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*AN ECONOMETRIC ANALYSIS OF
AGGREGATE DEMAND IN ITALY FROM 1980 TO 2000:
THE IMPACT OF ADVERTISING*

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ABSTRACT

Aggregate consumption dynamics are one of the major determinants of modern economies' macroeconomic fluctuations, and the theoretical and empirical analysis has progressed considerably (since Keynes) in the continuous attempt to describe consumption dynamics as realistically as possible. Nevertheless, such an analysis has persistently relied on the neo-classical assumption of exogeneity of preferences, thereby ignoring the role of advertising in altering consumers' preferences and increasing the overall level of consumption. This paper conducts an empirical analysis of the effect of advertising on aggregate consumption in Italy in the period 1980-2000, using quarterly data. It builds an econometric model assuming different geometrically rate of decline for explanatory variables (advertising, disposable income and prices), and subsequently test various restrictions depending on the assumed rates of decline. The conclusion is that advertising had a positive impact on aggregate consumption, with short-term and log-term elasticities being respectively 0.034 and 0.16

The persuasive nature of advertising might therefore represent a potential tool to sustain consumers demand. This particular feature carries many interesting and far-reaching implications in modern economies, being themselves increasingly characterized by a "monopolistic competition" industrial structures.

I would like to thank my supervisor, Prof. Keith Cowling, and Dr. Mike Clemens for helpful comments. I also thank dott. Salvatore Nisticò (University of Tor Vergata, Rome), for many reasons, not only academic.

“The chief thing that the common-sense individual actually wants is not satisfaction for the wants which he has, but more and better wants”.
F.H. Knight, 1935 (*“The Ethichs of Competition”*, New York, Harper and Bros)

“The only institution we have for instilling new needs, for training people to act as consumers, for altering men’s values and thus for hastening their adjustment to potential abundance is advertising”.
D. Potter, 1954 (*“People of Plenty”*, Chicago, University of Chicago Press)

“What does it mean to say that depression economics has returned? Essentially it means that for the first time in two generations, failures on the demand side of the economy – insufficient private spending to make use of the available productive capacity – have become the clear and present limitation on prosperity for a large part of the world”.
Paul Krugman, 1999 (*“The Return of Depression Economics”*, Penguin, London)

1.INTRODUCTION

The study of consumer demand is important for a number of reasons.

First, as total consumption absorbs more than 70 percent of GDP in most countries¹, it is the largest of the macroeconomic aggregates, thus having great significance for the state of the economy as a whole, for business conditions, and for the determination of the business cycle. Consumption, in fact, is currently thought of as being the only force capable to prevent United States’ economy from going into a deeper recession in this uncertain economic and political context; at the same time, consumption is believed to be the main reason behind the last United States recession, the one between the third quarter of 1990 and the first quarter of 1991.

Secondly, the pattern of consumption contains a wealth of useful information regarding economic welfare and living standards; in a certain sense consumption (both current and future) is the ultimate objective of all economic activity and economic systems, therefore it can reasonably be asserted that consumption patterns are an objective way of measuring and assessing economic performances.

Finally, an understanding of the price-responsiveness of consumption is of crucial importance for a host of microeconomic policy issues including public-utility pricing, the measurement of distortions, optimal taxation and the treatment of externalities.

¹ In Italy, the objective of the present study, the percentage is 71% (Source: ISTAT)

Therefore, the investigation of consumer demand is a crucial field of economics. Few areas of the discipline have been extensively researched as the aggregate consumption function; this can also be partly attributed to the prominence given to the subject by Keynes in his *General Theory*. Since then other prominent economists, usually working in the context of the neo-classical paradigm, have made major theoretical and empirical contributions to the subject. But unlike Keynes, who was mainly concerned with consumption as a major component of aggregate demand, the emphasis in most subsequent work has been on the development of the microfoundations of the aggregate function.

In the continuous effort to update the enormous literature on the subject, and to make the theoretical models as close as possible to reality, a particular feature has traditionally received very little attention: an investigation into the possible effects of advertising on aggregate consumption².

The reason of this scarce recognition is to be found in the fact that neo-classical economics generally relies on a certain set of assumptions; among them, perfectly competitive economy with no uncertainty, market clearing and exogeneity of tastes and technologies. Lately mainstream economics has increasingly started to depart from the strictness of such assumptions³, mainly because of their inability to describe, interpret and accordingly modify modern social and economic realities.

This study has its starting point in the neo-classical assumption of exogeneity of tastes and preferences in consumer demand. The central issue is to challenge it 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. This paper, therefore, represents a novelty within the national literature.

Chapter 2 offers a brief review of the enormous theoretical literature on advertising, aggregate consumption and the relationships between them.

Chapter 3 contains a survey of the empirical literature on the topic, reviewing the econometric studies of the effects of advertising in the consumption function. As previously stated, none of these studies was ever focused on Italy.

² As it will be better specified later in the study, the effect of advertising on the supply side has received a slightly greater amount of the attention in the economic literature.

³ For example, since Blanchard, O.J., Kiyotaki, N. (1987), mainstream economics has increasingly worked within a framework of imperfect competition.

Chapter 4 starts the econometric model. It exposes the source and the nature of data, as well as the theoretical motivations of the inclusion of each variable. It subsequently builds an Autoregressive Distributed Lags model relying on Koyck-transformation tools, assuming exogenous and different rate of declines for explanatory variables, thereby working out a set of restrictions.

Chapter 5 address the cointegration and simultaneity issues; therefore it performs tests on both the restricted and unrestricted model. It also analyse the short-run dynamic by building an Error Correction Model. It also builds an alternative model considering advertising as a stock rather than flow.

Chapter 6 shows a comparative analysis of advertising expenditure in Italy and United Kingdom. It also looks at the procyclically or countercyclically of advertising.

Chapter 7 concludes and lays the foundations for future research in the field.

2. THEORETICAL BACKGROUND: CONSUMPTION AND ADVERTISING

2.1. Informative advertising Vs persuasive advertising

Economic literature has considered advertising as being either **informative** or **persuasive**.

Informative advertising merely describes the characteristics of the product, and is useful in providing consumers with enough information to make informed choices with regard to goods and service they demand. The need for informative advertising can be traced back to microeconomics foundations: asymmetric information represents one of the market failures in neo-classical approach. Under perfect competition with no uncertainty, in fact, information is perfect and there is no need for advertising: buyers and sellers have perfect knowledge of market conditions. But as we introduce some element of asymmetry, the situation changes: Akerlof (1970) argued that if consumers do not have enough information to distinguish between low and high quality goods and services, a situation can arise where both types of product are sold at similar prices (classical moral hazard framework). Moraga-Gonzales (2000) makes an useful contribution in this area, by presenting a model of informative advertising that reduces problems with consumers face when attempting to collect information on potential purchases. From a theoretical perspective, therefore, informative advertising (namely, not aimed at modifying consumer's preferences) is useful in alleviating problems arisen from market with incomplete information.

Persuasive advertising, on the other hand, is conceived in order to modify consumer's tastes, and it distorts the information that consumers receive, making it difficult for them to make informed choices. Basic consumer theory is based on utility functions, and utility itself is defined as the satisfaction derived from the ownership of consumption goods and services. These goods are required as they satisfy the needs and wants of the individual. These physical and psychological needs are called "preferences", and those are assumed to be given and to change slowly over time. Persuasive advertising is aimed at affecting and modifying consumer's preferences. The aim of this study is to assess the impact of persuasive advertising on consumer's decisions.

The economic literature has equally split on the informative or persuasive nature of advertising; Marshall (1927) calls them, respectively, "constructive advertising" ("*measures designed to draw attention to opportunities for buying and selling*") and "combative advertising" (which, according to Marshall, involves social wastes). As the following survey will show, the most recent contributions tend to stress the informative aspect.

The traditional view of advertising embodied in the writings of Kaldor (1950), Bain (1956), Galbraith (1958, 1967) and Comanor and Wilson (1974) tends to take a negative view of its usefulness. The general argument is that advertising plays a role in distorting consumer preferences, whereby consumers are persuaded to buy products that are heavily promoted; this results in the appropriation of reputation and brand loyalty advantages from firms, and allows the potential for the exploitation of market power by charging higher prices for branded products.

Nawaz (1997) sums up this argument in the following manner: "*The goal of persuasive advertising is to change customers' perceptions of a product. If persuasive advertising works, it means that a branded product is considered in some non-tangible way to be **different** to its rivals. If successful, therefore, persuasive advertising may generate brand loyalty – customers may be unwilling to switch to competitors' products if they are convinced that their preferred brand offers something that no other product would be able to provide*".

Shepherd (1997) noted that "*persuasive advertising interferes with the exercise of innate preferences, it alters choices away from the efficient lines that consumer sovereignty would yield. Thus persuasive image instilling advertising is largely a form of economic waste*". Here Shepard uses the exact concept (advertising as social waste) that Marshall used seventy years before.

Rothschild (1942) was the first one to stress the possibility of advertising increasing the effective demand (and not merely swapping demand from one source of supply to another). However, he also added: "*I think it is hopeless to try a quantitative estimate of the effects of total advertising on total consumption*"

The alternative view of advertising forwarded by writers such as Stigler (1961), Telser (1964), Nelson (1974a, b, 1975, 1978) and Littlechild (1982) argued that advertising provides consumers with valuable information which allows them to make rational choices. Under this view, advertising plays a crucial role in ensuring the efficient allocation of resources in the economy.

Stigler (1961) argues that consumers conduct a search process in the pursuit of knowledge to make decisions. In doing so the consumer incurs costs in the form of wages or leisure time foregone; however, although each hour of search involves costs, it also brings benefits in the form of increased knowledge as consumers discover the firms offering products at low prices. This process can be analysed in a context of cost/benefits analysis; the process of consumer search is likely to continue for as long as the marginal benefits of the search exceed the marginal costs (in other words the consumer will continue to collect information as long as increased knowledge obtained from the search is not outweighed by the costs). Stigler argues that advertising reduces the costs of obtaining information. In other words, it is easier for the consumer to obtain information on the price and quality of products through advertisements than to engage in a lengthy search process to collect this information independently. He argues (pag.182):

“Advertising is among other things, a method of providing potential buyers with knowledge of the identity of sellers. It is clearly an immensely powerful instrument for the elimination of ignorance – comparable in force to the use of the book instead of the oral discourse to communicate knowledge”.

Telser (1964) argued that informative advertising performed the following functions:

- it identifies the existence of sellers
- it identifies the key characteristics and attributes of various products and services available to consumers
- advertising plays a useful role in bringing buyers and sellers together by reducing the amount of time and costs that buyers incur searching for available goods and services. This aids in the efficient distribution of resources and leads to higher levels of welfare in the economy.

