The Relationship between Advertising and Consumption

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Abstract

This paper investigates the relationship between advertising and consumption with panel data at the industry level for some European countries. At the macroeconomic level, consumption can increase only if saving decreases. However, the competition effect of advertising is better captured at the industry level, which allows for interaction between firms. We explore possible relationships with a unique dataset of consumption and advertising spending in 27 sectors across 9 years for 5 European Union countries. Our results show that consumption has a significant influence on advertising, but the reverse does not apply. Our findings also suggest that business stealing is the dominant effect of advertising relative to consumption increasing.

Keywords: consumption, advertising, panel data, media

JEL Codes: M37, E21, L11, L2, L8

1 Introduction

In modern society, advertising has become an industry with great significance. On a global basis, advertising spending has maintained an increasing trend in recent years: 504 billion in

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2016, followed by 590 billion in 2018 and up to 732 in 2021, with only a minor slowdown in 2020 due to the pandemic. In many countries, advertising represents a share between 0.5% and 1% of GDP.

This increasing trend is mainly due to the rise of advertising spending in Asian countries such as China and India. In 2021, the leading country in advertising spending was the United States, with 284 billion US dollars, followed by China and Japan.

Firms spend on advertising because they believe that providing information on a product through advertising can promote the sales of that product's consumption by providing information on the product and persuading customers to purchase it (Elliott 2004).[1] This is particularly true from a micro-level perspective for a specific brand, while at the aggregate level, the relationship is more uncertain. Advertising can increase sales through different channels that reflect the different views of advertising. It can persuade consumers to buy a product by influencing and changing consumer preferences and therefore shifting the demand curve to the right. Advertising can have an informative role and lower search and transaction costs for consumers. Finally, a business stealing effect can emerge if advertising primarily moves sales from one brand to another.

The narrower the framework of analysis is, the stronger the perceived effect of market expansion becomes. If a single product is considered, the eventual market share effect is captured by consumer demand expansion. However, our results show that at the industry level, the market expansion effect disappears and the increase in the consumption of advertised products occurs mainly at expenses of other products in the same category or sector. On the other hand, when adopting a macroeconomic perspective, in the whole economy, if a product gains market share at the expense of other products, all replacement effects are cancelled, leaving only a possible role of global demand expansion that is more difficult to obtain.

Various studies have shown a positive relationship between consumption and advertising

[1] Elliott (2004) provided a recent theoretical analysis on advertising spending and quality produced in equilibrium.

from both macro- and micro-level perspectives. Even from statistics for the United States for 1950-1960, we observe that total advertising increased as the economy was expanding and decreased when the economy was contracting (Simon (1970)). Analysing US data from 1900 and 2007, Hu and Sanyal (2006) find that at the aggregate level, co-integration analysis shows that as GDP increases, it causes advertisement spending to increase faster than its own growth. Similar results were obtained for Germany after 2001 (Lischka, Kienzler and Mellman, 2014) and for China (Chan-Olmsted, Su, 2017).

However, the debate over whether advertisements influence consumption or whether consumption influences advertisements still has not yielded unambiguous answers. Theoretically, both causality narratives make sense: consumers purchase more of a brand of good because the brand advertises more, which draws more attention from consumers and increases consumers' willingness to purchase the product fixing price constant; on the other hand, it may be the case that consumption causes advertisement because brands (or industries) consumed more can give producers more incentive to advertise these products (or industries). Firm-level data show that firms often make their advertising budgets based on the sales of their products (Kotler (1976) and Schmalensee (1972)). Therefore, the empirical analysis of the effect of advertising on consumption may yield a mixed effect of advertising plus consumption on consumption (Siegel, Ross, Albers, et al. 2016). Misleading results on the effect of advertising on consumption may cause firms to develop unsuitable advertising strategies and governments to create misleading policies encouraging or discouraging firms' advertising.

Economics and management use different perspectives and methodologies to research this issue. In management and microeconomics methods, advertising cost is viewed as a selling cost and can be redistributed across firms in an industry without influencing the total market size. The management perspective mainly focuses on consumers' behaviour and argues that advertising increases consumption because it changes consumers' preferences. However, evidence has shown that advertising may impact total demand in a dynamic way (Molinari and Turino, 2009). Rather than analysing firm-level data, macroeconomists usually use

time series data on consumption and advertisement spending in one or several countries to analyse whether advertising spending has a positive effect on consumption. The empirical results given in Esteve and Requena (2006) show that macroeconomic structure could have a significant impact on the effect of firms' advertising. Therefore, the effect of advertising on the scale of the economy should be taken into consideration, since the effect is observed from an aggregate perspective.

The extant literature on the relationship between consumption and advertising dates back to the 1960s (Blank (1962)). Most of the literature from this period does not use formal models or hypothesis testing (Simon (1970) and Schmalensee (1972)). Microeconomics theories such as Becker and Murphy's (1993) model advertising as a way to change the elasticity of a product, thus persuading consumers to purchase more even at a high price. Erdem, Keane and Sun (2006) use microdata from different TV brands and set microeconomics models to analyse how advertising changes consumer demand for a brand. However, to our knowledge, empirical papers using microdata use data from one type or brand of good, which lacks representativeness of the whole marketplace. The large body of literature also explores the effects on prices (Rauch, 2013) and market value (Garcia-Zambrino, Rodriguez, Garcia-Merino, 2018) and the possible relationship with economic development (van der Wurff, Bakker Picard, 2008). Driver (2017) reviews the different possible economic effects of advertising.

The representative macroeconomic literature includes Ashley, Granger and Schmalensee (1980), who test causality between advertising and consumption. Regarding the topic of advertising, the literature discusses the substitutability of different types of advertising media and the effect of advertising on the growth of industry and the whole economy. Most of the papers on this topic, however, use data from a single country or industry, which indicates an important limitation. That is, the absence of sector-level data may lead to difficulty in disentangling the effects of advertising and competition among different industries. For example, vehicles and public transportation are substitutes to some degree.

Therefore, increasing the purchasing of vehicles will lead to a decrease in public transportation, holding other factors constant. As a result, when the advertising of both industries changes, when we have only country-level data rather than industry-level data, we are not able to measure whether the change in total consumption in a country is driven by the change in advertising inputs or by the interaction of the consumption of different industries. To examine the mutual influences of advertising and consumption, this paper uses a rich dataset from five European countries.

