Sunk Costs and Firms' Investment Decisions in the Italian Domestic Appliance Industry

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Abstract

The paper uses the Haskel Scaramozzino (1997) framework in order to provide some explanations of the company behavior in the Italian domestic appliance industry. We show that a "sunk costs hypothesis" holds for the company investment policy in this industry. Preliminary results show that market share has a positive effect on the operating profit margin, but that such effects are reduced if investments in intangibles are taken into account. In particular, investments in intangibles seem to act as a substitute for the market share in shaping firms' profit function.

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1. Introduction

The debate concerning the empirical analysis of firm behavior in an industry is still open and in constant evolution. Along the line of the "new industrial organization" literature, many recent papers (Courts, 1999; Frangouli, 1999) have shown how the relationship between the conduct of the company and its relative market share weakens when company's characteristics are critical in determining firms' behavior.

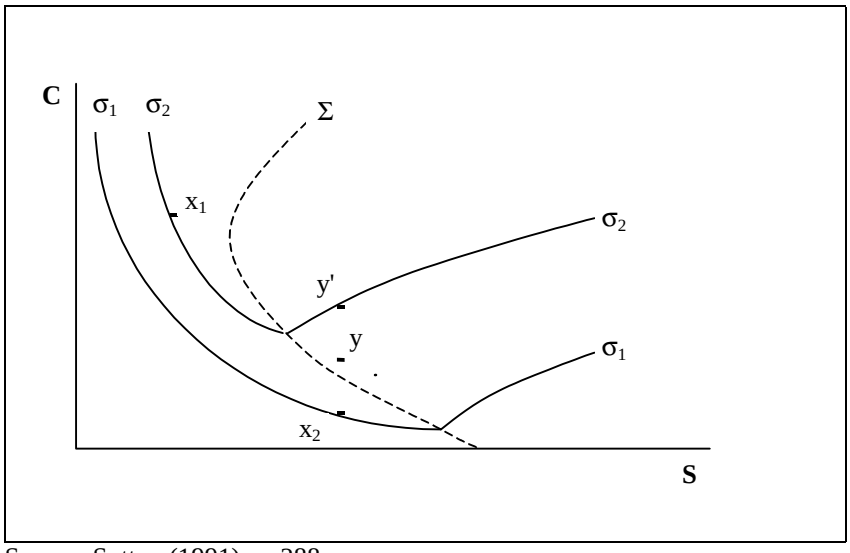
Haskel and Scaramozzino (HS 1997)[1] show how company's behavior can be explained when characteristics of other companies in the industry, as well as of the company itself, are explicitly taken into account in the definition of company's CVs. In their model, the root of the conjectural variation relies on a set of measures of the operational and financial status of the company. The present paper use the HS framework in order to provide a preliminary test of the hypothesis that the behavior of companies in the Italian domestic appliance (DA) industry can be related to their investment in Intangible Asset (R&D and advertising). Differently from HS, we use a measure of conjectural variation that combines the firm's investment in intangible asset, which include R&D and advertising, instead of a measure of capacity utilization and an index of financial status. This change allows us to pursue two complementary purposes. First, we can test a different specification of the HS model by changing the variables used to describe CVs; second, we can empirically test the hypothesis that the behavior of a company that belongs to an industry in which the "endogenous sunk costs" (Sutton, 1991, 1997) are important may be determined by "deliberate" investment policies towards R&D and advertising, in the sense of the Sutton's model.

Sutton[2] has shown that in those industries where it is possible to increase the perception of product quality through advertising expenditure (or R&D), there is a critical level of market size beyond which it is in the company interest to sustain such a cost. The amount of advertising expenditure turns out to be proportional to the size of the market as it is recouped by an increase in the volume of product sold. A change of regime occurs for a critical value of the size of the market: below this value, economies of scale

[1] Haskel J., Scaramozzino P., 1997, pp. 27-45.
[2] Sutton, 1991, 1997.

influence the structure of the sector; above the value endogenous costs (advertising expenditure and R&D) become determinant. In the first regime, the level of concentration diminishes with the market expansion, while in the second regime the relationship is reversed. The model is able to determine the lower limit of concentration consistent with the relevant structural characteristic of the industry. Fixed costs being equal (i.e. given the level of economies of scale), this lower limit becomes higher as consumer sensitivity to product quality increase.[3]

Fig. 1 – Market size and market concentration in the Sutton's endogenous sunk cost model.



