The relevance of marketing in the success of innovations.

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--Very preliminary draft please do not quote--

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Abstract (Summary)

New products are a substantial part of technological change. From a conceptual point an innovation occurs when there is either a new process (a new way of producing and old product) or a new product (a product that is different from what other existing products)

Although the issue of innovation is at the center of the economic discussion, very little is known about new products and their contributions to the economy. A partial explanation is due to the fact that economists do not have a very good explanation for evolution of consumers' preferences. And in the case of demand of a new product it necessarily has to be because somehow consumer's preferences have changed. The creation of a new need, can be also understood in parallel with the idea of creative destruction, since new goods are competing on the consumer's budget with old goods.

The aim is not so much to understand how preferences change but assuming in the case of new products that they do change what is the strategy followed by firms to take advantage of these changes. Everybody will agree that a successful innovation plan will raise it results if R&D investments are increased. The idea of the paper is to look at whether a combined strategy of investing in R&D and on marketing leads to more successful sales. But the interest of the papers comes not just from a business point of view it wants to make a connection with a macro dimension although with a microeconomic foundation. If marketing is able to raise the preferences of consumers, it means higher monopoly power for the firms which will turn out into higher profits. Although the paper will be concentrated in the relation between marketing and innovative sales, a positive relation between both could be seen a positive translation into higher levels of production. In other words, because marketing positively affects the preferences of the consumers, it raises innovative sales which mean higher levels of GDP.

The analysis is based on the microdata of the third wave of the Community Innovation Survey (CIS 3) covering 18 European countries: Belgium, Bulgaria, Check Republic, Germany, Estonia, Spain, Finland, Greece, Hungary, Island, Italy, Latvia, Lithuania, Norway, Portugal, Romania, Slovenia and Slovakia. The period covered by this survey is 1998-2000.

We are in the presence of a system of simultaneous equations with limited dependent variable as in Crepon, Duguet and Mairesse (1998). The three dependent variables are censored variables. The econometric model is estimated by using the method of ALS(Asymptotic least squares). In a first stage, the reduced form equations of the model are estimated. To estimate the first reduced equation a tobit is run on marketing expenditures, using firms that have only information on other expenditures on innovation is purely marketing expenditures, and firms that report zero on other innovation expenditures. The latent for marketing is created for all firms. A simple tobit is also estimated for R&D, and Innovative sales using as explanatory variable the two previous latent variables from the previous two tobits

The paper focuses on the combinations of R&D investments and marketing expenditures and their relations with innovative sales. A higher investment in R&D it is associated to a higher quality innovation or a faster innovation, with a positive impact on sales and in a macro sense in GDP. The paper raises the issue that good innovation need a strong marketing effort in order for this innovation to have an impact in the society, they need to be desired by consumers. The paper finds empirical evidence that marketing expenditures explains a lot of the success of the innovation (measure in terms of the elasticity of this effort to innovative sales), even more than the flow of investment in R&D. In fact the size of the coefficient for marketing doubles those found for R&D, a quite surprise result taking into consideration the little importance that marketing has in innovation studies.

1. Introduction

New products are a substantial part of technological change. From a conceptual point an innovation occurs when there is either a new process (a new way of producing and old product) or a new product (a product that is different from what other existing products)

Although the issue of innovation is at the center of the economic discussion, very little is known about new products and their contributions to the economy. A partial explanation is due to the fact that economists do not have a very good explanation for evolution of consumers' preferences. And in the case of demand of a new product it necessarily has to be because somehow consumer's preferences have changed. Since she will be consuming something which she was not consuming before.

The aim is not so much to understand how preferences change but assuming in the case of new products that they do change what is the strategy followed by firms to take advantage of these changes. Everybody will agree that a successful innovation plan will raise it results if R&D investments are increased. The idea of the paper is to look at whether a combined strategy of investing in R&D and on Marketing leads to more successful sales. But the interest of the papers comes not just from a business point of view it wants to make a connection with a macro dimension although with a microeconomic foundation. If marketing is able to raise the preferences of consumers, it means higher monopoly power for the firms which will turn out into higher profits. Although the paper will be concentrated in the relation between marketing and innovative sales, a positive relation between both could be seen a positive translation into higher levels of production. In other words, because marketing positively affects the preferences of the consumers, it raises innovative sales which mean higher levels of GDP.

