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## Multinational Enterprises And The Regional System Of Innovation: The Case Of Navarre

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## MULTINATIONAL ENTERPRISES AND THE REGIONAL SYSTEM OF INNOVATION: THE CASE OF NAVARRE

*40<sup>th</sup> Congress of the European Regional Studies Association on “European Monetary Union and Regional Policy”, Barcelona, 29 August-1 September, 2000.*

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*The aim of this paper is to analyse the role of the multinational enterprises in the system of innovation of Navarre. In these pages it will be studied, firstly, the relevance of the R&D in the region, secondly, the relationships carried on among the different elements of the system of innovation (universities, technological centres, enterprises...) and thirdly, the local R&D activities supported by the multinational enterprises located in Navarre.*

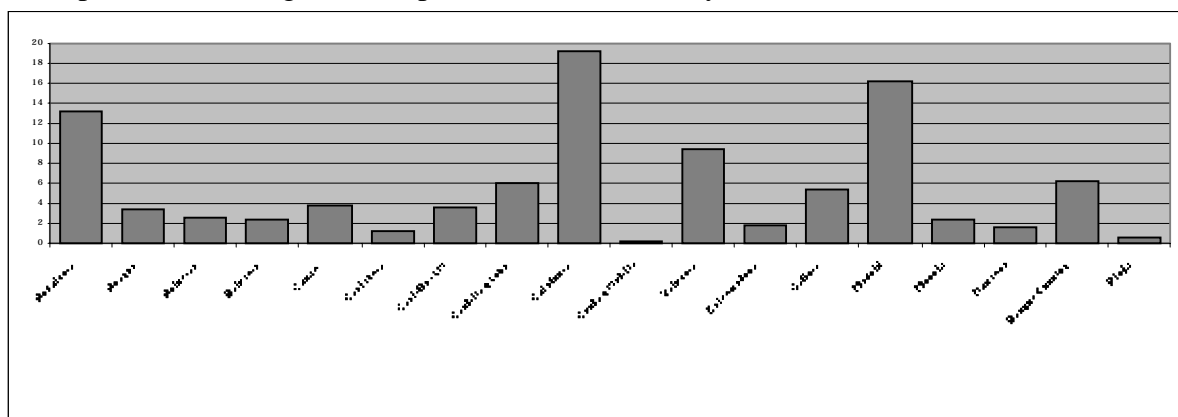
*The internationalisation of R&D activities and the globalisation of the innovatory capacity it is the most important issue that will be questioned in this paper. In the literature it is common to affirm that the innovatory activities are not globalised. Even very large corporations in most cases perform most of their R&D at home (Pavitt and Patel, 1999). Taking into accounts this literature and with the purpose of contributing to this debate, in this paper it will be analysed an empirical study: the Autonomous Community of Navarre.*

*Navarra it is a small economy that has just half a million inhabitants and generates approximately the 1,6 % of the Spanish GDP. On the other side, it has the lowest unemployment rate, one of the highest economic growth and it is the fourth community with the biggest percentage of R&D respect to GDP of the state. Also, in the last decade, this region has been very attractive for foreign capital and as a consequence, it has more than one hundred multinational enterprises located in the region.*

## 1. INTRODUCTION

Navarre is one of the seventeen Autonomous Communities of Spain and it is situated in the north of the State. It links the east part of the Basque Country and the north part of the region has more than 100 kilometres frontier with France. This region is a small economy that has just half a million inhabitants (1.3% of Spain) and it generates approximately 1,6% of the Spanish GAV.

Graphic 1: Percentage of the Spanish GAV in 1996 by Autonomous Communities



Source: Own elaboration from INE.

In Navarre, agriculture has been and it is very relevant for its economy. As we see in Table 1, in 1996 agriculture generated 6.0% of the GAV in the region, compared to 3.7% in Spain and 2.3% in EUR-15. On the other side, industry is also very relevant, generating 43.5% of the GAV in Navarre, compared to 33.2% in Spain and 30.7% in EUR-15.

