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The FTC and the Effectiveness of Cigarette Advertising Regulations

Robert McAuliffe

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Cigarette advertising and its regulation have been controversial issues over the last several decades, and the Federal Trade Commission (FTC) has played an important role in the federal regulation of this industry. Many researchers in economics and marketing have tried to determine the effects of advertising regulations on the industry and cigarette consumption. Have the federal government's policies toward cigarette advertising served the public interest, or have these policies simply helped the cigarette industry? Although most research has found that cigarette advertising regulations have not been successful in reducing cigarette consumption, the results of many of these studies are biased, as we will argue in sections two and three. Since most of the previous work is statistically biased, the basic questions remain unanswered: Did the 1964 Report of the Surgeon General have any effect on cigarette consumption in the United States? Was the 1965 cigarette labeling requirement effective in changing cigarette demand? Did the 1971 broadcast advertising ban affect cigarette demand? And finally, have the federal government's policies toward the cigarette industry promoted the public interest?

One problem which has plagued the government's efforts to regulate cigarette advertising has been the proper definition of "the public interest." Most of the regulations promoted by the FTC were aimed at eliminating deceptive advertising practices and improving the information available to the public. However, other government agencies, such as the Department of Health and the Surgeon General were more interested in reducing the consumption of cigarettes altogether. Unfortunately, these different interpretations of the public interest created conflicts and inconsistencies in the federal regulation of cigarette advertising which reduced the effectiveness of these policies.

In section one, the FTC's policies toward cigarette advertising over the last three decades are reviewed and critically evaluated. Despite the commission's intentions, these policies have generally served the industry. A recent study examined the effects of the federal labeling requirements (which were supported by the FTC) concerning the dangers of cigarette smoking, and the results of this research are presented and evaluated in section two.

Perhaps the most controversial public policy toward the cigarette industry was the federal broadcast ban imposed on cigarette advertising in 1971. Despite a considerable amount of research on the effects of this ban, many of these studies are biased and unreliable. After a review of this literature in section three, new and consistent estimates of the demand for cigarettes and the effectiveness of the cigarette advertising ban are presented in section four. A summary and several conclusions follow in section five.

The FTC and Cigarette Advertising Regulations

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The FTC won several judgments against individual cigarette companies for false and deceptive advertising practices in the early 1950's, but these judgments took years to obtain and frequently the deceptive advertising practices had ceased by the time the court's decision was rendered.¹ So the FTC established voluntary

advertising guidelines for the industry in 1955 which prohibited cigarette companies from making any unsubstantiated health claims about tobacco products.² The Commission hoped these guidelines would improve industry advertising practices without the long delays created when advertising cases were brought to court.

However, these guidelines also reduced competition between cigarette companies to produce 'safer' cigarettes. When cigarette sales dropped in 1953 after the Sloan-Kettering report which linked cigarette smoking with lung cancer, cigarette advertising continued to emphasize brands which were healthier due to filters and lower tar and nicotine. This approach led *Business Week* to ask: "Why has the industry persisted in this negative form of advertising even when, as tobacco growers and others complain, it hurts the trade by making people conscious that cigarettes can be harmful?"³ But the voluntary guidelines provided an opportunity for the cigarette manufacturers to stop this self-destructive competition without fears of an antitrust suit. The guidelines prohibited any advertising which contained unsubstantiated health claims, and the industry happily obliged.

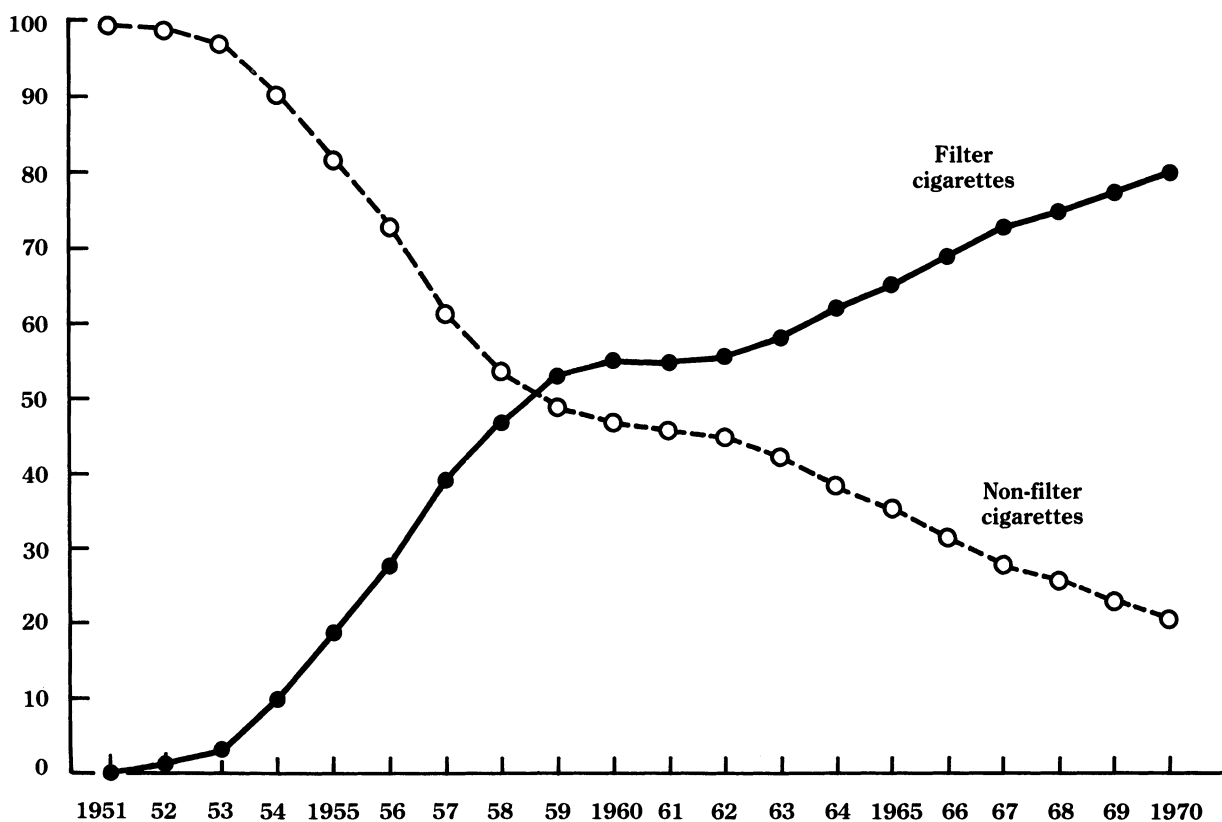
In 1960, however, the FTC decided to apply these guidelines to advertisements about tar and nicotine content, and the Commission informed cigarette producers that it would consider *any* claims about tar and nicotine content or filter efficiency as health claims. This meant that if a cigarette company advertised that its brand had lower tar and nicotine or had a more effective filter than other brands, the FTC would view the ad as a health claim and a violation of the 1955 industry advertising guidelines. Furthermore, the FTC stated that even if the claims were true, the Commission would litigate and force the company to prove that the product was significantly different (physiologically) from other brands.⁴ As a result of this pressure from the Commission, the cigarette producers and the FTC reached an 'informal agreement' in 1960 where the cigarette companies agreed to: 1) end all tar and nicotine claims in their advertising, 2) end all claims about the comparative efficiency of their filters, and 3) end all explicit and implicit health claims in their advertising.⁵