While the consumption of old goods could be explained from the point of view of the formation of habits (Duesenberry (1949), Pollack (1973) and Ryder and Heal (1973)) the consumption of new products needs to be explained with a different set of arguments. As already commented economic theory gives very little explanation for the consumption of new goods. The only relevant attempt was made by Lancaster (1966) arguing that goods are

consumed because of their characteristics and new goods are recombination of old characteristics; the combination of characteristics that the new good offers is closer to consumer's preferences than those of the old good, hence new goods are bought. The main problem of this approach, is mention by Swam(2002), is that the question of why we consume new goods is simply reworded as why we consume new characteristics of goods. A different alternative was used by Stigler and Becker (1977) suggesting to compare a consumer to a firms. In this approach consumer is treated as if he were producing utility in a firm whose inputs are characteristics. However the question of why we consume new characteristics remains without an answer. More successful although less formal is the explanation given by Scitosvky(1977); the consumer needs change in what she consumes simply because she needs novelty to reach well being and comfort. Following his ideas, and merging them with the previous ones, we find useful work done by Bianchi (1998, 2002). She argues that novelty is a relevant factor in the inputs that the consumer is using to maximize utility. Both Scitosky and Bianchi acknowledge in their work the research concerning novelty done by Berlyne (1974). Deepening in these ideas some of my previous work try to prove that a minimum level of novelty is needed to make an innovation successful (Garcia, 2009). And that a very good innovation (with a high potential to generate experienced utility) might fail simply because it is unknown to the consumers; it lacks novelty.

Although Garcia (2009) treats novelty from the perspective of consumer and discusses the reasons why a consumer might need novelty, in this paper firms are allowed to raise the novelty for a specific new good through expenditures in marketing. The aim of the paper is to understand if the success of innovation is purely explained by the investments in R&D or part of the success depends on the commercialization of the innovation, specifically on the expenditures on marketing.

Although the Economic literature is not very interested in general on marketing, the business literature has studied the issue in extend. There interest starts from looking at how the department of R&D and marketing are integrated. People working on the R&D department have very different objectives from people working in marketing their backgrounds and their interests are of different nature. A higher integration of both department positively affects the performance of firms (Gupta and Wilemon (1986), Ayer et al (2001), Becker et Lillemark (2005) and Caraballo(2009)). Although integration between R&D and marketing is generally

seen as positive, Hashai and Almor(2008) say that integration is good up to a threshold of R&D intensity, after which such integration negatively affect performance.
Focusing on the pharmaceutical sector and studying patents, Brecke and Straume (2008) built a simulation model. They concluded that in this sector the expenses on marketing can negatively affect the expenses on R&D. Their model gives evidence that marketing expenses can be used to detract an entrant to invest in R&D. Ofek and Sarvary(2003) with a similar model reach a different conclusion; the leader tends to invest more in marketing to keep its leading position while the follower concentrates more on R&D. Miltersen and Schwartz(2004) based on game theory concluded that strong competence favors the speed at which the results from the R&D are coming. It also positively affect at a more aggressive marketing strategy. Ramattan (1998) focusing on the bigger automobiles companies in the US, say that primarily in this sector firms compete on R&D and only secondary in marketing.

Anderson and Renault (2006) look at the advertising content of new products. They study a sample of monopolists and they look at whether they give information on product characteristics, price or both. They conclude that the innovating firm tries to minimize consumer's search costs. A bit more in line with this paper is the work done by Dutta et all(1999) they studied the combination of technological effort and marketing expenditures. Their results are in line with the work of this paper and will be further discussed on the conclusion of the paper.

The paper is structure as follows, section 2 will discuss the data used, section 3 will present the econometric model, and section 4 will discuss the results, section 5 gives the conclusion and policy implications.

2. Data.

The analysis is based on the microdata of the third wave of the Community Innovation Survey (CIS 3) covering 18 European countries: Belgium, Bulgaria, Check Republic, Germany, Estonia, Spain, Finland, Greece, Hungary, Island, Italy, Latvia, Lithuania, Norway, Portugal, Romania, Slovenia and Slovakia. The period covered by this survey is 1998-2000. The research was carried out in the Safecenter at Eurostat in Luxemburg. Although we had access to more recent waves of the survey (CIS 4 and CIS 5), the structured of questions from CIS 3

has more detailed information on marketing expenditures. This will be further explained in section 3 when we introduced the model.

After a few identifying questions, respondents have to answer the following four central questions: (1) During the period 1998-2000, has your enterprise introduced on the market any new or substantially improved products? (2) During the period 1998-2000, has your enterprise introduced any new or substantially improved production process? (3) By the end of 2000, did your enterprise have any ongoing innovation activities? (4) During the period 1998-2000, did your enterprise have any innovation activities that were abandoned?

A first way to characterize innovators is to consider as innovators those that have responded "yes" to one of those four questions. This is in the spirit of the CIS survey, where those who have responded "no" to all four questions are considered as non-innovators and do not have to respond to most of the other questions in the survey. There is therefore only scant information about non innovators. However for the goal of the paper we can easily focus on innovators, since we are primarly interested in the interrelation between R&D and marketing, and any firm doing R&D is an innovator.

After some basic cleaning of the dataset [1] we end up with 61 540 observations, 20 920 are innovators (under the CIS definition of an innovator), and 6400 observations report to have some marketing expenditures. Of especial interest for this research is the question about marketing expenditures therefore a detailed description of this question will be offered. For those firms that report to have innovation activity, they are asked to give an estimation of their distribution of innovative expenditures: how much the firm invested in intramural R&D, extramural R&D, acquisition of machinery, acquisition of external knowledge and other innovative expenditures. The sum of all these subsections gives the total innovation expenditure of the firm in 2000.

