3 and 4).

4 Research Design

4.1 Methodology

To study the relationship between advertising and concentration in 2007 and 2009, OLS regressions of (6) are stimulated using sector-level Canadian-US manufacturing data. CR and HH are used as estimations of $Measure$. Seven independent variables other than $Measure$ and $Measure^2$ are included to investigate their effects on the relationships. An increase in

five of those variables, namely $Employees$, ROA, $Investment$, $Receivables$, $Inventories$, increases the firm's financial potential to make more advertising and have a greater influence with a higher rank in the respective industry. Thus, these variables are expected to be positively related to either $Adv.Intensity$ or $Measure$. However, the variable $Debt$ has opposite effects on the relationship, that is, it is negatively related, to either $Adv.Intensity$ or $Measure$. It is important to note that, the relationship between $Profitability$ and $Adv.Intensity$ remains ambiguous. Firms often advertise to attract consumers to purchase their products, hence to increase profits; however, more advertising lowers profits as it adds to a source of expenses.

$$\begin{aligned} Adv.Intensity = {} & \beta_0 + \beta_1 Profitability + \beta_2 Employees + \beta_3 Debt + \beta_4 ROA \\ & + \beta_5 Investment + \beta_6 Receivables + \beta_7 Inventories + \beta_8 Measure \\ & + \beta_9 Measure^2 + \nu_1 \end{aligned} \tag{6}$$

where $Adv.Intensity$ denotes advertising Intensity, $Employees$ denotes the number of employees, $Debt$ denotes long-term debt, $Investment$ denotes total investment, $Receivables$ denotes trade receivables, $Measure$ denotes the measurements of concentration (either CR or HH index), ν_1 denotes the error term.

4.2 Data

The sector-level Canadian-US manufacturing data for 2007 and 2009 are classified into consumer and producer goods industries separately. Then, five biggest sectors of each industry are selected based on net revenue in 2018, where the data is obtained from the Canadian Industry Statistics website. For each of these five sectors, six leading Canadian or US companies are included according to the sector's sales data from Factiva. As in Figure 1, the sectors for consumer industry are Food, Beverage, Furniture and related products, Printing, Clothing; As in Figure 2, the sectors for producer industry are Chemical, Paper, Machinery,

Petroleum and coal products, Transportation equipment. The variables as defined in Table 0 are used.

Other than the CR and HH data, which are obtained from Odesi, the data of all other variables are obtained from Mergent Online. Owing to data unavailability, the top4 Canadian CR in each of the respective sectors is chosen to approximate the CR of that sector, regardless of the number of firms selected in each sector or whether the firms are US-based. Note that $Adv.Intensity$ is calculated in terms of global values. There are 30 observations for each of the above variables. The descriptions of the data are summarized in Table 1.

While observing the data, some sectors stand out with their dominance in particular variables. In the consumer goods industry, the Beverage sector has the highest concentration, either measured in CR or HH, and it is also the most profitable sector with a higher net return on assets and total investment. The furniture sector has the most employees and inventories. In contrast, in the producer goods industry, the petroleum and coal products sector has the highest concentration, either measured in CR or HH. The machinery and chemical sectors stand out in having higher long-term debt, trade receivables and inventories. However, in the pooled industry, the advertising intensities of the highest concentration sectors do not stand out.

In addition, by considering revenue per employee (revenue divided by the number of employees), it is shown that the beverage and furniture sectors are using the least labor relative to other sectors in the consumer goods industry. The beverage sector, where three of the six selected firms have high productivities, constitutes the highest share of market concentration at 40 percent in CR or 70 percent in HH. In the producer industry, the machinery and paper sectors are the most capital intensive among other sectors. Neither of them has the highest concentration: The petroleum and coal sector has the highest, which made up 53 percent (in CR method) or 33 percent (in HH method). Also, neither the machinery nor the paper sectors have the highest advertising intensity among their respective industries.

5 Findings and Discussions

5.1 Findings

The advertising-concentration relationship is estimated by (6) with the consumer, producer and pooled industry data obtained. Each dataset is stimulated with the two ways of calculating market concentration separately, CR or HH.

The pattern of the advertising-concentration relationship can be explained by either the coefficients of CR and CR^2 or HH and HH^2. The estimated coefficients for CR and CR^2 are 1.1 and -1.5 in the pooled industry, 2.3 and -2.8 in the consumer goods industry and 0.26 and -0.41 in the producer goods industry respectively. The estimated coefficients for HH and HH^2 are 1.5 and -4.7 in the pooled industry, 6.1 and -15 in the consumer goods industry and -0.71 and 1.5 in the producer goods industry respectively. Changing from one range of coefficients to another signifies not only the shape of the relationship but also more fluctuations in advertising intensity. The regression results follow Lee's (2002) findings: In the consumer goods industry, the relationship has an inverted U-shape; In the producer goods industry, a lazy J-shaped relationship is observed. Note that in the producer goods industry, the coefficients of CR and CR^2 are 0.26 and -0.41. This suggests that the advertising-concentration relationship exhibits an inverted lazy J-shape when CR is used. In the Canadian-US context, advertising intensity is maximum at 96 percent of CR or 34 percent of HH. That is, the market has the highest advertising when the top 4 firm's revenue ratios are at 96 percent, or the total revenue ratios of firms in a sector are at 34 percent. Unlike Lee's (2002) findings, the pooled industry regressions do not exhibit a positive and significant relationship. Rather, the two regressions follow the shape of the regressions for the consumer goods industry.