Our data include 27 industry sectors that represent the whole economy so that we can capture both the macroeconomics effect on consumption and the competitive dimension of a specific industry. To our knowledge, this is the first paper to explore the relationship between advertising and consumption while maintaining the industry dimension in which competitive choice as advertising investment is effectively taken. With respect to our dataset, the main differences of our paper from the extant literature are as follows. First, we use time series data not only for different countries across years but also for different sectors within each country across years. We take into account two important factors, namely, interactions among industries and differences across countries. Second, our dataset contains the macroeconomic variables of each country for each year, such as GDP, purchasing power and the lending rate, allowing us to control macro-level variables that may have an impact on consumption and/or advertising. Both of these points significantly increase the credibility of our results relative to those of other literature.

Our results show that consumption drives advertising, while the reverse does not apply. Past years' consumption has a significant effect on the present year's advertising spending when taking into account macro-level economic conditions and country fixed effects. This finding seems to confirm the common management practice of fixing the advertising budget as a share of sales in past years. On the other hand, past years' advertising spending has insignificant effects on consumption at the sector level. This means that the effect of advertising operates mainly within a certain category of consumption, moving expenses between

brands and possibly shifting consumption between neighbouring categories. The results are robust to changes in sectors and countries, which provides evidence that consumption plays a more important role in driving advertising. Certain sectors may have complementary or substitute relationships. Theoretically, such relationships are displayed more obviously in terms of consumption, yet no theory or empirical evidence shows that such relationships drive advertising directly. Moreover, there is no strong evidence showing that the integration of EU countries and the difference in industrial structures among those countries significantly affect advertising.

There are many interactions between advertising and consumption, and therefore, an obvious problem of endogeneity can emerge. The nature of our data does not allow us to use instrumental variables or natural experiments. However, we can mitigate the endogeneity in several ways. While it is true that decisions regarding advertising and consumption can be correlated, we note that such decisions are made by different agents at different times. Usually, advertising is purchased and planned months in advance. We use a panel approach with three dimensions (time, industries and country), and we use other country or other sector dimensions to mitigate the possible endogeneity. Finally, we try to correct endogeneity with Arellano–Bond panel estimation.

The remainder of the paper is organized as follows. Section 2 describes the dataset we use, presents summary statistics and discusses their advantages. Section 3 sets up the model employed and presents our methodology. Section 4 presents the empirical results of our analysis. Section 5 discusses the results and their implications for firms and policy-makers. Section 6 concludes.

2 Data description and summary statistics

To answer our research questions, we collected core data about advertising and consumption at the industry level. Data on consumption were obtained from Eurostat and include the

consumption of 27 sectors of five European countries (France, Germany, Italy, Spain and the UK) from 1998 to 2006. Data for advertising were obtained from Nielsen Media Research and cover advertising spending for mainstream media: television radio, newspaper magazine, outdoor, cinema and internet outlets. Using time series data for each sector of each country provides us with advantages over other empirical papers by allowing us to control for relationships between consumption in different sectors, such as complementary or substitute relationships.

Macroeconomic variables for each year for each of the countries in our dataset were collected from Eurostat. These variables include the price index, the deposit rate, household consumption, GDP, government expenditures, the inflation rate and household consumption. Since customers' consumption behaviour and entrepreneurs' advertising behaviour depend heavily on macroeconomic conditions, their behaviours will impact macroeconomic conditions. As a result, controlling for macroeconomic variables will reduce omitting variable bias in our estimations.

Following different market conditions, advertising data are collected net of discounts for Italy and the United Kingdom, while for France, Spain and Germany, they are available only gross at list prices. We estimated average discounts by media to convert gross data in net data using IREP net figures by media for France. For Spain, Publiespana provided us with the average discount by media source and year, and for Germany, we used both ZAW and European Advertising and Media Forecast figures to obtain average discounts.

The use of net data is important because in advertising markets, discounts are widely used at different levels to deal with demand seasonality and to manage robust first-degree price discrimination. This is possible because contracts do not allow arbitrage, and each purchase is made on behalf of a specific client.

Eurostat organizes data consumption following the Classification Of Individual Consumption by Purpose (COICoP), which covers 47 categories at the 3-digit level. Nielsen uses a proprietary sector classification widely accepted in the advertising industry that is more gran-

ular than the COICoP and that we used to reconcile advertising figures with consumption figures since the two sources do not use the same taxonomy.

For some consumption sectors, no advertising figures are available, such as those for secondary education, actual rentals for housing, postal services, prostitution, primary education, narcotics, and tobacco. Therefore, we excluded these sectors from the consumption figures.

We omitted some minor advertising categories that are addressed to the professional sector and that do not find correspondence in consumption figures such as professional services, machinery, information technologies and institutions. Overall, these sectors represent 8% of advertising spending, leaving our coverage quite broad.

For some important advertising sectors, there are no consumption data in Eurostat, and we estimate turnover using other sources. In some cases, as in banking and retail, there are unrealistic consumption figures. Therefore, to maintain comparability with sectors, we collected data on figurative turnover.