Of especial interest for us is the last section, other innovation expenditures which is subdivided in three parts:

- Training expenditures for the personnel directly aimed at the development of innovations.

[1] The original dataset has been cleaned by eliminating the firms that reported zero turnover or zero employees.

- Internal or external marketing activities directly aimed at the market introduction of your enterprise's new or significantly improved products.
- Designs and other preparations for deliveries.

Each of the three questions is a yes/no answer and if the firm answered in any of the three yes, then it is asked to give an estimation of the expenditure in these activities. So, that other innovative expenditure is a mixture of these three activities. For the goal of the paper it will be very useful to have a separated estimation of marketing expenditures isolated from training expenditures and preparations for deliveries.

Table 1. Distribution of innovators with marketing activities

	Number of observations	Percentages with respect to all firms	Percentages with respect to innovative firms
Total	61540	100.0%	
Innovators	20920	34.0%	100.0%
Product innovators	15653	25.4%	74.8%
Other expenditures	8370	13.6%	40.0%
Marketing	6400	10.4%	30.6%
Only marketing	1203	2.0%	5.8%

Table 1 makes a representation of the spectrum of innovators that we have in the sample, out of a total of 61540 data, a 34 % of them are considered an innovator under the CIS more relaxed definition of innovator. A fourth of the firms in the sample reported to have introduced a new product. The analysis will be concentrated on innovators, since very scant information it is offered for non innovator. It is also not the goal of the paper understand what is the effect of marketing on sales, but marketing on innovative sales. Therefore there is no selection bias, since the interest of the paper is not marketing in general (also related to old products) but marketing in the specific case of new products. Therefore reducing the sample to innovators induces no problem of selectivity.

8370 firms, a 40% of the innovators, reports to have some devoted some investment to training, marketing or designs. 6400, a 30.6 % of the innovators answered that they have some investments in marketing, and 1203 firms, a 6% of the sample has reported to have invested only in marketing without any contribution to training or to designs. In this case the amount

devoted to other innovations expenditures will be equal to total expenditures in marketing. Making use of the big size of the sample this 6% percent will be use to extract the characteristics of firms which determines their level of marketing expenditures. This will be further explained in the section 3 when we talk about the model and the construction of the latent variables.

3. Methodology

The question is whether marketing activities affect to the success of innovation. In other words are firms that invest money in marketing more successful than those firms that do not advertise their new products? Do they reach better demand needs? And in which way do expenditures on R&D relate to marketing?

3.1 Econometric Model

It is not sufficient to compare the means of the respective variable for firms doing marketing and not doing marketing. A control for other variable it is needed since other variable might be explaining the changes in those means. Moreover the investments in marketing and R&D might be endogenous, that is, there might be a correlation between those expenditures and the size of the firm, the fact that they belong to a group, and many other variables. Therefore a matching estimator will offer little light to the questions of the paper. Instead a structural model set to specifically deal with the endogeneity related to the decision of investing in marketing, in R&D and its impact on innovative sales.

The main endogeneity issue comes from the fact that firms determine at the same time their investments in R&D and their expenditures in marketing, so the same factors affecting one decision might at the same time be determining the other decision. For example, if a firm is big in size it will have a higher investment in R&D and higher expenditures in marketing. A system of simultaneous equations is established were marketing expenditures, R&D investments and innovative sales are all three endogenous. More precisely, the model is composed of three equations. The first equation determines the expenditures of marketing expenditures, the second the investment in R&D and both affect innovative sales. A latent variable will be defined for each equation. The definition of the latent has to reasons, one methodological, it is the only way a system can be defined using non linear estimations

(tobit), and a theoretical reason; the existence of externalities beyond the limits of the firms. To explain this last point, consider the expenditures on marketing of one firm in one sector, might indirectly affect the sales of their competitors in a similar substitutive product. A similar idea, it is used when defining a latent for R&D; the effort made in one specific area affect positively competing firms close to this one, through spillovers, spin off and all other possible sorts of positive externalities of R&D.

The sample has been restricted to innovative firms, but within these innovative firms a very big proportion of them report zero expenditure in marketing, in R&D or zero innovative sales. Therefore the system of equations is formed by three tobits one for expenditures in marketing, one for investments in R&D and one for innovative sales. The latent variables of the two first ones enter as explanatory variable in the latent for innovative sales.