Regarding the coefficients of independent variables, several variables have surprising estimates in terms of their magnitudes. The coefficient of $Investment$ is expected to be larger as it provides a source of income to the industry to support the advertising spendings. By

dividing total investment with revenue, the average proportion of investment is significantly higher across all sectors in the producer goods industry. It is interesting to note that the sign of coefficient in the consumer goods industry is negative and that of the producer goods industry is positive. In addition, the estimate of *Receivables* is negative in the consumer goods industry but is positive in the producer goods industry. Since trade receivables are a source of income for the expenditures of a firm, the estimate is expected to be positive. A possible explanation for the negative magnitude is that Canada and the US are net importers in the consumer goods industry.

Due to the 2008 financial crisis, the advertising-concentration relationship is expected to have significant deviations from 2009. Therefore, the regressions for 2007 following (6) are done to investigate the effects. For the consumer goods industry, despite the choice of $Measure$, the estimates stimulate the same inverted U-shaped relationship as in the regressions for 2009; For the producer goods industry, both regressions rather follow the inverted lazy J-shaped relationship. Even though the regressions for 2007 are not as robust as in 2009, two main disparities can be seen from estimating the relationship between two years. Firstly, the signs of $Profitability$, $Debt$ and $Inventories$ are opposite to those in 2009, and the magnitude of $Numberofemployees$ is substantially smaller in 2007. Second, $Profitability$ is estimated to be significant at 0.95 significant level in the consumer goods industry, which is not significant in 2009. As a whole, the estimations for the pooled industry in 2007 highly resemble the pattern as in the consumer goods industry.

The causality of the advertising-concentration relationship is unsure. Thus, OLS regressions of (7) are done to take into account the reverse causality of the relationship in 2009.

$$\begin{aligned} Measure = \beta_0 + \beta_1 Adv.Intensity + \beta_2 Adv.Intensity^2 + \beta_3 Profitability + \beta_4 Employees + \beta_5 Debt \\ + \beta_6 ROA + \beta_7 Investment + \beta_8 Receivables + \beta_9 Inventories + \nu_2 \end{aligned} \tag{7}$$

where $Adv.Intensity$ denotes advertising Intensity, $Employees$ denotes the number of employees, $Debt$ denotes long-term debt, $Investment$ denotes total investment, $Receivables$ denotes trade receivables, $Measure$ denotes the measurements of concentration (either CR or HH index), ν_2 denotes the error term. The following are observed. For the consumer goods industry, the regression with CR gives a slightly higher R^2 and adjusted R^2 than the regression with HH, but the standard error of regression (s.e.e.) is also larger. The opposite happens in the producer goods industry, where the regression with HH gives a little higher R^2 and adjusted R^2 estimates with a lower s.e.e. than that of CR regression. Thus, in estimating the concentration-advertising relationship, CR is a better measure of concentration in the consumer goods industry and HH is better in the producer goods industry.

5.2 Discussions

Considering the regressions for the pooled industries, the estimates of CR and HH and their squares are not significant as they are in Lee's (2002) datasets. This suggests that the explanatory power of CR and HH is low and insufficient in our context. Nonetheless, in an industrial-based view, the advertising-concentration relationship is similarly explainable either using CR or HH as $Measure$ in the regressions following (6).

The OLS regression results of the advertising-concentration relationship agreed with different views depending on the industry. In the consumer goods industry, since it has an inverted U-shaped relationship, it agrees with the informative views before reaching the maximum and with the persuasive views after the maximum. That is, advertising is perceived as beneficial when the market concentration is less concentrated and becomes harmful after the maximum at 96 percent of CR or 34 percent of HH. In the producer goods industry, the lazy-J-shaped relationship agrees with the informative views that advertising is good for the market. Considering the pooled industry, the relationship follows the shape of the consumer goods industry. This implies that advertising promotes a competitive market at low levels of concentration but creates an unfairly dominated market at higher levels in the

whole manufacturing industry. (Bagwell 2007)

One of the reasons that contribute to the opposite signs of $Profitability$, $Debt$ and $Inventories$ between 2007 ad 2009 regressions is the firm's dependence on demand and working capital. Claessens, Tong, and Wei (2011) studied the effects of the 2008 financial crisis on the firm's performance, namely profitability, sales and investment. The authors found that, due to the lack of working capital supply after the crisis, profits and sales fell tremendously for firms that are more sensitive to demand, trade and capital stocks. This result fits in the Canadian-US context, where the sectors in the consumer goods industry are very sensitive to demand and those in the producer goods industry are sensitive to capital stocks. Hence, either Canadian or US firms experienced a huge drop in profitability and inventories, and a rise in long-term debt to finance expenses during the crisis. As a result, after the crisis in 2009, advertising intensity fell with profitability and inventories, and long-term debt, which positively relates to profitability and inventories, and negatively with long-term debt. In particular, the opposite sign of $Profitability$ between two years of regressions confirms the ambiguity of its relationship with $Adv.Intensity$. Despite this fact, $Profitability$ is significant in the consumer goods industry only before the 2008 financial crisis happened. This reassures the sensitivity of demand in the consumer goods industry.

While noting the advertising-concentration relationship agrees with different views depending on the type of industry, economic policies should be employed accordingly. In the producer goods industry, policies should be made in a way such that competition between firms is encouraged at all levels of market concentration. In the consumer goods and pooled industries, the same type of policies should be employed at low levels of market concentration, but entry-promoting policies should be established once market concentration exceeds the maximum level.