With this agreement, the FTC hoped to end what was called the 'tar derby'—the growing competition between cigarette companies over filters and tar and nicotine content—and it signaled a new and more aggressive commission policy toward cigarette advertising. Since the Surgeon General did not state that low tar or filtered cigarettes were safer to health, the FTC did not feel advertising could mention any health claims.⁶ The Commission argued that the informal agreement simply reaffirmed the 1955 advertising guidelines adopted by the industry. But the FTC's requirement that brands must have significant physiological differences and its interpretation of all filter and tar and nicotine advertising as health claims revealed a more aggressive policy than in the past; a policy which caused changes in both industry and consumer behavior.

Advertising Age criticized the agreement at the time because it prevented the cigarette companies from describing important product attributes, and argued that the agreement would cause the sales of safer brands (those with filters and lower tar and nicotine) to decline.⁷ Two years later, the cigarette companies stated that the FTC's informal agreement had increased consumption of cigarettes with high levels of tar and nicotine while it discouraged consumption of low tar brands and research on improved filters.⁸ A report from the British Royal College of Physicians in 1962 further embarrassed the FTC, emphasizing that while cigarette smoking was dangerous, filtered cigarettes were safer to consume.⁹

Was the FTC's policy effective? Certainly the Commission hindered the growth and development of cigarettes which might have been 'safer' due to advanced filters and lower tar and nicotine content. The data graphed in Figure 1 show the market shares of filter and non-filter cigarettes from 1951 to 1970. The market

Figure 1. Market Share of Filter Cigarettes



Sources: Business Week: annual survey of the cigarette industry.
Federal Trade Commission Report to Congress Pursuant to the Federal Cigarette Labelling and Advertising Act (1985).

share growth of filter cigarettes clearly leveled off in 1960 when the FTC reached its informal agreement with the cigarette producers, although the growth of filter brands had declined somewhat in 1959. Filter cigarettes resumed their growth two years later as a result of the health scare and the Surgeon General's report, but this change in consumption had nothing to do with the FTC's policy. In retrospect, the FTC's informal agreement which prohibited cigarette producers from advertising the comparative benefits of filter-tip and low-tar and nicotine brands is quite remarkable and certainly did not encourage the consumption of safer cigarettes.

Even if this policy had no effects on cigarette consumption, it may have hindered the development of safer cigarettes. Newer filters and lower tar and nicotine brands might have been developed had the FTC allowed cigarette companies to advertise the advantages of these new products, and the public would have benefited from consuming safer cigarettes. Unfortunately, these opportunity costs cannot be accurately measured—even though they may be large—and perhaps because they defy easy measure, regulatory agencies and public policy-makers continue to ignore them.

Under the weight of new health information, such as the 1964 Surgeon General's report on smoking, and mounting criticism, the Commission reversed itself in 1966 and argued that it would no longer consider tar and nicotine statements to be health claims. In fact, in 1967 the FTC standardized tests for tar and

nicotine content and recommended legislation to Congress which would require cigarette producers to state the tar and nicotine content of their brands on the package. In 1970 the FTC proposed a rule which would require tar and nicotine labeling and faced with this, the cigarette industry volunteered to provide this information. After the FTC's policy reversal, competition between tobacco manufacturers intensified. The number of new brands increased substantially as marketers tried to segment consumers into various product classes, such as menthol, filter, and nonfilter categories. These efforts significantly increased the costs of introducing new brands as the market became more and more fragmented, and the marketing divisions of these companies faced a growing challenge to maintain market share for their brands.¹⁰ This was especially difficult since new brands, such as a filter version of an old brand, would often reduce sales of the old brand with little increase in new sales. Brand proliferation and marketing tactics soon became very defensive in the industry.

After the Surgeon General's report in 1964, the FTC proposed a trade regulation which required a health warning on cigarette packages and in cigarette advertising, leading to the 1965 Federal Cigarette Labeling and Advertising Act which mandated these health warnings. Unfortunately, the law required labels only on cigarette packages and did not require them on cigarette advertising as the FTC wanted. Worse yet, the law prohibited the FTC, the FCC, and state and local governments from taking any additional action on cigarette labeling or advertising for the next three years. As Elizabeth Drew described it, the 1965 Cigarette Labeling Act was a clear victory for the cigarette industry.¹¹

With the support of the FTC, Congress later strengthened the health warning labels in 1970 (see section two). In 1969, the FTC announced a procedure for stronger health warnings and indicated to Congress that it would suspend the proposed rule if a ban on cigarette advertising on radio and television were enacted. This eventually led to the broadcast ban that became effective in 1971 (discussed in section three of this paper).