Formally the model is as follows,

$$
\begin{aligned}
MKT &= MKT^* && if \quad MKT^* = \beta_{MKT} z_1 + \varepsilon_{MKT} > 0 \\
&= 0 && if \quad MKT^* = \beta_{MKT} z_1 + \varepsilon_{MKT} \le 0 \\
R\&D &= R\&D^* && if \quad R\&D^* = \beta_{RD} z_2 + \varepsilon_{RD} > 0 \\
&= 0 && if \quad R\&D^* = \beta_{RD} z_2 + \varepsilon_{RD} \le 0 \\
INNO &= INNO^* && if \quad INNO^* = \beta_{INNO} MKT^* + \beta_{INNO} R\&D^* + \beta_{INNO} z_3 + \varepsilon_{INNO} > 0 \\
&= 0 && if \quad INNO^* = \beta_{INNO} MKT^* + \beta_{INNO} R\&D^* + \beta_{INNO} z_3 + \varepsilon_{INNO} \le 0
\end{aligned}
$$

Where ε_{MKT}, ε_{RD}, and ε_{INNO} are normally distributed error terms with zero mean and resp. $\sigma_{mkt,}$ $\sigma_{rd\ and}$ σ_{inno} standard deviations,
z_1, z_2, z_3 are vectors of controls variables,
MKT(Marketing)= log of total expenditures in marketing done by the firms.
R&D(Resarch & Development)= log of total investments in research and development, intramural y extramural.
INNO(Innovative sales)= log of total innovative sales, (sales*share in sales due to innovative sales)

We are in the presence of a system of simultaneous equations with limited dependent variable as in Crepon, Duguet and Mairesse (1998). The three dependent variables are censored variables. The econometric model is estimated by using the method of ALS(Asymptotic least squares), also known as minimum distance estimator. In a first stage, the reduced form equations of the model are estimated. To estimate the first reduced equation a tobit is run on

marketing expenditures, using firms that have only information on other expenditures on innovation is purely marketing expenditures, and firms that report zero on other innovation expenditures. The latent for marketing is created for all firms. A simple tobit is also estimated for R&D, and Innovative sales using as explanatory variable the two previous latent variables from the previous two tobits. In the second stage (if there are overidentifying restrictions) the parameters of the structural form are estimated by minimizing the distances between the estimated reduces form parameters and those predicted by the model form the identigying constrains, weighted by the estimated variance-covariance matrix of the reduce form parameters (See Goerieroux, Montfort, Trognon 1985). Identification is generally assured by way of exclusion restrictions. Asymptotic least squares yield convergent and asymptotically normal estimates. Endogeneity and selectivity are explicitly taken into account in the estimation of the model. As opposed to Heckman's selection models there is no allowance for correlation between the errors terms of the selection and the outcome equations, but a latent is estimated for marketing and R&D for every firm in the working sample. (for examples of sample selection modelsin this context, see Busom, 2000 and Hussinger 2008).

Firms that have not introduced a product, a process, and have no unfinished or abandoned innovation activities are asked to respond to only a few identifying questions. Relevant information for trying to explain what determines a certain level of marketing expenditures, or R&D investment is only available for 20920 firms in the sample that are considered innovative in some way. For this reason, and from the idea that we are mostly interesting in marketing for new products, the analysis is run on this subsample of innovating firms.

3.2 Control Variables.

In each equation, there is a control for a number of other determinants than marketing and R&D. The idea of introducing other control variables is to isolate the effect of these two investments from other factors affecting the innovative performance. The choice of control variable is not a trivial one, it is done base on the literature (similar studies) and partially on the availability of data given by the CIS. To reduce the effects of the choice of control variable, a different set of them are used in each equation, generating three different estimation model one, model two and model three(a combination of the two previous ones). This is done as a robust check for the estimates. To identify the parameters of the model exclusion restrictions are imposed, i.e. some explanatory variables are excluded in some of

the equations in order to identify the other ones. The choice of exclusion restrictions is partly motivated on theoretical grounds (for example marketing expenditures might be more important for a firm that have introduces some aesthetic changes, these aesthetic changes might be less related with R&D investments), and partially based on the significance of the estimated coefficeintes. Non- significant coefficients might characterize bad instrumets to identify other key parameters of the model.

Table 2 gives a brief discussion about the variables that we are using in the model. There is a control for size effect by using the number of employees. Also there are control variable for competiveness, the fact that the firm belongs to a group. These variables and the industry and country dummies enter in all 3 equation of the system.

- Specific variable entering as explanatory variables in the marketing equation are:
    - Using clients as a source of innovation, since it is expected that if a firm bases its innovation in the information that gets from its clients also makes a higher effort on marketing expenditures, i.e. in letting its clients know about the innovation.
    - Changes in marking strategy. If the strategy has been change, it is because the firm realizes about the importance that advertising their innovations has.
- Aesthetic changes on the products/designs. Probably a firm that changes the appearances of their product is keener on expending on marketing. For the R&D equation:
    - Skilled labour. A positive relation is expected between a higher education and a higher effort in the R&D investments.
    - Funding. If the firms receive any kind of help, it is expected that they do raise their investments for innovation.
    - Patent. If a firm is applying for a patent is because it has previously done some investment that needs to be protected.
    - Cooperation. If a firm it is cooperating doing innovation might be well make a bigger investment in R&D.
- In the innovation sales we have as exclusion restriction
    - Information from the Universities. It is used as a proxy for how close the firms is from basic research.

