Impact of American cigarette advertising on imported cigarette consumption in Osaka, Japan

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Abstract

Objective - To determine the predictors of imported cigarette consumption and the market share held by imported cigarettes in Osaka, Japan, for the period 1970-1990.

Methods - Regression analyses including variables such as television cigarette commercials, cigarette prices, income, and cigarette consumption in the previous year.

Results - In the first regression analysis, in which the dependent variable was imported cigarette consumption, the regression coefficients for gross rating point and income for American television cigarette commercials were 0.006 and 0.026, respectively ($p < 0.01$). However, the prices of imported and domestic cigarettes were not significant predictors. In the second regression analysis, in which the dependent variable was market share of imported cigarettes, the regression coefficient for the television commercial ratio for imported to domestic cigarettes was 0.018 ($p < 0.01$). The price ratio for domestic to imported cigarettes was not a significant predictor.

Conclusion - Television commercials for American cigarettes have been effective in inducing brand switching from domestic to imported cigarettes in Osaka in the period 1970-1990.

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Keywords: television; cigarette; commercials; women.

Introduction

In Asian countries including Japan, the prevalence of smoking is high among males and relatively lower among females. Public awareness of the harmful effects of smoking is relatively low. Disposable income is rapidly increasing, and more women are entering the work force in certain Asian countries. These factors are considered to play a role in increasing cigarette use, which makes the Asian market extremely attractive to the tobacco industry. American tobacco companies have successfully lobbied the United States government to help open Asian markets. Making use of the 1974 Trade Act, Section 301,¹ as a tool for negotiation, the US government pressured Asian countries to open their markets. The

first targeted country was Japan. In 1986, Japan became the first country in Asia to sign an agreement with the United States to fully open its market to American tobacco companies, effective as of 1988.

The Japanese government controls cigarette marketing and promotional activities through self regulatory mechanisms, such as voluntary codes of standards to which the cigarette companies are supposed to adhere. Since American cigarette companies entered the Japanese market, promotional and commercial activities among cigarette companies have intensified, often leading them to violate the rules. In Japan, TV cigarette commercials are still broadcast, although they have aroused opposition.^{2,3} A dramatic jump in TV tobacco commercials occurred around 1986. By the end of 1988, cigarettes ranked second in total TV commercials, up from 40th place two years previously.⁴ This increase was primarily the result of the entry of American tobacco companies into the Japanese market.

In the present study, data on audience ratings for TV cigarette commercials between 1970 and 1990 in Osaka, Japan, were used to examine the effect of American TV cigarette commercials on consumption of imported cigarettes, most of which are American, in the Osaka area. Many studies have reported that advertising for American cigarettes has focused upon younger female generations^{2,4-7}. Then, based upon data from a smoking survey and the results of the analyses in the first study, the possible impact of cigarette advertising upon smoking prevalence among young women was considered. Public health policy issues concerning how to regulate cigarette commercial activities in Japan are also considered.

Methods

Two types of regression analyses were performed. The models and variables adopted for use are presented in table 1.

FIRST ANALYSIS

The dependent variable in this analysis was the annual per capita imported cigarette consumption for the period 1970 to 1990 in Osaka prefecture, Japan. As a tobacco consumption tax, each prefectural government taxes tobacco companies a certain percentage of monthly gross sales, which is the average price of one

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Table 1 Parameters of the model

(1) Imported cigarette consumption	
$CONSUMPTION_t$	$= \alpha_1 + \alpha_2 GRP(A)_t + \alpha_3 GRP(D)_t + \alpha_4 PRICE(I)_t + \alpha_5 PRICE(D)_t + \alpha_6 INCOME_t + \alpha_7 CONSUMPTION_t + \alpha_8 CONSUMPTION(D)_{t-1}$
Where:	
$CONSUMPTION_t$	= per capita number of imported cigarettes consumed in time period t
$GRP(A)_t$	= gross rating point for American cigarettes in Osaka area in time period t
$GRP(D)_t$	= gross rating point for domestic cigarettes in Osaka area in time period t
$PRICE(I)_t$	= price of one imported Lark cigarette in time period t
$PRICE(D)_t$	= price of one domestic HI Lite, Seven Stars, or Mild Seven cigarette in time period t
$INCOME_t$	= income in time period t
$CONSUMPTION(I)_{t-1}$	= per capita number of imported cigarettes consumed in time period $t-1$
$CONSUMPTION(D)_{t-1}$	= per capita number of domestic cigarettes consumed in time period $t-1$
(2) Share of imported cigarettes	
$SHARE_t$	$= \alpha_1 + \alpha_2 (GRP\ RATIO)_t + \alpha_3 (PRICE\ RATIO)_t + \alpha_4 INCOME_t + \alpha_5 SHARE_{t-1}$
Where:	
$SHARE_t$	= share of imported cigarettes in time period t
$(GRP\ RATIO)_t$	= ratio of GRP for imported TV cigarette commercials (CM) to that for domestic cigarette CM in time period t
$(PRICE\ RATIO)_t$	= ratio of price of an imported cigarette (Lark) to that of a domestic best selling cigarette (Hi Lite, Seven Stars or Mild Seven) in time period t
$INCOME_t$	= income in time period t
$SHARE_{t-1}$	= share of imported cigarettes in time period $t-1$