The Effectiveness of the Cigarette Labeling Acts

The effects of the 1965 labeling requirement and the strengthened warnings in 1970 were recently investigated by Abernethy and Teel [1986]. They argued that the advertising regulations (the labeling requirements and the 1971 broadcast ban) decreased U.S. cigarette consumption. Abernethy and Teel used dummy variables to estimate the effects of the 1965 and 1970 labeling requirements, and they also included dummy variables to account for the anti-smoking commercials which ran from 1967-1970, and the 1971 broadcast ban. To determine whether the labeling requirements were effective, they regressed per capita tobacco consumption against broadcast and print advertising variables, the price per 1000 cigarettes, lagged consumption, and the dummy variables. Although Abernethy and Teel found that the advertising regulations appeared to reduce cigarette consumption, the results from their study are biased because these authors used ordinary least squares to estimate the demand equation for tobacco. Demand equations cannot be consistently estimated by ordinary least squares except under very restrictive and unusual circumstances.¹² It is unlikely that the market for cigarettes satisfies this requirement, and even if it did, the demand curve is not identified in their model.¹³ Unfortunately, as we will see in the next section, most of the empirical research investigating the effects of government regulation in the cigarette industry has employed the biased ordinary least squares technique to estimate cigarette demand and has failed to identify the demand curve for cigarettes as well. Since the results of the study by Abernethy and Teel are biased, the effects of the labeling acts and the Fairness Doctrine period are still unclear and will be evaluated in section four.

The identification problem is sufficiently important to merit additional discussion. The data used by economists and marketers on prices and quantities are determined by the forces of supply and demand in the market. The crucial point to realize is that price and quantity data reflect elements of *both* supply and demand. If researchers simply regress quantity against price and other variables, how do they know that the fitted equation represents a demand curve rather than supply? When there are shifts in both demand and supply, the price and quantity data will reflect the shifts in both curves and additional information is needed to determine whether the fitted equation represents a demand curve or a supply curve. For example, if we knew that there had been no shifts in the supply of cigarettes during the sample period but the demand curve did shift (due to the Surgeon General's report or the cigarette labeling requirement), then the shifts in demand would trace out the supply curve and the price and quantity data would reflect cigarette supply during this period. However, in this case we would not be able to identify the demand curve for cigarettes. To accomplish this objective, it is necessary to include variables which shift only the *supply* curve so that we know the resulting price and quantity data trace out the demand for cigarettes. Since Abernethy and Teel and the other researchers whose work is reviewed below failed to do this, their estimates do not identify the demand for cigarettes.

Another controversial aspect of the labeling act which Abernethy and Teel did not discuss has recently become an important issue in the judicial system. Once the health effects of cigarette smoking became clear, a long series of lawsuits by consumers who had smoking-related diseases threatened the tobacco industry. But recently a Boston court ruled in favor of the tobacco companies arguing that the warning labels on cigarettes protected the tobacco companies from product liability claims.¹⁴ This is why the tobacco lobby supported the labeling bill which was passed by Congress. Without the labeling act, the tobacco companies may not have been protected from these lawsuits, and the publicity and possible losses from these suits could have seriously damaged the industry—an outcome smoking opponents would prefer. Instead, the very legislation established to protect the consumer from the health effects of smoking now protects the industry.

A final point should be made regarding the study by Abernethy and Teel. These authors included dummy variables for the 1965 labeling act, the 1967–1970 period of anti-smoking commercials, and the 1971 broadcast advertising ban. The periods covered by the dummy variables overlap at several points and this makes it likely that these variables are highly collinear. Perhaps more important, however, is the possibility that these variables may reflect other factors which affect the demand for tobacco. For example, the 1964 Surgeon General's report on smoking has been cited as an important development which reduced cigarette and tobacco consumption in the United States.¹⁵ The dummy variables used by Abernethy and Teel to reflect the effects of the 1965 and 1970 labeling requirements could simply reveal the impact of the Surgeon General's report. Some care is required in modeling the various factors which affected cigarette and tobacco consumption during this period; dummy variables cannot be used indiscriminately.

The Effects of the 1971 Broadcast Advertising Ban

The Federal Communications Commission (FCC) brought additional pressure on the cigarette industry when it decided to apply the Fairness Doctrine to cigarette commercials. Under the FCC's ruling, television and radio stations that aired cigarette advertisements were also required to provide free air time for anti-smoking commercials. All broadcast advertising for cigarettes was banned by the Public Health Cigarette Smoking Act in 1971 and the warning labels on cigarette

packages were also strengthened. Unfortunately, the broadcast ban also ended the equal time requirement for anti-smoking commercials and the number of these messages declined significantly.¹⁶

The effects of the advertising ban were first analyzed in a well-known study by Hamilton [1972]. He argued that the anti-smoking commercials and the 1964 report of the Surgeon General had created "health scare effects" which reduced cigarette consumption more than the increase caused by cigarette advertising. He contended that the anti-smoking commercials were particularly effective in reducing cigarette consumption, and when the ban caused the number of these messages to decline, cigarette consumption increased. Hamilton did not directly estimate the demand for cigarettes, however, he used cross-section estimates of the price and income coefficients for cigarette demand. The estimated coefficients for the dummy variables during the Fairness doctrine period were larger than those for the advertising variable, and this supported Hamilton's argument that the anti-smoking commercials were more effective in reducing cigarette consumption than cigarette advertisements were in promoting consumption.

These conclusions were also reached by Doron [1979] in his study of cigarette regulations. He found that the industry was better off after the ban: advertising costs had been reduced and the number of anti-smoking commercials had declined. But the estimates obtained by Doron are unreliable for several reasons. First, he constructed an "effective price" variable to measure cigarette prices: per capita disposable income divided by a weighted average of cigarette prices. There is no theoretical justification for combining the income and price variables this way, and any estimates obtained cannot be easily interpreted: What does the coefficient for income divided by price mean in terms of cigarette demand? More problematic is the fact that Doron used ordinary least squares to estimate the demand for cigarettes, and this procedure is biased when price and quantity are determined by supply and demand.¹⁷ Therefore Doron's estimates of the effects of the cigarette advertising ban are biased and inconsistent.