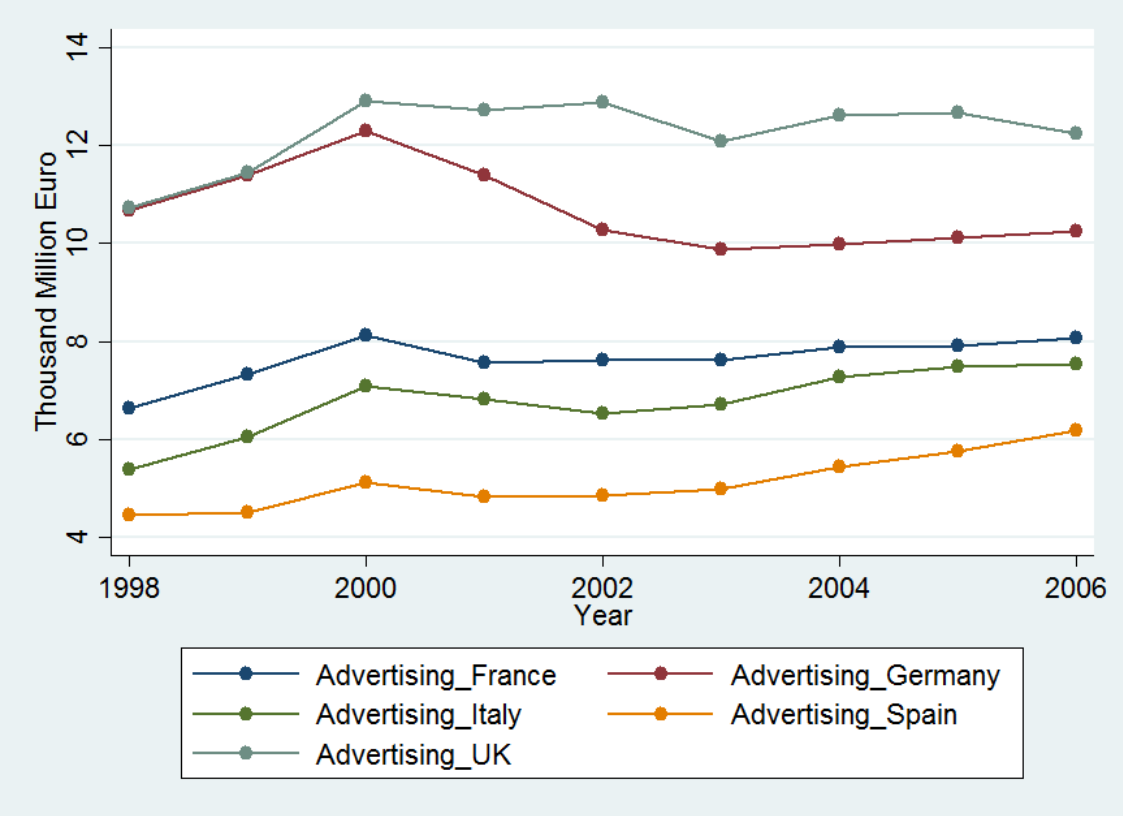
For telecommunications, we used figures from the European IT Observatory. For banking, turnover can be approximated by the banking intermediation margin, which includes the net balance of interest income and expenses and all commercial revenues for services and commissions. For retail, we used the difference between sales and the cost of sales approximated by value added in retail published by Eurostat. For insurance, turnover is the sum of premiums paid by clients.

In all four sectors, there is a lack of homogeneity with Eurostat consumption figures, and the data we used also include some money paid by companies that are outside the scope of final consumption. However, we choose to focus our attention on figures that represent the actual turnover of the industry that invests in advertising.

Ultimately, we obtain 27 sectors with homogeneous data on advertising and turnover. These sectors represent an average of 94% of total advertising spending.

The two parts of the data are merged together. An observation is for a sector of a country

Figure 1: *Advertising for 5 EU Countries from 1998 to 2006*



in a given year. We observe advertising from each media source on a given sector in a given country and year, its consumption, and the macroeconomic condition of the country in the given year. Note that by construction, all sectors in a country in the same year take the same value for the macroeconomic variables.

Figure 1 shows the trend of total advertising spending in the five EU countries from 1998 to 2006. From 1998 to 2000, in each of the five countries, advertising increased. However, after 2000, there was a brief 2- to 3-year decrease before a steady increase. Therefore, we observe a "peak" in advertising spending in 2000 for all 5 countries. This phenomenon can be explained by the fact that the new millennium provided a great incentive for entrepreneurs to increase their advertising and, second, by the fact that after the internet bubble, there was a sharp decrease in advertising spending. Another possible explanation is that the drop of 2001 related to the dotcom bubble contributed the 2000 peak.

Figure 2: *Consumption for 5 EU countries from 1998 to 2006*

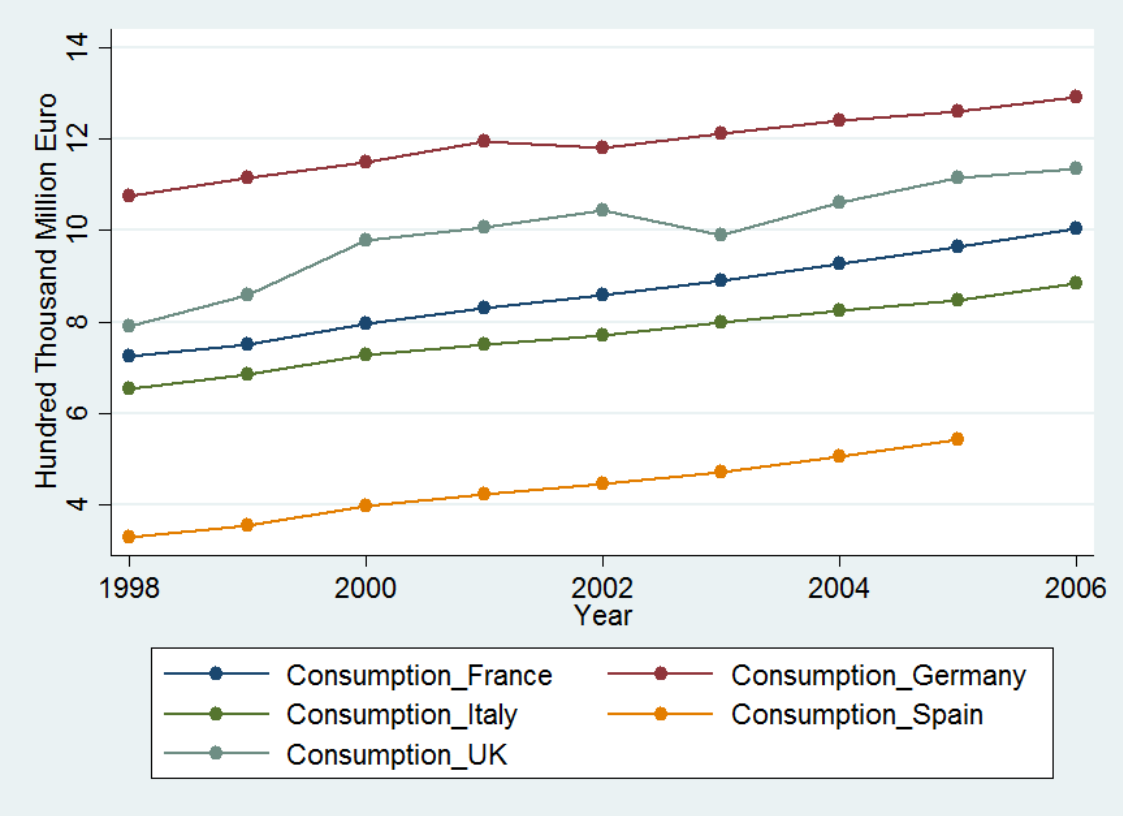


Figure 2 displays the trend of total consumption in the 5 EU countries from 1998 to 2006.[2] Here, we do not observe such a "peak" in consumption in 2000. In general, total consumption spending is increasing for all 5 countries with minor fluctuations. Therefore, we find little evidence that the new millennium provides a special incentive for consumption because the growth of the world economy was generally persistent over the 9 years, creating a relatively stable impetus for growth in consumption. Henceforth, 2000 can be used as a "special break" for our analysis because trends approaching 2000 are independent of consumption, creating a greater incentive for advertising spending than for consumption. However, in the two to three years after 2000, there was not as strong an incentive as for the period from 1998 to 2000, so comparing the results using data for before and after 2000 offers us some insight into the effect of advertising on consumption.