cigarette multiplied by the number of cigarettes sold to retailers within the prefecture. Yearly statistics for domestic and imported cigarettes sold to retailers for resale within Osaka prefecture from 1965 up to the present are available.⁸ The published numbers of domestic and imported cigarettes include sales of pipe tobacco and cigars. The Osaka prefectural government converted the sales of pipe tobacco and cigars to equivalent numbers of cigarettes rather than by their weight, although we could not verify in detail how the conversion was performed. According to the most recent statistics available, however, the proportion of gross tobacco sales accounted for by domestic pipe tobacco and cigars within Osaka prefecture in 1984 was less than 0.01 %. Therefore, we believe that the conversion of the indicator noted above could not have had any substantial impact upon the analyses in this study.

Annual per capita imported cigarette consumption data for the period 1970 to 1990 were used for the analysis, which was based on available data concerning TV tobacco commercial audience ratings within Osaka prefecture (1970–1990; $n = 21$). In order to adjust for changes in population size and age distribution occurring during the period studied, per capita cigarette consumption (based on the number of persons aged 15 years or older in Osaka prefecture) was used for the analysis. The change over time in per capita total and imported cigarette consumption is illustrated in the second panel of the figure.

The independent variables included in the analysis were TV commercials for American and domestic cigarettes, the average prices of one imported Lark cigarette and one best selling domestic cigarette, personal income, and per capita imported and domestic cigarette consumption in the previous period. Basic data concerning TV tobacco commercials were available from the Osaka branch of Video

Changes over time in each of the variables used in the analyses. Computations were made using yearly data (1970–1990). Price (price per cigarette) and per capita monthly income were adjusted for changes in the consumer price index (all items) with the value of the yen in 1970 used as a standard.

Research, Ltd. Specifically, on-line meters had been installed at randomly selected houses in Osaka prefecture ($n = 250$), based upon results of the national census, in order to monitor continuously the audience status for every TV set (up to three) in each targeted house. Each set of data from every selected house was then transmitted immediately to the data collection centre by a special circuit, and television audience ratings for all commercial or programme broadcasts in Osaka prefecture were calculated. Data concerning TV audience ratings and the time duration of TV tobacco commercials broadcast in Osaka prefecture (measured in seconds) were available for the period 1970–1990. Therefore, the gross rating points (GRPs) for American and domestic cigarettes, which were calculated by summing the products of the audience ratings and the corresponding time durations of all the TV commercials for American and domestic cigarettes broadcast in Osaka during a given time period (year), were used in the first analysis as the variable representing TV commercials for American and domestic cigarettes. GRP is calculated as follows:

$$GRP = \sum_{T=1}^N (TV \text{ audience rating}_T) \times (\text{time of cigarette commercial}_T)$$

where TV audience rating_T = TV audience rating of the Tth cigarette commercial during a given period (year); time of cigarette commercial_T = time duration of the Tth TV cigarette commercial broadcast during a given period (year); and N = total number of TV cigarette commercials broadcast in Osaka during a given period (year).

The change over time in each GRP for domestic and imported cigarettes is shown in the third panel of the figure.

Because the average prices of imported and domestic cigarettes were not available during a part of the study period, the price of one Lark cigarette, which has consistently been one of the most popular foreign brands, and the price of one of the best selling domestic cigarettes over the period studied [High Lite (1970–74), Seven Stars (1975–77), and Mild Seven (1978–90)] were used as the prices of one imported and one domestic cigarette. As an index of income, per capita disposable family income in Osaka was calculated using publicly available statistics.⁹ In order to correct for variations in prices as well as in per capita disposable family income, the price of one Lark cigarette, the price of one domestic cigarette (Hi Lite, Seven Stars, and Mild Seven), and the per capita disposable income were adjusted according to the consumer price index (all items) in terms of constant 1970 yen. Changes over time in these variables are shown in the first and fourth panels of the figure.

