THE IMPACT OF ADVERTISING ON AGGREGATE CONSUMPTION: THE CASE OF ITALY

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Abstract:
One of the last assumptions of neoclassical economics that has not yet been fully challenged is the exogeneity of consumers' preferences. In this paper we attempt to verify and measure the effects of advertising on consumers' demand.

We do so by carrying out an econometric analysis, relying on a rather simple econometric model on Italian economy, using quarterly data from 1980 to 2000. We build an ADL model with Koyck transformation and different (and advertising-specific) geometrical rates of decline, and we test both the flow-form and the stock form of advertising. Our conclusions show that in the period under consideration advertising had a positive and significant effect on consumption, with short term and long term elasticities equal respectively to 0.034 and 0.16.

Keywords: ADL models, advertising, Koyck transformation.

JEL classification: D12, D83

1. Introduction

In the continuous effort to update the enormous literature on consumers’ demand, a particular feature has traditionally received very little attention: the investigation of the possible effects of advertising on aggregate consumption. The reason of this scarce recognition is to be found in the fact that neo-classical economies generally relies on a certain set of assumptions; among them, perfectly competitive economy with no uncertainty, market clearing and exogeneity of tastes and technologies. While virtually all of them have been relaxed within the increased realism and complexity of economic modelling, the last ones still stand as crucial milestone of economic theory.

The central issue of this paper is to challenge the exogeneity of preferences from a merely empirical point of view, by verifying and quantifying the impact of advertising on aggregate demand.

In Italy, the country this study is devoted to, very little research has been directed at any macro-implications of the effect of advertising, despite millions of euro being increasingly devoted to marketing and expenditure over recent years. Moreover, no italian study is known to have included a proxy for advertising expenditure among the explanatory variables in the aggregate consumption function.

The remainder of this paper is organized as follows. Section 2 offers a brief review of the existing empirical literature. Section 3 presents the econometric model, an Autoregressive Distributed Lags framework relying on Koyck-transformation tools; the two subsections explore the two alternative ways to consider advertising. Section 4 addresses the cointegration and simultaneity issues and also analyses the short-run dynamic by building an Error Correction Model. Section 5 offers some concluding remarks.

2. Literature review

Empirical studies are found both to support and oppose a positive relationship between advertising and consumption; here we present a small survey of these opposite views, dividing them according to their final predictions.

Most contributions find a positive effect. Jung and Seldon (1995a) regress aggregate consumption on lagged consumption and advertising, finding a positive relationship. However, they only used a bivariate model, and this obviously weakens the argument, as advertising could capture the effects of a number of other variables which are usually though of as relevant in the specification of the consumption function (such as disposable income, interest rate and so on). In a second paper published in the same year, Jung and Seldon (1995b), they introduced cointegration techniques in their analysis on the relationship between advertising and consumption, based on U.S. data. They found that
the two variables are integrated of order one and that are cointegrated; consequently, they examined an Error Correction Mechanism and found a two-way causality between advertising and consumption. They also put forward a rather doubtful assertion, according to which the original increase in consumption (triggered by advertising) could be offset by a decrease in investment, because of the decrease in savings, which in turn was caused by the increase in consumption; the overall impact on aggregate demand, therefore, would be nullified.

Keir (1993) used quarterly UK data from 1970 to 1991; he recognised the potential endogeneity of advertising and tested it using the Hausmann tests, thereby finding that the hypothesis of endogeneity cannot be rejected. Therefore, there is a dual relationship between consumption and advertising: the former causes the latter, and the latter causes the former. He deflates advertising expenditure with a television advertising price index to obtain the messages per 1000 homes. He calculated that in the long run a £1 increase in advertising leads to a £8.97 increase in consumption.

Peel (1975) used quarterly data for United Kingdom from 1956 to 1966. He estimated two different specification of the consumption function, a Keynesian one and a permanent income one, both augmented by advertising: in the first case, short run and long run impact are respectively found to be of £ 2.15 and £ 4.48, whereas in the second case of 0.05 and 0.06. He obtained similar results when he explicitly considered the issue of simultaneity, by using a system of equations. The overall conclusion is that advertising has a significant impact on aggregate consumption, although his approach does present some weak points, such as a non-completely accurate specification of the permanent income consumption function, and some doubts in the econometrics (for instance, he only tested for first-order autocorrelation although using quarterly data). It is interesting to note that Keir’s estimate of the long-run impact of advertising is twice as much as the one found by Peel.