Table 2. Description of the covariates used in the regression

Variable	Explanation	mean	Stand. Dev.
Size	logarithm of the number of employees (ln emp)	3.79	1.26
competitiveness	The firm declare that has some activities in the international market (sigmar=4)	0.22	0.42
Group	Reports to belong to a group (ho)	0.21	0.41
Information from Clients	Reports to use clients as a source of information for innovation (scli)	0.67	0.46
Marketing Strategy	Change on the marketing strategy from the firm (actmar)	0.21	0.41
Aesthetic Changes	Significant aesthetic appearance or design in one of the products. (actaes)	0.25	0.43
Skilled labour	Logarithm of the number of employees with higher education. (ln emphi)	1.61	1.52
Funding	Access to any funding (funloc, fungmt, funeu or funrtd)	0.28	0.50
Patent	Application for at least one patent (paap)	0.06	0.25
Cooperation	Any cooperation for innovation (co)	0.26	0.43
Information from University	Reports to use clients as a source of information for innovation (suni)	0.32	0.47
Industry dummies	Based on NACE (2 digits)		
Manufacture			
High tech	30+32+33	0.03	0.17
Medium high tech	24+29+31+34+35	0.13	0.33
Medium low tech	23+25+26+27+28	0.14	0.34
Low tech	15+16+17+18+19+20+21+22+36+37	0.33	0.47
Electricity	40+41	0.02	0.14
Services			
Market service low	51+60+63	0.41	0.20
Financial services	65+66+67	0.03	0.17
High tech services	64+72+73	0.05	0.21
Low tech services	50+60+63	0.20	0.40
Country dummies (dummy mean)	Based on nuts_2.		
Belgium(0.019), Bulgaria(0.201), Check Republic(0.053), Germany(0.045), Estonia(0.037), Spain(0.128), Finland(0.023), Greece(0.024), Hungary(0.015), Island(0.011), Italy(0.20), Latvia(0.03), Lithuania(0.03), Norway(0.05), Portugal(0.02), Romania(0.026), Slovenia(0.040) and Slovakia(0.027).			

As it was mention before, another reason for the selection of some of the variable in one equation and not in other is exclusion restrictions. We need at least one variable, whose estimation coefficient is statistically significant (different from zero) in each of the equation to be able to identify the coefficients from the reduced form to the structural form parameters (which are the interest of the paper).

As said before, a robust check is carry out by playing a bit with the set of covariates introduce in each of the equations, Table 3 is a map of the variable that enters in each of the models. It is use to make the reader understand the results of the next section.

Table 3. Relation between the model and the presence of the covariates

	MODEL 1			MODEL 2			MODEL 3		
	MKT	R&D	INNO	MKT	R&D	INNO	MKT	R&D	INNO
Size(ln emp)	x	x	x	x	x	x	x	x	x
competiveness	x	x	x	x	x	x	x	x	x
gp	x	x	x	x	x	x	x	x	x
industry dummies	x	x	x	x	x	x	x	x	x
country dummies	x	x	x	x	x	x	x	x	x
Inf. Clients	x			x			x		
Marketing estr	x						x		
Aest. Changes				x			x		
Ln Emp hi		x			x			x	
Funding		x			x			x	
Patent		x						x	
Cooperation					x			x	
Inf. University			x			x			x

4. Results.

Table 4 contains the magnitude and the direction of the marginal effects of the ALS estimation. Due to space the same coefficient for the industries and country dummies are reported in Table 5. The difference between model 1, model 2 and model 3 is just the selection of the variables.(see Table 3). In the case of the estimation for the marketing equation out of the three common variables only size seems to play a role in the decision to increase the number of employees in 1% will increase on average a 0.04% the expenditures in marketing done by that firms. Neither the fact that firms face pressure from the international markets (measure by the variable competiveness) nor the fact that they belong to a group makes any distinction on the way they decide for their marketing expenditures.

The variables that have specifically enter in the marketing equation, are always significant, partially because those firms reporting that the information from clients is important for innovation, to have introduced changes on the marketing strategy or some kind of aesthetic changes are firms that are closer to final demand. Firm reporting clients as a source for innovation make between 0.37% to 0.44% more than another not reporting to have use the comments of the clients. It makes sense that if a firms produces an innovation according to the needs of the clients, it makes also spends some extra effort in letting them known that there is a new product in the market that suits existing needs. If a firm reports to have changed its marketing strategy is expending 0.53-0.46% more than a firm which has not changed its strategy related to marketing. no to changes in their marketing strategy.

By looking at Table 5 we can see that non of the industry dummies, with the exception of financial services is significant. Partially this can be explained by the fact that the grouping of the sector is base on R&D intensity. It will be interesting to repeat the exercise classify the sectors in function of how close or far they are from final demand, and in such a case the industry dummies will be more significant. However firms in the financial service sector make around a 0.6% more expenditures than the rest of the firms. The country dummies are in general significant capturing country differences across the European nations.