As the effect of employment in 2007 regressions drops substantially, economic policies should focus on industrial diversification to avoid future crises. Wang, Madsen, and Steiner (2017) analyzed the impact on employment in the 2008 financial crisis. The authors found

that local competition and cross-industry diversity rose despite the remarkable drop in employment growth. Therefore, to be better prepared for the future economic crisis, policies should emphasize industrial-based diversity to insure the economy or even promote economic growth.

Upon estimating the reverse causality of the relationship, the concentration-advertising relationship remains plausible. The concentration-advertising relationship indeed seems to exist in the consumer goods industry due to the outstanding significance in explaining the model. However, the relationship is not established in the pooled industry. As in Tables 3 and 4, the concentration-advertising relationship for the pooled industry has the lowest R^2 and adjusted R^2, which indicates the relationship is not well-explained by the model. Thus, the concentration-advertising relationship remains ambiguous, even though using HH gives a lower standard error of regression.

Referring to the implication done by Chandra and Weinberg (2018), the ambiguity of the concentration-advertising relationship in the consumer goods industry suggests that, to a certain degree, firms are not using advertising optimally as a way to promote their products and make profits. A possible reason for this phenomenon to be significant in the consumer goods industry is the prevalence of franchised chains. Since a franchise shared its name and assets among its business, firms of a franchise chain have less incentive to make advertisements, thus the advertising intensity is lower than non-franchised chains (Michael 1999). However, this does not mean firms in the pooled industry use advertising optimally; Rather, the insignificance of the relationship may due to possible endogeneity such as the missing of an independent time variable.

6 Conclusion

The welfare effects of advertising and market concentration have long been discussed. On one hand, the social welfare of advertising is determined mainly by its effect on market price.

Stivers and Tremblay (2005) further developed that search costs and the types of advertising (persuasive or informative) are also needed to consider in examining the welfare effects of advertising. Persuasive advertising leads to oversupply through raising market prices, while it may not happen in informative advertising due to the substantial drop in search costs. On the other hand, market concentration establishes entry barriers with positive welfare. Filatov and Makolskaya (2017) investigated the welfare of an increase in market concentration. They showed that entry barriers redistribute total surplus as consumer surplus counteracts the rise in producer surplus. Also, entry barriers serve to prevent excessive competition as directed by the government.

Many works of literature studied the patterns of the advertising-concentration relationship, proposed either a linearly or inversely relationship (Telser 1964, Chandra and Weinberg 2018). Among those works of literature, Lee (2002) performed a good analysis of the relationship by regressing data on Korean manufacturing industries, however the scenario of Canada and the US is not investigated. Therefore by regressing the manufacturing data in 2007 and 2009, this paper studied the relationship between advertising intensity and market concentration in the Canadian-US context. The regression results follow Lee's (2002) findings on the pattern of the advertising-concentration relationship: an inverted U-shape in the consumer goods industry and a lazy J-shape in the producer goods industry when HH is used as $Measure$. However, some differences remain. An inverted lazy J-shape relationship is observed in the producer goods industry when CR is used, and the relationship in pooled industry mimics the pattern of inverted U-shape as in the consumer goods industry, rather than a positive significant relationship. Even though the concentration-advertising relationship is plausible, it is found that CR is a better measure of concentration in the consumer goods industry and HH is better in the producer goods industry. To enrich the model, the effects of the 2008 financial crisis are brought into the discussion in the advertising-concentration relationship. Despite the choice of $Measure$, the relationship follows an inverted U-shape in the consumer goods industry and an inverted lazy J-shaped in the producer goods industry.

Nonetheless, with broader datasets available, the model can be estimated more precisely. Variables such as advertising intensity, which is defined as the ratio of advertising expenditure to shipment in Lee's (2002) paper, are adjusted due to unavailable data. Also, the model can be extended in several ways: the introduction of time-lagged variables to study the effects of time, IV estimator to address endogeneity, advertising competence (σ) to study the relationship with market concentration.

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8 Appendix

Table 0: Definition of variables

Variable	Definition
$Adv.Intensity$	Advertising Intensity: global selling expenses divided by global revenue
$Adv.Intensity^2$	The square of $Adv.Intensity$
$Profitability$	EBITDA* Margin percentage
$Employees$	The number of full-time and part-time employees of a firm
$Debt$	The amount of debt a firm owes for a long term, in thousands of USD
ROA	Net return on Assets: the percentage of profitability of a firm's assets
$Investment$	Total investment a firm holds, in thousands of USD
$Receivables$	Present and future receivables from trade, in thousands of USD
$Inventories$	The stocks a firm holds, in thousands of USD
CR	The Canadian-top4 ratio of a firm's revenue to the sector's revenue
HH	The sum of revenue ratios from goods, manufacturing value added and employment in the sector
CR^2 and HH^2	The respective square terms of CR and HH

Note: * EBITDA stands for Earnings Before Interest, Taxes, Depreciation, and Amortization. CR, HH and their respective square terms are obtained from Odesi at https://search2.odesi.ca. All other variables are obtained from Mergent Online at https://www.mergentonline.com/login.php.