SECOND ANALYSIS

The dependent variable in the second analysis was the market share held by imported cigarettes in Osaka prefecture. The share of imported cigarettes in Osaka (1970–90; n = 21) was calculated by dividing the annual consumption of imported cigarettes by total cigarette consumption. The independent variables considered were the ratio of TV tobacco commercials for domestic cigarettes to those for imported cigarettes, personal income, ratio of prices of imported cigarettes to those of domestic cigarettes, and the share of the market held by imported cigarettes in the previous year. Because average prices of imported cigarettes and domestic cigarettes were not available for comparison, as in the first analysis, the price of one imported Lark cigarette, and the price of one Hi Lite (1970–74), Seven Stars (1975–77), or Mild Seven (1978–90) cigarette were used to calculate the price ratio. As the ratio of TV tobacco commercials for imported cigarettes to those for domestic cigarettes, the ratio of GRP for imported cigarettes to that for domestic cigarettes was used.

STATISTICAL PROCEDURES

Both of the models include a dynamic element – imported domestic cigarette consumption or the market share of imported cigarettes in the previous period – as an independent variable. These models then incorporate the effect of previous consumption or market share upon

current consumption or market share. These models are called “habitual” models, which are used in explaining the acquisition of new habits. In order to avoid the problem of autocorrelation, the models in the study were not expressed in logarithmic form. The first model includes every potential variable which might be relevant to the demand for imported cigarettes. The second model also includes potential variables which are relevant to the market share of imported cigarettes. These two regression models are fitted using the ordinary least squares method. For statistical evaluation of the coefficient of determination before and after inclusion of GRP for American cigarettes or ratio of GRP, a partial F test was performed.

Results

Table 2 shows the mean and standard deviation of each variable in the first and second analyses. Table 3 shows the regression coefficients for the first analysis upon the imported cigarette consumption. The coefficient for annual TV commercials for American cigarettes was 0.006 (p < 0.01). This finding indicates that if the GRP for American cigarettes increased by 100 points, an annual increase in per capita consumption of six imported cigarettes would result. The result of a partial F test of this variable was 9.84 (p < 0.01). The coefficients for the price of one Lark cigarette and one domestic cigarette were 30.137 and 32.536, respectively neither of which was statistically significant. The coefficient for per capita annual income was 0.026 (p < 0.01). The R² statistic was 0.920, showing that 92.0 % of total variance was explained by the model used. The Durbin h statistic was 1.61 (p > 0.05), showing no evidence of autocorrelation.

Table 4 lists the regression coefficients for the second analysis upon the market share of imported cigarettes. The coefficient for the GRP ratio for imported to domestic cigarettes was 0.018 (p < 0.01). This finding indicates that if the GRP for imported cigarettes increased to that for domestic cigarettes [(GRP

Table 2 Descriptive statistics of each variable. Values are means (SD)

<i>Imported cigarette consumption¹ (n = 21)</i>		
Per capita imported cigarette consumption (number)	165.65	(204.92)
GRP for American cigarettes (point)	13184.57	(21195.82)
GRP for domestic cigarettes (point)	11762.52	(10764.89)
Price of one Lark cigarette (yen)	6.03	(1.30)
Price of one domestic cigarette (yen)	3.35	(0.42)
Income (yen)	42241.88	(12769.74)
Per capita imported cigarettes consumed in previous period (number)	106.15	(127.58)
Per capita domestic cigarettes consumed in previous period (number)	3710.30	(299.61)
<i>Share of imported cigarettes¹ (n = 21)</i>		
Ratio of GRP	0.63	(0.70)
Ratio of price	1.81	(0.38)
Share of imported cigarettes in previous period	0.04	(0.05)
Income (yen)	42241.88	(12769.74)

¹ 1970–1990.