Overall, Telser argue that in the absence of informative advertising, the rational consumer would have insufficient information to make consumption choices.

Nelson (1974a) criticised the view that advertising distorts consumers preferences. He argues that *“consumers are not completely helpless pawns in the hands of greedy businessmen. Though they have far less than perfect information, consumers have far more than zero information”.* Nelson argues that the extent to which advertising provides information crucially depends on whether the goods in question can be classified as search goods (products which can be inspected by either touch or sight prior to purchase, such as clothes, carpets, shoes) or experience goods

(which must be consumed in order for an assessment to be made, such as food, CDs, university courses). Nelson argues that advertising is likely to be informative for search goods (given that consumers can easily assess quality prior to purchase). As a consequence, advertising expenditure will be lower for search goods, rather than for experience goods. Nelson (1974b) found that advertising expenditure on experience goods are likely to be three times those on search goods. However, consumers do have some control over their consumption of experience goods. Nelson (1974a), again, argues that: *“Repeat purchases of the brands they like is the major source of control that consumers have over the market for experience goods. However, experimenting with unknown brands is a fairly expensive way for consumers to learn about the qualities of goods. Whenever possible, consumers seek to make their experiments less costly. One of the ways they do this is to choose their experiments guided by the recommendations of relatives and friends or of consumers magazines”*.

Resnick and Stern (1977) developed a number of criteria to assess whether advertising informs consumers (information on price, quality, performance, contents, availability, taste, guarantees, safety and so on); they argued that advertising can be thought of as informative if they included one or more of the above features. To test this, they tested 378 advertisements. Of these, only 49.2 per cent were regarded as informative. However, these results are sensitive to any changes in assumptions. They noted that *“if the criterion had been the communication of three different information cues, only 1% of the total sample, would have been informative”*. This conclusion generated a substantial body of research, most of which confirmed Resnick and Stern’s findings.

Abernethy and Franke (1996) analysed a sample of 91.438 advertisements, and they found an average number of cues of 2.04. The percentage of advertisement found to provide one, two, or three information cues were respectively 84, 58 and 33 per cent. They also found that advertising media, outdoor advertising and TV advertising contained the least amount of information, while magazine and radio provided more information. However, they did not consider the fact that the population of consumers is not equally spread across those media: without doubts, TV advertising is the most effective one, and therefore, in order to assess the overall impact of “imperfections” in advertising such an analysis should have included some sort of “weights” to distinguish among media.

Selvanathan (1995) gives a theoretical analysis of the effects of advertising on consumption in a microeconomic context; he obtains demand equations from the theory of the utility-maximizing consumer which include advertising variables. The analysis is very complex and relies extensively on advanced mathematical tools, but he comes to some interesting conclusions about the link

between the effects of advertising on consumption and the conventional substitution effect (he argues that the former can only cause the latter).

In reality it appears difficult to make a clear distinction between advertising that informs and advertising that persuades. Kizner (1997) concludes: *“To interpret advertising effort as primarily designed to persuade consumers to buy what they really do not want, raises an obvious difficulty. It assumes that producers find it more profitable to produce what consumers do not want, and then to persuade them to buy it, with expensive selling campaigns, rather than to produce what consumers do already in fact want (without need for selling effort)”*.

2.2. The economic literature on aggregate consumption and relationships with advertising

How did economic analysis explain aggregate consumption patterns?

Keynes (1936) took it for granted that current consumption expenditure is a highly dependable and stable function of current income (*“the amount of aggregate consumption mainly depends on the amount of aggregate income”*); he also argued that *“short-period changes in consumption largely depend on changes in the rate at which income (measured in wage-units) is being earned and not on changes in the propensity to consume out of a given income”*. Therefore, Keynes did not include anything similar to advertising in the factors affecting consumption.

This first initial theoretical contribution triggered empirical work; after some studies that seemed to acritically confirm Keynes’s hypothesis, after the Second World War the experience underlined the inadequacy of a consumption function relating consumption (or savings) solely to current income.⁴ This stimulated a number of more complex hypothesis. Brady and Friedman (1947) suggested that a consumer unit’s consumption depends not on its absolute income but on its position in the distribution of income among consumer units in its community; they based their hypothesis (which was then called the *“relative income hypothesis”*) exclusively on empirical data.

Duesenberry (1949) based the same hypothesis on a theoretical structure, and his contribution is very relevant for the purposes of the present study, besides being one of the most interesting (and sadly, long forgotten) alternative to dominant mainstream consumption theories.⁵

Neo-classical approach assumes that individual preferences are independent of other individual’s consumption. Duesenberry challenged this belief, by arguing that individual’s consumption is

⁴ Specifically, there was a need to reconcile the cross-section observations of the household saving ratio declining with income and the relative constancy of the aggregate personal saving ratio over time.

⁵ It is not very well-known that also Franco Modigliani (who later will be the father, along with Milton Friedman, of the life cycle/permanent income hypothesis) worked on relative income hypothesis. See Modigliani F., (1949), *“Fluctuations in the Saving-Income Ratio: A Problem in Economic Forecasting”* Studies in Income and Wealth, New York, National Bureau of Economic Research.

constantly driven to higher consumption by the so-called “demonstration effect”: he divided the utility index $U_i = F_i (C_{i1}, C_{i2}, \dots, C_{in}, A_{i1}, A_{i2}, \dots, A_{in})$ by a weighted average of the consumption expenditure of other individuals. As a result, an individual average propensity to consume will depend upon his position in the income distribution: someone’s utility will be lower if they consume less than the average for the population. In other words, the division of income between consumption and saving depends on the individual’s relative rather than absolute income.⁶ He run a regression for United States in the period 1929-1941 to test this theory, and obtained reasonably good results.

Why is Duesenberry’s approach so significant in the present study?

Because he was the first one to understand (and formalize the intuition) that the essence of the consumption problem was the dynamic desire for goods and services; the neo-classical approach said nothing about how such desires arise or how they change. According to Duesenberry, consumption decisions consisted of two elements: learning and habit forming. Habit patterns can be broken as a result of continual contact with superior goods⁷; this **frequency of contact** is the driving force to higher consumption, “*a drive sufficiently strong to account for the amount of work people do, and for the small size of their saving in the face of considerable insecurity*”. For any individual, the frequency of contact with superior goods increases if other people’s consumption expenditure increases or if they are constantly “demonstrated” the superiority of other goods.

Advertising fits perfectly in this framework, as consumers are continually bombarded with supposedly superior goods, which persuades them than their previous consumption bundle was below average; furthermore, advertising can also help reinforce habits so that consumers are encouraged to continue buying the same brand. The two processes described above are not contradictory as it might seem, since obviously the first effect (drive to higher consumption) is targeted at those consumers who are not already buying the product in question, whereas the second (habits reinforcement) is aimed at customers which are already using that product. However, it is certainly true that consumers are continually “torn” between those two effects. In other words, advertising can establish an initial desire for consuming but also change these desires by making the consumer aware of superior goods as advertising itself provides the means for continual contact.

However, Duesenberry denied the role of advertising in continually promoting higher consumption; he explicitly stated: “*It seems doubtful that advertising accounts for the phenomenon before us*”.

⁶ Although Duesenberry’s approach does not represent a dramatical departure from Keynes’ work, the issue of distribution of income stresses a diversity of view between them: while Keynes clearly suggested that a government policy that resulted in a reduction in the inequality of income distribution would increase consumption, Duesenberry’s relative income hypothesis and interdependence of preferences seems to go towards the opposite direction.

⁷ By “superior goods” he meant goods that are more effective in satysfying people’s needs.

The main departure from Keynesian consumption function occurred with the development of the permanent income and life cycle hypothesis, put forward by Modigliani and Brumberg (1954) and Friedman (1957), which do not leave any room for advertising and tastes manipulation. Consumers behaviour, in fact, is strictly driven by utility maximization framework where preferences are given. The most recent refinements of life cycle theories has included many previously unexplored features, such as liquidity and credit constraints, a modest degree of heterogeneity of households, and rational expectations (whose advent in macroeconomics, in the 70's, affected heavily also the theoretical and empirical work on the aggregate consumption function). The aim was to overcome the rather implausible assumptions of the initial formulation in the 50's. This ongoing process of refinements, however, has always denied any role of advertising in changing preferences and directly affecting aggregate consumption levels. Rather, it still considers advertising as acting to merely reallocate a given budget among alternatives, and views its role as solely informative.

The most radical departure from mainstream theories, regarding both consumption patterns and, more generally, the broader socio-economic approach, comes from Baran and Sweezy (1966). They characterise the economy of United States (but, extensively, they refer to western economies) by a monopolistic industrial structure⁸. In such a situation, we can observe a price rigidity downwards, due to the fact that firms are not incentivised to engage in price competition for fear of retaliation from rivals. Instead, firms use other non-price instruments such as advertising and product differentiation to increase sales and secure market position. *“Advertising becomes to an ever increasing extent the principal weapon of the competitive struggle”*. In theoretical terms, this is not so far a contradiction of neo-classical approach: in fact, the importance of advertising is expected to vary according to the type of industry under consideration.

Under perfect competition, there is no role for advertising because the firm faces a perfectly elastic demand curve and so can sell all the output it produces at the market-determined price.

Under monopoly there is also little role for advertising, given that the monopolist already faces an inelastic demand curve, and so has substantial control over the prices it charges.

Under oligopoly (which is the industrial structure Baran and Sweezy consider dominant), firms recognise interdependence and may choose to avoid price competition, and instead engage in non-price competition through mainly advertising and innovation. Or, more generally, through product differentiation, since the textbook definition of advertising is *“form of product differentiation whereby firms communicate to consumers what goods and services they have to sell”*⁹.

⁸ In the Introduction of their book, Baran tells us where the term “monopoly capitalism” comes from: during a Robert Kennedy’s official visit in Indonesia in 1962, one student stood up and defined USA’s economy as a “monopoly capitalistsim”. Bobby Kennedy was offended by that, and asked the student to specify what he exactly meant by “monopoly capitalism”. But the student did not reply, and nor did anyone in the audience.

⁹ Lipczynski, Wilson (1998)

Monopoly capital- approach¹⁰ agrees with more traditional approach regarding the statement that in oligopolistic industries the predominant type of competition is carried out on a non-price basis, one of which is advertising. The point of departure between those two approaches is, again, in the issues of exogeneity of preferences and the broad role of advertising within the economy.