[2]Data for consumption in Spain in year 2006 is missing.

Advertising intensity can be measured as the share of advertising on turnover and at the industry level on consumption. Advertising intensity varies greatly by sector, as shown in Table 1. In Table 1, each cell denotes the average advertising intensity for a sector in a country over the 9 years. Each row represents a sector, and each column represents a country. The last row shows the average advertising intensity for a certain country, and the last column shows the average advertising intensity for a certain sector.

There is a minimum level for fuels, catering services, insurance and footwear, all under 0.5% on sales, and some sectors with advertising over 2% on sales such as the personal care, soft drinks and automotive industries. A possible explanation for a low level of advertising is that in a sector such as clothing, a large proportion of sales is made for unbranded products without advertising. Consequently, the more brand strategies gain space, the more advertising intensity grows. Another factor that can explain differences in advertising intensity is the structure and concentration of retailing, at least for industries whose sales go through independent retail organizations. Large retailers with important market share exert significant countervailing power over producing firms, and a possible answer is an increase in advertising expenses to increase brand loyalty relative to store loyalty.

Advertising intensity also varies by country, although not as much as the variation in sectors, as shown in Table 2. Among the 5 EU countries, Italy has the lowest advertising intensity of 0.88%, while the UK has the highest at 1.24%. In general, countries with better economic performance tend to have lower advertising intensity.

Following Dorfman-Steiner theorem (1954), advertising intensity depends positively on gross margins and consumption elasticity to advertising. At the industry level, another reason can be the different diffusion of branded goods, which are more advertising intensive relative to total consumption. Despite economic convergence, these five European countries exhibit significant differences in advertising intensity in the various industries. In clothing, the high advertising intensity in Italy (double the average) and low level in Germany (half the average) can probably be explained by differences in consumption: Italians spend more

than Germans on clothing. The same reason can explain the low advertising expenses of Italy and Spain for books and newspapers. Sometimes the difference is related to external factors, such as the higher summer temperatures of Italy and Spain, which justify a high level of advertising intensity dedicated to beverages. However, the level of product differentiation and the nature of competition at the industry level seem appropriate to explain the low level of advertising in Italy for banking and insurance and the contemporary high levels in the UK and Germany.

Table 2 shows the mean and standard deviation of the advertising intensity for each country across the 9 years in the 28 sectors. We find that for the five EU countries, the mean and standard deviation were similar - Spain had higher advertising intensity and a larger standard deviation.

Summary statistics are as follows:

Table 1: *Advertising intensity by sector (advertising spending for the sector divided by consumption for the sector)*

	France	Germany	Italy	Spain	UK	Sector
Alcoholic beverages	.0088	.0172	.03	.06	.0196	.0255
Clothing	.0049	.0027	.0085	.0056	.0044	.0052
Footwear	.0028	.0027	.005	.0013	.0037	.0032
Electricity/fuels	.0017	.0012	.0005	.0029	.0018	.0015
Furniture	.0028	.0015	.0071	.0059	.0149	.0065
Household appliances	.011	.0061	.0129	.0154	.013	.0115
Glassware/tableware	.0031	.0019	.0047	.024	.0029	.0065
Tools/house equipment	.0051	.0007	.0022	.001	.0059	.0031
Household maintenance	.0105	.0137	.014	.0136	.030	.0164
Medical products/equipment	.0034	.0064	.0074	.0096	.0119	.0076
Vehicle	.0203	.015	.0246	.0253	.0196	.0208
Personal transport equipment	.0003	.0011	.0005	.0014	.0011	.0009
Transport Service	.0054	.0061	.0055	.0068	.007	.0061
Information processing equipment	.0267	.0129	.023	.0352	.0231	.0237
Equipment gardens/pets	.0106	.0074	.0123	.0172	.0096	.0111
Recreational/cultural services	.0196	.0128	.011	.0234	.0183	.0167
Newspaper books	.032	.0478	.0189	.0403	.0177	.0309
Package holidays	.0103	.017	.0101	.0007	0	.0101
Catering services	.0013	.0013	.0003	.0008	.0014	.0011
Accommodation services	.0012	.0023	.0008	.0016	.003	.0018
Personal care	.0296	.0276	.0277	.0362	.029	.0298
Insurance	.0013	.0013	.0003	.0013	.0012	.0011
Bank	.0029	.0076	.0037	.0055	.0099	.0055
Beverages	.0225	.0143	.0365	.0373	.0232	.0263
Distribution and Retail	.0078	.01	.0032	.0059	.0104	.0074
Food	.007	.008	.0101	.0065	.0106	.0085
TLC	.0137	.0119	.0144	.015	.0146	.0139
Country	.0089	.009	.0088	.0117	.0124	.0113

Table 2: *Summary Statistics of Advertising intensity by country*

	France	Germany	Italy	Spain	UK
Mean	0.0089	0.009	0.0088	0.017	0.0124
Std	0.01	0.01	0.01	0.015	0.009

Table 3 shows the summary statistics of the macroeconomic variables across countries. The table shows the average value of the price index, the real value GDP, the current value GDP, real value household consumption and the unemployment rate of the 9 years for each of the five EU countries. We find that for all five countries, household consumption accounts for

more than half of GDP. Table 4 shows the mean of these variables across the 5 EU countries for each year. From this table, we can see that the economic situation from 1998 to 2006 was quite stable, and in particular, the price index and GDP both showed an increasing trend. Therefore, the relationship between consumption and advertising becomes an increasingly important research question.