Table 1: Desciptive Statistics

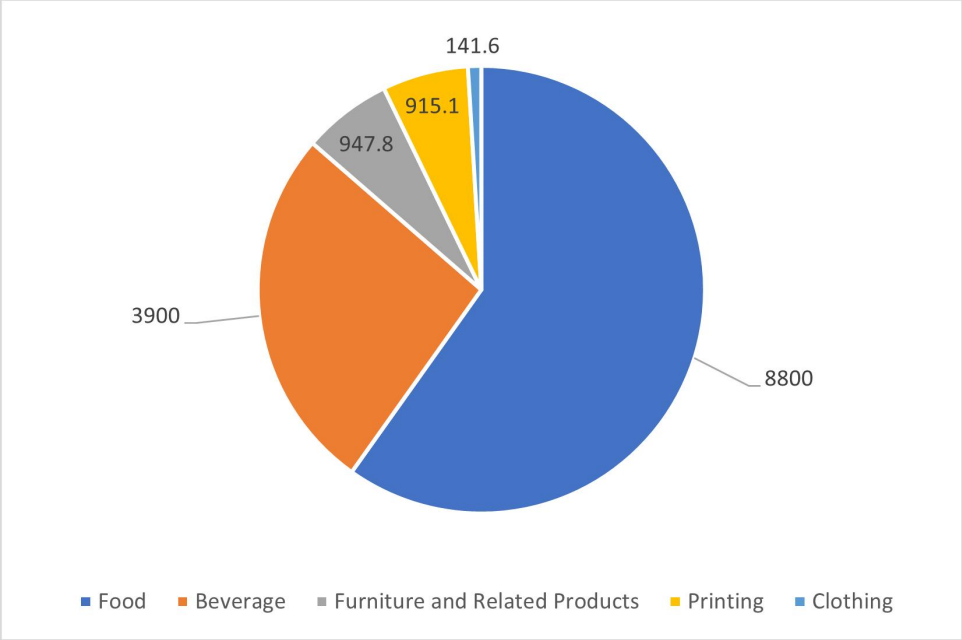
	Pooled Industry		Consumer Goods Industry		Producer Goods Industry	
	2007	2009	2007	2009	2007	2009
Variable	Mean					
Adv.Intensity	0.19	0.23	0.25	0.24	0.12	0.22
	(0.24)	(0.28)	(0.25)	(0.21)	(0.22)	(0.33)
$Adv.Intensity^2$	-	0.13	-	0.10	-	0.15
	(-)	(0.27)	(-)	(0.20)	(-)	(0.32)
$Profitability$	14.70	13.02	14.75	11.92	14.66	14.11
	(9.12)	(9.29)	(6.25)	(7.38)	(11.42)	(10.89)
Employees	53927.55	499884.18	57933.97	53914.77	49921.13	45853.60
	(88011.94)	(82282.65)	(80267.82)	(75264.92)	(96349.25)	(89869.80)
Debt	3600206	9641581	2578848	2894018.53	4621564	16389144
	(5440971)	(43739961)	(3236600)	(3047210.22)	(6898935)	(61553680)
ROA	8.45	6.29	9.35	7.25	7.55	5.33
	(5.61)	(5.08)	(5.06)	(4.79)	(6.05)	(5.26)
Investment	6203692	12825369	4312945	10774070.57	8094439	14876667
	(12101112)	(15297749)	(10620030)	(13778337)	(13331989)	(16660237)
Receivables	2858551	2357879	1291226	1154242.73	4425877	3561514
	(5630139)	(4259685)	(1542072)	(1651872)	(7551793)	(5584751)
Inventories	2177118	2250616	2174948	1889418.97	2179287	2611813
	(3113389)	(3467105)	(3233837)	(2722371)	(3043505)	(4095720)
CR	0.30	0.30	0.25	0.25	0.34	0.34
	(0.20)	(0.21)	(0.20)	(0.20)	(0.20)	(0.21)
CR^2	0.13	0.13	0.10	0.10	0.15	0.16
	(0.15)	(0.17)	(0.15)	(0.15)	(0.15)	(0.18)
HH	0.11	0.11	0.10	0.10	0.13	0.13
	(0.12)	(0.12)	(0.13)	(0.13)	(0.12)	(0.12)
HH^2	0.03	0.03	0.03	0.03	0.03	0.03
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)
Number of observations	30					

Note: Adv.Intensity denotes advertising Intensity, *Employees* denotes the number of employees, *Debt* denotes long-term debt, *Investment* denotes total investment, *Receivables* denotes trade receivables. '-' indicate the data entry is not applicable since only Advertising-Concentration Relationship is estimated in 2007. Standard deviations are in parentheses. All numbers are corrected to two decimal places except for *Debt*, *Investment*, *Receivables* and *Inventories*.