Several recent studies by Lewit, Coate, and Grossman [1981]; Schneider, Klein, and Murphy [1981]; McLeod [1986]; and Holak and Reddy [1986] are all biased for the same reasons. In all these studies the authors have used ordinary least squares or similar methods to estimate the demand for cigarettes with no correction for simultaneous equations bias. For example, Lewit, Coate, and Grossman estimated teenage demand for cigarettes and argued that the anti-smoking commercials under the Fairness doctrine were very effective in reducing teenage smoking. They used better measures of the Fairness doctrine period by calculating the number of anti-smoking messages aired, but their estimates of the effects of the doctrine were obtained by ordinary least squares and the demand for cigarettes was not identified. Since their estimates are biased, it is not clear that the Fairness Doctrine reduced teenage smoking as they claim.

This problem also arises with the estimates obtained by Schneider, Klein, and Murphy. They argued that the demand for cigarettes has been misspecified because researchers have used the number of cigarettes consumed as the dependent variable, yet cigarette technology has changed over time. When the public became aware of the health effects of cigarette smoking, "safer" cigarettes were demanded and produced. As improved filters and lower tar and nicotine brands were introduced, each cigarette smoked became safer than before. Therefore, even if Americans were smoking the same number of cigarettes today as before the Surgeon General's report, this would not mean that the report had no effects on consumption since the cigarettes consumed today are safer. Improved filters and lower tar and nicotine reduce the total amount of tobacco in a cigarette, so Schneider, Klein, and Murphy conclude that researchers must estimate tobacco consumption directly or include a variable such as the pounds of tobacco per

cigarette to correct for this change in cigarette technology. When they made these corrections, these authors found that the 1953 report of the American Cancer Society and the 1964 Surgeon General's report were quite effective in reducing cigarette consumption in the United States: tobacco consumption per capita peaked in 1953 and cigarette consumption per capita peaked in 1963. Unfortunately, these authors also used ordinary least squares to obtain their estimates, and they did not identify the demand curve in their study. Once again, the estimates are biased and unreliable, although their argument concerning cigarette technology is quite valid.

Holak and Reddy [1986] used the 1971 advertising ban as a 'natural experiment' to examine brand and industry trends before and after the ban. They found that the price and advertising elasticities of demand were significantly different after the advertising ban. The advertising elasticity of demand was lower in the post-ban period while the price elasticity was higher after the ban, and Holak and Reddy recommended policies for managers based upon these results. However, they also used biased procedures to obtain their results: a maximum likelihood method (which is equivalent to ordinary least squares in their model) was employed which did not correct for simultaneous equations bias and did not identify the demand curve for cigarettes. Thus, their findings and recommendations, both for public policy and for managerial policy, are also suspect.

Three studies which have used consistent methods to estimate and identify the demand for cigarettes are those by Bishop and Yoo [1985], Porter [1986], and McAuliffe [1987]. Bishop and Yoo used two- and threestage least squares to estimate both the supply and demand for cigarettes in the U.S. Their model is specified as follows:

$$\begin{aligned} 1) Q_t &= a_0 + a_1P_t + a_3DI_t + a_4AD_t + a_5D_{64} + e_{1t} \\ 2) Q_t &= b_0 + b_1P_t + b_2TX_t + b_3FPI_t + b_4D_{71} + e_{2t} \end{aligned}$$

where Q_t is the number of cigarettes consumed (all variables are in logs except the dummy variables and error terms), P_t is the relative retail price index per cigarette, DI_t is an index of real disposable income (not per capita), AD_t is an index of total industry advertising, D_{64} is a dummy variable for the 1964 Surgeon General's report, and e_{1t} is an error term for the demand curve.

Bishop and Yoo argued that the 1971 broadcast advertising ban raised the costs of advertising and thus had a greater impact on cigarette supply than on cigarette demand. Therefore the supply curve includes a dummy variable for the broadcast advertising ban, D_{71} , total federal and state taxes per cigarette, TX_t , an index of cigarette costs, FPI_t , and an error term in the supply curve, e_{2t} . Note that the inclusion of the tax variable, cigarette costs, and the 1971 dummy variable in the supply equation shift the supply curve and thus serve to identify the demand for cigarettes—an important issue overlooked in all the studies reviewed above.

These authors estimated the supply and demand equations for cigarettes both individually and as a complete system. They found that the demand for cigarettes was inelastic, that advertising had a very small but significant effect on cigarette demand, and that the 1964 Surgeon General's report significantly reduced cigarette consumption in the U.S. The estimated elasticity of supply was significantly positive with values between 1 and 2.2. This implies that the price and quantity of cigarettes are determined by both supply and demand and so simultaneous equations methods must be used to estimate cigarette demand.

Although the Bishop and Yoo study is the most careful and reliable of those reviewed thus far, several issues were not considered in their study. For example, many researchers have argued that advertising expenditures are simultaneously determined with sales, yet Bishop and Yoo treat these expenditures as if they were independent of sales in their model.¹⁸ Also, the model they estimate

does not consider the changes in cigarette technology noted by Schneider, Klein, and Murphy. Finally, Bishop and Yoo use a retail price index for the price variable in their cigarette demand equation, yet demand theory specifies that the *relative* price is the appropriate price in the demand curve.

These problems with the Bishop and Yoo study were recently corrected by McAuliffe [1987], and the relevant policy questions raised in this paper will be examined using an updated version of that model in the next section.

Robert Porter [1986] also employed consistent estimation procedures in his study of the cigarette industry. He argued that the response of both consumers and producers must be examined to determine the effectiveness of government policies toward the cigarette industry. For example, the 1971 broadcast advertising ban may have caused producers to lower prices and this reaction must be included with the effects on demand when evaluating the success of the government's policy.