Brack and Cowling (1983) proposed a slight change of perspective; they tested empirically their theoretical view, according to which advertising affects consumption via the labour supply response. They argue that previous study on advertising’s importance have usually focused on the propensity to consume, which has proved fairly constant over the long-run. However increasing the average propensity to consume is only one of a number of possible responses to advertising. According to them, the increase in desires caused by advertising can only be fulfilled by an increase in income for a large part of the labour force, since their average propensity to consume already tends towards one, and therefore their artificially increased needs encounter a budget constraint. Thus they investigated the possibility that advertising induces labour force to work longer hours than would be the case if advertising never took place. They use a measure of the advertising stock, rather than the flow, in order to be able to capture the cumulative effect. Following a growth of real advertising messages per head of 150%, a decay rate of 0.75 and an advertising elasticity of 0.18, the work year was approximately 27% longer than it would have been in 1976 in absence of advertising.

Taylor and Weiserbs’s work (1972) was based on an extension of Houthakker-Taylor state adjustment model. They assumed that the effect of advertising on consumption is direct and that it operates through a flow rather than state variable; so if the flow suddenly stopped, the preference map (which is assumed to be modified as far as the marginal rate of substitution of consumption for saving is concerned) would revert to the shape it had before there was advertising. Their results suggest a positive impact of advertising on consumption; they found that a $1 per capita increase in advertising expenditure leads to an increase in per capita consumption of $4.55 in the short run and $7.85 in the long run. However, in evaluating their results, they highlight some of the aspects that might question the validity of the results. Particularly, they argue that the result may be spurious as advertising may act as a proxy for some other factor; furthermore, they find that the presence of simultaneity cannot be ruled out.

However, a number of studies contradicts the existence of a positive and significant effect of advertising on aggregate consumption. Schmalensee (1972) uses instrumental variables estimation and adds lagged, current and future advertising to the consumption function, finding that future advertising outperformed the current one, which in turn outperformed the past in fitting consumption data. Although no formal tests were applied, he used this result to imply that causation runs from consumption to advertising, and not the other way round.

In a later paper with Ashley and Granger (1980), he attempted to address the issue of causality more formally. They found that the post sample mean squared error of the model containing equations
for advertising causing consumption as well as those for consumption causing advertising (the bivariate model) is 5.1% lower than the univariate model (containing only equation for consumption causing advertising). Therefore, they conclude that the bivariate model is not a significant improvement, and retain their null hypothesis that aggregate advertising does not have any role in explaining aggregate consumption. However, a major criticism of this paper is that they used raw consumption data along with seasonally adjusted quarterly advertising data, which is likely to introduce bias into the analysis of causality.

Pitelis (1987b) drew the attention to the effect of advertising on consumption through profits. According to him, the relationship works through two different ways: on one hand, increased profits lead to decreased consumption, given the assumption of a lower propensity to consume out of profit income than out of wages. On the other, more profits lead also to increased retained profits, which will reduce consumer’s expenditure, provided the retained profits are not perfectly substitutable for personal savings (a result proved in Pitelis (1987a)). Using quarterly data for United Kingdom from 1960 to 1972, he found that advertising does not cause consumption directly, but then he goes on to examine the relationship between advertising and profits: profits do not cause advertising, but advertising is highly significant in explaining profits. Therefore, while he casted doubts on any direct positive effect running from advertising to consumption, he found an indirect negative link through profits: advertising increases profits, which in turn decrease consumption.

To summarise, we have showed that different empirical studies (referring mainly to US and UK) are found both to support and oppose a positive relationship between advertising and aggregate consumption. Even among those studies that agree on a positive impact, there is quite a great variety in the magnitude of this effect.