Table 2: Details of Firms

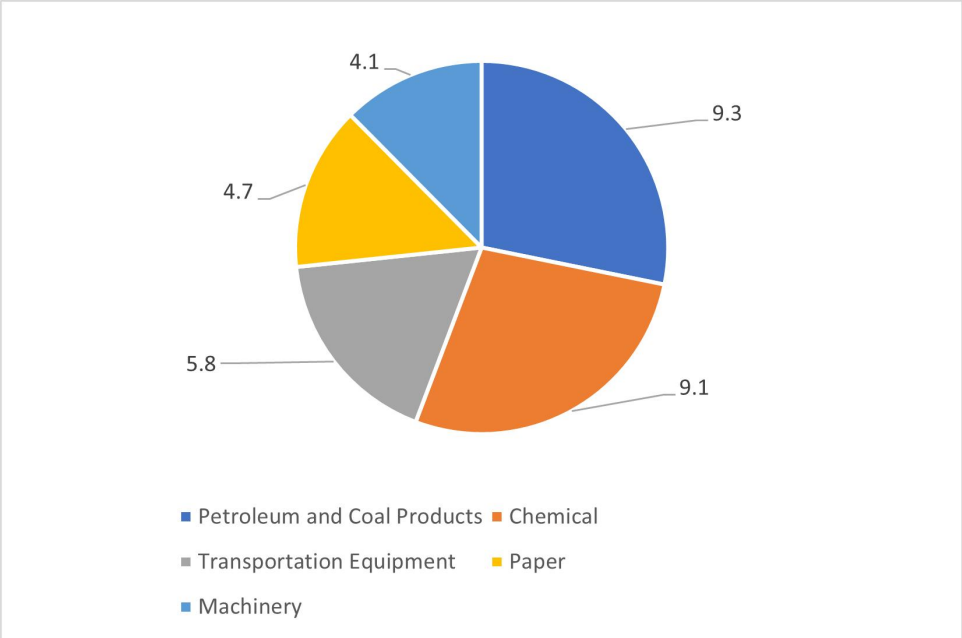
Consumer Goods Industry:			Producer Goods Industry:		
Sector	Firm	Base	Sector	Firm	Base
Food	Archer Daniels Midland Co	US	Machinery	Canadian Solar	Canada
	Bunge Ltd	US		Applied Materials Inc	US
	George Weston Ltd	Canada		Catepillar Inc	US
	Tyson Foods Inc	US		Cummins Inc	US
	General Mills Inc	US		Deere and Co	US
	Saputo Inc	Canada		General Electric Co	US
Beverage	PepsiCo Inc	US	Paper	Mercer International Inc	Canada
	The Coca Cola Co	US		Resolute Forest Products Inc	Canada
	Altria Group Inc	US		Verso Corp	US
	Keurig Dr Pepper	US		Domtar Corp	Canada
	Constellation Brands Inc	US		International Paper	US
	Molson Coors Canada Inc	Canada		Clearwater Paper Corp	US
Furniture and Related Products	Home Depot Inc	US	Petroleum and Coal Products	Valero Energy Corp	US
	Lowes Co Inc	Canada		Phillips 66	US
	Best Buy Co	US		HollyFrontier Corp	US
	Sherwin Williams	US		Marathon Petroleum Corp	US
	BMTC Group	Canada		Delek US Holdings Inc	US
	Leons Furniture Ltd	Canada		Imperial Oil Ltd	Canada
Printing	RR Donnelley and Sons Co	US	Chemical	Cenovus Energy Inc	Canada
	Transcontinental Inc	Canada		Chevron Corp	US
	PVH Corp	US		Exxxon Mobil Corp	US
	Quad/Graphics Inc	US		Suncor Energy Inc	Canada
	Deluxe Corp	US		Canadian Natural Resources Ltd	Canada
	ARC Document Solutions Inc	US		Keyera Corp	Canada
Clothing	VF Corp	US	Transportation Equipment	World Fuel Services Corp	US
	Hanesbrands Inc	US		Air Canada	Canada
	Levi Strauss and Co	US		Canadian Pacific Railway Ltd	Canada
	Gildan Activewear Inc	Canada		TFI International	Canada
	Under Armour	US		United Parcel Service Inc	US
	Ennis Inc	US		FedEx Corp	US
Number of firms: 30			Number of firms: 30		

Figure 1: Top 5 Consumer Goods Sectors, by Net Revenue as of 2018 (in Millions)



Note: These sectors are selected based on net revenue in 2018, where the data is obtained from the Canadian Industry Statistics website: https://www.ic.gc.ca/app/scr/app/cis/search-recherche?lang=eng. Then, six leading companies in each sector are selected based on the sector's sales data from Factiva: https://visit.dowjones.com/factiva/lp/dg/factiva.

Figure 2: Top 5 Producer Goods Sectors, by Net Revenue as of 2018 (in Billions)



Note: These sectors are selected based on net revenue in 2018, where the data is obtained from the Canadian Industry Statistics website: https://www.ic.gc.ca/app/scr/app/cis/search-recherche?lang=eng. Then, six leading companies in each sector are selected based on the sector's sales data from Factiva: https://visit.dowjones.com/factiva/lp/dg/factiva.