Source: Sutton (1991), p. 288.

Considering the peculiarity of the domestic appliance industry (DA) in terms of financial commitment, R&D and advertising, this industry is an ideal candidate for testing if and how much the company behavior is affected by the presence of the "endogenous" sunk cost. In Section 3 of the paper we will discuss this issue more extensively. The structure of the Italian DA industry and the behavior of Italian companies in the EU market lead us to believe that the behavior of a those companies is influenced by their choices with respect to the intangible asset. In particular, in this paper we provide a

[3] Sutton, 1991.

preliminary test of the relevance of R&D and advertising costs in shaping the behavior of the companies in the Italian DA. [4]

The paper is structured as follows. Section 2 presents a short review of the empirical literature on conjectural variations. Section 3 presents data used for the estimates and estimates results. Section 4 concludes.

2. A quick overview of the empirical literature on CV estimate

The empirical literature on the CV empirical estimates can be divided into two main strands of research. The original CV approach assumes that the firm's CV is a parameter to be estimated in a system that specified demand elasticity, profitability and marginal cost. Studies in this first group have generally found that the CV was significantly different from zero but give little indication about the precise nature of the interactions.

A later, second group of studies allowed CV to depend on own firm characteristics, principally on market share. Four main approaches have been suggested to model CV within this research field. Iwata and Appelbaum[5] impose no structure at all on CV and treat it as a single parameter to be estimated. Iwata proposes an econometric approach to the problem of price determination in oligopoly in which the price level - in a homogeneous product oligopoly market - is determined as a function of three factors: the price demand elasticity, the marginal cost and the conjectural variation of each firm. The CV's value is determined by the marginal cost and the demand elasticity estimate. The statistic properties of this estimate come from the statistic properties of the marginal cost and elasticity demand estimate. Appelbaum extends the use of econometric production

[4] The evolution of the Italian DA industry during the '90th has mainly motivated the study. Because of the opening of East European markets in late '80th and the Italian currency devaluation in 1992, the Italian share of European output (and export) has steadily increased in the decade. Today, the Italian domestic appliance industry accounts for a share of 40% of total European production and 50% of total European exports. The share of export on domestic production is more than 80% for almost all the products included in the Italian DA industry.

theory to a general class of oligopolistic market. The study provides a measure of the degree of oligopolistic power of a firm that measures the deviation from purely monopolistic and competitive behavioral modes. The model suggests that the measure of oligopoly power is composed of two parts: the inverse demand elasticity and the conjectural elasticity, that involves both the firm's market share and its conjectural variation. The CV is not restrict to any specific type, so it can correspond to a general behavioral mode.

A second approach is developed by Gollop and Roberts.[6] They develop econometrics models capable of identifying the pattern of interdependent behavior among firms in an oligopolistic industry. In those models, CV is estimated freely for a number of benchmark firms, while conjectures of other firms are assumed proportional to the benchmarks, depending on relative market shares. The implicit restriction here is that firms of similar market share have similar CV. This restriction is open to criticism. The main remark that can be made to this approach consists in the fact that, unless the distribution of the company size is unusually grouped around the size of the hypothetical company-sample of each class, the assumption of homogeneity conflicts with the continuous nature of the data.

A third approach is developed by Spiller and Favaro, Kwoka and Ravenscraft, Machin and Van Reenen[7]. The studies assume that CV depend on market shares. The difficulty here is that firms of similar market share are assumed to have similar conjectures. Spiller and Favaro consider two group of firms: the dominant group and the fringe. According to the model, a dominant firm expects strong retaliation from other dominant firms, while it expects accomodation from the fringe firms; a fringe firm should expect some small retaliation from the dominant firms with no reaction from the others fringe firms. Kwoka and Ravenscraft used market shares and scale economies to study firm interaction. A larger market share raises a firm's own margin, though for a leading firm the effect is bound up in other control variables. A larger leader lowers follower margins in high-scale industries, but has little effect where scale economies are not

[5] Iwata G., 1974, pp. 947-966; Appelbaum E., 1982, pp. 287-299.
[6] Gollop F. M., Roberts M., 1979, pp. 313-331; Roberts J., 1984, pp. 367-383.

important. Moreover, larger second-ranked firms can significantly lower leaders' margins. Machin and Van Reenen present an econometric model in which firms' profitability depends on both firms' characteristics (profit margins and market shares) and industry's characteristics (concentration).