Table 3: *Summary Statistics of macroeconomic variables (average across years)*

	France	Germany	Italy	Spain	UK
$PriceIndex$	94.66	95.79	93.45	91.35	92.96
$GDP(constant)$	1.55×10^{12}	2.14×10^{12}	1.29×10^{12}	7.42×10^{11}	1.00×10^{12}
$GDP(current)$	1.48×10^{12}	2.08×10^{12}	1.21×10^{12}	6.71×10^{11}	1.02×10^{12}
$HHConsumption(constant)$	8.41×10^{11}	1.22×10^{12}	7.2×10^{11}	4.02×10^{11}	6.77×10^{11}
$unemployment$	9.66	9.41	9.41	12.2	5.23

Table 4: *Summary Statistics of macroeconomic variables (average across countries)*

	$PriceIndex$	$GDP(constant)$	$GDP(current)$	$HHConsumption(constant)$	$unemployment$
1998	86.08	1.18×10^{12}	1.16×10^{12}	7.01×10^{11}	11.76
1999	87.19	1.21×10^{12}	1.20×10^{12}	7.26×10^{11}	10.84
2000	89.27	1.26×10^{12}	1.26×10^{12}	7.49×10^{11}	9.68
2001	91.37	1.28×10^{12}	1.31×10^{12}	7.66×10^{11}	8.24
2002	93.28	1.30×10^{12}	1.36×10^{12}	7.75×10^{11}	8.56
2003	95.46	1.31×10^{12}	1.40×10^{12}	7.86×10^{11}	8.66
2004	97.75	1.34×10^{12}	1.46×10^{12}	8.00×10^{11}	8.68
2005	100	1.36×10^{12}	1.51×10^{12}	8.13×10^{11}	8.32
2006	102.4	1.39×10^{12}	1.58×10^{12}	8.28×10^{11}	7.94

3 The Model

If advertisement spending assists consumption, then it should influence consumption with a positive sign. We use past values of advertising and consumption to assess the direction of influence. Stationary time series Y_t is said to influence stationary series X_t if under the assumption that all other information is irrelevant, the inclusion of past values of Y_t significantly reduces the predictive error variance of X_t. In our exercise, we test whether Y_t has a significant impact on X_t by regressing X_t on its own lags and lags of Y_t. If the lags of Y_t are found to be jointly statistically significant, this can be viewed as evidence that Y_t has an influence on X_t.

Due to an improvement in the ability to achieve datasets with higher quality, researchers are working with time series in panel data settings more frequently. Therefore, recently, under a panel data setting, how to analyse the possible influences of one time series on another has been discussed both theoretically and empirically. Examples of such studies include Arellano and Bond (1991), Hartwig (2010), Dumitrescu and Hurlin (2012) and Lopez and Weber (2017). One of the most important issues in managing time series in panel data involves addressing endogeneity. In this paper, to manage endogeneity, we follow the two-step GMM estimator proposed by Arellano and Bond (1991) and implemented in Hartwig (2010).

As Arellano and Bond (1991) pointed out, such methodologies require data to be stationary, and the resulting time series is tested for the existence of unit roots. The results of such tests are tested in the next section. When the tests reject the hypothesis that there are unit roots, we can set up the panel data model, for which the restriction of identical coefficients of lagged X_{ijt} and Y_{ijt} variables is imposed. Thus, we estimate a time series VAR model adapted to the panel context, which is similar to Hartwig's (2010) model but also unlike it and other literature using data with structures similar to ours, and we control for the country-level macroeconomic time-varying variables. The form is

$$X_{ijt} = \alpha_0 + \Sigma_{l=1}^{m} \alpha_l X_{ijt-l} + \Sigma_{l=1}^{m} \delta_l Y_{ijt-l} + \theta Z_{jt} + \mu_j + u_{ijt} \tag{1}$$

X_{ijt} and Y_{ijt} are respectively consumption and advertising spending on sector i in country j in year t. Five countries are included in our dataset: France, Germany, Spain, Italy and Spain. In each of these five countries, there are 28 sectors.[3] Therefore, 140 observations are observed in each of the T = 9 years (1998-2006).

We include Z_{jt} as a vector of country-level macroeconomic time-varying variables. Z_{jt} includes the price index, GDP (both constant and current prices), the unemployment rate,

[3]These include a "sector" named "total", which denotes the sum of advertising spending on all sectors. In our data analysis, we do not use the "total" sector.

and household consumption (current price). All of these variables can impact both consumption and advertising, and to control for purchasing power and inflation, we include GDP for both constant and current prices.

We also add country fixed effects as μ_j, which is a vector of country dummy indicators, using the UK as the base country. Disturbance u_{ijt} is assumed to be independently distributed across countries with a zero mean.

We wish to test whether influence runs in both directions. Therefore, in addition to testing whether advertisement drives consumption, we also test whether consumption drives advertisement, and we estimate Model (2).

$$Y_{ijt} = \beta_0 + \Sigma_{l=1}^{m}\beta_l X_{ijt-l} + \Sigma_{l=1}^{m}\gamma_l Y_{ijt-l} + \Sigma_{l=1}^{m}\lambda_{t-l}\bar{X}_{it-1} + \zeta Z_{jt} + \eta_i + \nu_{ijt} \qquad (2)$$

When estimating Equations (1) and (2), we pay special attention to the coefficients associated with vector Y_{ijt-l} in Equation (1) and vector X_{ijt-l} in Equation (2). The most important problem is that Equations (1) and (2) are subject to endogeneity because if the country-specific dummy variable impacts consumption in Equation (1) or if advertising in Equation (2) in one period may also have an impact in previous periods, then the dummy variables will be correlated with the unobservables in previous periods. To solve the endogeneity problem, Arellano and Bond (1991) proposed using the lagged dependent variable from at least two periods earlier and the lags of variables on the right-hand side as instrument variables in a General Method of Moments (GMM) estimator. We estimate Equations (1) and (2) using three different methods: pooled OLS, Arellano and Bond (1991) one-step GMM and Arellano and Bond (1991) two-step GMM. Based on the estimation results, we test whether the coefficients associated with Y_{ijt-l} in Equation (1) and with vector X_{ijt-l} in Equation (2) are jointly zero by presenting the Wald tests.

One point we must emphasize is that in Model (2), we include one more variable than in Model (1), namely, $\Sigma_{l=1}^{m}\lambda_{t-l}\bar{X}_{it-1}$, the lagged average consumption of sector i in year t. We expect more advertisement to be spent on larger industries than on smaller industries.

Therefore, we include the lagged average consumption of an industry to capture the effect of an industry's size on advertising spending on it. When the size of an industry changes, it is important to distinguish whether the change in advertising in the industry is driven by the change in consumption or in industry size.