Figure 3: Example of an Inverted U shape

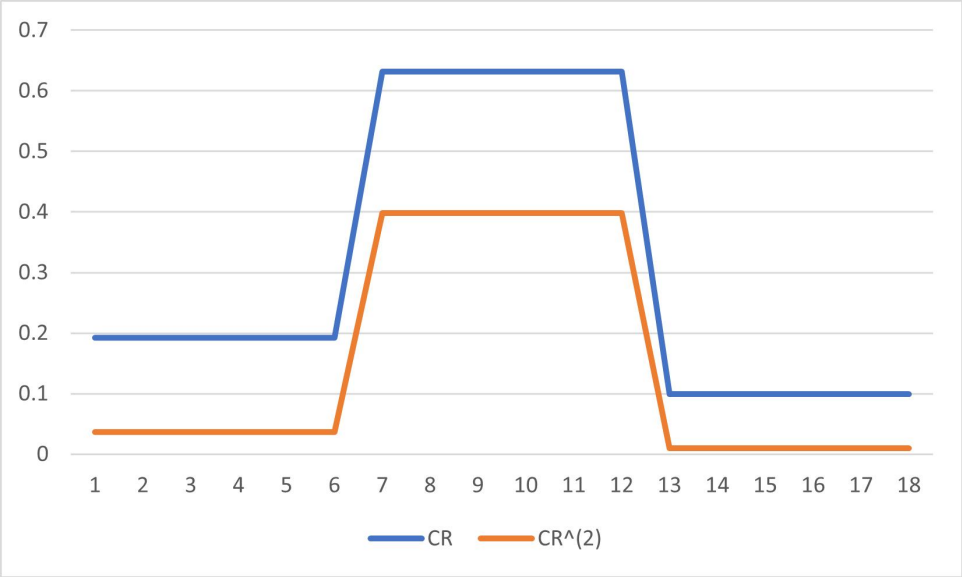


Figure 4: Example of a lazy J shape

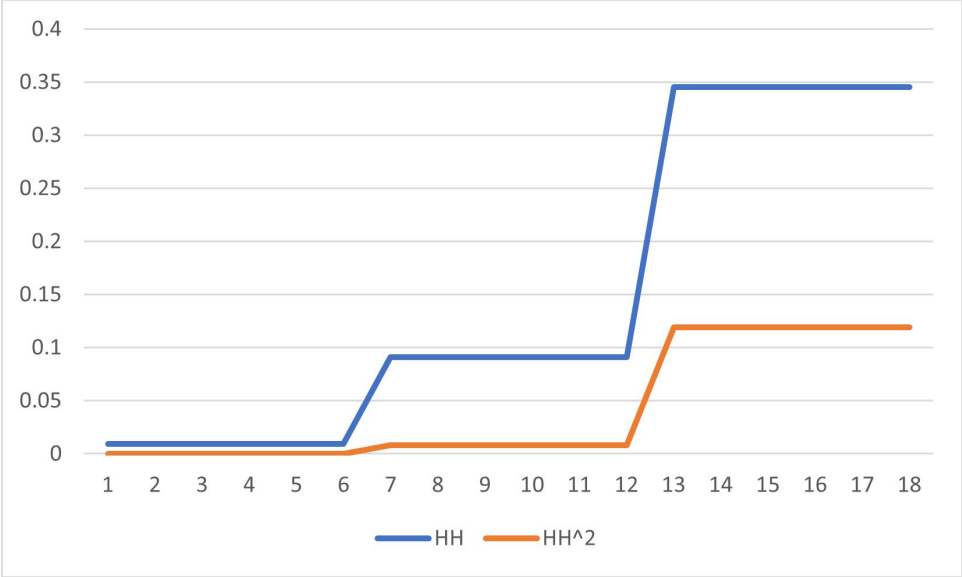


Table 3: Estimation of Advertising-Concentration Relationship

Dependent variable: *Adv.Intensity* in 2009			
Variable	Pooled Industry	Consumer Goods Industry	Producer Goods Industry
Profitability	$-6.4e^{5}$	0.0016	-0.00062
	(0.0041)	(0.0062)	(0.0057)
Employees	$1.2e^{-6}$	$4.6e^{-7}$	$5.8e^{-6}$
	$(7.7e^{-7})$	$(7.8e^{-7})$	$(2.0e^{-6})$*
Debt	$2.2e^{-9}$	$-1.2e^{-8}$	$5.6e^{-10}$
	$(9.9e^{-10})$*	$(2.1e^{-8})$	$(1.4e^{-9})$
ROA	0.021	0.038	0.020
	(0.0066)**	(0.0092)**	(0.010)
Investment	$-2.1e^{-9}$	$-7.8e^{-9}$	$2.2e^{-9}$
	$(2.7e^{-9})$	$(4.8e^{-9})$	$(3.9e^{-9})$
Receivables	$-1.2e^{-9}$	$-6.1e^{-8}$	$3.5e^{-9}$
	$(1.1e^{-8})$	$(2.9e^{-8})$*	$(1.5e^{-8})$
Inventories	$-2.3e^{-9}$	$4.0e^{-8}$	$-9.5e^{-8}$
	$(2.1e^{-8})$	$(2.9e^{-8})$	$(4.7e^{-8})$
CR	1.1	2.3	0.26
	(0.78)	(1.2)	(1.3)
CR^2	-1.5	-2.8	-0.41
	(1.0)	(1.6)	(1.7)
Constant	-0.051	-0.28	0.024
	(0.12)	(0.20)	(0.21)
Number of observations	60	30	30
R Square	0.38	0.56	0.59
Adjusted R Square	0.27	0.37	0.41
s.e.e.	0.23	0.17	0.25

Note: Adv.Intensity denotes advertising Intensity, *Employees* denotes the number of employees, *Debt* denotes long-term debt, *Investment* denotes total investment, *Receivables* denotes trade receivables. Standard errors are in parentheses. * and ** indicate the estimates are significant at 0.95 and 0.99 confidence levels respectively. All numbers are corrected to two significant figures.