Looking at the R&D equation we can see that size explains 0.3% of capacity to benefit from clients, if the firms faces competition it makes 0.7-0.6% more expenditures than another firm that does not face such international pressure. There is not significant distinction on belonging to a group of firms, probably this effect is capture by the other covariates. An increase in the number of employees with secondary degree of a 1% increases the investment on R&D on a 0.8-0.7%. Receiving a funding either from the European government or from national one increases the R&D effort between 1.7-2%. If the firm has applied for at least one patent on average this firm is making a 1.8-2% investments on R&D. The same level of impact is found by the variable cooperation.

Table 4. ALS stimation. Marginal Effects.

Variables	Model 1	Model 2	Model 3	Variables	Model 1	Model 2	Model 3	Variables	Model 1	Model 2	Model 3
								marketing*	**0.676 *****	**0.548 *****	**0.708 *****
								randd*	**0.32 *****	**0.325 *****	**0.347 *****
Size(ln emp)	0.046 *	0.042 *	0.042 *	Size(ln emp)	0.322 **	0.307 **	0.3 ***	Size(ln emp)	0.245 *	0.333 **	0.191 *
competiveness	-0.095	-0.072	-0.091	competiveness	0.709 **	0.773 **	0.64 ***	competiveness	0.654 **	0.574 *	0.621 **
gp	0.056	0.033	0.057	gp	0.318	0.168	0.133	gp	0.052	0.144	0.065
Inf. Clients	0.377 ***	0.439 ***	0.359 ***								
Marketing estr	0.541 ***		0.462 ***								
Aest. Changes		0.28 ***	0.286 ***								
				Ln Emp hi	0.81 ***	0.8 ***	0.727 ***				
				Funding	2.133 ***	1.941 ***	1.752 ***				
				Patent	2.06 ***		1.845 ***				
				Cooperation		2.028 ***	1.875 ***				
								Inf. University	0.62 **	0.91 **	0.425 *
Industry dummies and country dummies(table 5)				Industry dummies and country dummies				Industry dummies and country dummies			

	Reference models Innovative Sales.			
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 0**
marketing* randd*	0.366***	0.366***	0.408***	
Size(ln emp)	0.563***	0.567***	0.511***	1.122***
competiveness	0.2*	0.194*	0.149	0.736***
gp	0.254**	0.267**	0.24**	0.578***
Inf. University	1.138***	1.09***	0.976***	1.486***
Industry dummies and country dummies				

(*) Significant at the 10%, (**) significant at the 5%, and (***) significant below the 1%.