Baran and Sweezy argue that preferences are not the unalterable characteristic of man, but are created by employing “*techniques of suggestion and brainwashing*”. The system of monopoly capital has a tendency towards chronic stagnation, because prices are rigid downwards and there is a continual pursuance of cost minimisation. Furthermore, as society becomes more wealthy, a greater and greater proportion of the population is able to decide whether to consume or save (as opposed to the situation where many people must consume), and therefore there is the potential risk of stagnation. They argue that “*the economic importance of advertising lies not primarily in its causing a reallocation of consumers’ expenditure among different commodities, but in its effect on the magnitude of aggregate effective demand and thus on the level of income and employment*”. This is exactly the “core” of our analysis: the role of advertising not merely as informative, and not even as a mean of consumer expenditure reallocation, but as a tool to be used by firms (operating in an oligopoly framework) to sustain aggregate demand, thereby avoiding stagnation, which is the natural tendency of an increasingly monopolised economy. Here the distance with neo-classical authors is evident: if it is true that Pigou, for instance, argued that “*when we are in a situation of monopolistic competition, the way is opened up for a new kind of investment which consists in competitive advertising*”, (which is Baran and Sweezy’s approach) it is also true that he added “*whose sole purpose is transferring the demand for a given commodity from one source of supply to another*”.

Baran and Sweezy go on by stating: “*The function of advertising, perhaps its dominant function today, thus becomes that of waging, on behalf of the producers and sellers of consumers goods, a relentless war against saving and in favour of consumption. And the principle means of carrying out this task are to induce change in fashion, create new wants, set new standards of status*”.

Galbraith (1967) also adds that such an industrial structure results in the need for planning and control of demand because of the restricted mobility of resources: not only must the needs of the consumers be anticipated, but their willingness to purchase must be increased whenever it is lacking. Even though large firms have control over prices, unless they can also control the quantities bought and sold, they will be still susceptible to consumer’s sovereignty; large corporations, the main actors of the modern supply side, cannot afford to leave the all important decision to buy in the hands of consumers, since they will be guided by hard-to-predict random fate

¹⁰ We will call “monopoly-capital” approach the radical departure from mainstream theories, which was initiated by Baran and Sweezy’s analysis and updated and developed further by Keith Cowling’s contribution (1982).

of taste and accident. Instead, the corporations act to “dominate” their environment, so as to overcome as many uncertainties as they can. *“In the absence of the massive and artful persuasion that accompanies the management of demand, increasing abundance might well have reduced the interest of people in acquiring more goods.... the consequences – a lower and less reliable propensity to consume – would have been awkward for the industrial system”*.

More recently Galbraith (1992) re-affirmed his theory: *“The great business enterprise, it is assumed and taught, is in the service of the consumer and is subject in all important respects to his or her sovereign authority. In fact, the consumer is very substantially in the service of the business firm. It is to this end that advertising and merchandising in all their cost and diversity are directed; consumer wants are shaped to the purposes and notably to the financial interests of the firm”*.

Cowling (1982) updated and developed the “monopoly-capital-approach” by providing a theoretical framework in which he derived the determinants of the degree of monopoly, showing how these determinants are partly controlled by the actions of the firms themselves.

Formally:

$$\frac{p_k - c_k'(X_k)}{p_k} = \frac{\alpha_k}{\eta_k} + \frac{(1 - \alpha_k)}{\eta_k} H_k$$

where:

p_k = market price

$c_k'(X_k)$ = industry’s marginal cost function (which is a weighted average of the marginal cost functions for the n firms in the industry k)

H_k = Herfindhal measure of concentration ($\sum_i [X_{ik} / X_k]^2$)

η_k = absolute value of the industry price elasticity of demand ($- d \log X_k / d \log p_k$)

α_k = it captures each firm’s expectations about the response of each rival to its own output decisions ($[d X_{ij} / d X_{ik}] [X_{ik} / X_{jk}]$)

Thus the degree of monopoly in a given industry is directly related to the degree of concentration in that industry and inversely related to the absolute value of the industry price elasticity of demand¹¹.

Cowling argues that advertising has a direct effect and an indirect effect:

¹¹ It is also, obviously, affected by the value of α .

a) Direct effect: advertising can make demand more inelastic, by promoting loyalty to a given brand. By doing so, consumers will be sensitive to price changes.

b) Indirect effect: advertising can affect the degree of monopoly through H (the Herfindhal measure of concentration): in the long-run, advertising will allow a firm to secure a more dominant position as it can be used as a competitive weapon to drive out rivals.

Cowling also shows that “*any tendency for a rising level of market concentration over time allows for the potential existence of a rising profit share*”. Namely, as monopoly increases, so does the potential for rising profit share. However, as he stresses, “*the basic question is whether the level of aggregate demand will be sufficient to allow the potential profits arising from increased monopoly power to be actually realized*”. To answer this “*basic question*”, Cowling analyses how effective demand is affected by the underlying tendency for income to be redistributed from workers to consumers, which is the essence of monopolisation process.

By using a Kaleckian scheme, after a little manipulation:

$$\Pi = I + C_c + E - M + B - W_s$$

where:

Π = gross profits after tax

I = investments

C_c = capitalist consumption

$E - M$ = trade balance

B = budget deficit

W_s = workers savings

Thus any tendency for profits to rise (because of an increase in the degree of monopoly) has to be matched by commensurate changes in these aggregate variables.

How does advertising affect this?

By getting workers to decrease their saving, and thus to consume more, a realisation crisis¹² can be avoided. Cowling argues that in a world of under-utilised capacity, a fall in the saving of workers will imply an increase in profits of precisely the same amount, given the constancy of other variables in the accounting identity above. “*The mechanism available to achieve a reduction in saving is via advertising and product innovation. Where wants do not exist, the capitalist system can respond by creating them*”.

¹² A situation where the potential profits are not realised because of insufficient demand is called “realisation crisis”.

In this perspective, Cowling complements Duesenberry's work, by including advertising among the tools that the capitalist system has at its disposal in order to "drive towards higher consumption" (while Duesenberry denied this role for advertising, and relied solely on the demonstration effect caused by the frequency of contact with other people's consumption).

Cowling also warned that this way (as well as others) of alleviating or preventing a realisation crisis "*contains the seeds of possible deeper crisis [...] should the system ever fail to satisfy such enhanced wants, then the consequences in terms of social disruption and breakdown will be that much more severe*".

In a later work, Cowling along with Brack (1983) recognised that the increased consumers' wants encounter a budget constraint, which is their labour income. Thus they extended the analysis addressing the issue of how consumers can obtain the increased income that they need to fulfil the increased needs caused by advertising. In other words, if advertising succeeds in stimulating the desire for both current and future consumption, then this may lead to an increase in the supply of work by affecting the work-leisure decision.

However, as Simon (1970) argues, if advertising were to act as an antidote to any under-consumptions crisis, it would exhibit a counter cyclical trend; advertising, instead, tends to move procyclically.

2.3. The literature so far

It has been shown that economic literature viewed advertising as being either informative (merely describing the characteristics of a product and notifies the existence of a seller, thereby alleviating asymmetric information imperfections) or persuasive (attempting to modify consumer's preferences). The literature has split almost equally, but the most recent contributions do tend to support the first view, thereby denying any role of advertising in manipulating consumer's tastes.

This is connected with the dominant mainstream approach regarding consumption patterns; the recent development and refinements of the permanent income and life cycle hypothesis do not consider advertising as playing a role in affecting consumption patterns. However, there is a branch of the literature that criticise this approach: from the initial contribution of Duesenberry, who thought consumption as being constantly driven by a demonstration effect, Baran and Sweezy, Galbraith and Cowling started considering advertising as an important tool of oligopolistic economies, and whose aim is to hold up aggregate demand thereby attempting to counter-act any stagnation tendencies.

In the next chapter, I will discuss how the relationship between consumption and advertising has been dealt with in the empirical literature.

3. REVIEW OF THE EMPIRICAL LITERATURE

This chapter turns to the empirical side, offering a survey of the previous studies on the effect of advertising on consumption; since such previous works relied on the extensive use of econometric tools, this review presents a predominantly technical nature. As stated in the Introduction, since no similar study is known to be conducted regarding Italy, the following review concerns empirical work on other countries.

Empirical studies are found both to support and oppose a positive relationship between advertising and consumption; Here a small survey of these opposite view is presented. To offer a more complete analysis, I will distinguish between the studies conducted at an aggregate level and those at specific industries-level. Most of the studies of the latter type regard the consumption of alcoholic beverage and cigarettes; this is quite understandable, since the consumption of these potentially harmful goods (especially by young people) is still a major concern for modern society, and therefore there is particular interest in defining whether advertising activities play any role in promoting consumption of these kind of goods.

3.1. Studies supporting the view of advertising causing consumption

3.1.1. The aggregate level

Jung and Seldon (1995a) find a positive relationship, regressing aggregate consumption on lagged consumption and advertising (variables being in logs). 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 thought 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 [$I(1)$] 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 specifications 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 (obviously as elasticities). Peel 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 (see previous chapter), 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 place¹³. They use a measure of the advertising stock (rather than the flow), in order to be able to capture the cumulative effect of it. Following a growth of real advertising messages per head of 150%, a decay rate of 0.75 and an

¹³ This reflects the already reported Galbraith’s view: “*Advertising and its related arts help to develop the kind of man the goals of the industrial system require – one that reliably spends his income and works reliably because he is always in need for more*”

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 (*"There is little question but that the results are favourable to the view that advertising has a positive impact on consumption"*); they found that a real \$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.

3.1.2. The sectorial level

Turning to specific industries, Duffy (1983) used quarterly data for the period 1963- 1978 for alcoholic beverage. He estimated demand equations in log-linear form, which expressed the consumption of each beverage as a function of real income, the own relative price and the own advertising deflated by the advertising of all other goods. He finds that beer and spirits advertising have significant effects on consumption, while the wine advertising does not.

McGuinness (1980) used annual data for the period 1956-75 to estimate a linear demand equation with total alcohol consumption as the dependent variable. The real price of alcohol, real income, real advertising of beer, wine and spirits (individually) and the number of licensed premises were the explanatory variables. The initial estimates of the coefficients of advertising of beer and wine are insignificant; McGuinness re-estimated with these two variables omitted, so that the only advertising of spirits was included. His results indicate that spirits advertising has a significant effect on the total consumption of alcohol.

In a subsequent study McGuinness (1983) used annual data from 1956 to 1979. He estimated separate linear demand equations for beer, wine and spirits with the volume of consumption of each beverage as the dependent variable; in each equation the independent variable were a time trend, the real prices of three beverages, real income, the number of licensed premises and real advertising of the three beverages as well as that of cider. The main difference between this study and the previous

one is that alcohol consumption is now disaggregated into beer, wine and spirits. The result of this study indicates that beer advertising has a significant effect on beer consumption; however, the other two coefficients were much less significant.