4 Results

4.1 Test for the direction of influence

First, to apply the methodologies proposed by Arellano and Bond (1991), we need to test whether in our dataset, the two time series, i.e., consumption and advertising, are stationary. We use 4 different tests to test the stationarity of the two time series: the Levin, Lin and Chu t^*-test, Im-Pesaran-Shin test, ADF-Fisher Chi-square test and PP-Fisher Chisquare test. Table 5 shows the results of the tests, and it shows that all 4 tests reject the hypothesis that either consumption or advertising is unit root at the significance level of 0.01.

We therefore do not find evidence to reject the hypothesis that both consumption and advertising are stationary time series, so conservatively speaking, we are not able to find evidence to refute the capability to test the direction of influence.

Because the results are very sensitive to the number of lags of X_{ijt} and Y_{ijt} on the right-hand side of Equations (1) and (2), we next examine how many lags we should choose. We run the OLS regression for Equation (1), including different numbers of lags of advertising and consumption, and we compare the two models using two information criteria, namely, the Akaike Information Criteria (Akaike 1974) and Bayesian Information Criteria (Schwartz 1978). Table 6 shows the results.

Based on these two criteria, the results are consistent: the model including 5 lags of X_{ijt} and Y_{ijt} on the right-hand side of Equation (1) yields AIC and BIC values closer to zero; that is, for our analysis, the optimal length of lags is 5.

Table 5: *Test for unit root*

Levin, Lin and Chu t*	Stat.	Prob.	Obs.
Consumption	-1.0×10^{13}	0.0000	1170
Advertising	-3.1×10^{13}	0.0000	1260
Im, Pesaran and Shin W-stat	**Stat.**	**Prob.**	**Obs.**
Consumption	-2.9775	0.0015	1170
Advertising	-8.1836	0.0000	1260
ADF - Fisher Chi-square	**Stat.**	**Prob.**	**Obs.**
Consumption	25.1413	0.0000	1170
Advertising	42.9400	0.0000	1260
PP - Fisher Chi-square	**Stat.**	**Prob.**	**Obs.**
Consumption	14.6889	0.0000	1170
Advertising	23.4206	0.0000	1260

Table 6: *Optimal lag length for Equation (1)*

Lag	2	3	4	5
AIC	-2820.083	-2656.587	-2134.137	-1691.343
BIC	-2767.58	-2596.719	-2068.059	-1620.675

4.2 Relationship between advertising and consumption

We first explore whether advertising is a significant driving force behind consumption. Table 7 shows the results of traditional panel data regression with fixed effects for Equation (1). Columns 1 to 4 show results that include 2, 3, 4 and 5 lags, respectively.

We find that when we regress the logarithm of consumption on past years' logarithmic consumption and past years' logarithmic advertising, previous years' consumption is always significant, especially past one-year consumption. However, past years' advertising is not significant, and the coefficients are small as well. Table 8 shows the results of the test of the hypothesis that the coefficients associated with past years' advertising are jointly zero using the F-test.

According to these results, if we include 2 lags in our model, we reject the hypothesis that past years' advertising has a joint zero effect on consumption at the significance level of 0.05 but fail to reject this at the significance level of 0.01. If we include 3, 4 or 5 lags in our model, we cannot reject the hypothesis at the significance level of 0.1. Therefore, we find little evidence that advertising is a significant driving force behind consumption.

Since we also want to test whether consumption drives advertising, we run the panel

Table 7: *Coefficient Estimation Results for Equation (1) Using fixed effects model*

	(1) logconsumption	(2) logconsumption	(3) logconsumption	(4) logconsumption
L.logconsumption	0.951***	0.919***	0.900***	0.843***
	(0.0338)	(0.0317)	(0.0424)	(0.0455)
L2.logconsumption	0.0469	0.121**	0.132*	0.169**
	(0.0340)	(0.0437)	(0.0528)	(0.0602)
L3.logconsumption		-0.0398	-0.177***	-0.132*
		(0.0316)	(0.0496)	(0.0586)
L4.logconsumption			0.148***	0.0166
			(0.0375)	(0.0551)
L5.logconsumption				0.105**
				(0.0388)
L.logadvert	-0.0199*	-0.00647	-0.0124	-0.00294
	(0.00787)	(0.00829)	(0.0101)	(0.0124)
L2.logadvert	0.0142	-0.00686	-0.00101	0.000280
	(0.00765)	(0.00924)	(0.0114)	(0.0150)
L3.logadvert		0.0107	0.00515	-0.00757
		(0.00701)	(0.00995)	(0.0112)
L4.logadvert			0.00604	0.000242
			(0.00782)	(0.0103)
L5.logadvert				0.0101
				(0.00789)
price index	-0.00345	0.00494	0.00120	0.00675
	(0.00248)	(0.00256)	(0.00321)	(0.00375)
GDP constant	-2.81e-13	8.19e-13**	8.63e-13*	1.79e-12***
	(2.58e-13)	(3.12e-13)	(3.99e-13)	(4.78e-13)
unemployment	-0.00202	-0.00234	-0.00273	-0.00726
	(0.00269)	(0.00280)	(0.00343)	(0.00402)
GDP current	3.60e-13	-1.70e-12**	-1.53e-12*	-2.26e-12**
	(4.28e-13)	(5.26e-13)	(6.41e-13)	(7.67e-13)
hhcons(curr)	-3.75e-13	1.33e-12**	1.14e-12	2.20e-12**
	(3.83e-13)	(4.71e-13)	(6.24e-13)	(8.29e-13)
cons	0.597**	-0.329	-0.0663	-1.549**
	(0.229)	(0.236)	(0.346)	(0.485)

* Significant at 10% ; ** Significant at 5% ; *** Significant at 1%

data regression with fixed effects for Equation (2) and conduct an F-test using the same technique as that for Equation (1). In the F-test, we test whether the coefficients associated with past years' consumption are jointly zero. Table 9 shows the results of the panel data regression for Equation (2) - Columns 1 to 4 show the results that include 2, 3, 4 and 5 lags, respectively.

Additionally, we control for average sector-level consumption across years. Table 10 shows the results for the F-test of the hypothesis that past year consumption has a jointly zero effect on advertising.