3. The econometric model

We use quarterly data from 1980:1 to 2000:4. The dependent variable is real private consumption expenditure (source OECD database). Explanatory variables are GDP at constant prices (base year 1995, source OECD), real advertising expenditure deflated by the standard GDP deflator1 (source Nielsen)2, consumer price index (included to capture possible money illusion effects, source OECD) and past values of real private consumption (to capture habits and adjustment costs). Consumption function to be estimated is therefore:

\[ C_t = f(Y_{t-1}, A_{t-1}, P_{t-1}, C_{t-1}) \] (1)

where: C – private consumption; Y – GDP; A – advertising; P – price index; with all variables being in logs.

But how is exactly advertising introduced into the model?

Earlier empirical analysis on the effect of advertising on consumption failed to recognize any dynamic effects, preferring to focus on the impact of current advertising on current consumption. Most of the recent economic studies have instead accepted that its impact is not fully dissipated in the period when that advertising takes place, and thus that any empirical model must include the effects of lagged values. This opinion seems reasonable for at least a couple of considerations. First, it may take a series of repeated advertising messages to break through a threshold of buying resistance; the last message, which actually triggers the purchasing, cannot be fully hold responsible for the success. Secondly, the potential consumer, once persuaded to buy the product, may not immediately purchase it; in other words, the consumer may well decide to purchase the good at time \( t \) (thereby marking the success of the advertising campaign) and actually going to the shop at time \( t + 1 \). Furthermore, we must take into account the possibility of lags between the investment in advertising by firms and the

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1In response to a criticism againsts the use of the GDP deflator to obtain a real measure of advertising expenditure, Jung and Seldon (1995b) found that the correlation between a specific cost-index for advertising and the GDP deflator is 0.992.

2Data show the following proportions of advertising expenditure shares: newspapers and magazines (59.47%), radio and televisions (37.54%), cinema (2%), other methods (0.78%).
moment where consumers actually get to see it: it is the case of advertising in durable media (e.g. magazines) that can be read months after the actual publication date, but also of TV-advertising, which requires some technical time to produce the spot (hiring the director, actors, and so on).

Recognition of the dynamic effects of advertising has an immediate implication for the specification of the model; there are two alternative ways to acknowledge the dynamic role of advertising in its impact on aggregate consumption:

1) lagged values of advertising flow should be included as explanatory variables.
2) the string of advertising-flow variables should be combined so as to form a single variable representing advertising stock in the current period.

The following two subsections will investigate both options.

3.1 Advertising in flow form

In this formulation, the equation to be estimated is:

\[ C_t = f(Y_{t-1}, P_{t-1}, A_{t-1}) \]

with \( i = [0,1,2,3, \ldots n] \)

Equation (2) is very likely to have an estimation problem posed by the presence of a long string of lagged regressors; degrees of freedom would disappear completely and even truncating the series several periods back, the remaining regressors would be likely to generate a high degree of multicollinearity in the model.

Here we assume that each of the three-lag structure in (2) takes a geometrically declining form, the so-called Koyck transformation. At this stage, we assume that the rate of decline \( \lambda \) is constant across the variables (we will abandon this assumption later on).

\[ C_t = \alpha + \beta_1 P_t + \lambda \beta_1 P_{t-1} + \ldots + \lambda^2 \beta_1 P_{t-2} + \beta_2 Y_t + \lambda \beta_2 Y_{t-1} + \ldots + \lambda^2 \beta_2 Y_{t-2} + \beta_3 A_t + \lambda \beta_3 A_{t-1} + \ldots + \lambda^2 \beta_3 A_{t-2} \]

Rearranging we get:

\[ C_t = (1 - \lambda) \alpha + \beta_1 P_t + \beta_2 Y_t + \beta_3 A_t + \lambda C_{t-1} \]

with \( 0 < (1 - \lambda) < 1 \) being the rate of decline common to all the three lag structure. Equation (4) is the standard final form of the equation (to be taken to estimation) under the Koyck transformation; \( \beta_3 \) is the short-term marginal impact of current advertising on current consumption, whereas the long-term impact is given by \( \frac{\beta_3}{(1 - \lambda)} \). Equation (4) is a reasonable model, and rather convenient for estimation purposes. However, the assumption of constant rate of decline across variables seems too restrictive. Particularly, the lagged structure of advertising is likely to be determined by characteristics unique to that variable: for example, a series of advertising messages is supposed to patiently push an individual through a threshold of buying resistance, and this may require a different amount of time compared to what is needed for prices or income to have an effect on consumer demand. Therefore, we modify the model by allowing the rate of decline to differ across the variables. Technically, we assume that there are two kinds of dynamic effect in the model:

- the first common to all variables, each being given the same geometrically declining lag structure (rate of decline: \( 0 < (1 - \varphi) < 1 \)).
- the second specific to advertising (rate of decline \( 0 < (1 - \omega) < 1 \))

Following this procedure, equation (4) is modified as follows:

\[ C_t = (1 - \omega)(1 - \varphi) \alpha + \beta_1 P_t - \omega \beta_1 P_{t-1} + \beta_2 Y_t - \omega \beta_2 Y_{t-1} + (\omega + \varphi)C_{t-1} - \omega \varphi C_{t-2} + \beta_3 A_t \]
From equation (5) we work out our unrestricted model, where we can now distinguish the two above different dynamic effects:

\[ C_t = \rho + \theta P_t + \tau P_{t-1} + \psi Y_t + \eta Y_{t-1} + \pi C_{t-1} + \delta C_{t-2} + \delta A_t \]  

(6)

Rearranging (5):

\[ C_t - (\omega + \varphi)C_{t-1} + \omega \varphi C_{t-2} = (1-\omega)(1-\varphi)\alpha + \beta_1(P_t - \omega P_{t-1}) + \beta_2(Y_t - \omega Y_{t-1}) + \beta_3 A_t \]

by renaming the coefficient according to:

\[ C_t - (\omega + \varphi)C_{t-1} + \omega \varphi C_{t-2} = K_t \]

\[ (1-\omega)(1-\varphi)\alpha = Z_t \]

\[ P_t - \omega P_{t-1} = M_t \]

\[ (Y_t - \omega Y_{t-1}) = \Phi_t \]

we obtain our restricted model:

\[ K_t = \Phi_t + \beta_1 Z_t + \beta_2 M_t + \beta_3 A_t \]  

(7)

In section 4 we will test the validity of the restrictions.

3.2. Advertising is stock form

The alternative to the flow-form is to combine the string of advertising-flow variables so as to form a single variable representing advertising stock in the current period. Defining this stock as:

\[ G_t = A_t + \lambda A_{t-1} + \lambda A_{t-2} + \ldots \lambda A_{t-n} \]

(8)

we represent formally the alternative way to consider the impact of advertising on consumers’ perception: the cumulative stock of advertising messages received until that moment is responsible for persuading potential buyers. Plugging (8) into the standard equation, we obtain:

\[ C_t = \alpha + \beta_1 P_t + \beta_2 Y_t + \beta_3 G_t \]

(9)

which represents the stock-form model.

4. Cointegration and estimation

This section is concerned with the econometric analysis. First, issues of order of integration and simultaneity will be addresses, and subsequently we will estimate the unrestricted and restricted model presented in section 3. The last subsection builds an ECM to analyse the short term dynamics.

All variables are found to be I(1), according to the Dickey-Fuller procedure; Engle-Granger test show that they are also cointegrated, thereby pointing out a long run relationship among them.

The simultaneity issue is crucial. As argued in section 2, the empirical literature has long debated on the direction of causality between advertising and aggregate consumption. Not only, in fact, it is possible that advertising can cause consumption through the creation of wants, but it is also possible that consumption may cause advertising because higher consumption leads to higher profits, which in turn are the source of further funding for advertising. One of the assumption of Ordinary Least Squares regression is that explanatory variables are either non-stochastic or, if stochastic, they must be distributed independently of the stochastic disturbance term. If they are not, the OLS estimators are biased and inconsistent. Therefore it is vital to examine the question of potential endogeneity of advertising; we do so by applying the Hausmann test. First we postulate the consumer demand equation and the advertising equation, here in implicit form:

\[ C_t = f(P_t, P_{t-1}, Y_t, Y_{t-1}, C_t, C_{t-1}, A_t) \]  