In his review of previous research, Porter criticized the studies by Lewit, Coate and Grossman [1981] and Schneider, Klein and Murphy [1981] because both studies used ordinary least squares. As mentioned above, this procedure is biased when market prices and quantities are determined by both supply and demand. In addition, Porter found that the model estimated by Schneider, Klein, and Murphy did not perform well when he extended the sample period. For these reasons, he estimated a similar model using twostage least squares to eliminate simultaneous equations bias. Several variables were included to shift the supply curve and ensure that the demand for cigarettes was identified in his study. Porter regressed the log of the per capita demand for cigarettes against the log of relative cigarette prices, the log of per capita real income, the log of the percentage of tobacco consumed as cigarettes, the log of advertising expenditures, and the market shares of filter-tip and low-tar cigarettes for the period from 1947–1982. He found that the estimated elasticity of demand was smaller than that obtained by other researchers (his estimates ranged from $-.26$ to $-.29$); advertising expenditures had a small but significant positive effect on cigarette demand; and the variable pounds of tobacco per cigarette was not significant. Dummy variables were included for the 1953 American Cancer Society report and the Fairness Doctrine period and they had small but significantly negative effects on per capita cigarette demand.

Although Porter's study is carefully executed, there are some difficulties with his estimates as well. Like Bishop and Yoo [1985], Porter used advertising expenditures which were deflated by the CPI and not by the cost per million viewers. Therefore his measure of advertising does not reflect the number of potential consumers who see the advertising messages. The variables he used in his regressions also exhibit considerable trend (as he himself admitted). Therefore it is possible that his results simply reflect the effects of trend and not changes in demand responding to government policies.¹⁹ Finally, he excluded the dummy variable for the 1964 Surgeon General report in many of the regressions, yet that report may have significantly changed cigarette demand.

Advertising Regulations and Cigarette Demand

The basic demand equation estimated by Bishop and Yoo [1985] was changed by McAuliffe [1987] in three important ways: advertising expenditures were not considered to be independent of sales, the retail price index for cigarettes was divided by the consumer price index to reflect relative cigarette prices, and a variable to measure changes in cigarette technology—pounds of tobacco per cigarette—was added to the demand equation. That model is extended here with data from 1957 to 1985, and the effects of the 1964 Surgeon General's report, the Fairness Doctrine, and the 1971 broadcast ban on the demand for cigarettes

can be tested to determine whether these policies were effective in changing cigarette demand. As noted in McAuliffe [1987], the demand for cigarettes showed strong trend effects in log-level form, so it was necessary to difference all the variables (except the dummy terms). Estimates of the demand equation were very unstable when the data were not differenced, and it is possible that the results obtained by earlier researchers are biased by trend effects. The fact that the demand for cigarettes is not stable for the log of cigarettes consumed is not surprising given the length of time (three decades) over which the demand curve was estimated.

To test the various hypotheses reviewed in the literature, the following demand equation was estimated:

$$3) DQ_t = c_0 + c_1 DP_t + c_2 DDI_t + c_3 DRAD_t + c_4 D_{64} + c_5 D_{67} + c_6 D_{71} + c_7 DTPC_t + u_{1t}$$

where all variables are logs (except the dummy terms), "D" is the difference operator (that is, DQ_t is the difference of the log of the quantity of cigarettes consumed, etc.), TPC_t is the log of pounds of tobacco per cigarette, and RAD_t is the log of real advertising expenditures.²⁰ If the Surgeon General's report reduced cigarette demand, as Hamilton [1972], Schneider, Klein, and Murphy [1981], Bishop and Yoo [1985], and McAuliffe [1987] have argued, then the coefficient for that dummy variable should be significant and negative (D_{64} has a value of 1 from 1964 on and 0 otherwise). If the anti-smoking commercials during the Fairness Doctrine period were effective in reducing cigarette demand, as Abernethy and Teel [1986], and Lewit, Coate and Grossman [1981] argue, then the estimated coefficient for this variable should be significantly negative as well. The dummy variable (D_{67}) for the Fairness Doctrine has a value of one from 1967 through 1970 and is zero otherwise. Finally, the coefficient for the 1971 broadcast ban should be significantly negative if the arguments raised by Abernethy and Teel [1986] and Holak and Reddy [1986] are consistent with the data.

Equation (3) was estimated by twostage least squares over the period 1957–1985. The instrumental variables used to eliminate simultaneous equations bias and identify the demand curve were: the difference of the log of real disposable income, a time trend, the inflation rate, the difference of the log of tobacco per cigarette, the difference of the log of total tobacco consumed, D_{64} , D_{67} , D_{71} , and the difference of the log of total wage and salary costs per cigarette. Cigarette and tobacco consumption data were obtained from *Agricultural Statistics of the United States*; cigarette price data were obtained from the *Handbook of Labor Statistics*, "The Consumer Price Index for Selected Items and Groups Other Than Food"; and advertising data were compiled from the annual survey of advertisers by *Advertising Age* and summed over the six cigarette companies. The advertising series was deflated by an advertising cost index for each of the media to obtain a measure of real advertising expenditures.²¹ Data for real disposable income, total wage and salary costs in the cigarette industry, and the consumer price index were obtained from Citibase.