Table 1: Gross Added Value, 1996. Navarre, Spain and EUR-15.(%)

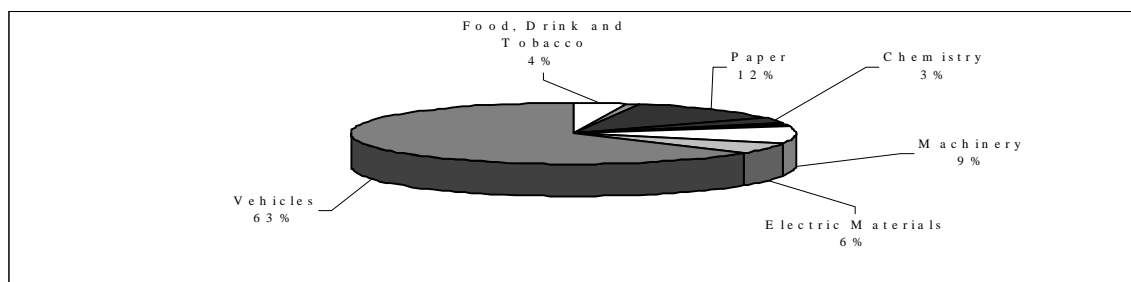
	Agriculture	Industry	Services
Navarre	6,0	43,5	50,5
Spain	3,7	33,2	63,1
EUR-15	2,3	30,7	67,0

Source: Own elaboration from Eurostat and Gobierno de Navarra.

In the last decade, the Foral Community of Navarra has been one of the most attractive regions for foreign capital together with Madrid, Catalonia and Andalusia. As a consequence, it has more than one hundred multinational enterprises located in the region and very high percentages of FDI respect to GAV. The most important years for the FDI in Navarre were 1993, 1994 and 1997. In all the cases the capital was destined to the automobile sector, and the difference was the origin of the inversion. In

1994 and 1997 it came from Germany and in 1993, the capital was from different autonomous communities of Spain. The most FDI attractive industrial sectors in the last decade in Navarra were vehicles (63% of the total), paper (12%), machinery (9%) and electric materials (6%).

Graphic 2: Percentage of FDI in Navarra in 1988-1997 by industrial sectors.



Source: Own elaboration from DGPCIE.

In the next pages it will be reviewed the theoretical framework of R&D internationalisation and then, it will be analysed some quantitative indicators of Research and Development and Innovation in the region to give a vision of the innovatory capacity of Navarra.

## 2. DO MULTINATIONAL ENTERPRISES INTERNATIONALISE THEIR R&D ACTIVITIES?

Multinational enterprises (MNEs) can foster the economic development of a region, on the one side, through the technology transfer and the international networks in which they are immersed and on the other side, from the externalities provoked in competitors and suppliers due to their presence in a determined area. Therefore, MNEs can contribute to the enhancement of the regional innovation systems in which their R&D centres are located or their R&D activities are carried out.

In the last years the internationalisation of the firms' (mainly MNEs) technological activities is increasing (Gerybadze y Reger, 1999; Cantwell, 1994; Molero, 1995; OCDE, 1999). Consequently, the R&D activities are not just carried out in the home country, but the subsidiaries firms become more important when they turn into innovative agents in the region where they are located.

In most cases, the propensity of foreign-owned affiliates to engage in R&D is about

the same as, or less than, their indigenous competitors. Viewed from a host country perspective, the R&D activities of multinational affiliates are often relatively quite important (Dunning, 1994, p. 72, 73).

However, the internationalisation of R&D activities cannot be generalised to all sectors and countries because of the big differences between them. For example, firstly, in the case of companies from large European countries like Germany, France and United Kingdom with an important technological base in their home country, concentrate a great part of their research at home, especially in sectors like machinery, vehicles and electric material. On the other side, in sectors like chemistry and pharmaceuticals a high proportion of R&D is carried out abroad. For the last industries mentioned, knowledge bases and customer requirements are basic factors to provoke the decentralisation of the R&D activities. Firms gain comparative advantage by simultaneously being active in several centres of learning (Gerybadze and Reger, 1999). Secondly, the companies from a small country are obliged to actively participate in foreign research centres, due to their reduced size, the openness of their economy, their industrial fabric and the weakness of their technological and scientific base.