Table 3 Regression coefficients for imported cigarette consumption: Osaka area 1970–1990 (annual data) ($n = 21$). Figures in parentheses are standard errors

Gross rating point for American cigarettes [GRP (A) _t]	0.006† (F* = 9.84†) (0.002)
Gross rating point for domestic cigarettes [GRP (D) _t]	−0.007 (0.007)
Price of one Lark cigarette [PRICE (I) _t]	30.137 (39.708)
Price of one domestic cigarette [PRICE (D) _t]	32.536 (55.769)
Income (INCOME _t)	0.026† (0.008)
Per capita imported cigarette consumption in previous time period [CONSUMPTION (I) _{t-1}]	0.000 (0.000)
Per capita domestic cigarette consumption in previous time period [CONSUMPTION (D) _{t-1}]	−0.000 (0.000)
Constant	−555.725 (566.734)
R ²	0.920
Durbin h statistic	1.61

† $p < 0.01$.

F*: partial F test.

Table 4 Regression coefficients for share of imported cigarettes: Osaka area 1970–1990 (annual data) ($n = 21$)

Ratio of GRP [(GRP RATIO) _t]	0.018† (F* = 8.82†) (0.006)
Ratio of price of one cigarette [PRICE RATIO] _t	−0.023 (0.014)
Share of imported cigarettes in previous time period (SHARE _{t-1})	0.915‡ (0.107)
Income (INCOME _t)	−0.000 (0.000)
Constant	0.085 (0.057)
R ²	0.957
Durbin h statistic	1.58

† $p < 0.01$; ‡ $p < 0.001$.

F*: partial F test.

RATIO)_t = 1], an annual 1.8 % increase in the share of the market held by imported cigarettes would result. The result of a partial F test of this variable was 8.82 ($p < 0.01$). The coefficient for the price ratio of imported to domestic cigarettes was −0.023, which was not significant. The coefficient for the market share of imported cigarettes in the previous time period was 0.915 ($p < 0.001$). The coefficient for income was −0.000 (not significant). The R² statistic was 0.957, showing that 95.7 % of all variance was explained by the model used. The Durbin h statistic was 1.58 ($p > 0.05$), showing no evidence of autocorrelation.

Discussion

In the first regression analysis, we determined the predictors of imported cigarette consumption in Osaka. The most important findings were the coefficients for GRP for American cigarettes (0.006; $p < 0.01$) and for income (0.026; $p < 0.01$). The latter indicates that an income increase of 100 yen (INCOME_t = 100) would result in an increase of 2.6 cigarettes in the annual per capita consumption of imported cigarettes. The coefficients for prices were not significant; the lack of statistical significance, however, might have been due to the small number of observations included in the analysis ($n = 21$) or the method used in this analysis (use of the price of one Lark cigarette and the price of one domestic cigarette (Hi Lite, Seven

Stars, and Mild Seven) as the prices of one imported and one domestic cigarette).

In the second regression analysis, we examined predictors of the share of the market held by imported cigarettes in Osaka. The most important findings were the coefficients for the GRP ratio for imported to domestic cigarettes (0.018; $p < 0.01$) and for the share of imported cigarettes in the previous year (0.915; $p < 0.001$).

Recently, outdoor events including car races and sports tournaments in which cigarette logos are constantly displayed have been popular among younger people in Japan. Moreover, as of 1990, there were 500 000 tobacco vending machines in use in Japan,¹⁰ from which cigarettes can be obtained as easily on the street as soft drinks. However, variables concerning outdoor events and tobacco vending machines were not included in our model owing to lack of available data. The results of our analyses, which did not include these important variables, showed that TV commercial advertising is a significant predictor of aggregate imported cigarette consumption and the market share held by imported cigarettes (tables 3 and 4). Therefore it is reasonable to infer that a certain degree of GRP elasticity in the demand for imported cigarettes exists, and that the more commercials for imported cigarettes there are, the more brand switching from domestic to imported cigarettes will occur.

We observed a certain degree of elasticity in the ratio of GRP in the share of the market, and that an increase in the TV commercial volume for imported cigarettes to that for domestic cigarettes would enlarge the market share of imported cigarettes by 1.8 %. Two types of regression analyses indicate that American cigarette advertising was effective in inducing brand switching from domestic to imported cigarettes in the Osaka area. During the five year period beginning in 1985, the market share of imported cigarettes has increased by more than 10 %.