Table 4: Estimation of Advertising-Concentration Relationship

Dependent variable: *Adv.Intensity* in 2009			
Variable	Pooled Industry	Consumer Goods Industry	Producer Goods Industry
Profitability	0.00095	0.0014	0.00011
	(0.0039)	(0.0061)	(0.0055)
Employees	$1.2e^{-6}$	$5.0e^{-7}$	$6.2e^{-6}$
	$(7.7e^{-7})$	$(7.7e^{-7})$	$(2.1e^{-6})$*
Debt	$2.1e^{-9}$	$-1.4e^{-8}$	$2.2e^{-10}$
	$(9.7e^{-10})$*	$(2.1e^{-8})$	$(1.3e^{-9})$
ROA	0.021	0.041	0.021
	(0.0067)*	(0.0097)**	(0.010)*
Investment	$-2.1e^{-9}$	$-8.3e^{-9}$	$1.6e^{-9}$
	$(2.8e^{-9})$	$(4.8e^{-9})$	$(3.8e^{-9})$
Receivables	$-1.0e^{-8}$	$-6.7e^{-8}$	$4.9e^{-9}$
	$(1.1e^{-8})$	$(3.0e^{-8})$*	$(1.5e^{-8})$
Inventories	$-4.2e^{-9}$	$4.9e^{-8}$	$-1.0e^{-7}$
	$(2.1e^{-8})$	$(3.0e^{-8})$	$(4.8e^{-8})$*
HH	1.5	6.1	-0.71
	(1.3)	(2.9)*	(2.2)
HH^2	-4.7	-15	1.5
	(3.7)	(7.4)	(6.3)
Constant	0.020	-0.21	0.084
	(0.087)	(0.15)	(0.15)
Number of observations	60	30	30
R Square	0.38	0.57	0.58
Adjusted R Square	0.27	0.38	0.39
s.e.e.	0.24	0.17	0.17

Note: Adv.Intensity denotes advertising Intensity, *Employees* denotes the number of employees, *Debt* denotes long-term debt, *Investment* denotes total investment, *Receivables* denotes trade receivables. Standard errors are in parentheses. * and ** indicate the estimates are significant at 0.95 and 0.99 confidence levels respectively. All numbers are corrected to two significant figures.

Table 5: Estimation of Concentration-Advertising Relationship

Dependent variable: Concentration Ratio (CR) in 2009			
Variable	Pooled Industry	Consumer Goods Industry	Producer Goods Industry
$Adv.Intensity$	-0.69	0.41	-1.8
	(0.45)	(0.53)	(0.97)
$Adv.Intensity^2$	0.69	-0.29	1.9
	(0.45)	(0.57)	(1.0)
$Profitability$	-0.00019	0.0055	-0.0020
	(0.0034)	(0.0062)	(0.0049)
$Employees$	$-1.5e^{-7}$	$-7.4e^{-7}$	$-1.6e^{-6}$
	$(7.1e^{-7})$	$(7.6e^{-7})$	$(1.9e^{-6})$
$Debt$	$-1.7e^{-10}$	$1.9e^{-8}$	$-3.1e^{-10}$
	$(8.5e^{-10})$	$(1.8e^{-8})$	$(9.1e^{-10})$
ROA	0.0011	-0.011	-0.0026
	(0.0062)	(0.0089)	(0.0099)
$Investment$	$5.1e^{-9}$	$8.5e^{-9}$	$5.7e^{-10}$
	$(2.2e^{-9})$*	$(4.2e^{-9})$	$(3.0e^{-9})$
$Receivables$	$-4.2e^{-9}$	$3.6e^{-8}$	$-1.5e^{-8}$
	$(9.8e^{-9})$	$(2.5e^{-8})$	$(1.2e^{-8})$
$Inventories$	$-8.8e^{-9}$	$-3.7e^{-8}$	$3.8e^{-8}$
	$(1.8e^{-8})$	$(2.4e^{-8})$	$(4.3e^{-8})$
Constant	0.33	0.12	0.51
	(0.066)**	(0.080)	(0.088)**
Number of observations	60	30	30
R Square	0.17	0.62	0.34
Adjusted R Square	0.025	0.44	0.041
s.e.e.	0.21	0.15	0.21

Note: *Adv.Intensity* denotes advertising Intensity, *Employees* denotes the number of employees, *Debt* denotes long-term debt, *Investment* denotes total investment, *Receivables* denotes trade receivables. Standard errors are in parentheses. * and ** indicate the estimates are significant at 0.95 and 0.99 confidence levels respectively. All numbers are corrected to two significant figures.

Table 6: Estimation of Concentration-Advertising Relationship

Dependent variable: Herfindahl Indexes (HH) in 2009			
Variable	Pooled Industry	Consumer Goods Industry	Producer Goods Industry
Adv.Intensity	-0.28	0.34	-0.95
	(0.26)	(0.34)	(0.51)
$Adv.Intensity^2$	0.25	-0.31	0.99
	(0.26)	(0.37)	(0.54)
$Profitability$	-0.00070	0.0029	-0.0017
	(0.0029)	(0.0039)	(0.0026)
Employees	$-9.9e^{-8}$	$-5.4e^{-7}$	$-9.6e^{-7}$
	$(4.1e^{-7})$	$(4.9e^{-7})$	$(1.0e^{-6})$
Debt	$1.5e^{-10}$	$1.2e^{-8}$	$3.7e^{-11}$
	$(4.9e^{-10})$	$(1.1e^{-8})$	$(4.8e^{-10})$
ROA	0.0023	-0.0039	-0.00091
	(0.0035)	(0.0057)*	(0.0052)
Investment	$3.3e^{-9}$	$5.4e^{-9}$	$6.0e^{-10}$
	$(1.3e^{-9})$*	$(2.7e^{-9})$	$(1.6e^{-9})$
Receivables	$-3.5e^{-9}$	$1.9e^{-8}$	$-9.2e^{-9}$
	$(5.7e^{-9})$	$(1.6e^{-8})$	$(6.4e^{-9})$
Inventories	$-5.3e^{-9}$	$-2.0e^{-8}$	$2.2e^{-8}$
	$(1.1e^{-8})$	$(1.5e^{-8})$	$(2.3e^{-8})$
Constant	0.12	-0.0041	0.22
	(0.038)*	(0.052)	(0.046)**
Number of observations	60	30	30
R Square	0.18	0.60	0.37
Adjusted R Square	0.027	0.42	0.092
s.e.e.	0.12	0.097	0.11