The study of the internationalisation of R&D activities is based in the reasons that make the technological production to be maintained in the country of origin in some cases, or to be decentralised in other ones. So, this paper will pursue some of the motives that promote the decentralisation of Research and Development activities.

Foreign-owned enterprises to internationalise their R&D centres should act following the transnational innovation new paradigm (Gerybadze and Reger, 1999):

- ❑ Traditional paradigm (outward learning): It is characterised by a one-way technology transfer. In a dominant home base it is generated the product concepts and technological knowledge bases. Afterwards, they are copied in other locations where the affiliates just develop the exploitation of knowledge.
- ❑ New paradigm (inward and outward learning): It is characterised by a technology interaction, multiple centres of knowledge, interactive technology transfer etc.

The firm has the capacity to learn from its own practice in the home country and to be

taught from foreign experiences through the interactive process of learning. Transfer of technology would be bi-directional (country of origin - foreign locations - country of origin). The interactions in the process of learning make the firm change its innovatory trajectory along the time.

Furthermore, once it is observed the impact of the MNEs in the innovatory capacity of the host countries, it is interesting to study the behaviour of MNEs in the different host systems of innovation. In this case, more than analysing the R&D and innovation expenditures carried out by firms in the host region, which is a necessary but simple quantitative indicator, it is important to evaluate a qualitative one, such as the existing relationships between the different agents in the system of innovation. This means to revise the R&D co-operation between the innovative organisations such as universities, technological centres, firms etc. with the aim of observing if MNEs are external agents to the system or if in contrary, they are agents embedded in the host regional system of innovation.

Lundvall (1992) defines an innovation system as being constituted by a number of elements and by the relationships between these elements and with their environment. The elements are firms and institutions represented by organisations such as research laboratories, industrial associations, enterprise support and financial institutions that interact (university-enterprise, firms-enterprise support...). It is defined the Innovation System at a National level.

Regions have evolved along different trajectories through combinations of political, cultural and economic forces (Cooke et al, 1997). These authors define regions as territories smaller than their state possessing significant supralocal governance capacity and cohesiveness differentiating them from their state and other regions. In this sense, in the next pages, the study will focus in the regional approach of system of innovation.

Innovation and learning are the central processes under investigation, and knowledge transfer among formal R&D, educational and economic organisations is the focus (Edquist, 1997). Innovation and learning are closely linked. There can be no change without previous learning (Cooke et al, 1997). Learning sometimes requires or is accompanied by an institutional change, a cultural change, a change in rules, habits,

etc.

For endogenous firms, the innovation process becomes a continuous interactive learning process through the co-operation in innovation matters with the rest of the agents in the system. For MNEs, whose R&D centres or innovation activities are decentralised in a host country, the interactive learning results are twofold. Firstly, in the same way as endogenous firms, they can improve their innovative capacity through the local agents interactions (host country learning) carried out in the system of innovation. Secondly, through the application of the new knowledge generated abroad into the home technological base (inward learning). For both types of firms, innovation will provoke a continuous institutional change in the long run.

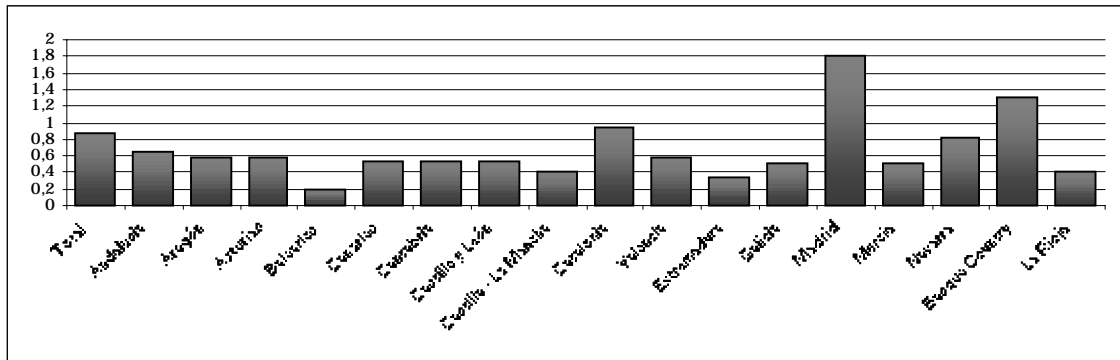
Learning should become a goal for regional governments. If they plan to promote the innovative capacity of the region, they should foster policies that encourage learning processes. With the appearance of innovation systems in different regions and within them different centres of knowledge, it will foster the localisation of MNEs' R&D centres or activities with the aim of learning from foreign sites.