Walsh (1982) commented on this McGuiness' study, regarding the regression of aggregate consumption on disaggregated advertising and the aggregated real price of alcohol. He then estimated demand equations for beer, wine and spirits individually. He found that spirit advertising has a significant effect on the consumption of wine and spirits.

3.2. Studies opposing the view of advertising causing consumption

3.2.1. The aggregate level

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:

- increased profits lead to decreased consumption, given the assumption of a lower propensity to consume out of profit income than out of wages.
- increased profits will lead to increased retained profits, which will reduce consumer's expenditure, provided the retained profits are not perfectly substitutable for personal savings (which Pitelis himself demonstrates 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 (the correlation is positive). 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.

3.2.2. The sectorial level

Turning to the specific sectors, Duffy (1982) used quarterly data for the period 1963-1978 for alcoholic beverages as a whole to estimate a log-linear demand equation. His model expressed consumption of alcohol as a function of real income, the relative price of alcohol and the relative advertising of alcohol. His results provided no evidence of a link between total consumption and advertising. In the same study he also estimated log-linear demand equations for each beverage with quarterly data for the period 1971-1978, and found that all the advertising elasticities are insignificant.

Hagman and Waterson (1983) used quarterly data for the period 1962-1980 and estimated a double-log demand equation, which expressed real expenditure on alcohol as a function of real income, the real price of alcohol, the stock of advertising and a lagged dependent variable. The advertising stock was assumed to have a depreciation rate of 70 per cent. They also estimated disaggregated demand equations, but found that none of the elasticities (at both the aggregate and disaggregate levels) were significant.

3.3. Is advertising moving procyclically or counter cyclically?

Verdon, McConnell and Roseler (1968) conducted a comparative analysis of advertising expenditure dynamics relative to the business cycle and to changes in GNP and industrial production. Their results suggest that advertising moves procyclically, with a lag of 3.75 months; that means that advertising continues to expand for almost four months after the business cycle had begun its slowdown. The interpretation of this result may be twofold. One explanation is that advertising continues to grow for inertial reasons, such as contractual arrangements making advertising slower to adjust to economy's slowdown, (advertising expenditure being a fixed percentage of past sales). An opposite explanation may be that firms initially try to counteract the slowdown, by continuing to raise advertising expenditure in an attempt to sustain aggregate demand

and prevent the economy from going into a deeper recession; after approximately four months, firms realize that the slowdown actually turned into a recession, and accordingly adequate advertising expenditure. This second explanation may suggest that there is an initial attempt to use advertising as counter cyclical tool.

However, Verdon, McConnell and Roseler conclude that advertising reinforces expansions and accentuates contractions, although the latter to a lesser degree. It is noteworthy that they conclude their paper by recommending counter cyclical rather than pro cyclical advertising.

Along this argument, Ekelund Jr and Gramm (1969) contest this policy suggestion. They argue that the validity of this argument crucially depends on actually showing that advertising is effective in stimulating aggregate demand, otherwise the alleged counter-cyclical force of advertising would be useless. They argue that “*advertising is an insignificant determinant of the business cycle via consumption*”.

3.4. The empirical literature

To summarise, I 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 consumption, both at the aggregate level and in specific industrial sectors. Even among those studies that agree on a positive impact, there is quite a great variety in the magnitude of this effect.

This paper will conduct an empirical analysis for Italy, thereby contributing to the debate.

4. DATA AND MODEL SPECIFICATION

This chapter begins the econometric analysis of the case study. Here I will expose the nature and the source of data, and the reasons why I included them in the initial specification of the model, which in turn is the objective of the second paragraph.

4.1. Data

The analysis relies on quarterly data, from the period 1980 – 2000.

The dependent variable is Real Private Consumption Expenditure (Q), and the source is O.E.C.D. (Organization for Economic Cooperation and Development) database. It is measured in

billion of euro. Obviously, it is a proxy for consumer demand, whose determinants are the ultimate objective of this study.

The explanatory variables are the following:

- Gross Domestic Product (Y), as a proxy for income. Since Keynes, one of the most accepted and verified propositions of economics is that income is the major determinants of consumption. As shown in chapter 2, one of the most fascinating debates in the literature has been about what kind of income should be used, whether current (like Keynesians think) or permanent (following the theories of Modigliani and Friedman). This study will rely mainly on a Keynesian view, although the inclusion of lagged value of income will rudimentarily introduce some elements of permanent income (but of course it is implied that the expectations will be adaptive rather than rational)¹⁴. Here GDP is presented in constant prices (base-year: 1995) and expressed in billion of euro. The source is O.E.C.D.

- The inclusion of the advertising variable (A) is the novelty of this work in the Italian empirical analysis of aggregate consumption. Contrary to many previous studies that always denied any role of advertising in increasing overall consumer expenditure, the aim of this paper is to assess quantitatively the impact of advertising on consumers' behaviour. The current expenditure on advertising was provided by Nielsen Media Research (an Italian private company); to deflate it, this study uses the GDP deflator. The reasons behind this choice are, ultimately, the non-availability of appropriate cost-index data to deflate current advertising expenditure by its own costs. However, in response to criticism about the use of a normal GDP deflator instead of a price-per-message index, Jung and Seldon (1995b) found that the correlation between the supposedly best-suited advertising price index used by Ashley, Granger and Schmalensee (1980) and the GDP deflator is 0,992. They therefore conclude that using the GDP deflator makes very little practical difference. Although the above-mentioned studies referred to United Kingdom economy (and therefore not blindly applicable to other countries), in absence of further data we might presume a not too different dynamics of the equivalent Italian data. (as we will show the size of the British economy is approximately the same as Italian economy). See Appendix 1 for advertising expenditure composition.

- The price variable (P) is included since it is another major determinant of consumption at a microeconomic level. As Patterson (1985) argues, if households are unaware of general price increases, they may believe that their real income has risen and thus spend more for a given level of savings; in other words, the inflation variable may capture some form of money illusion, as a factor affecting the marginal propensity to consume. On the other hand, high inflation could lead to more

¹⁴ Adaptive expectations have been almost completely overcome by rational expectations in the economic literature since Lucas' critique.

uncertainty in the economic system (for example, about the real purchase power or the dynamic of asset's value), and therefore a negative coefficient could be observed. Here I use the Consumer Price Index (base-year: 1995=100). Source: OECD.

- It is also expected that past consumption values will be among the explanatory variables, because of habits and adjustment costs.

The consumption function is initially thought of as being a function of the above variables.

$$C_t = f(Y_{t-i}, A_{t-j}, P_{t-j}, C_{t-i})$$

where:

t : (1980:1, 1980:2, 1980:3, 1980:4, 1981:1.....2000:4)

i : (0, 1, 2, 3.....n-1)

n : 85

The first (or second) difference of the above variables will be indicated with a d (or dd).

All variables are in log-form.

4.2. Model formulation

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. Why is this opinion reasonable?

First of all, 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 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.

In this paper I will investigate both options.

4.2.1. Advertising in flow form

If we follow this approach, then past values of advertising must be included as regressors.

$$Q_t = f(Y_t, Y_{t-1}, \dots, P_t, P_{t-1}, \dots, A_t, A_{t-1}, \dots) \quad [4.1]$$

Equation [4.1] 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 [4.1] takes a geometrically declining form¹⁵. At this stage, we assume that the rate of decline (λ) is constant across the variables (we will abandon this assumption later on).

$$Q_t = \alpha + \beta_1 P_t + \lambda \beta_1 P_{t-1} + \lambda^2 \beta_1 P_{t-2} + \dots + \beta_2 Y_t + \lambda \beta_2 Y_{t-1} + \lambda^2 \beta_2 Y_{t-2} + \dots + \beta_3 A_t + \lambda \beta_3 A_{t-1} + \lambda^2 \beta_3 A_{t-2} + \dots \quad [4.2]$$

Let's multiply both sides by λ and lag every variable by one period:

$$\lambda Q_{t-1} = \lambda \alpha + \lambda \beta_1 P_{t-1} + \lambda^2 \beta_1 P_{t-2} + \dots + \lambda \beta_2 Y_{t-1} + \lambda^2 \beta_2 Y_{t-2} + \dots + \lambda \beta_3 A_{t-1} + \lambda^2 \beta_3 A_{t-2} + \dots \quad [4.3]$$

Subtracting [4.3] from [4.2]:

$$Q_t - \lambda Q_{t-1} = (1-\lambda)\alpha + \beta_1 P_t + \beta_2 Y_t + \beta_3 A_t \quad [4.4]$$

¹⁵ We follow the assumption first made by Koyck in his study of investment function, and that was subsequently known as "Koyck transformation".

Bringing the lagged dependent variable on the RHS:

$$Q_t = (1-\lambda)\alpha + \beta_1 P_t + \beta_2 Y_t + \beta_3 A_t + \lambda Q_{t-1} \quad [4.5]$$

$0 < (1-\lambda) < 1$ is the rate of decline common to all three lag structures.

Within this model, β_3 the short term marginal impact of current advertising on current demand:

$$\delta Q_t / \delta A_t = \beta_3$$

The long-term marginal impact is given by:

$$\begin{aligned} Q_t - \lambda Q_{t-1} &= \beta_3 A_t && \text{in long term } Q_{t-1} = Q \\ (1-\lambda)Q &= \beta_3 A \\ Q &= \beta_3 / (1-\lambda) A \\ \delta Q / \delta A &= \beta_3 / (1-\lambda) && \text{long term marginal impact} \end{aligned}$$

Equation [4.5] 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: $0 < 1-\phi < 1$)
- the second unique to advertising (rate of decline $0 < 1-\omega < 1$)

Following this procedure, we recall equation [4.5], but now we distinguish the two different dynamic effects:

$$Q_t = (1-\phi)\alpha + \beta_1 P_t + \beta_2 Y_t + \phi Q_{t-1} + \beta_3 A_t + \beta_4 A_{t-1} + \beta_5 A_{t-2} + \dots \quad [4.6]$$

In equation [4.6], lagged values of advertising still appear; they reflect the second kind of dynamic effect, whereas ϕ is the rate of decline common to all variables.