Table 5. Marginal Effects of the country dummies and industry dummies. ALS

	Marketing expenditures			R&D expenditures			Innovative Sales		
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Industry Dummies									
Manufacture									
High Tech	0.383	0.424	0.333	3.919 ***	4.039 ***	3.693 ***	2.954 **	4.051 **	2.395 **
edium High Tech	0.353	0.386	0.306	3.374 ***	3.579 ***	3.178 ***	3.149 **	4.183 **	2.637 **
edium Low Tech	0.194	0.241	0.154	2.184 **	2.292 **	2.028 **	3.481 **	4.444 ***	3.11 ***
Low Tech	0.303	0.291	0.23	1.166	1.253	1.072	3.099 **	4.206 ***	2.758 **
Electricity	-0.122	-0.053	-0.1	0.433	0.139	0.174	0.008	0.555	-0.132
Services									
Low Tech	0.333	0.361	0.309	-0.324	-0.346	-0.497	3.456 **	4.557 ***	3.106 ***
Finantial	0.612 *	0.587 *	0.574 *	0.821	0.346	0.535	2.714 **	4.184 **	2.256 **
Market services	0.253	0.311	0.224	1.849 *	1.709 *	1.593 **	2.14 *	3.018 **	1.753 *
Hight Tech	0.237	0.288	0.203	3.841 ***	3.754 ***	3.569 ***	2.91 **	3.942 **	2.369 **
Country Dummies									
Belgium	-2.052 ***	-1.797 ***	-2.062 ***	-1.845 *	-1.892 *	-1.621 *	8.314 ***	6.072 ***	9.207 ***
Bulgaria	-2.505 ***	-2.113 ***	-2.47 ***	-7.96 ***	-8.269 ***	-7.874 ***	17.012 ***	13.974 ***	18.135 ***
Check Republic	-1.909 ***	-1.643 ***	-1.943 ***	-7.645 ***	-7.766 ***	-7.319 ***	3.993 **	0.653	5.151 ***
Estonia	-2.401 ***	-2.082 ***	-2.445 ***	-4.41 ***	-4.868 ***	-4.458 ***	14.192 ***	11.255 ***	14.871 ***
Finland	-2.554 ***	-2.124 ***	-2.534 ***	-1.188	-1.518 *	-1.304 *	10.171 ***	6.974 ***	11.014 ***
France	-2.467 ***	-2.01 ***	-2.401 ***	-2.29 **	-2.039 *	-1.916 **	11.654 ***	8.38 ***	12.499 ***
Germany	-2.843 ***	-2.402 ***	-2.826 ***	-3.013 **	-2.808 **	-2.71 ***	12.124 ***	8.62 ***	13.013 ***
Greece	-2.798 ***	-2.545 ***	-2.866 ***	-6.669 ***	-7.058 ***	-6.606 ***	13.88 ***	10.617 ***	14.992 ***
Hungary	-1.737 **	-1.461 **	-1.78 ***	-3.634 **	-4.619 **	-4.058 ***	5.493 **	3.22 *	6.328 ***
Island	-1.728 **	-1.56 **	-1.783 ***	0.6	-0.373	0.064	8.754 **	7.445 **	9.534 ***
Italy	-2.883 ***	-2.541 ***	-2.916 ***	-3.99 ***	-3.693 ***	-3.588 ***	13.759 ***	10.394 ***	14.776 ***
Latvia	-1.695 ***	-1.386 ***	-1.678 ***	-4.02 ***	-4.763 ***	-4.304 ***	7.11 ***	4.862 **	7.947 ***
Luxemburg	-3.222 ***	-2.825 ***	-3.221 ***	-3.279 **	-3.628 **	-3.253 **	14.743 ***	11.125 ***	15.755 ***
Netherlands	-3.869 ***	-3.291 ***	-3.802 ***	-1.72 *	-1.741 *	-1.51 *	18.74 ***	14.389 ***	19.896 ***
Norway	-2.852 ***	-2.382 ***	-2.815 ***	-1.722 *	-1.967 **	-1.75 **	13.41 ***	10.028 ***	14.266 ***
Portugal	-2.64 ***	-2.307 ***	-2.66 ***	-2.507 **	-2.795 **	-2.375 **	10.291 ***	7.032 ***	11.213 ***
Romania	-2.283 ***	-1.991 ***	-2.317 ***	-5.922 ***	-6.248 ***	-5.809 ***	11.676 ***	8.926 ***	12.605 ***
Slovakia	0.119	0.239	0.077	-1.007	-1.943	-1.571	-0.433	-0.753	0.206
Slovenia	-1.629 ***	-1.375 **	-1.672 ***	-0.609	-1.314	-0.781	6.652 ***	4.546 **	7.249 ***
Spain	-2.563 ***	-2.25 ***	-2.596 ***	-3.271 **	-3.205 **	-2.918 ***	14.98 ***	11.826 ***	15.803 ***
Sweden	-2.451 ***	-2.006 ***	-2.404 ***	-0.901	-0.909	-0.909	7.927 ***	4.757 **	8.576 ***

(*) Significant at the 10%, (**) significant at the 5%, and (***) significant below the 1%.

Again looking at Table 5 the effect of industry dummies and country dummies can be studied. In this case we can see that in manufacture for high tech sectors, medium high tech, and low high tech present a significant coefficient, in fact they are higher the higher is the intensity of R&D in the sector. Being in any case bigger for high tech and lower for medium low tech. It is not significant for low tech, electricity or financial services. But it is significant for market services (1.5-1.8%) and for high tech services (3.5-3.8%). In a way the coefficients are as expected since the grouping of the sector is related to R&D intensities.

Now when looking at the third equation we have to understand that marketing* and R&D* are latent variables. Is the latent that has been built according to the two previous tobit just discussed. As already introduced in previous section the idea of a latent, is that the effect of both variables in the economy cannot be purely captured by looking at firm single level efforts. It can not be done for endogeneity problems, but also for the externalities associated to both investments R&D and marketing. The effort made in one sector might affect the visibility of competitive innovation. Therefore the use of latent captures the general idea of an effort made in the nation with sectoral differences. It has to be said that the elasticity of R&D is to the flow of the latent variable, the differences in size might be due to the fact that the stock might be what is really affecting innovative sales. However we can in Table 4 that while the latent for R&D accounts for an increase in sales close to a 0.32%, the increases in the capacity of the firms to translate innovative effort into innovative sales. But the effect of the latent for marketing 0.54-0.7% is at least twice as much as the previous one. This is at least surprising, since most of the literature bases on the effort needed to be done on R&D, but very little attention is offered to the effect of the commercialization and marketing of the innovation. This result is in line with the idea offered in Garcia (2009) that very good innovations might be a failure simply because they are not known, they don't have enough novelty or in other words they need higher marketing expenditures.

Size explains about a 1.9-33% of the effect on innovative sales, competiveness 0.57-0.65% depending on the model, and information from universities (a proxy for how close the firms are from basic research) explains between 0.9 and 0.6.2%. Quite interesting is also the fact that industries dummies are relevant, and they show that low tech manufacturing and low tech services have very strong capacity to capture the innovative sales. Meaning that although those sectors are not the higher R&D investors they have a very strong capacity to take

advantage of sales and opportunities associated with innovation even more that other more intensive R&D sectors.