### 3. TECHNOLOGICAL INNOVATION IN NAVARRRE: SOME INDICATORS.

The concept of technological innovation it is not limited to Research and Development. Despite R&D expenditures is a very usable indicator, it does not reflect completely the concept of innovation. Technological innovation includes activities like acquisition of immaterial technology (patents, licences, etc), the design and industrial engineering, the commercialisation of new products and the development of new marketing mechanisms (CDTI).

Also, the concept of entrepreneurial innovation it is not understood as an isolated concept from the rest of the innovatory agents in the region. In this sense, innovation will be studied from a systemic point of view where all the innovatory agents in the region, like firms, technological centres, universities, government, etc interact constituting an innovation system.

Graphic 3: R&D expenditures/ GDP in 1997, shown by Autonomous Communities.

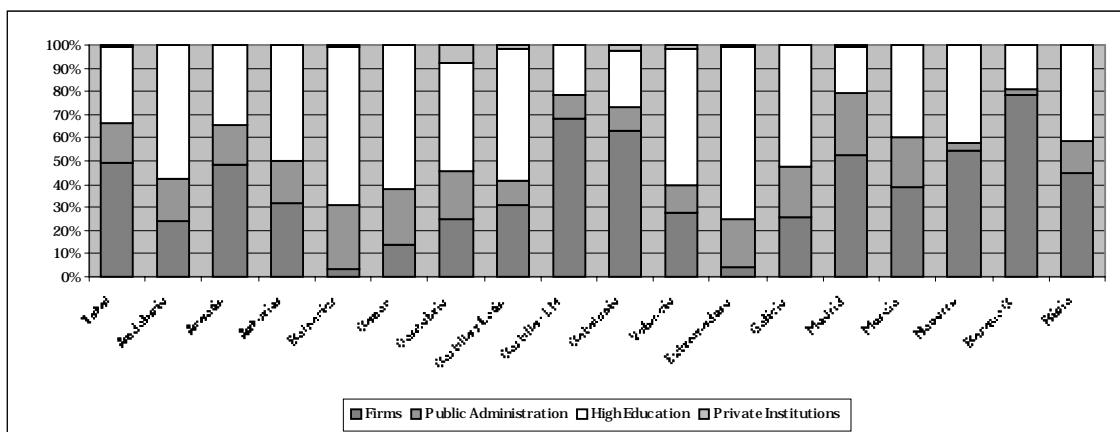


Source: Own elaboration from INE.

Navarre is the fourth autonomous community in R&D expenditures respect to GDP. Firstly, Madrid has the highest percentage (1,8%) followed by the Basque Country (1,3%). Near 1% it is Catalonia in third position and similarly to the Spanish average it is Navarre (0,8%).

In the next graphic we observe where these R&D expenditures are destined in the different regions. In this sense, in regions like Andalusia, Castilla-León, Valencia and Navarre, High Education has the highest R&D expenditure and it is even higher than the Spanish average. With the exception of the Foral Community of Navarre it is more relevant than the entrepreneurial R&D expenditure.

Graphic 4: R& D expenditures in 1997.



Source: Own elaboration from INE.