Several methodological, econometric, and statistical questions have been raised with respect to the New Zealand study conducted by Chetwynd and her colleagues,¹¹ who used regression models similar to those in the present study.^{12,13} We are indebted to Chetwynd *et al.* for the “habitual” model used in this study. Chetwynd and her colleagues have already responded to these critiques.^{14,15} However, there is one other methodological problem with regard to the use of annual cigarette consumption data. Chetwynd *et al.* have expressed reservations about the use of annual data by stating that annual time series is not appropriate because the inter-purchase time for cigarettes caused by cigarette commercials is only a matter of days.¹¹ In this study, annual cigarette consumption data were used because of the lack of monthly data. If monthly or quarterly data had been used, the impact of TV commercials upon the market share of imported cigarettes would have been evaluated more precisely. Our study using annual data still reports a positive effect of TV

commercials upon the market share of imported cigarettes. This implies that TV commercials are fairly effective in gaining market share.

In the present study, we used aggregated cigarette consumption data, which tend to mask the effect on specific gender and age groups. It is probable that the impact of TV cigarette commercials over time on changes in cigarette consumption differs for younger women and for other population subgroups. Therefore, it would have been desirable to perform analyses for specific gender and age groups to examine, for example, whether higher coefficients would be found for younger women and lower coefficients for other groups. In our study, unfortunately, appropriate data for this type of analysis were not available. In order to allow more detailed analyses to be undertaken, annual surveys to collect such data would be necessary in the future.

TV CIGARETTE COMMERCIAL CONTROL

Table 5 shows the results of a nationwide smoking prevalence survey, conducted annually by the Japan Tobacco Industry (JTI).¹⁶ Although the JTI survey was conducted nationwide, the results should still approximate the smoking prevalence in Osaka. For both males and females, the average prevalence in 1987–90 was lower than that in 1979–82. Knowledge concerning the health effects of smoking has increased widely since the early 1980s due to health education efforts by local and central governments in Japan.^{16,17} The decrease in smoking prevalence is probably due to this health education. In contrast to the gradual decrease in overall smoking prevalence among males, prevalence among females decreased slightly until 1990, when it suddenly increased again.

Since 1989, cigarette companies have set a ceiling on total TV cigarette commercials in order to avoid increased opposition from the anti-smoking movement.¹⁶ Smoking prevalence among females in their twenties increased markedly in 1989, while prevalence among females of 50 years and older decreased, despite the marked decrease in GRPs for domestic and imported cigarette TV commercials in 1989 (figure). TV commercials for American cigarettes, which are consistently directed toward young females, may have played a role in the increase in their smoking prevalence.^{2,4–7}

Table 5 Smoking prevalence (%), by sex and age, Japan, 1979–1990

	Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Males	20s								70.8	71.2	66.1	67.5	66.3
	30s								70.0	68.7	67.4	68.5	68.7
	40s								61.2	60.5	63.1	64.5	62.7
	50s								60.1	58.8	59.7	57.3	57.0
	≥60s								51.7	50.2	50.2	49.5	49.4
	Average	73.1	70.2	70.8	70.1	66.1	65.5	64.6	62.5	61.6	61.2	61.1	60.5
Females	20s								15.5	15.9	15.2	16.4	19.5
	30s								13.3	15.2	15.1	14.7	17.2
	40s								12.3	13.2	12.8	13.8	14.0
	50s								11.0	12.1	11.6	10.4	12.2
	≥60s								10.7	10.6	10.6	8.6	9.4
	Average	15.4	14.4	15.3	15.4	13.5	14.0	13.7	12.6	13.4	13.1	12.7	14.3

Source: Smoking prevalence surveys conducted by Japan Tobacco Industry (JTI).

In our study, we could not evaluate directly the relationship between TV cigarette commercials directed at young women and the increase in their smoking prevalence, nor the process whereby TV cigarette commercials may attract new, young female smokers, eventually resulting in the expansion of the market share held by imported cigarettes. However, there is substantial evidence from other studies that cigarette advertising affects smoking by young people, particularly females.^{18–22}

To protect the health of mothers and infants, banning TV cigarette commercials should be considered in Japan, unless evidence is provided that TV cigarette commercials do not increase smoking prevalence, especially among young females. Cigarette companies have agreed voluntarily not to target young women and children in their advertisements. Because compliance with this self-regulatory system has been incomplete, it may be necessary to regulate their advertising and promotional activities by law.

In conclusion, in our study we found significant coefficients for TV commercials for American cigarettes and for the ratio of GRPs. These results imply that TV commercials for imported cigarettes have induced brand switching from domestic cigarettes to foreign brands. There is evidence of a positive relation between TV cigarette commercials directed toward young females and increased smoking prevalence in this group. Therefore stricter regulation of TV cigarette commercials should be considered.

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Young ladies passing out free samples of Lark cigarettes on the streets of Tokyo.