5. Conclusions

The idea of the paper was too look at the marketing activities of innovative firms. In particular the paper focuses on the combinations of R&D investments and marketing expenditures and their relations with innovative sales. A higher investment in R&D it is associated to a higher quality innovation or a faster innovation, with a positive impact on sales and in a macro sense in GDP. The paper raises the issue that good innovation need a strong marketing effort in order for this innovation to have an impact in the society, they need to be desired by consumers.

The paper finds empirical evidence that marketing expenditures explains a lot of the success of the innovation (measure in terms of the elasticity of this effort to innovative sales), even more than the flow of investment in R&D. In fact the size of the coefficient for marketing doubles those found for R&D, a quite surprise result taking into consideration the little importance that marketing has in innovation studies.

The main policy conclusion is to see the innovation process not in isolation from the commercialization phase of the product. Most of the policy designed to help innovation focus on the R&D phase (tax incentives, funding, co-funding…) but it is hardly difficult to find a program that supports innovation in the commercialization. (it is hardly difficult to find any governmental program designed to help the marketing effort done by the firms). That fact that very good innovation, not known to consumers, turn out to be failures could be even more important among Small and Medium sized Firms. The papers finds always a significant impact of size in the three equations, highlighting that small firms have difficulties investing in marketing, R&D and less capacity recovering the investment in terms of innovative sales.

Bibliography

Anderson S.P and Renault Regis(2006) Advertising content. American Economic Review.

Ayers, D. J., G. L. Gordon, et al. (2001). "Integration and New Product Development Success: The Role of Formal and Informal Controls." Journal of Applied Business Research 17(2): 133-148.

Becker, M. C. and M. Lillemark (2006). "Marketing/R&D Integration in the Pharmaceutical Industry." Research Policy 35(1): 105-120.

Berlyne, D. (1974). Studies in the new experimental aesthetics: steps toward an objective psychology of aesthetic appreciation. Washington Hemisphere Pub. Corp.

Bianchi, M. (1998). The Active Consumer. London: Routledge.

Bianchi, M. (2002). Novelty, preferences, and fashion: When goods are unsettling.

Brekke, K. R. and O. R. Straume (2009). "Pharmaceutical Patents: Incentives for Research and Development or Marketing?" Southern Economic Journal 76(2): 351-374.

Caraballo, E. L. (2009). "Leveraging Champions to Build a Knowledge Management System for the Research and Development and Marketing Interface." Journal of CENTRUM Cathedra 2(2): 22-31.

Duesenberry, J.S (1949),. Income, saving and the theory of consumer behaviour. Cambridge journal.

Dutta, S., O. Narasimhan, et al. (1999). "Success in High-Technology Markets: Is Marketing Capability Critical?" Marketing Science 18(4): 547-568.

Garcia-Torres, M.A.(2009) Consumer behaviour: evolution of preferences and the search for novelty UNU-MERIT Working Paper 2009-005.

Gupta A. K, Raj S.P and Wilemon D. (1986) A Model for Studying R&D-Marketing interfase in the product innovation process. Journal of Marketing Vol 50. Aprill 1986. 7-17

Lancaster (1966) Change and innovation in the technology of consumption. The American Ecnomi Review 56(1/2), 14-23.

Hashai, N. and T. Almor (2008). "R&D Intensity, Value Appropriation and Integration Patterns within Organizational Boundaries." Research Policy 37(6-7): 1022-1034.

Miltersen, K. R. and E. S. Schwartz (2004). "R&D Investments with Competitive Interactions." Review of Finance 8(3): 355-401.

Ofek, E. and M. Sarvary (2003). "R&D, Marketing, and the Success of Next-Generation Products." Marketing Science 22(3): 355-370.

Pollack (1970) Habit formation and the dynamic of demand functions. The Journal of Political economy 78 (4, part 1). 745-763

Ramrattan, L. B. (1998). "R&D Rivalry in the U.S. Automobile Industry: A Simultaneous Equation Model Approach to Bain's Hypothesis." American Economist 42(1): 42-55.

Ryder , H and Heal M. (1973). The optimal growth with intertemporaally dependen preferences. The Review of Economic Studies. 40 (1),1-31.

Scitosvky, T. (1977). The joyless economy: an inquiry into human satisfaction and consumer dissatisfactionn. Oxford University Press

Swann, P. (2002). There's more to economics of consumption tha (almost) unconstrained utility maximization. In M. T. Andrew McMeekin, Keen Green and V. Walsh. (Eds.), Innovation by the demand, pp. 23-41.Manchester: Manchester University Press.

Stigler, G. J. and G. S. Becker (1977). De gustibus non est disputandum. The American Economic Review 67 (2), pp. 76-90