The estimates of cigarette demand appear in Table 1. To test each hypothesis, the dummy variables were added one at a time. Thus in equation one in Table 1, the price elasticity of cigarette demand is significantly negative and inelastic and the coefficient for the 1964 Surgeon General's report is also significantly negative. The estimated price elasticity of demand is very close to the estimates obtained by those who have used consistent procedures to estimate the demand function.²² Although there was no evidence of autocorrelation in the error terms (which might occur if there were lags in the response of cigarette consumption), a lagged consumption term was included. The lagged variable was not significant,

**Table 1. Estimates of Cigarette Demand 1957–1985
Two-stage Least Squares**

$$1) DQ_t = .032 - .38DP_t + .229DDI_t - .027DRAD_t - .26DTPC_t$$

$$(.01) (.133) (.221) (.029) (.179)$$

$$-.035D_{64}$$

$$(.009)$$

$$R^2 = .492, D. W. = 1.77, 29 \text{ obs.}$$

$$2) DQ_t = .031 - .37DP_t + .242DDI_t - .029DRAD_t - .26DTPC_t$$

$$(.01) (.135) (.228) (.029) (.18)$$

$$-.033D_{64} - .008D_{67}$$

$$(.009) (.011)$$

$$R^2 = .514, D. W. = 1.86, 29 \text{ obs.}$$

$$3) DQ_t = .032 - .38DP_t + .242DDI_t - .028DRAD_t - .26DTPC_t$$

$$(.01) (.138) (.249) (.029) (.184)$$

$$-.036D_{64} - .001D_{71}$$

$$(.012) (.01)$$

$$R^2 = .495, D. W. = 1.78, 29 \text{ obs.}$$

$$4) DQ_t = .034 - .38DP_t + .178DDI_t - .032DRAD_t - .26DTPC_t$$

$$(.01) (.138) (.258) (.029) (.184)$$

$$-.026D_{64} - .015D_{67} - .008D_{71}$$

$$(.016) (.16) (.01)$$

$$R^2 = .517, D. W. = 1.92, 29 \text{ obs.}$$

Standard errors are in parentheses. Instrumental variables are: time, the inflation rate, D_{64} , D_{67} , D_{71} , DDI_t , $DTPC_t$, total wage and salary costs per cigarette, and the difference of the log of total tobacco consumed.

and this result is consistent with the estimates obtained by Bishop and Yoo [1985] and Porter [1986].

The real disposable income and advertising variables are not statistically significant, which contradicts some earlier work.²³ However, the results of previous research were often biased, as mentioned in section three, and even in those studies where advertising was found to have significant effects, the estimated coefficients were frequently small. For example, Porter [1986] found that per capita real income had no significant effect on cigarette demand, and the effect of advertising was very small and positive. Since real advertising expenditures are not significant, the results reported here suggest—as many cigarette ad men have argued in the past—that advertising may be effective in changing market shares between companies but it has little effect on total cigarette demand.

The real difference between the results in Table 1 and those obtained elsewhere is the fact that real disposable income is not significant. Since the data in this study are differenced, spurious trend effects with the disposable income variable may have been eliminated here which are present in other studies (as with Porter [1986] and Bishop and Yoo [1985]). Recent work suggests that disposable income per capita has a strong trend and that differencing may be required.²⁴ Intuitively, it is hard to imagine strong income effects for cigarette consumption given the health effects of the product. Most consumers would be likely to enjoy an increase in income by increasing their consumption of other goods rather than smoking more frequently. Finally, the variable pounds of tobacco per cigarette is not significant but it has the expected negative sign; as the

tobacco content of cigarettes falls, the number of cigarettes demanded should rise, all else equal. Porter obtained a similar result; the estimated coefficient for this variable was insignificantly negative in his study.

The dummy variable for the Fairness Doctrine period was then added to the estimated equation to determine if the anti-smoking commercials had any additional effects on cigarette demand. These results are presented in equation two of Table 1, and the estimated coefficient for the Fairness Doctrine dummy variable is not significant. In contrast to the results obtained by Hamilton [1972], Lewit, Coate, and Grossman [1981], Porter [1986], and Abernethy and Teel [1986], the anti-smoking commercials did not appear to significantly affect cigarette demand. This result is due to the fact that a dummy variable for the effects of the 1964 Surgeon General's report was included here, and this variable picks up the effects that other researchers have attributed to the Fairness Doctrine and/or the 1971 broadcast advertising ban. Since the Surgeon General's report received wide publicity, and since per capita cigarette consumption peaked in 1963 just before this report, it seems quite reasonable to include a dummy variable for this event.

Finally, the dummy variable for the 1971 broadcast advertising ban was added to the original equation (with the Fairness Doctrine variable removed). The estimated coefficient is not statistically significant, so it appears that the broadcast advertising ban also had little effect on cigarette consumption. Holak and Reddy argued that the ban changed cigarette demand, but their conclusion is rejected here. Since they also contended that the broadcast ban changed the elasticity of demand with respect to advertising and price, interaction terms between the dummy variable for the broadcast ban and the price and advertising variables were also included in the equations. The interaction terms were never significant, and multi-collinearity between these variables and others in the model caused the results to deteriorate badly. In all cases, the hypothesis that the broadcast ban caused significant changes in either the price or advertising elasticities was rejected, so the conclusions reached by Holak and Reddy are not supported here. Equation four in Table 1 presents the results when all three dummy variables are included, and the general fit of the model declined. We conclude that the Fairness Doctrine period and the 1971 broadcast ban had no significant effects on cigarette demand in the United States.

The results from estimating the per capita demand for cigarettes appear in Table 2, and the basic approach of including the dummy variables sequentially is repeated here with little change in the findings. The price variable is significantly negative and inelastic, as before, and the dummy variable for the Surgeon General's report remains significantly negative. The estimate of the price elasticity of demand (-.29) reported here is almost identical to those obtained by Porter [1986]. However, the Fairness Doctrine and broadcast ban variables were not significant, nor were the coefficients for the difference of the log of the real disposable income per capita and advertising expenditures. The variable for the change in cigarette technology, the difference of the log of pounds of tobacco per cq, became significant in the per capita cigarette demand equations, however. Schneider, Klein, and Murphy argued that this variable was needed when modelling the per capita demand for cigarettes, and its significance in these equations supports their reasoning.²⁵ They also concluded that the 1964 Surgeon General's report had a significant, negative effect on per capita cigarette consumption, and that result is supported by these estimates. Apparently the voluntary changes in cigarette consumption after the report reflected an adjustment by the market to new information about the health effects of cigarettes which was far more effective in reducing cigarette demand than subsequent federal regulatory actions.