A fourth approach is the Haskel and Scaramozzino framework. It presents two innovative points: the analysis is at firm level, not at industry level; two main types of measures are used, i.e. physical capacity and the financial status of the firm. Main financial status indicators are the borrowing ratio (BR) and the ratio of cash to current liabilities (CL); physical capacity indicator is capacity utilization (CU). By using company accounts data, they estimate a profit rate equation in which is present a CV variable λ_i as in the relationship:

$$\frac{p - c'}{p} = \frac{s_i}{\eta}(1 + \lambda_i)$$

that describes the standard approach to measure the market power of a company.

The conjectural variation of the company *i* (λ_i) towards its rivals is identified by the effects of both the financial capacity, derived from the values of the borrowing ratio (BR) and the ratio of cash to current liabilities (CL), as well as the productive capacity, represented by the used physical capacity.

The estimate equation takes the form of:

(1) $\lambda_i = \alpha_0 + \alpha_1 CU_i + \alpha_2 CU_{-i} + \alpha_3' FS_i + \alpha_4' FS_{-i}$

in which *FS* is a vector of the companies' financial status, while the *–i* refer to the competitors of company *i*.

To allow for a different reaction between leaders and followers, as envisaged in the basic hypothesis, the (1) will be reformulated as follows:

(2) $\lambda_i^{\omega} = \beta_0^{\omega} + \beta_1^{\omega} CU_i + \beta_2^{\omega} CU_{-iL} + \beta_3^{\omega} CU_{-iF} + \beta_4^{\omega}' FS_i + \beta_5^{\omega}' FS_{-iL} + \beta_6^{\omega}' FS_{-iF}$

In which $\omega = L, F$, where *L* e *F* denote leaders and followers respectively.

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[7] Spiller P. T., Favaro E., 1984, pp. 259-277; Kwoka J., Ravenscraft D., 1986, pp. 351-364; Machin S., Van Reenen J., 1993, pp. 29-50.

Under the hypothesis of profit maximization, the estimating equation is a profit margin equation as:

$$OPM_{it}^{L} = \psi_0^L s_i + \psi_1^L s_i CU_i + \psi_2^L s_i CU_{-iL} + \psi_3^L s_i CU_{-iF} + \psi_4^L{}' s_i FS_i + \psi_5^L{}' s_i FS_{-iL} + \psi_6^L{}' s_i FS_{-iF} + \psi_7^L OPM_{i,t-1}^{L} + \psi_8^L \left(\frac{K}{Y}\right)_{it}^{L} + FE_i + TD_t + \varepsilon_{it} \quad (3)$$

and

$$OPM_{it}^{F} = \psi_0^F s_i + \psi_1^F s_i CU_i + \psi_2^F s_i CU_{-iL} + \psi_3^F s_i CU_{-iF} + \psi_4^F{}' s_i FS_i + \psi_5^F{}' s_i FS_{-iL} + \psi_6^F{}' s_i FS_{-iF} + \psi_7^F OPM_{i,t-1}^{F} + \psi_8^F \left(\frac{K}{Y}\right)_{it}^{F} + FE_i + TD_t + \eta_{it} \quad (4)$$

where $\frac{K}{Y}$ is the capital-output ratio, *FE* and *TD* are respectively fixed effects and time dummies; ε_{it} and η_{it} are serially uncorrelated disturbances. Equations (3) and (4) are for leaders and followers respectively. Firm profit rates depend on own market share and own market share interacted with both a) own physical capacity and financial conditions and b) with rivals' physical capacity and financial conditions. The main finding is that own profits depend significantly on both own and rivals' physical capacity and financial factors: as a consequence, CV depends on the firm's actual ability to respond which in turn depends on physical and financial factors. The study rejects homogeneous conjectures: the results show leader/follower asymmetries, with leaders expecting accomodation from rivals and followers typically behaving as Cournot players.