For the models that include 4-year lags in consumption, we can reject the null hypothesis at a significance level of 0.01, while in the models that include 2-year and 3-year lags in

consumption, we can reject the null hypothesis at a significance level of 0.05, and we fail to reject the null hypothesis only for the model that includes 5-year lags. Therefore, we find evidence that gives us reasons to suspect that the coefficients associated with consumption are not jointly zero, which is also possible evidence that consumption significantly drives advertising. However, further evidence needs to be analysed.

We also find that none of the coefficients associated with a sector's size in past years are significant. This is evidence that when making their decisions on advertising, firms consider consumption in their country in past years rather than the size of the sector.

Some other facts from Tables 7 and 9 are worth mentioning. First, when we run the OLS regression for Equation (1), that is, using consumption as the dependent variable, in general, the country fixed effect is not significant. Note that we select the UK as the base country. Second, GDP has a significant effect on advertising after controlling for past years' consumption and advertising, but the effect of GDP on consumption is not significant after controlling for past years' consumption and advertising. Third, the unemployment rate and household consumption have a significant effect on advertising but no significant effect on consumption. To summarize, advertising is more sensitive to macroeconomic conditions, but when past years' consumption is controlled, other macroeconomic conditions do not have a significant effect on consumption. These phenomena are partly due to consumption representing one part of GDP, while other facets of GDP, such as exports, government spending and investment, do not have a significant impact on consumption.

As we have pointed out, the fixed effect estimator for Equations (1) and (2) is subject to endogeneity, and therefore, we apply Arellano–Bond one-step GMM and Arellano–Bond two-step GMM to Equations (1) and (2). Note that in this case, the country dummy variables are dropped because of collinearity. Table 11 shows the estimation results for Equation (1) using Arellano–Bond two-step GMM.

Table 12 shows the F-test of the hypothesis that the coefficients associated with the logarithm of advertising are jointly zero. The results achieved by using both methodologies

cannot lead us to reject the hypothesis that past years' advertising has a jointly zero effect on consumption. Therefore, we still find no evidence that advertising drives consumption.

Table 13 shows the estimation results for Equation (2) obtained using Arellano–Bond two-step GMM, and Table 14 shows the F test of the hypothesis that the coefficients associated with the logarithm of consumption are jointly zero. Note that we control for average consumption each year. Based on the results, we reject the hypothesis that the values jointly zero at a significance level of less than 0.05. Therefore, we find more evidence that consumption drives advertising rather than advertising driving consumption.

Table 14 also shows the F-test of the hypothesis that the coefficients associated with the logarithm of the size of the sector in past years on advertising are jointly zero. We fail to reject the null hypothesis at a significance level of 0.1, which shows that the change in advertising in a sector is driven by the change in consumption in the past year rather than by the sector's size.

In the above regressions, we control the consumption and advertising of different sectors, so to a large extent, we have taken into account relationships between industries when analysing the effects of advertising. However, we wish to check whether the results are robust to the changes in the sectors included, that is, to what extent the positive influence between consumption and advertising is robust to the changes in the relationships between the sectors. Additionally, we wish to check whether the results are robust to changes in the specific conditions of countries. Therefore, for the robustness check, we estimate Equations (1) and (2) by dropping each of the 27 sectors in turn and then estimate Equations (1) and (2) by dropping each of the 5 countries in turn.

Our results show that past years' advertising has a jointly zero effect on consumption, regardless of using Arellano–Bond one-step GMM or Arellano–Bond two-step GMM, and regardless of excluding each of the 27 sectors. Similarly, the test results do not change regardless which country is excluded. The estimation of Equation (2) using both Arellano Bond one-step GMM and Arellano–Bond two-step GMM shows that past years' consumption

has a jointly significant positive effect on advertising, regardless of which sector or country is excluded. Therefore, our result is robust to changes in both countries and sectors.

Table 8: *Test for past year advertising have jointly zero effect on consumption*

	2 lags	3 lags	4 lags	5 lags
Stat.	3.99	1.14	0.73	0.42
P-value	0.0189	0.3308	0.5699	0.8326

Table 9: *Coefficient Estimation Results for Equation (2) Using fixed effect model*

	(1) logadvert	(2) logadvert	(3) logadvert	(4) logadvert
L.logconsuumption	0.0713	0.107	0.338*	0.284
	(0.134)	(0.136)	(0.157)	(0.151)
L2.logconsumption	-0.0123	0.109	-0.101	-0.226
	(0.135)	(0.198)	(0.208)	(0.211)
L3.logconsumption		-0.162	-0.155	-0.0561
		(0.148)	(0.206)	(0.217)
L4.logconsumption			-0.0209	0.124
			(0.158)	(0.206)
L5.logconsumption				-0.0865
				(0.146)
L.logadvert	0.727***	0.705***	0.839***	0.939***
	(0.0304)	(0.0348)	(0.0373)	(0.0409)
L2.logadvert	0.190***	0.189***	-0.0215	-0.108*
	(0.0295)	(0.0390)	(0.0423)	(0.0498)
L3.logadvert		0.0467	0.0297	0.0508
		(0.0298)	(0.0374)	(0.0375)
L4.logadvert			0.0792**	0.0283
			(0.0292)	(0.0345)
L5.logadvert				0.0454
				(0.0263)
price index	-0.00277	-0.000712	-0.0218	-0.00320
	(0.00959)	(0.0107)	(0.0120)	(0.0126)
GDP constant	2.20e-12*	1.41e-12	-6.44e-13	5.07e-13
	(9.96e-13)	(1.31e-12)	(1.47e-12)	(1.57e-12)
unemployment	-0.0130	-0.00320	0.00657	-0.00807
	(0.0104)	(0.0117)	(0.0127)	(0.0134)
GDP current	-1.85e-12	-6.00e-13	1.60e-12	1.86e-12
	(1.65e-12)	(2.20e-12)	(2.36e-12)	(2.51e-12)
hhcons(current)	-3.76e-13	-1.65e-12	-3.24e-12	-3.09e-12
	(1.48e-12)	(1.98e-12)	(2.30e-12)	(2.73e-12)
L.logconsumption(mean)	-0.0115	-0.0309	0.172	0.0156
	(0.199)	(0.198)	(0.195)	(0.183)
L2.logconumption(mean)	0.201	-0.204	-0.438	-0.819
	(0.224)	(0.382)	(0.384)	(0.446)
L3.logconsumption(mean)		0.209	-0.151	0.616
		(0.307)	(0.420)	(0.466)
L4.logconsumption(mean)			0.112	-0.181
			(0.305)	(0.399)
L5.logconsumption(mean)				0.435
				(0.286)
cons	-1.645	0.566	6.244	-0.831
	(2.344)	(3.032)	(3.826)	(4.687)