Now we assume that in equation [4.6] coefficients on advertising regressors have a geometrically declining distribution at rate $0 < 1-\omega < 1$:

$$Q_t = (1-\phi)\alpha + \beta_1 P_t + \beta_2 Y_t + \phi Q_{t-1} + \beta_3 A_t + \omega\beta_3 A_{t-1} + \omega^2\beta_3 A_{t-2} + \dots \quad [4.7]$$

Let's multiply both sides for ω and lag all variables by one period:

$$\omega Q_{t-1} = \omega(1-\phi)\alpha + \omega\beta_1 P_{t-1} + \omega\beta_2 Y_{t-1} + \omega\phi Q_{t-2} + \omega\beta_3 A_{t-1} + \omega^2\beta_3 A_{t-2} + \dots \quad [4.8]$$

Subtracting [4.8] from [4.7] and moving ωQ_{t-1} on the RHS we obtain:

$$Q_t = (1-\omega)(1-\phi)\alpha + \beta_1 P_t - \omega\beta_1 P_{t-1} + \beta_2 Y_t - \omega\beta_2 Y_{t-1} + (\phi+\omega)Q_{t-1} - \omega\phi Q_{t-2} + \beta_3 A_t \quad [[4.9]$$

From equation [4.9] we work out our **unrestricted model**:

$$Q_t = \rho + \theta P_t + \tau P_{t-1} + \psi Y_t + \eta Y_{t-1} + \pi Q_{t-1} + \delta Q_{t-2} + \sigma A_t \quad [4.10]$$

By imposing some arbitrary values for the rates of decline $(1-\phi)$ [common to all variables] and $(1-\omega)$ [unique to advertising] we work out the restricted model.

ϕ^* = fixed value of ϕ

ω^* = fixed value of ω

The [4.9] becomes:

$$Q_t = (1-\omega^*)(1-\phi^*)\alpha + \beta_1 P_t - \omega^*\beta_1 P_{t-1} + \beta_2 Y_t - \omega^*\beta_2 Y_{t-1} + (\phi^*+\omega^*)Q_{t-1} - \omega^*\phi^*Q_{t-2} + \beta_3 A_t \quad [4.11]$$

Rearranging:

$$Q_t - (\phi^*+\omega^*)Q_{t-1} + \omega^*\phi^*Q_{t-2} = (1-\omega^*)(1-\phi^*)\alpha + \beta_1 P_t - \omega^*\beta_1 P_{t-1} + \beta_2 Y_t - \omega^*\beta_2 Y_{t-1} + \beta_3 A_t \quad [4.12]$$

$$Q_t - (\phi^*+\omega^*)Q_{t-1} + \omega^*\phi^*Q_{t-2} = (1-\omega^*)(1-\phi^*)\alpha + \beta_1 (P_t - \omega^*P_{t-1}) + \beta_2 (Y_t - \omega^*Y_{t-1}) + \beta_3 A_t \quad [4.13]$$

Now:

$$Q_t - (\phi^* + \omega^*)Q_{t-1} + \omega^*\phi^*Q_{t-2} = K \quad [4.14]$$

$$P_t - \omega^*P_{t-1} = Z \quad [4.15]$$

$$Y_t - \omega^*Y_{t-1} = M \quad [4.16]$$

$$(1 - \omega^*)(1 - \phi^*)\alpha = \Phi$$

Equation [4.13] becomes:

$$K = \Phi + \beta_1 Z + \beta_2 M + \beta_3 A_t \quad [4.17]$$

Equation [4.17] represents our **restricted model**, whose exact specification obviously depends on the value of the parameters ϕ and ω .

In the next chapter, we will conduct the preliminary tests on [4.10], and subsequently test the validity of the following restrictions on [4.17], using a normal F-test.

$$\rho = (1 - \omega^*)(1 - \phi^*)\alpha$$

$$\theta = \beta_1$$

$$\tau = -\omega^*\beta_1$$

$$\psi = \beta_2$$

$$\eta = -\omega^*\beta_2$$

$$\pi = \phi^* + \omega^*$$

$$\delta = -\omega^*\phi^*$$

$$\sigma = \beta_3$$

4.2.2. Advertising in 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. The starting point is equation [4.1]:

$$Q_t = f(Y_{t-i}, P_{t-i}, A_{t-i}) \quad \text{with } i = 0, 1, 2, 3, 4, \dots, n$$

Continuing to assume a linear functional form, we can focus on the string of advertising flow variables (A_{t-1} , A_{t-2} , A_{t-3} , and so on) and combine them into a stock at period t .

Assuming that the coefficients on advertising flows have a geometrically declining distribution at rate $(1-\lambda)$, we obtain:

$$Q_t = \alpha + \beta_1 P_t + \beta_2 Y_t + \beta_3 A_t + \lambda \beta_3 A_{t-1} + \lambda^2 \beta_3 A_{t-2} + \dots + \lambda^n \beta_3 A_{t-n}. \quad [4.18]$$

which is exactly equation [4.2] but “isolating” the dynamic effect of advertising. Instead of subjecting the equation to the Kyock transformation, we can define:

$$G_t = A_t + \lambda A_{t-1} + \lambda^2 A_{t-2} + \dots + \lambda^n A_{t-n} \quad [4.19]$$

Variable G_t denotes the stock of advertising in period t . This is another way of considering the impact of advertising on consumers’ perception: the cumulative stock of advertising messages received until that moment is responsible for persuading potential buyers.

Substituting [4.19] into [4.18]:

$$Q_t = \alpha + \beta_1 P_t + \beta_2 Y_t + \beta_3 G_t \quad [4.20]$$

When it comes to estimation, a particular decline rate of advertising will be chosen, thereby constructing the variable G_t .

The next chapter will deal with the estimation of the above models.

5. ECONOMETRIC MODELLING

This chapter contains the econometric analysis. First, issues of order of integration and simultaneity will be addressed, and subsequently I will estimate the unrestricted and restricted model presented in chapter 4. The last paragraph builds an ECM.

5.1. Analysis of cointegration

First of all, it is necessary to examine the order of integration of each variables, as spurious regression can occur if the time series are not cointegrated. Dickey-Fuller tests are performed and shown in Appendix 2. All variables are found to be I(1) at 5% significance level.

It is necessary now to check whether these variables are cointegrated; we will do that by using an Engle-Granger test (also reported in Appendix 2). Basically, it checks whether the residuals from the unrestricted model are I(0). If so, there is an indication about a long-run relationship between variables in the model. As we see from the Dicky-Fuller test performed on residuals, there seems to be cointegration.

5.2. Analysis of simultaneity

As we have discussed in chapter 3, the empirical literature on the topic has argued about 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 nonstochastic 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; in this paper this task is accomplished by Hausmann Test¹⁶.

The following equation are postulated:

$$Q_t = \rho + \theta P_t + \tau P_{t-1} + \psi Y_t + \eta Y_{t-1} + \upsilon Q_t + \mu Q_{t-1} + \sigma A_t \quad [5.1]$$

$$A_t = \chi + \Omega A_{t-1} + \nu Q_t + \gamma Q_{t-1} \quad [5.2]$$

Equation [5.1] describes consumer demand as a function of (among others) advertising, whereas equation [5.2] shows advertising as a function of consumer demand.

Following the procedure, now we regress A_t on all exogenous variables:

$$A_t = \text{const} + \beta_1 P_t + \beta_2 P_{t-1} + \beta_3 Y_t + \beta_4 Y_{t-1} + w \quad [5.3]$$

¹⁶ Hausmann (1976)

Now we take the residuals w and include them among the regressors of equation [5.4], which regress consumer demand on exogenous variables.

$$Q_t = \text{const} + \beta'_1 P_t + \beta'_2 P_{t-1} + \beta'_3 Y_t + \beta'_4 Y_{t-1} + \beta'_5 w + u_t \quad [5.4]$$

According to the Hausmann-test procedure, if the coefficient attached to the residuals of [5.3] is significant, there is a simultaneity problem, otherwise there is not.

As we can see from the regression output (reported in Appendix 2), the coefficient β'_5 is found not significant at 5% level. Therefore, we conclude that for the time period under consideration and for the data available, there was not simultaneity between advertising and consumption in Italy.

5.3. Testing the restrictions

Following the mathematical derivations of chapter 4, now we estimate the unrestricted and restricted model, thereby testing the validity of the restrictions.

Unrestricted model:

$$Q_t = \rho + \theta P_t + \tau P_{t-1} + \psi Y_t + \eta Y_{t-1} + \pi Q_{t-1} + \delta Q_{t-2} + \sigma A_t \quad [4.10]$$

Dependent Variable: Q
Method: Least Squares
Date: 09/11/02 Time: 06:44
Sample(adjusted): 1980:3 2000:4
Included observations: 82 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.170469	0.195993	-0.869771	0.3872
P	-0.227209	0.096880	-2.345269	0.0217
P(-1)	0.197372	0.093559	2.109583	0.0383
Y	0.284130	0.084232	3.373196	0.0012
Y(-1)	-0.111345	0.090815	-1.226066	0.2241
Q(-1)	1.254625	0.098921	12.68310	0.0000
Q(-2)	-0.433398	0.085443	-5.072357	0.0000
A	0.034583	0.016924	2.043429	0.0387
R-squared	0.999161	Mean dependent var	4.827085	
Adjusted R-squared	0.999082	S.D. dependent var	0.132891	
S.E. of regression	0.004027	Akaike info criterion	-8.099270	
Sum squared resid	0.005120	Schwarz criterion	-7.864468	
Log likelihood	340.0701	F-statistic	12592.50	
Durbin-Watson stat	1.979974	Prob(F-statistic)	0.000000	

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.

In the long run:

$$Q_t = 1.25 Q_{t-1} - 0.43 Q_{t-2} + 0.03A$$

$$Q^* - 1.25 Q^* + 0.43Q^* = 0.03 A$$

$$0.18 Q^* = 0.03 A$$

$$Q^* = 0.16 A$$

Therefore the long-term impact of advertising on consumption is more than four times greater than the short-term impact.

The very high value of R^2 suggests a very high explanatory power of the model. 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 (all is reported in appendix 2). Looking at the residual graph, we can notice an interesting outlier in 1992-1993; those years marked the deepest point of Italian crisis: in September 1992 the currency was forced out of EMS, the corruption scandal was at its peak¹⁷ and on October 17th the country risked the financial collapse. The economic situation required the approval, in December, of the biggest budget law a European country has ever seen: 30 billions of pound (the Prime Minister was Giuliano Amato); this drastic measure beyond doubt decreased consumers' confidence, and private expenditure collapsed even more than this model predicts.

Turning to the restricted model, prior to any estimation it is necessary to choose some pre-determined values for the rate of decline $(1-\phi)$ and $(1-\lambda)$. Several simulations were carried out, and the best results were obtained with the following values:

$$\omega = 0.05 \quad \phi = 0.03$$

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

¹⁷ The so-called "Tangentopoli".

rate of decline of advertising has already been used in an empirical analysis on the topic (Malcom, 1997).