3. *The empirical analysis*

3.1. The Italian DA industry

The success of the Italian DA industry dates back to the '50s, when a large number of small producers started much small scale business in order to satisfy the strong

expansion in domestic demand. During the '60s, the rise in demand stimulated subsequent improvements in the technical and managerial structure of the industry: heavy investment in product and process innovation stimulated strong benefits in the efficiency of the industry that allowed Italian producers to increase their share in the European market of DA. From the mid-'70s until the end of the '80s, the European DA industry experienced an intense process of concentration, that activated a massive re-location of a large share of continental production in few European countries, including Italy. Because of the opening of East European markets in late '80th and the Italian currency devaluation in 1992, in the '90s the Italian share of European output (and export) has steadily increased. Today, the Italian DA industry accounts for a share of approximately 20% of total European production and 50% of total European exports. The ratio of exports on domestic production is more than 80% for almost all the products in the industry.

Tab. 1 - DA output in Europe - Country shares

	1980-81	1990-91	1994-95	1999-00
European countries	61.1	62.2	72.6	71.4
France	7.0	7.8	9.3	8.4
Germany	20.7	16.8	15.4	14.1
Italy	12.7	13.1	17.4	19.7
Spain	10.7	13.8	13.2	15.1
UK	5.1	4.1	5.4	6.4
Others	4.8	6.6	11.9	11.9
ex EFTA	3.2	2.9	3.5	2.1
East Europe	13.0	13.5	12.2	15.2
Other countries	4.1	3.7	3.5	2.4
Europe	81.3	82.3	91.8	92.7
Ex-URSS	18.7	17.7	8.2	7.4
Total	100.0	100.0	100.0	100.0
Abs. values (million pieces)	56.704	75.391	74.347	75.578

Source: United Nations Commodity Statistics

The relevance of the Italian DA industry in the European panorama is evident from data on country specialization obtained from the Grubel-Lloyd index of intra-sectoral trade. From Table 2 Italy come out as a main exporter in almost all types of

product included in the DA industry (refrigerators, freezers, washing machines, dishwashing machines, cooking plates and other appliances).

Tab. 2 - Grubel – Lloyd index of intra-sectoral trade – Average 1995-97

Countries	Fridges	Freezers	Washing-machines	Dish-washers	Cookers	Household appliances
Germany - D	6.9	8.2	16.9	46.3	19.2	17.5
France - F	0.6	14.3	22.7	6.6	20.0	12.3
Netherlands- NL	0.1	0.4	0.1	0.2	3.5	0.3
Belgium B	1.5	0.3	0.8	0.0	0.6	0.9
UK	1.1	16.7	0.2	0.0	37.3	4.5
Denmark - DK	3.0	112.1	0.1	0.0	21.8	18.9
Ireland - IRL	0.1	0.8	0.0	0.0	1.1	0.1
Greece - GR	3.4	0.7	2.5	3.0	4.6	1.8
Spain - E	44.9	14.4	37.2	5.9	44.1	33.8
Portugal - P	6.7	35.7	0.0	0.0	100.9	22.9
Sweden - S	25.0	7.6	0.9	17.4	10.9	12.3
Finland - FIN	1.1	0.0	0.0	0.0	0.0	0.3
Austria – A	2.8	13.2	0.4	0.1	40.6	5.9
UE COUNTRIES	7.5	13.5	11.6	20.2	28.2	13.0
Norway - N	0.2	0.3	0.0	0.6	0.0	0.1
Switzerland - CH	0.2	0.1	0.9	0.6	2.9	1.0
East Europe	15.9	36.8	4.3	0.1	0.2	9.5
OTHER EU C.	13.8	28.3	4.1	0.2	0.6	8.6
USA	191.7	19.6	0.5	1.3	39.4	73.0
Canada - CDN	31.9	2.0	1.4	1.9	56.6	14.5
Japan – J	28.0	0.0	0.1	0.2	0.0	0.2
South Korea - ROK	176.4	57.9	84.9	0.1	2.5	100.2
China – RC	183.8	47.0	0.2	4.8	45.7	45.9
Taiwan	0.0	0.0	0.0	0.0	0.0	9.6
Australia - AU	0.3	0.0	0.0	0.0	0.0	0.0
Egypt – ET	1.1	0.3	0.0	0.0	0.1	0.1
Arabia Saudi - SA	0.3	0.0	0.0	0.0	0.0	0.0
Algeria – DZ	0.0	0.0	0.0	0.0	0.0	0.0
Other Arabic countries	0.0	0.0	0.0	0.0	0.0	0.0
Other countries	7.5	0.3	0.0	4.6	0.2	1.1
TOTAL OTHER C.	29.9	1.1	1.1	3.3	0.5	4.4
TOTAL	9.9	14.5	8.0	17.3	13.8	10.9