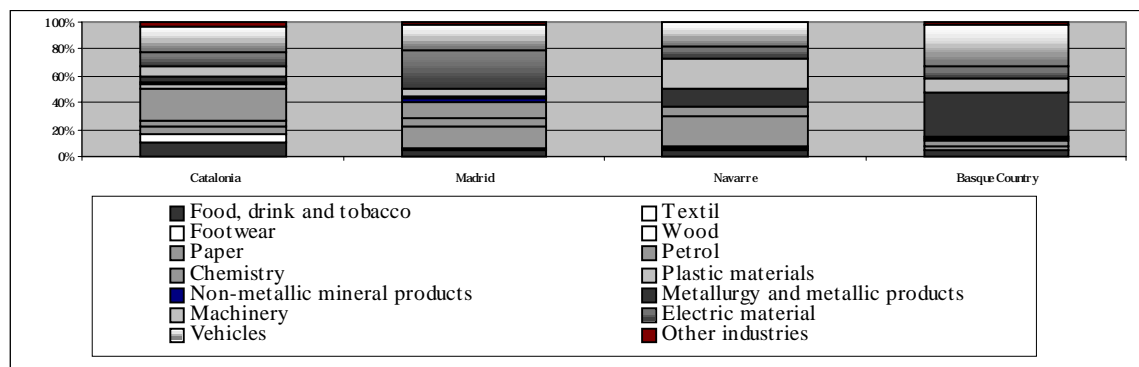
In Navarre, Public Administration has dedicated few resources to R&D. When the industrial development process started in the decade of the sixties, the regional government focused all its policies in the promotion of the private investment, the



creation of firms and the attraction of new productive firms, etc.. At the beginning of the 80's, the public sector approved the Research and Development support regulation with several actions for the promotion of these activities, and which they are still operative.

After those first measures, in 1991 the regional government elaborated the “Research Regional Plan (1992-1995)” but it was not operative due to political reasons. It will not be until 1999 when it approves a plan for the region “Technological Plan of Navarra 2000-2003”. With this plan the government will try to facilitate the access to new technologies for the Small and Medium Enterprises, to support with financing the entrepreneurial innovation activities, to promote technological centres and the innovation fields of the multinational enterprises located in Navarra.

Graphic 5: Innovation expenditures in 1998 in Catalonia, Madrid, Navarra and Basque Country in manufacturing industry desegregated by sectors.

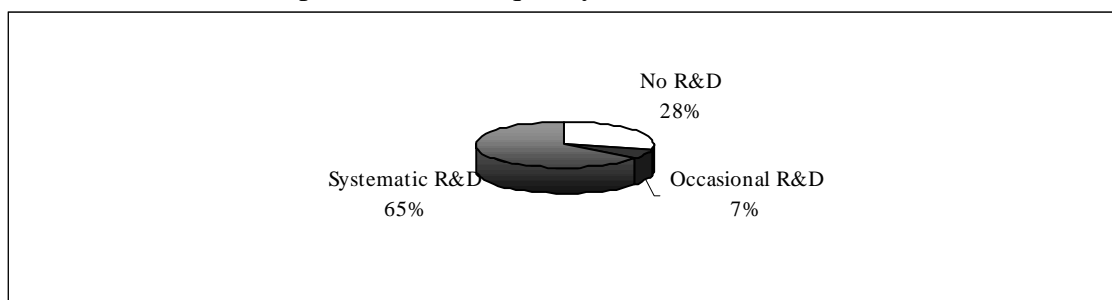


Source: Own elaboration from INE.

Analysing the innovation expenditures carried out by enterprises in four autonomous communities (Catalonia, Madrid, Navarra and Basque Country), we observe that the sectorial distribution is very different in the regions. In Catalonia, the most active sectors in innovation expenditures are chemistry and pharmaceutical products and transport material. In Madrid, the highest expenses in innovation are carried out in electric and electronic material and secondly in vehicles. In Navarra, the most active sector is machinery followed by paper. Although sectors like metal products and electric material are not very important in innovation matters, their relevance is remarkable. In the case of the Basque Country the innovation expenditures concentration is higher. Principally, the biggest amount of innovation expenses are performed in two sectors: Metallurgy and transport material.

In Navarre, analysing the frequency of R&D activities, we observe that 65% of the firms performed in 1998 systematic R&D, while 7% just carried out occasional activities related to R&D. It is remarkable that 28% of the enterprises do not execute any Research and Development.