The restricted model as presented in equation [4.11]

$$Q_t = (1-\omega^*) (1-\phi^*)\alpha + \beta_1 P_t - \omega^*\beta_1 P_{t-1} + \beta_2 Y_t - \omega^*\beta_2 Y_{t-1} + (\phi^*+\omega^*)Q_{t-1} - \omega^*\phi^*Q_{t-2} + \beta_3 A_t$$

was transformed into a convenient form for estimation purposes in equation [4.17]:

$$K = \Phi + \beta_1 Z + \beta_2 M + \beta_3 A_t$$

This is the estimation output:

Dependent Variable: K

Method: Least Squares

Date: 09/11/02 Time: 07:53

Sample(adjusted): 1980:3 2000:4

Included observations: 82 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.249827	0.431449	-0.579041	0.5642
Z	-0.165641	0.085832	-1.929828	0.0432
M	0.837012	0.400657	2.089098	0.0387
A	0.070057	0.040625	1.724480	0.0589
R-squared	0.994237	Mean dependent var		4.448576
Adjusted R-squared	0.994015	S.D. dependent var		0.122460
S.E. of regression	0.009474	Akaike info criterion		-6.433033
Sum squared resid	0.006001	Schwarz criterion		-6.315632
Log likelihood	267.7544	F-statistic		4485.374
Durbin-Watson stat	1.732355	Prob(F-statistic)		0.000000

As it can be seen, the coefficient on the variable Z (= $P_t - \omega^*P_{t-1}$) 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.

Unrestricted model:

$$Q_t = \rho + \theta P_t + \tau P_{t-1} + \psi Y_t + \eta Y_{t-1} + \pi Q_{t-1} + \delta Q_{t-2} + \sigma A_t$$

Restricted model:

$$Q_t = (1-\omega^*) (1-\phi^*)\alpha + \beta_1 P_t - \omega^*\beta_1 P_{t-1} + \beta_2 Y_t - \omega^*\beta_2 Y_{t-1} + (\phi^*+\omega^*)Q_{t-1} - \omega^*\phi^*Q_{t-2} + \beta_3 A_t$$

Restrictions:

$$\theta = \beta_1$$

$$\tau = -\omega^* \beta_1$$

$$\psi = \beta_2$$

$$\eta = -\omega^* \beta_2$$

$$\pi = \phi^* + \omega^*$$

$$\delta = -\omega^* \phi^*$$

$$\sigma = \beta_3$$

$$F = \frac{(RSS_R - RSS_{UR}) / m}{RSS_{UR} / (n - k)} \quad [5.1]$$

RSS_R : residual sum squares of restricted model
 RSS_{UR} : residual sum squares of unrestricted
 m : number of linear restrictions
 k : number of parameters in the unrestricted
 n : number of observations

The [5.1] follows the F-distribution with m , $(n-k)$ degrees of freedom.

In our case:

$$F = \frac{(0.006001 - 0.005120) / 7}{0.005120 / 82 - 8} = 1,819$$

Now this computed value must be compared to the critical values:

$$F_{0.01}(8, 74) = 2,82$$

$$F_{0.05}(8, 74) = 2.10.$$

$$F_{0.10}(8, 74) = 1.77$$

At 5% critical level we accept the null hypothesis and therefore the validity of the restrictions.

5.4. Analysis of restricted model and ECM

Since in the unrestricted model we could not reject the hypothesis of cointegration between variables, we expect to find the same in the restricted model; appendix 3 shows the Engle-Granger test on the residuals, which result to be $I(0)$. Therefore, as expected, variables in the restricted model are cointegrated. We can rule out heteroskedasticity problems (see White test in Appendix 3).

In order to describe more accurately the short-term dynamics 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. ECM includes also the residuals from the long-run equation (in this case, the restricted model), lagged by one period (RESIDRESTRICTED(-1)) Estimation output can be found in Appendix 3, together with the residual graph. As it can be seen, 24.2 per cent of the deviation from the equilibrium error is corrected in each period.

5.5. Advertising in stock form

As mentioned in chapter 4, the alternative way to recognize the dynamic effects of advertising on consumption is to combine the string of past advertising-flow variables into a single variable representing the advertising stock in the current period.

Formally:

$$Q_t = \alpha + \beta_1 P_t + \beta_2 Y_t + \beta_3 A_t + \lambda \beta_3 A_{t-1} + \lambda^2 \beta_3 A_{t-2} + \dots \lambda^n \beta_3 A_{t-n}. \quad [4.18]$$

$$G_t = A_t + \lambda A_{t-1} + \lambda^2 A_{t-2} + \dots \lambda^n A_{t-n} \quad [4.19]$$

Where variable G_t represent the stock of advertising at time t .

The model is therefore:

$$Q_t = \alpha + \beta_1 P_t + \beta_2 Y_t + \beta_3 G_t \quad [4.20]$$

In order to be consistent with the previous analysis, I will choose the same rate of decline for advertising as in the previous section: $\lambda = \omega = 0.05$.

This is the estimation output:

Dependent Variable: Q
Method: Least Squares
Date: 09/11/02 Time: 08:11
Sample(adjusted): 1981:3 2000:4
Included observations: 78 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.254733	0.562447	-0.452900	0.6519
P	-0.187311	0.028026	-6.683480	0.0000
Y	0.870906	0.320041	2.721232	0.0034
G	0.075679	0.041703	1.814713	0.0574
R-squared	0.993807	Mean dependent var	4.838170	
Adjusted R-squared	0.993556	S.D. dependent var	0.126589	
S.E. of regression	0.010162	Akaike info criterion	-6.290427	
Sum squared resid	0.007642	Schwarz criterion	-6.169570	
Log likelihood	249.3266	F-statistic	3958.361	
Durbin-Watson stat	1.651103	Prob(F-statistic)	0.000000	

The coefficient on G is significant, with elasticity equal to 0.075. In the previous paragraph, by considering advertising in flow-form, we found an elasticity of 0.034.

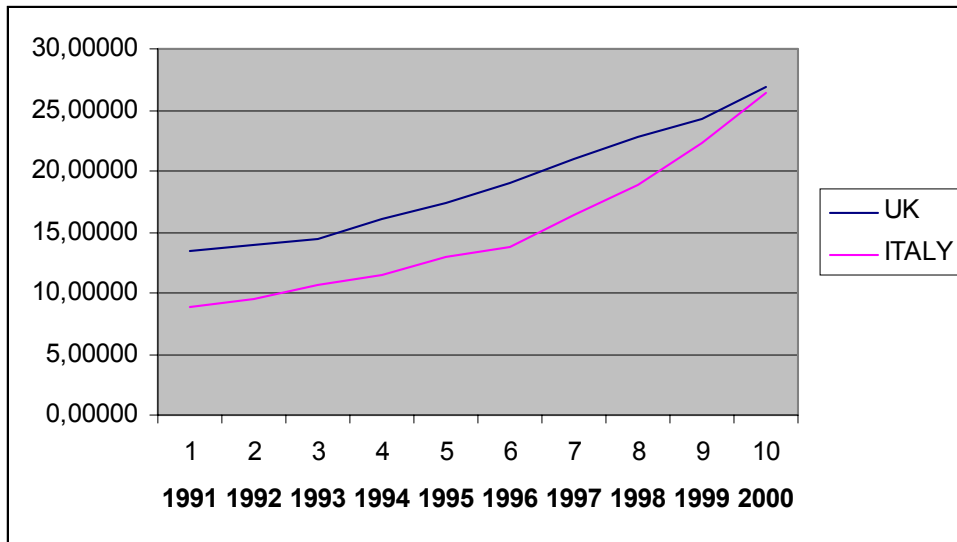
Thus, recognizing the dynamic effect of advertising by considering it as flow-form or stock form does not change either qualitatively nor quantitatively the main conclusion of this paper: advertising has a positive impact on aggregate consumption, whose magnitude can reasonably be estimated between elasticity of 0.034 and 0.075 (in appendix 3 we also present the stock-model with the inclusion of lagged value of price and income; as it can be seen, the advertising elasticity in that case respect fully our estimate of elasticity).

6. COMPARISONS WITH UK AND GDP TREND

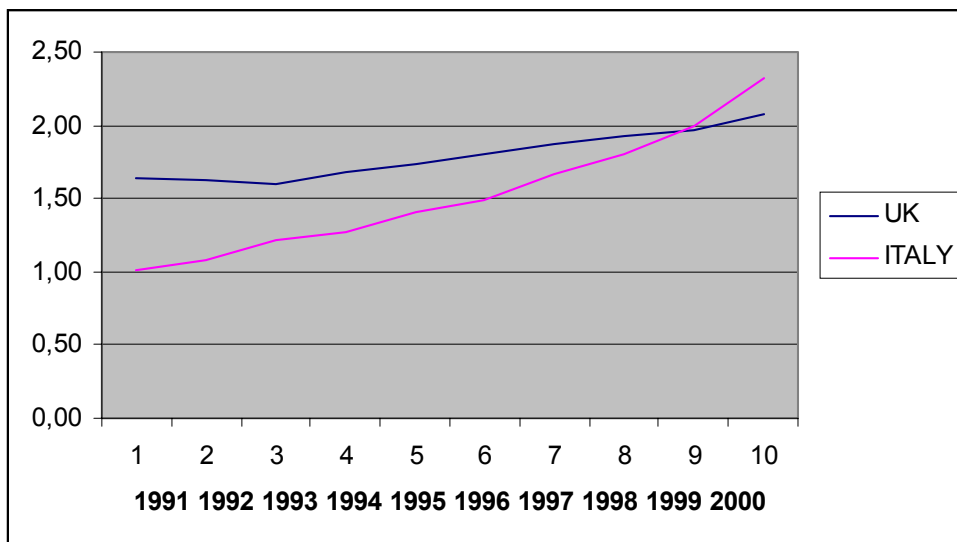
6.1.. *Comparisons with United Kingdom*

It is particularly interesting to compare advertising expenditure in Italy with another European country. Here I chose United Kingdom, basically because it is the most similar country to Italy as far as economy and population's sizes are concerned. Due to a data problem, I am only able to use annual observations relative to the last decade.

Here we can compare advertising expenditures (current prices) from 1991 to 2000. The prices are in billion of euro (the exchange rate used was 1.577, 29th August, time: 18.44).