Source: our elaborations on Comext database

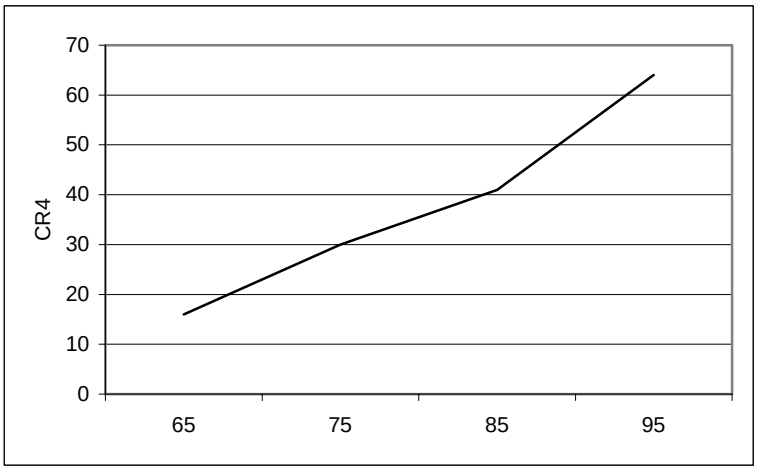
Table 3 show the trend in market share for the main European producers. As evident from the table, the European DA industry have undergone an intense process of concentration that has allowed a small group of producers to come out as leader in the "new oligopoly" of this industry in Europe. (See Tab.3 and Fig.2)

Tab. 3 - European market share of main producers (physical output).

	1964[I]	1976[II]	1986[III]	1994[IV]	1996[V]
Electrolux			15	22.5	25
Philips (now Whirlpool)			*13*		
Bosch-Siemens			8	15.0	16
Whirlpool				14.0	15
AEG (now Electrolux)			*4*		
Indesit (now Merloni Elett.)			*4*		
Merloni Elettrodomestici			3	8.0	10
EL.FI. Brandt				10.5	10
Candy			3	6.5	
Miele			3	3.0	
General Electric / GDA				3.0	
Hoover (now Candy)			*2*		
Thomson Electromén. (nowELFI)			*6*		
Hotpoint (now GE)			*3*		
Ocean-SanGiorgio(now ELFI)					
CR_4 (market share of four bigger producers)	**16**	**30**	**42**	**62**	**66**

Sources:
[I] Baden-Fuller, Stopford (1991), p. 497.
[II] Paba (1991), p.5
[III] Baden-Fuller, Stopford (1991), p. 497.
[IV] Paba (1991), p. 170.
[V] Eurostat.

Fig. 2 - CR_4 index of concentration in the HA industry in Europe



Tab. 4 summarizes the key variables for understanding the concentration process observed in the DA industry during the last decades. After an "automation phase" that has affected the industry restructuring during the '60s, the excess of productive capacity in the '70s, together with a deceleration in the international demand, have fostered an intense process of concentration mainly based on mergers and acquisitions between major groups. In the '90s, a fairly weak demand together with selective effects on European markets have strengthen the relevance of "brand loyalty" as well as the appearance of "endogenous sunk cost" effects as in the Sutton's model.

Tab. 4 – Trend in demand and concentration process in the DA industry.

Period	Demand	Key variable for the concentration process	Authors
'60	Increase	Economies of scale	Pratten ('71), Scherer ('73)
'70	Decelerate	Excess capacity – (mergers & acquisitions)	Baden-Fuller, Stopford ('91) Paba ('91)
'80-'90	-Slightly increasing -Substitution demand -Market selectivity	-Brand loyalty -Advertising and R&D ("endogenous sunk cost")	Balloni, Cucculelli, Iacobucci ('99)

Tab. 5 - Minimum Efficient Scale (MES) estimates in the DA industry - Thousand pieces and %.