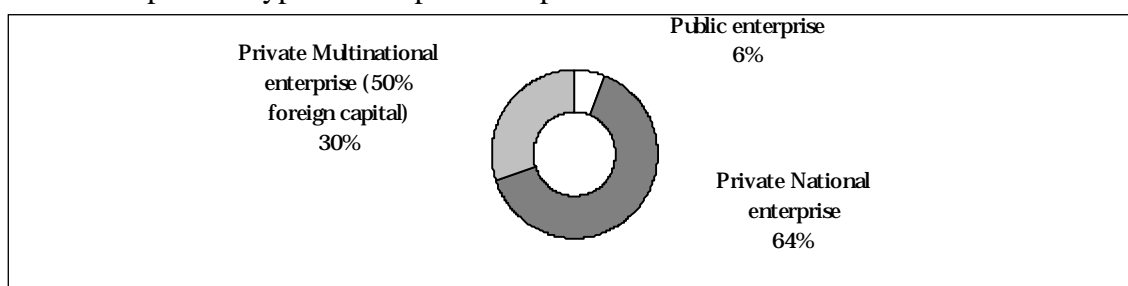
Graphic 6: R&D frequency in Navarre in 1998.



Source: Own elaboration from INE.

As it was mentioned before, Navarre is a very attractive area for Foreign Direct Investment, therefore there are more than 120 foreign-owned enterprises located in the region. In the next graphic it is shown the type of enterprise which performs R&D activities. The most active firms are the private national ones (64%). Also, it is important that 30% of the firms that carry out R&D in the region are foreign-owned enterprises.

Graphic 7: Type of enterprise that performed R&D in 1998 in Navarre.



Source: Own elaboration from INE.

Once the quantitative indicators of innovation (R&D and innovation expenditures) are reviewed and with the main goal of deepening in the innovative character of Navarre, next pages will focus in qualitative signs like the relationships carried out by the different agents of the system of innovation. Also there are more qualitative factors such as the innovative culture, the costume, the trajectory followed along the time, trust, values that will condition the system of innovation.

#### 4. SYSTEM OF INNOVATION.

In the next lines the Navarre's system of innovation will be analysed studying the potentials and insufficiencies of the system following the differential indicators that Cooke, Uranga and Etxebarria (1998) offer:

##### **Stronger RSI potential**

Autonomous taxing and spending  
capacity for financing  
on strategic infrastructure  
Regional vocational-training competencies

##### **Weaker RSI potential**

Regional private finance  
Regional mediation and promotion  
Integrated R&D laboratories  
Regional innovation strategy  
Decentralised spending and/or  
taxation  
Dependence on national financial organisations  
Weak regional capacity for  
partnership financing  
Limited mediation and promotion competence  
No control over  
strategic infrastructure  
Disembedded universities  
Absence of R&D laboratories  
Normal state training system  
Piecemeal innovation projects

Source: Cooke, Uranga and Etxebarria (1998).

##### **Autonomous Community**

Navarre received its competencies from the Spanish Constitution in 1978. This region assumed through the Foral Regime's Reintegration and Improving Organic Law (LORAFNA) in 1982, several competencies in economic subject. Navarre has the exclusive competence in scientific and technological research, although the state keeps for itself "the faculties of promotion and general co-ordination". Navarre also, has the exclusive competence in the "planning of the economic activity and the promotion of the economic development".

##### **High Education Organisations**

In Navarra, there are two universities: the University of Navarra (UN) and the Public University of Navarra (UPNA). The University of Navarra (UN), founded in 1952, has been very implicated since its beginnings in research activities, providing the region with a very relevant academic and research tradition. In 1986, the Scientific and Technological Institute (ICT) was created as a non-lucrative entity, promoted by the UN to facilitate the contracts and the service provision to the enterprises.

The UN's R&D services are commercialised by the ICT, through three research centres that have a multidisciplinary character because of the union of different departments in a same centre: CIFA (Centre of Applied chemistry research), IBA

(Applied biology institute) and CINDEB (Biomedical R&D centre) and also by two trade marks: EUROVIEW (formed by the Audio-visual Department of the Information Faculty) and CADIA (mark that commercialises the research made in the High Technical School of Architecture, supported by the Construction Centre).