Note: Adv.Intensity denotes advertising Intensity, *Employees* denotes the number of employees, *Debt* denotes long-term debt, *Investment* denotes total investment, *Receivables* denotes trade receivables. Standard errors are in parentheses. * and ** indicate the estimates are significant at 0.95 and 0.99 confidence levels respectively. All numbers are corrected to two significant figures.

Table 7: Estimation of Advertising-Concentration Relationship

Dependent variable: *Adv.Intensity* in 2007			
Variable	Pooled Industry	Consumer Goods Industry	Producer Goods Industry
Profitability	-0.027 (0.0099)*	-0.027 (0.0099)*	0.0041 (0.0053)
Employees	$8.2e^{-7}$ $(8.9e^{-7})$	$8.2e^{-7}$ $(8.9e^{-7})$	$8.7e^{-7}$ $(7.8e^{-7})$
Debt	$8.2e^{-8}$ $(3.9e^{-8})$*	$8.2e^{-8}$ $(3.9e^{-8})$*	$-3.1e^{-8}$ $(1.8e^{-8})$
ROA	0.041 (0.013)**	0.041 (0.013)**	0.0042 (0.011)
Investment	$-9.3e^{-9}$ $(6.6e^{-9})$	$-9.3e^{-9}$ $(6.6e^{-9})$	$3.0e^{-9}$ $(5.6e^{-9})$
Receivables	$-6.5e^{-8}$ $(4.4e^{-8})$	$-6.5e^{-8}$ $(4.4e^{-8})$	$-3.6e^{-8}$ $(1.8e^{-8})$
Inventories	$-7.8e^{-8}$ $(4.0e^{-8})$	$-7.8e^{-8}$ $(4.0e^{-8})$	$1.1e^{-7}$ $(5.2e^{-8})$*
CR	2.8 (1.5)	2.8 (1.5)	1.9 (1.2)
CR^2	-3.3 (2.0)	-3.3 (2.0)	-2.9 (1.7)
Constant	-0.077 (0.25)	-0.077 (0.25)	-0.18 (0.22)
Number of observations	60	30	30
R Square	0.45	0.45	0.29
Adjusted R Square	0.20	0.20	-0.027
s.e.e.	0.23	0.23	0.23

Note: Adv.Intensity denotes advertising Intensity, *Employees* denotes the number of employees, *Debt* denotes long-term debt, *Investment* denotes total investment, *Receivables* denotes trade receivables. Standard errors are in parentheses. * and ** indicate the estimates are significant at 0.95 and 0.99 confidence levels respectively. All numbers are corrected to two significant figures.

Table 8: Estimation of Advertising-Concentration Relationship

Dependent variable: *Adv.Intensity* in 2007			
Variable	Pooled Industry	Consumer Goods Industry	Producer Goods Industry
Profitability	-0.027 (0.010)*	-0.027 (0.010)*	0.0046 (0.0055)
Employees	$8.7e^{-7}$ $(9.0e^{-7})$	$8.7e^{-7}$ $(9.0e^{-7})$	$8.8e^{-7}$ $(8.0e^{-7})$
Debt	$7.9e^{-8}$ $(3.9e^{-8})$	$7.9e^{-8}$ $(3.9e^{-8})$	$-3.2e^{-8}$ $(1.8e^{-8})$
ROA	0.040 (0.013)**	0.040 (0.013)**	0.0022 (0.011)
Investment	$-9.1e^{-9}$ $(6.6e^{-9})$	$-9.1e^{-9}$ $(6.6e^{-9})$	$3.6e^{-9}$ $(5.9e^{-9})$
Receivables	$-6.6e^{-8}$ $(4.5e^{-8})$	$-6.6e^{-8}$ $(4.5e^{-8})$	$-3.0e^{-8}$ $(1.7e^{-8})$
Inventories	$-7.5e^{-8}$ $(4.1e^{-8})$	$-7.5e^{-8}$ $(4.1e^{-8})$	$9.1e^{-8}$ $(5.1e^{-8})$
HH	7.2 (4.2)	7.2 (4.2)	1.6 (2.0)
HH^2	-18 (11)	-17 (11)	-6.0 (5.5)
Constant	0.051 (0.20)	0.051 (0.20)	0.017 (0.16)
Number of observations	60	30	30
R Square	0.43	0.43	0.25
Adjusted R Square	0.18	0.18	-0.085
s.e.e.	0.23	0.23	0.23

Note: Adv.Intensity denotes advertising Intensity, *Employees* denotes the number of employees, *Debt* denotes long-term debt, *Investment* denotes total investment, *Receivables* denotes trade receivables. Standard errors are in parentheses. * and ** indicate the estimates are significant at 0.95 and 0.99 confidence levels respectively. All numbers are corrected to two significant figures.