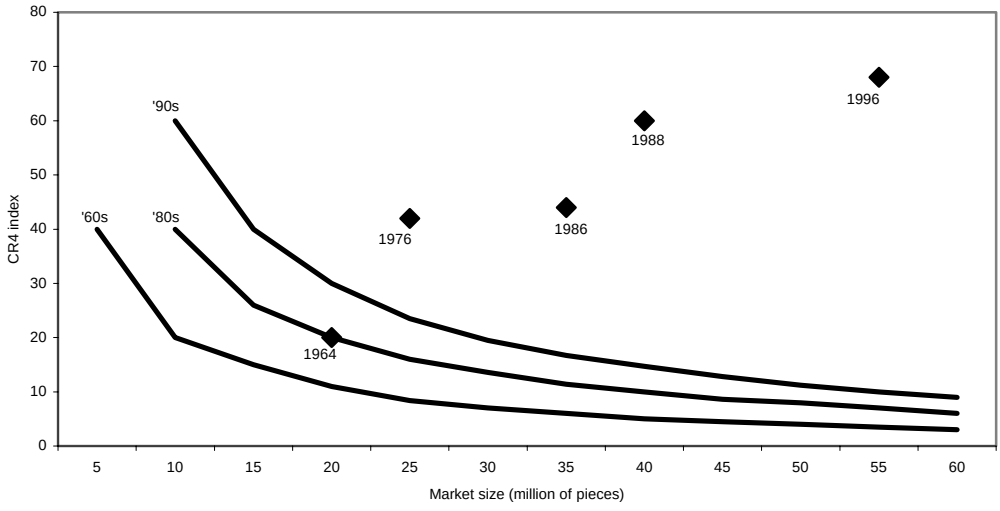
	'60		'70		'80		'90	
	Pcs	%	pcs	%	pcs	%	pcs	%
Refrigerators			300 [b]	3.5			600	
Washing-mach.			300 [b]	4.0			800	
Dom.Appl.	500 [a]	2,5	400-800 [c]	2-4	800-1200 [d]	2-3	1500 [e]	3-4

a) Pratten, in Paba (1991), p. 152-153.
b) Balloni (1978)
c) Sherer, in Paba (1991), p. 154-155.
d) Owen, in Paba (1991), p. 156.
e) Plants +500 employees

Estimates of the minimum efficient scale of plant in the industry are summarized in Tab. 5. As we can see, absolute value for MES have almost triplicate from ‘60s to ‘90s, while the percentage incidence on the single plant on the total industry output have grown at a slower pace.

Fig. 3 describes the CR4 concentration index for the European market in relation to the European market size. In Fig. 3, “lower bound” approximated curves are also depicted in order to show the relation between economies of scale, endogenous costs and the market size. From mid-‘70s, concentration in the industry has risen at a higher speed then expected on the basis of the conjectured effect of economies of scale. On the contrary, even if in a heuristic way, the observed “actual” trend in the concentration is quite similar to the estimated trend from the Sutton’s model of vertical product differentiation reported in Fig.1.

Fig. 3 – Market size, economies of scale and concentration in the European DA industry



Source: Balloni, Cucculelli Iacobucci, 1999. “Theoretical” concentration curves for the ‘60s, ‘80s and ‘90s have been obtained under the hypothesis that the four major producers in the industry run their plants at a minimum efficient scale, as it emerges from Tab.5.

3.2. Data on the Italian DA industry

The empirical test has been carried out by using balanced accounting data for the major companies that belongs to the Italian DA industry. From the Mediobanca database, 14 companies have been selected with a market share of no less than 0,5%. Cumulative sales are approximately equal to about 80% of total industry sales. The period is from 1992 to 1999. CR4 varies from 72% to 74% in the whole period. Estimate has been run as a balanced panel of 14 companies over 8 years. Tab.6 provides some descriptive statistics.

Tab.6 – Italian DA companies included in the sample.

Company	s_i % on the turnover (92)	s_i % on the turnover (95)	s_i % on the turnover (99)	s_i % on the turnover (92/99)
Electrolux Zanussi	26,48	28,55	27,02	26,66
Philips	24,70	14,92	18,75	18,26
Merloni Elettrodomestici	14,17	17,47	18,73	17,96
Antonio Merloni	7,54	11,62	9,84	10,07
Candy	5,74	6,48	7,37	6,89
Ocean	7,90	5,93	3,58	5,67
Smeg	3,09	3,69	4,28	3,67
Costan	2,65	2,76	2,67	2,59
Philco	2,03	2,07	1,59	2,01
Zerowatt	1,74	1,97	1,89	1,92
Donora	1,38	1,85	1,80	1,72
Faber	0,79	1,00	1,18	1,06
Bessel	1,05	0,99	0,80	0,95
Gasfire	0,74	0,69	0,50	0,59
CR_4	72,89	72,56	74,34	72,95

Source: Mediobanca Report.