It is possible that the significance of the dummy variable for the Surgeon

Table 2. **Estimates of Cigarette Demand Per Capita 1957–1985**
Two-stage Least Squares

$$1) DQ_t = .020 - .29DP_t + .211DDI_t - .026DRAD_t - .38DTPC_t$$

(.008) (.119) (.205) (.025) (.159)

$$-.039D_{64}$$

(.009)

$$R^2 = .628, D. W. = 1.58, 29 \text{ obs.}$$

$$2) DQ_t = .019 - .28DP_t + .225DDI_t - .028DRAD_t - .39DTPC_t$$

(.008) (.119) (.205) (.025) (.16)

$$-.038D_{64} - .008D_{67}$$

(.009) (.010)

$$R^2 = .645, D. W. = 1.67, 29 \text{ obs.}$$

$$3) DQ_t = .020 - .29DP_t + .212DDI_t - .028DRAD_t - .38DTPC_t$$

(.008) (.122) (.222) (.026) (.163)

$$-.039D_{64} - .0001D_{71}$$

(.011) (.008)

$$R^2 = .628, D. W. = 1.58, 29 \text{ obs}$$

$$4) DQ_t = .021 - .29DP_t + .153DDI_t - .031DRAD_t - .39DTPC_t$$

(.009) (.121) (.225) (.026) (.162)

$$-.029D_{64} - .016D_{67} - .01D_{71}$$

(.014) (.14) (.01)

$$R^2 = .652, D. W. = 1.75, 29 \text{ obs.}$$

The quantity and real disposable income variables are per capita figures. Standard errors are in parentheses. Instrumental variables are: time, the inflation rate, D_{64} , D_{67} , D_{71} , DDI_t , $DTPC_t$, total wage and salary costs per cigarette, and the difference of the log of total tobacco consumed.

General's report also reflects the effect of the warning labels on cigarettes, as Abernethy and Teel [1986] have argued. However, the per capita consumption of cigarettes peaked in 1963, as Schneider, Klein, and Murphy noted, and not later when the health warnings were required. Even so, these two explanations are not mutually exclusive; the Surgeon General's report and the warning labels both reflect new information about the same phenomenon.

Conclusions The policies implemented by the federal government and by the FTC toward cigarette advertising over the last three decades have not generally had the effects which were intended. The 1955 advertising guidelines and the informal agreement in 1960 which banned advertisements of filter efficiency and the benefits of lower tar and nicotine appear to have reduced the growth in the market share of filter cigarettes. Since filter cigarettes were known to be safer at the time, this policy hindered the development and consumption of safer cigarettes. Contrary to recent research, the cigarette labeling act which the FTC supported does not appear to have had a significant independent effect on cigarette demand, and ironically, a recent court decision cited this act in dismissing a product liability suit against a cigarette manufacturer.

The 1971 broadcast advertising ban on cigarettes did not significantly affect cigarette consumption according to the estimates in section IV. Hamilton [1972]

argued that the ban was ineffective because it brought an end to the free time for anti-smoking commercials which aired from the middle of 1967 until the end of 1970. Although the results from this study did not show that the Fairness Doctrine had significant effects on cigarette demand, it is possible that better measures of the Fairness Doctrine period, such as the number of anti-smoking messages aired, would find that these messages were successful. High collinearity between the dummy variable for the Surgeon General's report and the Fairness Doctrine variable could also explain the absence of any effects from the anti-smoking campaign. The broadcast advertising ban certainly made it more difficult for new firms to enter the U.S. cigarette market, and as Doron [1979], Miles [1982] and Porter [1986] have argued, this increased the monopoly power of domestic cigarette manufacturers.

Although many researchers have investigated the effects of various cigarette regulations, most of the studies have used biased procedures to obtain their results. In general, demand equations cannot be consistently estimated by ordinary least squares, and simultaneous equations methods are required. This is particularly true in the case of the cigarette market, where it appears that prices and output are determined simultaneously. The estimates obtained here support the general results reported by Porter [1986] and Bishop and Yoo [1985], although the real disposable income and advertising variables were not significant in the cigarette demand equations. Although the number of observations is relatively small in this study, the results support the conclusions reached by other researchers who have used consistent estimation procedures and time series data.

The broadcast advertising ban imposed on the industry in 1971 does not appear to have had any significant effect on the demand for cigarettes, and while this result is consistent with the conclusion reached by Bishop and Yoo, it contradicts the results obtained by Holak and Reddy. However, since Holak and Reddy's estimates are biased, such a contradiction is not surprising. The implications for public policy are clear from this study: regulators should exercise extreme care when recommending or implementing new policies. The advertising guidelines and the broadcast advertising ban reduced competition in the cigarette industry and strengthened the market power of the remaining firms, and Miles [1982] and Porter also reached this conclusion regarding the broadcast ban. The decline in filter-tip cigarette growth, the increase in cigarette consumption after the 1971 advertising ban, and the reduced incentives that advertising regulations have created in developing safer cigarettes all indicate that the unintended consequences of cigarette policies may be precisely the opposite of those originally planned and may ultimately reduce public welfare.

Notes

1. Testimony of Robert T. Secret, Acting Chairman, Federal Trade Commission in *False and Misleading Advertising (Filter-Tip Cigarettes)*, Hearings Before a Subcommittee of the Committee on Government Operations, July 1957.
2. The Guidelines are reprinted in *False and Misleading Advertising*, pp. 299–300. See the testimony of Robert Secret.
3. "Cigarette Scare: What'll the Trade Do?" *Business Week*, December 5, 1953, p. 60.
4. *Federal Trade Commission Annual Report*, 1960, p. 82. "New FTC Cigaret Ad Policy Seen as One of 'Containment' on Health Basis," *Advertising Age*, February 15, 1960, p. 1.
5. "Cigaret Makers Drop Nicotine, Tar Ad Claims," *Advertising Age*, February 8, 1960, p. 1.