* Significant at 10% ; ** Significant at 5% ; *** Significant at 1%

Table 10: *Test for past year consumption have jointly zero effect on advertising*

	2 lags	3 lags	4 lags	5 lags
Stat.	4.36	3.03	3.81	1.48
P-value	0.0131	0.0287	0.0046	0.1960

Table 11: *Estimation for Equation (1) using Arellano and Bond (1991) two step method*

	longconsumption
L.logconsumption	-0.360
	(0.240)
L2.logconsumption	0.0113
	(0.0905)
L3.logconsumption	-0.0264
	(0.150)
L4.logconsumption	-0.0484
	(0.0696)
L5.logconsumption	0.0915
	(0.0723)
L.logadvert	0.0234
	(0.0307)
L2.logadvert	0.00647
	(0.0126)
L3.logadvert	0.00592
	(0.0169)
L4.logadvert	0.00159
	(0.0151)
L5.logadvert	0.0193*
	(0.00959)
PriceIndex	0.00554
	(0.00662)
GDPConstant	-3.47e-14
	(2.98e-13)
unemployment	-0.00837*
	(0.00363)
GDPCurr	-4.51e-13
	(3.77e-13)
HHconsCurr	1.65e-12**
	(5.34e-13)

*Significant at 10%; **Significant at 5%; ***Significant at 1%

Table 12: *Test for past year advertising has jointly zero effect on consumption*

	Advertising
Stat.	4.80
P-value	0.4402

5 Discussion and Managerial Implications

Our main results contribute to the debate on the mutual influence between advertising and consumption. Our findings on the relationship between consumption and advertising are consistent with many papers showing a prevailing influence of consumption on advertising,

Table 13: *Estimation for Equation (2) using Arellano and Bond (1991) one step and two step method*

	longadvertising
L.logadvert	-0.0176
	(0.424)
L2.logadvert	-0.0519
	(0.0710)
L3.logadvert	-0.0742
	(0.0898)
L4.logadvert	-0.0199
	(0.0617)
L5.logadvert	0.0726
	(0.0442)
L.logconsumption	0.130
	(0.337)
L2.logconsumption	0.286
	(0.197)
L3.logconsumption	-0.0380
	(0.255)
L4.logconsumption	0.242
	(0.218)
L5.logconsumption	0.409*
	(0.203)
PriceIndex	-0.0108
	(0.0133)
GDPConstant	-1.24e-12
	(1.27e-12)
unemployment	-0.0321*
	(0.0156)
GDPCurr	2.00e-12
	(1.73e-12)
HHconsCurr	-1.96e-12
	(2.05e-12)
L.logyearconsum	-0.238
	(0.145)
L2.logyearconsum	-0.301
	(0.353)
L3.logyearconsum	0.0813
	(0.444)
L4.logyearconsum	-0.383
	(0.349)
L5.logyearconsum	0.388
	(0.340)

*Significant at 10%; **Significant at 5%; ***Significant at 1%

Table 14: *Test for past year consumption and lagged consumption have jointly zero effect on advertising (two step GMM)*

	Consumption	Lagged Average Consumption
Stat.	11.43	6.75
P-value	0.0435	0.2402

but the results of our paper are even more convincing because of the unique advantages of our dataset. Our paper suggests that advertising is more likely to be a reaction to consumption rather than the driving force behind consumption. This finding has important implications

for firms and governments. For firms, if we find no effect on market expansion at the industry level, this suggests that the broad observed positive effect of advertising arises mainly through a business stealing effect. Advertising spending should be used strategically and with caution because in some cases, its effects might not be significant (Squalli (2010)). In an oligopoly, for instance, when multiple firms advertise heavily, there is a significant risk that advertising investments will cancel each other. At the same time, managers must cautiously address advertising campaigns that basically aim to increase consumption, as observed in many examples of collective advertising. Tremblay et al. (2013) examined the automobile market from a theoretical perspective and showed that firms can either be under-advertising or over-advertising, depending on whether advertising can change customers' tastes. From a government's perspective, a government should explain the relationship between consumption and advertising to firms so that they can manage their finances properly. Additionally, when developing policies, governments should take incentives for firms' advertising into consideration and be prudent in encouraging advertising behaviours.

The results are robust to excluding certain countries or sectors from the dataset. The robustness check provides strong evidence that consumption plays the main role in driving advertising instead of the substitute or complementary relationships among different sectors. Otherwise, we would have observed different results when excluding some sectors from our analysis. Our results are also robust to variation in the countries included in the dataset, which indicates that the economic structure of different EU countries does not significantly influence the relationships between advertising and consumption. By using data from different sectors and countries, we are able to take into account impacts of the interactions of sectors and countries.

Moreover, our dataset contains not only total advertising spending for each observation but also advertising spending for different media. In addition to the finding that total advertising spending does not influence advertising spending, we did not find that advertising from any type of media drives consumption. Hence, no evidence shows that the media type

of advertising matters in driving consumption.

Our results have important management implications for firms and for society as a whole. For firms, advertisement indeed can increase the share of consumption of some firms but at the cost of other firms. Moreover, advertisement cannot create new consumption and therefore cannot promote industry vitality. The most important way to enhance the competitiveness of a firm is through innovation, which can distinguish products from others in an industry and in turn increase consumption in an industry as well.

Another interesting point is that our dataset passes the year 2000. The new millennium provided good opportunities for advertising, although other events such as the dotcom bubble may also have had an impact on advertising. Whether such special events can help advertising boost consumption is worthy of discussion; however, a lack of data and strong evidence limits our ability to answer this question.

6 Conclusion

In conclusion, this paper contributes to the debate on whether advertising influences consumption or whether consumption drives advertising using a unique macrolevel dataset from EU countries. Our data allow us to control relationships between the consumption of different sectors and the relationships between spending on different types of media on advertising. Our empirical results demonstrate that consumption positively and significantly drives advertising, but advertising does not significantly drive consumption. Our results imply that advertising is more likely to reflect a reaction to consumers' behaviour rather than a means to change consumers' behaviour. Additionally, the effect of advertising is more related to business stealing from competitors rather than market expansion. Therefore, a firm's marketing strategy should be coordinated with its innovation, which distinguishes its products from other firms, and advertising should be used as a way to help consumers understand the uniqueness of different products. We believe that this is the best way to develop the leading

firm in an industry.

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