3.3. The econometric model

The empirical test is based on the Haskel and Scaramozzino model. The aim of their paper consists in defining an empirical framework for estimating the CV variable λ_i in the mark-up equation:

$$\frac{p - c'}{p} = \frac{s_i}{\eta}(1 + \lambda_i)$$

that describes the market power of the firm in terms of observable variables, such as the market share s_i, and unobservable variables. The CV of company *i* (λ_i) towards its rivals is related to both its financial status, given by its borrowing ratio (BR) and cash to current liabilities (CL) ratio, and its used productive capacity.

Differently from the HS paper, we model CV variables on the investment policy in intangible asset (R&D and advertising), instead of on capacity utilization and firm financial status as in HS. The model run a first test on the relationship between market share and investment in intangible asset. As a second step, we try to assess the relationship between firm investment policy in intangible asset and firm profitability.

The hypothesis we want to test is that the behavior of a company that belongs to an industry in which the "endogenous sunk cost" are important may be determined by deliberate investment in policies towards R&D and advertising, rather than by its productive and financial status. The estimating equation is the following:

$$OPM_{it} = \alpha S_i + \alpha AI_{it} + \alpha ID(S_{it} \cdot AI_{it}) + \alpha OPM_{i,t-1} + \left(\frac{K}{Y}\right)_{it} + F_i + T_t$$

where *OPM* is the operating profit margin used as a proxy of the price-cost margin, S_i is the market share of firm *i* , *AI* represents intangible asset and *ID(S.AI)* is the interaction variable between market share and investment in intangible assets. The use of OPM as a proxy of the price-cost margin makes it necessary to add the ratio between capital and product $\left(\frac{K}{Y}\right)$ among the regressors, in order to take into account the capital intensity of the single company. Moreover, both a fixed effects (*F*) and a time dummies (*T*) have been

included in the estimate in order to control for differences between companies and for the trend during the '90s. In the estimates, the *AI* variable have assumed two different specifications: the ratio of investment in R&D, advertising and other yearly expenses on turnover and on fixed asset.

3.4. Estimate results

Estimate results are shown in Tables 7, 8 and 9. Two distinct group of models have been estimates with two different dependent variables: market share (S) in the first and the operating profit margin (OPM) in the other two. Table 7 reports estimate results from the first group of models that test the relationship between market share (as dependent variable) and:

1. Advertising on turnover
2. R&D expenses on fixed asset (OP/AF);
3. R&D expenses on turnover (OP/F);

Tab. 7 – Estimates of the relationship between market share and IA

Dep. Var.: Market Share	*(1)*	*(2)*	*(3)*
Advertising	1,259 (6,079)		
OP/AF		0,791 (3,052)	
OP/F			2,526 (3,212)
R^2	0,252	0,078	0,086
N. Observations	112	112	112

Value of t-stat below each coefficient in parentheses.

The regressions show that all the variables, in particular advertising, are significantly related to the dependent variable (S). In order to control for endogeneity, we have used a IV estimate with lagged market share as instrument.

Tab. 8 and 9 summarize the results of estimates of company behavior on the operating profit margin. Even if both estimates include market share as a principal regressor, two different formulations has been tested: regressions from number 1 to number 5 (Tab.8) include a dummy leader-follower to evaluate the different behaviour among company leaders and followers. Regressions from number 6 to 8 (Tab.9) are constructed with an interaction dummy between market share and AI.

The results of empirical tests using both methodologies (dummy leader/follower, interaction dummy market share/AI) show a positive relationship between market share and operating profit margin. This relationship does not change significantly when we take into account the leader and the follower market share (test 2).

The test of the relationship between OP/AF, OP/F and advertising (models 3-5) with operating profit margin provides very modest results: all regressors have a fairly small statistical significance. Interacting the investment variables with leader/follower position provides quite similar results: all coefficients present a low t-stat, with the negative sign that indicates that the sensitivity of OPM to changes in AI variables decrease when companies are industry leaders.