(10)
Then we regress advertising on the exogenous variables of (10) and (11):

\[ A_t = f (A_{t-1}, C_t, C_{t-1}) \]  

Then we regress advertising on the exogenous variables of (10) and (11):

\[ A_t = f (P_t, P_{t-1}, Y_t, Y_{t-1}, w) \]  

with \( w \) being the stochastic residuals, to be included in the following equation for the final stage of the test:

\[ C_t = \text{const} + \beta_1 P_t + \beta_2 P_{t-1} + \beta_3 Y_t + \beta_4 Y_{t-1} + \beta_5 w_t + u_t \]  

with \( u_t \) being the error term.

According to the Hausmann-test procedure, if the coefficient \( \beta_5 \) is significant, there is a simultaneity problem, otherwise there is not.

Regression output shows a value for \( \beta_5 \) equal to 0.04491, with standard error 0.036 and a corresponding p-value of 0.1289; therefore it is found not significant at 5% level. We conclude that for the time period under consideration and for the data available, there was not simultaneity between advertising and consumption in Italy.

We can now proceed with the estimation of the unrestricted model, equation (6) of the previous section. Table 1 reports the OLS estimation output:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P_t )</td>
<td>-0.2272</td>
<td>0.0968</td>
</tr>
<tr>
<td>( P_{t-1} )</td>
<td>0.1973</td>
<td>0.0935</td>
</tr>
<tr>
<td>( Y_t )</td>
<td>0.2841</td>
<td>0.0842</td>
</tr>
<tr>
<td>( Y_{t-1} )</td>
<td>-0.1113</td>
<td>0.0908</td>
</tr>
<tr>
<td>( C_{t-1} )</td>
<td>0.2546</td>
<td>0.0989</td>
</tr>
<tr>
<td>( C_{t-2} )</td>
<td>-0.4333</td>
<td>0.0854</td>
</tr>
<tr>
<td>( A )</td>
<td>0.034</td>
<td>0.0169</td>
</tr>
</tbody>
</table>

As it can be seen from estimation output, the model presents rather satisfying results: all coefficients (apart from the lagged value of income) are significant at 5% level.

As far as elasticities are concerned, these are the results:

In the short run, price elasticity is estimated at 0.22, whereas income elasticity at 0.28.

However, for the purpose of this study, the most relevant is the elasticity of consumption with respect to advertising, which is estimated at 0.034. Long run elasticity of advertising is estimated at 0.16. Therefore the long-term impact of advertising on consumption is more than four times greater than the short-term impact. The analysis of residuals shows no sign of autocorrelation; this hypothesis is confirmed by the analysis of correlogram and the Breusch-Godfrey Serial Correlation LM test.

Turning to the restricted model, prior to any estimation it is necessary to calibrate the values for the rates of decline \( (1 - \varphi) \) and \( (1 - \omega) \). Several simulations were carried out, and the best results were obtained with the values of, respectively, 0.03 and 0.05. They correspond to a rate of decline of 95% for advertising and 97% for other variables. This might be considered reasonable since it can be argued that past advertising has a slight greater effect on current propensity to consume than past values of income or price. Furthermore, this particular rate of decline of advertising has already been used in an empirical analysis on the topic (Malcom, 1997).

Table 2. Estimation output for the restricted model:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>( Z )</td>
<td>-0.1656</td>
<td>0.4314</td>
</tr>
<tr>
<td>( M )</td>
<td>0.8370</td>
<td>0.085</td>
</tr>
<tr>
<td>( A )</td>
<td>0.070</td>
<td>0.40</td>
</tr>
</tbody>
</table>
where, as recalled in the previous section:
\[(1 - \omega)(1 - \varphi)\alpha = Z, \]
\[P_t - \omega P_{t-1} = M, \]