Here, we compare the ratio advertising/GDP:



As it can easily be seen, Italy's advertising expenditure has been considerably lower than British one for most of the last decade (and, according to sporadic sources¹⁸, also previously). This might be due to the Italian peculiar industrial structure, which is characterized by a clear predominance of small and medium enterprises (98% of firms, according to I.S.T.A.T.); thus, it might be possible that advertising investments are positively correlated with the size of the firm. Obviously, this statement should be accurately and formally investigated, and this might be the aim of a future work. However, as the graphs show, in the last couple of years the Italian "catch-up" seems to have

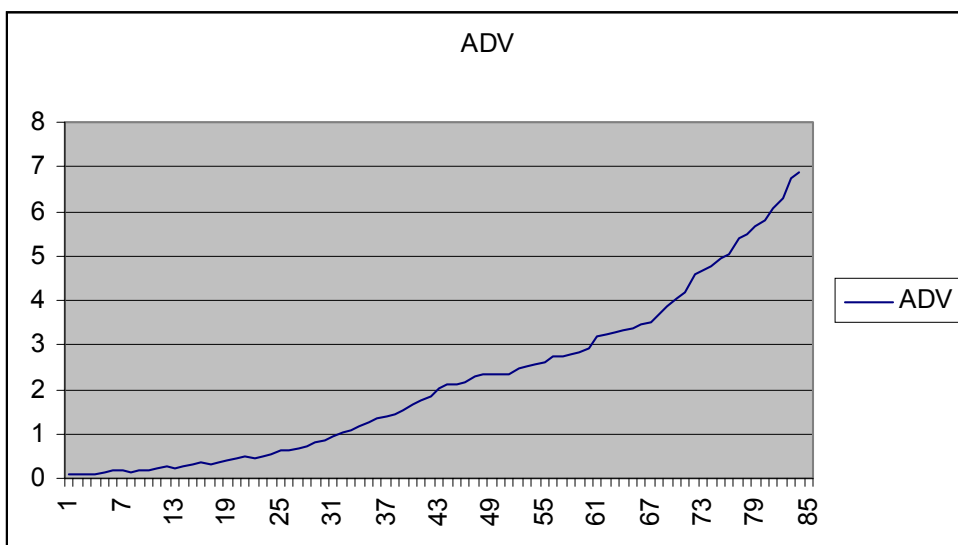
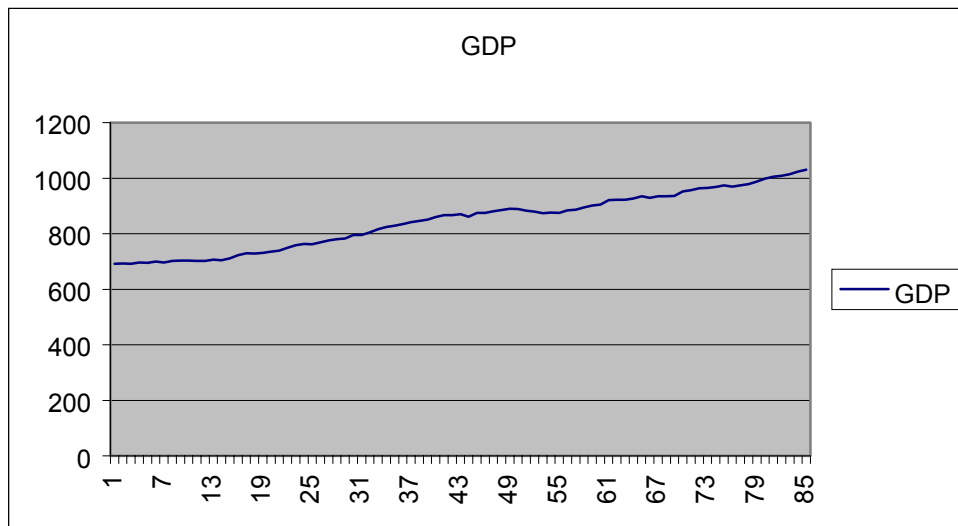
¹⁸ Journal of Advertising, Vol.1, January-March 1982. Advertising/Gdp ratio is at 0.33% for Italy and 1.28% for UK.

come to an end: both the current expenditure and the ratio advertising/GDP converge to the British case.

6.2. Is advertising moving procyclically in Italy?

As discussed in previous chapter, one of the most important issues related to advertising is its presumed role in counteracting economic downturns; in order to assess whether this happened in Italy, we need to compare the dynamics of GDP and advertising expenditure.

These are the graphs:



This rough comparison' conclusions are very likely to be strongly affected by the few number of observations: moreover, we are considering a period of time which has not really been heavily affected by periods of recessions, and therefore our ability to investigate pro-cyclicality or counter-cyclicality is probably compromised. However, we can reasonably suggest that the dynamics of advertising expenditure (which this paper proves to be sustained also before 1991) presents an "ironic" conclusion to the pro/counter-cyclicality debate: advertising seems to be constantly rising, probably regardless of the business cycle.

7. CONCLUSIONS

This paper addressed the issue of 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 summarized as follows:

1) 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. This paper has shown that the results are approximately the same if we consider advertising in stock form instead of flow form.

2) Advertising seemed to be moving nor procyclically neither counter cyclically; simply, it just showed a constantly raising dynamic, particularly in the last decade. Therefore, it followed the business cycle when output is rising, but seems to counter-act it in recession times. This might support the view according to which advertising has been used as a tool to sustain aggregate demand, thereby avoiding stagnation.

3) Advertising expenditure in Italy used to be traditionally lower than in other European countries; this paper has shown a comparison with United Kingdom, the country that it is most similar to Italy as far as economy and population's size are concerned. This might be due to the Italian peculiar industrial structure, characterized by the predominance of small and medium enterprise, which supposedly spend less on advertising than big firms. This leads us to the question: "If advertising is being used as a tool to avoid realisation crisis, is it a tool at everybody's disposal or only big firms have the financial means to effectively use it?". An investigation regarding the correlation between size of the firm and advertising expenditure is one of the most interesting

research suggestions that this paper puts forward. However, last year Italian's "catch up" seems to be over: advertising expenditure is the same as United Kingdom, both in absolute terms and as a ratio of GDP.

However, in my opinion my analysis presents the following limitations:

1) The specification of the model does not include all the relevant explanatory variables that are supposed to affect aggregate consumption (like wealth, distribution of income, etc.). I preferred to include just some of them, in order to maintain a relatively simple specification of the model, thereby avoiding potential estimation problems.

2) The rates of decline of explanatory variables are assumed exogenous, and derived on the basis of previous works and different simulations not included in the present paper. A more detailed analysis should definitely attempt to endogenize them.

3) The comparison with United Kingdom and the analysis of procyclicality suffers from lack of data, especially in the former case. To find good quality and detailed data on advertising expenditure was in fact the greatest difficulty in the preparatory work for this paper.

However, I believe that the methodology and the results of this paper can effectively contribute to the debate in question.

Let alone the empirical analysis, also at intuitive and sociological levels of debate there are few doubts that advertising does have a sort of effect of aggregate consumption, although people might disagree on their actual magnitude. Nevertheless, latest mainstream theories on consumption fail to recognize it, and continue to deny any interdependence between firms' investment on advertising and potential endogeneity of preferences. The biggest challenge, therefore, becomes to conduct a formal theoretical analysis by building a dynamic model with representative consumer and firm, where the advertising expenditure of the latter affect the preferences of the former, and where it all can be tested by conducting a more formal and sophisticated empirical analysis.

This is the aim for my next work, being deeply persuaded that economic analysis and its formal tools make sense only if they have the courage to "dive into the real world", guided by the constant mission of explaining the daily reality, providing policy-makers with the ability to understand it and, possibly, improve it.

APPENDIX 1: ADVERTISING EXPENDITURE COMPOSITION

According to the U.S. Department of State (Country Commercial Guide) in 2001 the composition of advertising expenditure was the following:

newspapers and magazines	70 per cent
radio and television	22 per cent
cinema	2 per cent
other methods	6 per cent.

In my research, I have found the following proportions:

newspapers and magazines	59,47 per cent
radio and television	37.54 per cent
cinema	2,20 per cent
other methods	0,78 per cent.

As it can be easily seen, the first estimate differs from the second one insofar as the radio and television sector is concerned: it takes nearly 16% of the expenditure in those media (equal to roughly 41% of the total expenditure in radio and television according to Nielsen) and reallocate among newspapers/magazines and other methods. In other words, according to American estimate advertising expenditure is more concentrated on newspaper and magazines than it is according to my source.

APPENDIX 2: SIMULTANEITY, COINTEGRATION AND UNRESTRICTED MODEL

1) UNIT ROOT TESTS

Dickey Fuller tests estimates the following regression:

$$\Delta X_t = (\rho - 1) X_{t-1} + \varepsilon_t$$

$H_0: (\rho - 1) = 0 \rightarrow$ non- stationarity of the series (or presence of a unit root).

$H_1: (\rho - 1) \neq 0 \rightarrow$ stationarity

If the DF Test Statistic is greater, in absolute value, than the corresponding critical value, H_0 is rejected. We will use a 5% level of significance.

CONSUMER DEMAND (Q)¹⁹

Levels : H_0 is accepted \rightarrow Q is non-stationary

ADF Test Statistic	-1.670950	1% Critical Value*	-4.0771
		5% Critical Value	-3.4666
		10% Critical Value	-3.1597

First difference: H_0 is rejected \rightarrow DQ is stationary \rightarrow Q = I(1)

ADF Test Statistic	-3.033568	1% Critical Value*	-3.5153
		5% Critical Value	-2.8986
		10% Critical Value	-2.5863

INCOME (Y)

Levels: H_0 is accepted \rightarrow Y is non-stationary

ADF Test Statistic	-1.842088	1% Critical Value*	-4.0771
		5% Critical Value	-3.4666
		10% Critical Value	-3.1597

First difference: H_0 is rejected \rightarrow DY is stationary \rightarrow Y = I(1)

ADF Test Statistic	-3.480904	1% Critical Value*	-3.5153
		5% Critical Value	-2.8986
		10% Critical Value	-2.5863

¹⁹ Being my model in logarithmic form, the Dickey-Fuller test will be performed on the log of each time series.

PRICES (P)

Levels: H_0 is accepted \rightarrow P is non-stationary

ADF Test Statistic	-2.419478	1% Critical Value*	-4.0771
		5% Critical Value	-3.4666
		10% Critical Value	-3.1597

First difference: H_0 is rejected \rightarrow DP is stationary \rightarrow P = I(1)

ADF Test Statistic	-3.142440	1% Critical Value*	-3.5153
		5% Critical Value	-2.8986
		10% Critical Value	-2.5863

ADVERTISING (A)

Levels: H_0 is accepted \rightarrow A is non-stationary

ADF Test Statistic	-3.124092	1% Critical Value*	-4.0771
		5% Critical Value	-3.4666
		10% Critical Value	-3.1597

First difference: H_0 is rejected \rightarrow DA is stationary \rightarrow A = I(1)

ADF Test Statistic	-3.371540	1% Critical Value*	-3.5153
		5% Critical Value	-2.8986
		10% Critical Value	-2.5863

2) COINTEGRATION TEST (ENGLE-GRANGER PROCEDURE)

Dickey-Fuller test on residuals of unrestricted model.