Models 6 and 7 give more interesting results. After the positive effect of market share on the OPM has been validated, the interaction between the AI variables and market share show that the positive relationship between OPM and market share is reduced if investment in AI is considered: the coefficients of the ID variable (OP/F and OP/AF) are negative and statistically significant, thus indicating that as market share increases (i.e. firms becomes larger with respect to the size of the market), the importance of market share decreases as AI increases: in other words, these variables (AI) act as a “substitute” for the market share in maximising firms’ profits. Furthermore, if we consider the cross-sectional nature of the data, the reduced importance of the size of the company (S) with respect to the AI variables also provides an indirect test of a reduced role of scale economies in the competitive strategies of companies in the DA industry.

Tab.8 – Estimates of the operating profit margin's equation

Dep. Var.: OPM	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
C	6,192	6,189	7,154	8,389	7,029
			(0,601)	(0,702)	(0,587)
S	0,031	0,032	0,067	0,066	0,018
	(0,849)	(0,519)	(1,679)	(1,652)	(0,437)
Dummy L/F		0,078			
		(0,018)			
ID S with L/F		-0,005			
		(-0,484)			
OPAF			-0,065		
			(-0,353)		
ID OPAF with L/F			-0,210		
			(-1,003)		
OPF				-0,014	
				(-0,023)	
ID OPF with L/F				-0,790	
				(-1,142)	
Advertising*					0,075
					(0,702)
OPM-1	81,288	81,311	77,818	77,623	80,979
	(13,182)	(0,262)	(12,329)	(12,255)	(13,067)
K/Y	3,981	3,946	4,505	4,698	3,669
	(1,916)	(13,012)	(2,188)	(2,251)	(1,723)
T	-0,082	-0,082	-0,095	-0,110	-0,089
	(-0,675)	(1,907)	(-0,772)	(-0,893)	(-0,728)
F	-0,034	-0,035	-0,021	-0,025	-0,030
	(-0,495)	(-0,672)	(-0,304)	(-0,364)	(-0,431)
R^2	0,713	0,713	0,728	0,726	0,715
N. Observations	112	112	112	112	112

Value of t-stat below each coefficient in parentheses.

Dummy L/F is "zero" when the company is follower e "one" when the company is leader.

* Only leader

Tab.9 – Estimates of the operating profit margin's equation

Dep. Var.: OPM	*(1)*	*(6)*	*(7)*	*(8)*
C	6,192	7,522	7,103	7,699
		(0,641)	(0,610)	(0,632)
S	0,031	0,072	0,082	-0,011
	(0,849)	(1,753)	(1,967)	(-0,141)
ID OP/F with S		-0,050		
		(-2,034)		
ID OP/AF with S			-0,020	
			(-2,384)	
ID Advertising with S				0,008
				(0,604)
OPM-1	81,288	77,754	77,250	80,823
	(13,182)	(12,301)	(12,325)	(12,967)
K/Y	3,981	4,686	4,526	3,698
	(1,916)	(2,256)	(2,212)	(1,731)
T	-0,082	-0,101	-0,095	-0,096
	(-0,675)	(-0,835)	(-0,796)	(-0,772)
F	-0,034	-0,023	-0,014	-0,018
	(-0,495)	(-0,343)	(-0,212)	(-0,242)
R^2	0,713	0,724	0,728	0,714
N. Observations	112	112	112	112

Value of t-stat below each coefficient in parentheses.

4. *Some conclusions*

The paper presents an empirical test of the relationships between market share, investment in intangible asset (IA) and firm profits. The model resembles the Haskel and Scaramozzino formulation in the use of proxy variables for the description of firm behaviour and for the definition of C.V. in the mark up equation.

The original HS econometric model has been modified by introducing a new set of variables that we consider more suitable for understanding the behaviour of companies

that belongs to the Italian domestic appliance industry. Changes has been implemented by starting from the assumption that "endogenous sunk costs" (R&D and advertising), as proposed by Sutton, are quite important in the domestic appliances industry. In particular, this extension reflects the trend in the investment policy recently observed in this industry and motivated by the need to maintain the levels of competitiveness and profit rates.

The results show that market share has positive effects on the operating profit margin but that such effects are reduced if investments in intangible asset are taken into account. In particular, investments in intangible asset seem to act as a substitute for the market share in determining firms' operating profit margins.

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