As it can be seen, the coefficient on the variable \(Z\) is negative just as well as it was the one on \(P\) in the unrestricted model, thereby confirming the validity of our construction. At this stage, we test the validity of the restrictions imposed on the model by using a F-test. The restrictions are as follows:

\[\theta = \beta_1,\]
\[\tau = -\alpha \beta_1,\]
\[\psi = \beta_2,\]
\[\eta = -\alpha \beta_2,\]
\[\pi = \varphi + \omega,\]
\[\delta = -\alpha \omega,\]
\[\sigma = \beta_3.\]

F-test is constructed according to the usual:

\[
F = \frac{RSS_r - RSS_{ur}}{RSS_{ur}/(n - k)} \quad (14)
\]

where:
\(RSS_r\) = residual sum squares of restricted model
\(RSS_{ur}\) = residual sum squares of unrestricted model

\(m\) = number of linear restrictions
\(n\) = number of observations
\(k\) = number of parameters in the unrestricted model

In our case, the null hypothesis (the validity of the restrictions) is accepted at 5% significance level, as the application of (14) returns a value of 1.819, to be compared with the following critical values:

\[F_{0.01} = 2.82,\]
\[F_{0.05} = 2.10,\]
\[F_{0.10} = 1.77.\]

Thus, our set of restrictions seems to be valid.

Turning our attention to the restricted model, Engle-Granger test shows that variables are I(0) and cointegrated. In order to describe more accurately the short-term dynamic of the restricted model, we build an Error Correction Model; since it has to include only stationary variables, we will use the first-difference of the previous series (indicated with a \(d\) before the corresponding letter). ECM includes also the residuals from the long-run equation (in this case, the restricted model), lagged by one period (indicated by RESID) Estimation output can be found in table 3, followed by the residual graph in Figure 1.
Table 3. Estimation of ECM

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
</tr>
</thead>
<tbody>
<tr>
<td>dZ</td>
<td>-0.003</td>
<td>0.001</td>
</tr>
<tr>
<td>dM</td>
<td>0.38</td>
<td>0.009</td>
</tr>
<tr>
<td>dA</td>
<td>0.009</td>
<td>0.006</td>
</tr>
<tr>
<td>RESID</td>
<td>-0.2420</td>
<td>0.006</td>
</tr>
</tbody>
</table>

Figure 1: Residual graph

As it can be seen, 24.2 per cent of the deviation from the equilibrium error is corrected in each period.

Finally, table 4 reports the estimation output for the model with advertising in stock form (equation 9):

Table 4. Estimation of the stock-form model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>(P_t)</td>
<td>-0.1873</td>
<td>0.028</td>
</tr>
<tr>
<td>(Y_t)</td>
<td>0.8709</td>
<td>0.32</td>
</tr>
<tr>
<td>(G_t)</td>
<td>0.075</td>
<td>0.417</td>
</tr>
</tbody>
</table>

The coefficient on the stock variable \(G\) is significant, with elasticity equal to 0.075. Previously, by considering advertising in flow-form, we found an elasticity of 0.034.

Thus, recognizing the dynamic effect of advertising by considering it as flow-form or stock form does not change either qualitatively nor quantitatively the main conclusion of this paper: advertising has a positive impact on aggregate consumption, whose magnitude can reasonably be estimated between elasticity of 0.034 and 0.075.\(^3\)

5. Conclusions

This paper attempted to analyse and measure the effects of advertising on aggregate consumption dynamics in Italy from 1980 to 2000. The empirical analysis has been conducted by building a model with different and exogenously-determined rates of decline for the explanatory variables of aggregate consumption (the dependent variable), among which aggregate advertising expenditure has been included for the first time in the national economic literature. The results can be

\(^3\)We also estimated the stock form model with the inclusion of lagged values of prices and income, and also in that case the advertising elasticity approximates the value reported in the paper.
summarized as follows. There seems to be a positive and significant impact of advertising on consumption; specifically, short run and long run elasticities are found to be, respectively, 0.034 and 0.16; we have also shown that the results are approximately the same if we consider advertising in stock form instead of flow form. The nature of the rather simple technical analysis leaves plenty of room to improve the adequacy of the investigation; the biggest obstacle in that sense is no doubt the lack of an appropriate dataset, able to account for cross-country differences and allowing researchers to better identify and measure the way advertising expenditure has affected consumption levels in our economies.

6. References