ADF Test Statistic	-3.964887	1% Critical Value*	-4.0803
		5% Critical Value	-3.4681
		10% Critical Value	-3.1606

Residuals are I (0) at 5% significance level.

3) HAUSMANN TEST

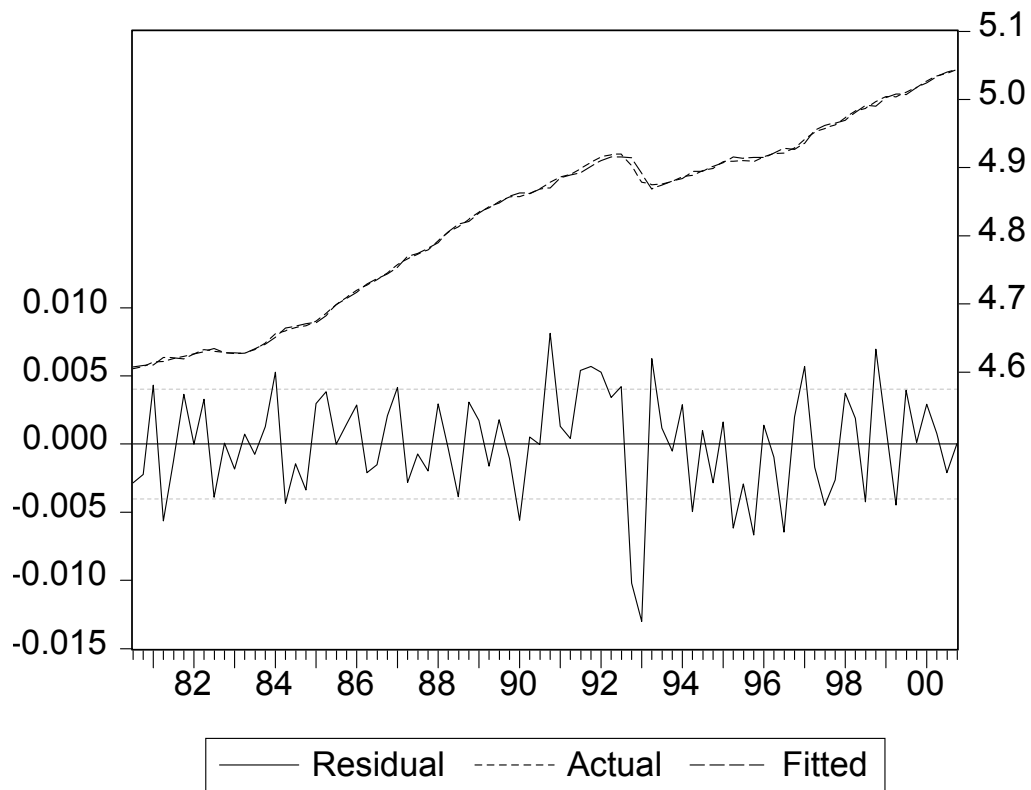
Dependent Variable: Q
 Method: Least Squares
 Date: 09/11/02 Time: 06:48
 Sample(adjusted): 1980:2 2000:4
 Included observations: 83 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.907792	0.195008	-14.91118	0.0000
P	-0.444698	0.218215	-2.037885	0.0450
P(-1)	0.417496	0.209297	1.994749	0.0496
Y	0.389664	0.194058	2.007975	0.0482
Y(-1)	0.777719	0.189989	4.093502	0.0001
RESID	0.044491	0.036299	1.225681	0.1289

Given the insignificance of the coefficient attached to RESID, we conclude that there is not simultaneity between A and Q.

4) UNRESTRICTED MODEL

RESIDUAL GRAPH.



CORRELOGRAM OF RESIDUALS

Date: 09/11/02 Time: 07:46
 Sample: 1980:3 2000:4
 Included observations: 82

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
. .	. .	1	0.007	0.007	0.0038	0.951
* .	* .	2	-0.165	-0.165	2.3581	0.308
. .	. .	3	0.042	0.046	2.5146	0.473
. .	. .	4	-0.026	-0.056	2.5746	0.631
. .	. .	5	0.028	0.045	2.6431	0.755
* .	* .	6	-0.071	-0.091	3.0962	0.797
* .	* .	7	0.089	0.113	3.8165	0.801
. .	. .	8	0.017	-0.023	3.8447	0.871
* .	* .	9	-0.142	-0.099	5.7484	0.765
* .	* .	10	-0.065	-0.084	6.1588	0.802
* .	* .	11	0.159	0.148	8.6050	0.658
* .	* .	12	0.126	0.098	10.164	0.602
* .	* .	13	-0.173	-0.132	13.143	0.437
. .	. .	14	-0.035	-0.017	13.268	0.506
. .	. .	15	0.024	-0.028	13.327	0.577
** .	** .	16	-0.237	-0.241	19.193	0.259
* .	* .	17	-0.085	-0.082	19.954	0.277
. .	* .	18	-0.039	-0.134	20.117	0.326
. .	. .	19	0.013	-0.048	20.136	0.386
. .	. .	20	-0.017	-0.026	20.167	0.448
. .	* .	21	-0.007	0.068	20.173	0.510
* .	. .	22	0.111	0.043	21.599	0.484
. .	. .	23	-0.025	-0.048	21.675	0.540
* .	* .	24	-0.179	-0.171	25.462	0.381
* .	* .	25	0.105	0.112	26.787	0.367
* .	. .	26	0.100	-0.010	28.005	0.358
. .	. .	27	-0.032	0.037	28.132	0.404
. .	. .	28	-0.047	0.005	28.415	0.443
. .	. .	29	0.020	0.013	28.467	0.493
. .	. .	30	0.006	-0.055	28.472	0.545
* .	* .	31	-0.097	-0.098	29.734	0.531
* .	* .	32	0.170	0.098	33.727	0.384

BREUSCH-GODFREY SERIAL CORRELATION LAGRANGE MULTIPLIER TESTS

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.037194	Probability	0.394309
Obs*R-squared	4.588069	Probability	0.332232

APPENDIX 3: RESTRICTED MODEL AND ECM

RESTRICTED MODEL

1) COINTEGRATION TEST (ENGLE-GRANGER)

Analysis on residuals of restricted model (Dickey-Fuller test)

ADF Test Statistic	-2.914161	1% Critical Value*	-3.5164
		5% Critical Value	-2.8991
		10% Critical Value	-2.5865

Residuals are I(0) at 5% significance level → there is evidence of cointegration in the restricted model.

2) WHITE HETEROSKEDASTICITY TEST

White Heteroskedasticity Test:

F-statistic	1.917047	Probability	0.088975
Obs*R-squared	10.90361	Probability	0.091402

3) ECM

Dependent Variable: DQ

Method: Least Squares

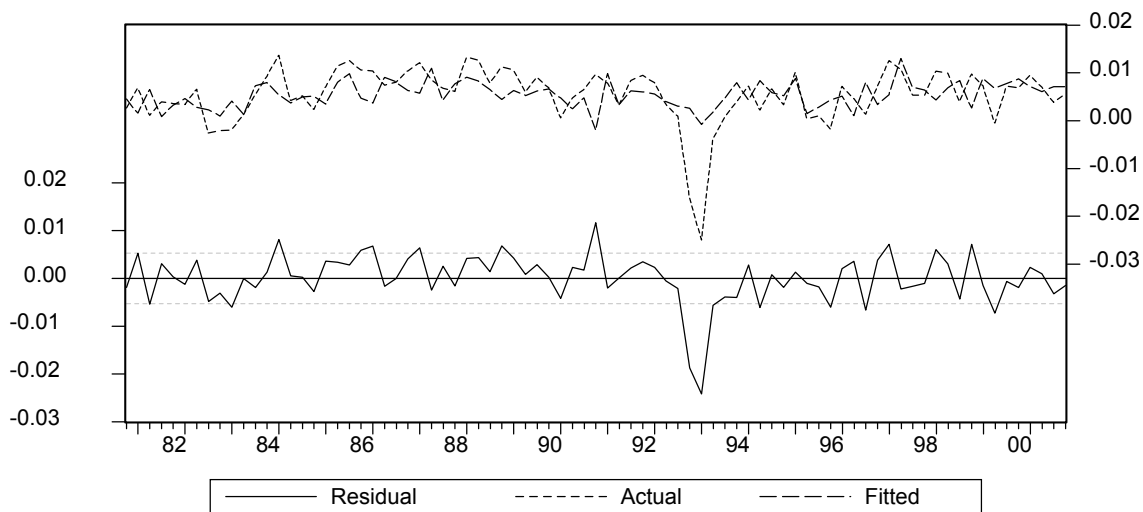
Date: 09/11/02 Time: 08:05

Sample(adjusted): 1980:4 2000:4

Included observations: 81 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.006619	0.001577	4.196081	0.0001
DZ	-0.003594	0.001418	-2.535265	0.0133
DM	0.380160	0.096083	3.956578	0.0002
DA	0.009946	0.006277	1.584388	0.1173
RESIDRESTRICTED(-1)	-0.242009	0.061217	-3.953322	0.0002

RESIDUAL GRAPH



4) MODEL IN STOCK FORM WITH THE INCLUSION OF P(-1) AND Y(-1)

Dependent Variable: Q

Method: Least Squares

Date: 09/11/02 Time: 08:12

Sample(adjusted): 1981:3 2000:4

Included observations: 78 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.717379	0.563916	-1.272139	0.2074
P	-0.429774	0.224287	-1.916177	0.0593
P(-1)	0.247104	0.217213	1.137611	0.2591
LY	0.371634	0.196413	1.892106	0.0625
Y(-1)	0.566458	0.198640	2.851686	0.0057
G	0.065858	0.011736	5.611869	0.0000
R-squared	0.994474	Mean dependent var	4.838170	
Adjusted R-squared	0.994090	S.D. dependent var	0.126589	
S.E. of regression	0.009732	Akaike info criterion	-6.353051	
Sum squared resid	0.006819	Schwarz criterion	-6.171766	
Log likelihood	253.7690	F-statistic	2591.360	
Durbin-Watson stat	0.679329	Prob(F-statistic)	0.000000	

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