6. Although the Commission's thinking is not entirely clear on this point, see the testimony of Paul Rand Dixon, Chairman of the Federal Trade Commission in *Cigarette Labeling and Advertising*, Hearings before the Committee on Commerce, Part I, March and April 1965, p. 419.
7. "FTC's Filter Claim Ban Drove Cigaret Makers Into False Ads, Says 'Digest'," *Advertising Age*, June 26, 1960, p. 3.
8. See "Cigarette Forces Build Fire Under U.S. Rule Makers," *Advertising Age*, May 28, 1962, p. 1. and "FTC may Revise Ban on Health Claims 'If Difference is Real'," *Advertising Age*, March 12, 1962, p. 12.
9. Royal College of Physicians (1962), *Smoking and Health*, London: Pitman.
10. See Doron (1979), Overton (1981), and Johnson (1984).
11. Elizabeth Drew (1965), "The Quiet Victory of the Cigarette Lobby," *Atlantic Monthly*, September 1965, pp. 76-80.
12. See the appendix of this paper, or any standard textbook in econometrics, such as Kmenta (1986).
13. Several studies have found that the price of cigarettes is determined by both supply and demand. See Vernon, Rives, and Naylor (1969) and Bishop and Yoo (1985), reviewed in the next section. For a discussion of the identification problem, see any standard textbook in econometrics such as Kmenta (1986).
14. According to some observers at the time, Congress seemed intent on protecting the cigarette industry when the labeling act was passed. See Elizabeth Drew (1965) and "Tobacco Wins One in Court," *Newsweek*, September 7, 1987, p. 44.
15. See Hamilton (1972); Schneider, Klein, and Murphy (1981); and McAuliffe (1987).
16. See Hamilton (1972), Doron (1979), and Levit, Coate and Grossman (1981).
17. Bishop and Yoo (1985) present evidence which shows that prices and output are determined by supply and demand. See the appendix for a proof that ordinary least squares estimates are biased in these cases.
18. See Sherman and Tollison (1972), Schmalensee (1972), Ehrlich and Fisher (1982), and McAuliffe (1987).
19. For example, Porter's figures for real advertising and the percentage of tobacco consumed as cigarettes show strong positive trends. The relation between these two series could result from increased advertising by cigarette producers which raised cigarette consumption, or the two variables might be positively related because of population growth.
20. See note 21 below.
21. The media expenditures reported by *Advertising Age* are for spot TV, network TV, spot radio, network radio, newspapers, magazines, and outdoor advertising. Cost indices for these media were obtained from Media Decisions and Schmalensee (1972). See also Schmalensee (1972), Ehrlich and Fisher (1982), and McAuliffe (1987) for details on the construction of an advertising cost index.
22. Bishop and Yoo (1985) found values of the price elasticity of demand between $-.4$ and $-.5$ for the log of cigarette consumption.
23. Several other researchers such as Hamilton (1972), and Bishop and Yoo (1985) found that real disposable income and advertising had significantly positive effects on cigarette demand.
24. For example, Mankiw and Shapiro (1985) found that disposable personal income per capita follows a random walk.
25. This variable may not have been significant in the previous regressions of total cigarette consumption because of population growth which is accounted for in these per capita regressions.

Appendix Proof that ordinary least squares estimates are biased when price and output are determined simultaneously.

Suppose for simplicity that the cigarette demand and supply curves are given by:

$$1) Q^d = a_1 + a_2 \text{Price} + e_d$$

$$2) Q^s = b_1 + b_2 \text{Price} + e_s$$

where the a's and b's are coefficients of demand and supply respectively, and e_d and e_s are random errors in demand and supply which are assumed to be normally distributed with zero mean and constant variance. If we solve the demand and supply equations for price, we obtain the following solution:

$$3) \text{Price} = (b_1 + e_s - a_1 - e_d)/(a_2 - b_2).$$

The OLS estimator for a_2 , a_{2ols} , is:

$$4) a_{2ols} = \text{Cov}(Q^d, \text{Price})/\text{Var}(\text{Price}),$$

where $\text{Cov}(Q^d, \text{Price})$ is the covariance of quantity demanded and Price and $\text{Var}(\text{Price})$ is the variance of the price of cigarettes. A crucial assumption for the OLS estimator in (4) to be unbiased is that the covariance between the independent variable (in this case, Price) and the error term, e_d , must be zero. To see if this assumption holds, take the covariance of both sides of the demand curve (1) with respect to Price. We obtain:

$$5) \text{Cov}(Q^d, \text{Price}) = a_2 \text{Var}(\text{Price}) + \text{Cov}(\text{Price}, e_d)$$

If we divide both sides by $\text{Var}(\text{Price})$ to solve for the OLS estimator of a_2 , the following result is obtained:

$$6) a_{2ols} = \text{Cov}(Q^d, \text{Price})/\text{Var}(\text{Price}) - \text{Cov}(\text{Price}, e_d)/\text{Var}(\text{Price}).$$

Equation (6) shows the bias from using OLS estimators in a simultaneous equations situation. The first term is the estimator of a_2 which we want, but the second term must equal zero if the OLS estimate of a_2 is to be unbiased. Unfortunately, our solution for Price in equation (3) above shows that Price will vary with e_s and e_d . Therefore the covariance between Price and the error term, e_d , in equation (6) will not be zero. This means OLS estimators of a_2 will be biased, and the extent of the bias will depend upon the size of the last term in (6).

This bias may not be large, that will depend on the specific case, but we know the OLS procedure will not be appropriate when price and output are determined simultaneously. When this problem is coupled with the fact that most researchers have not identified the demand curve at all, little faith can be placed in their estimates even if the bias were small. In the example presented here, neither the demand nor the supply curve can be identified without additional information.

The twostage least squares procedure corrects this bias by constructing fitted values for the Price variable which are not correlated with the error term. Since the estimates obtained apply to the fitted values for Price (and not Price itself), the benefits of twostage least squares apply in large samples (but OLS estimates are still biased even in large samples). Although the sample size is small in this study, the results are consistent with previous work which has employed unbiased procedures. The estimates of the price elasticity of demand, for example, are close to those obtained by Sullivan [1985] in *cross-section* estimation.

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McAuliffe

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