In this sense, a study carried out recently shows that one of the aspects to emphasise in Navarre's system is the weighty implantation of the UN. This relevance is basically due to the research in medical sciences that this private university performs through its medicine faculty, University Clinic and overall, through the ICT, that becomes the main research executor in Navarra after the enterprises (Lavía, Olazarán and Urrutia, 1995).

The Public University of Navarra (UPNA) was created in 1987 and it has 5 faculties. Among the departments that carry out R&D activities we find: Electric and Electronic engineering, Agro-production, Applied Chemistry, Physics, etc.

The studied departments within the UPNA worked in 1997 with 58 firms, and the ones in the UN for 129 enterprises (from which, 90 were from the construction department, mainly in analysis services). It is also remarkable the collaboration of the organic and pharmacy department of the UN with 12 enterprises during 1997 (AIN, AIN, CETENASA, 1999). In 1998 UN through ICT worked with more than 200 firms (55% in the pharmacy sector) mainly MNEs located outside the region.

As a conclusion, analysing the relationship between the universities and the firms we observe that it is stronger in the private university. The University of Navarra is more active in the collaboration with enterprises due to lesser bureaucracy and bigger flexibility compared to the public university and the higher co-operation among the own departments of the University of Navarra that permits to offer more adapted services to the firms specific necessities.

In the public case, the more general and common causes for the non-fluid university-enterprise relationships are: the lack of trust towards the university research, the lack of confidentiality, the working rhythm in each of them, the interest conflicts, the lack of habit to co-operate with the productive sector, the incentives in the academic

environment via curriculum and not monetary or the inefficiencies in the ILOs (Cotec, 1997 a). Apart from them, in Navarre, there are more particular reasons. Among these ones, there could be the relative youth of the university and the lack of a Scientific and Technological Plan until last year.

### **Technological centres / R&D associations**

In Navarre exist two multisectorial centres (CETENASA and AIN) and six sectorial ones (EVENA, CTNCV, ILL, ITGA, ITGG, LENSEA) specially focused in agriculture. Most of these centres were created in the decade of the 80s, with the exception of AIN, that was created in the 60s.

Technological centres in Navarre do not co-operate fluently with firms in innovation matters. In the relationship firms just look for analysis services, quality and training. In R&D the co-operation is very weak although the more active centres were the multisectorial ones (CETENASA and AIN) due to its large specialisation in several areas.

Taking into account universities and technological centres, we observe that they collaborate but the relationships are very limited due to their own activities. Sectorial centres as they are strongly specialised, are not very co-operative with university departments because activities in each other do not correspond. In this sense, CETENASA collaborates with some departments of UPNA because their R&D areas are covered jointly. In the case of University of Navarra, the collaboration is very weak because the specialisation areas do not match.

As a conclusion, although the University of Navarre is very active in innovation matters and it collaborates with enterprises, it is not embedded in the regional innovation system because its co-operation is mainly carried out with firms not located in the region. Anyway, it has a great potential. Technological centres do not co-operate much with firms in R&D matters, so they are not very integrated in the system. The relationship between universities and firms is stronger than technological centres and firms due to the specialisation of centres. Similarly, this scarce co-operation between technological centres and enterprises it is also observed in the relationship among technological centres and university departments. Their R&D activities do not

correspond and they cannot be complementary.

### 5. R&D ACTIVITIES EXECUTED BY MNEs LOCATED IN NAVARRE.

In Spain, the study achieved by Molero et al (1995) shows that MNEs have a central position in the R&D system (they carry out more than the 40% of the entrepreneurial activity) and its innovative effort is higher than the local enterprises. However, the number of R&D centres established by foreign owned firms is very limited, less than the 2% of the total.

### **Methodology**

The data base is the one offered by the Regional Development Agency (SODENA, 1998). For the study it will be considered 96 MNEs. The first contact was made by phone to know if the enterprise had a R&D department located in the region. 42% of the firms did not want to answer the question. From the rest 58%, 12% affirmed they had a R&D department and 21% pointed they carried out punctual activities.

Table 2: R&D activities carried out by MNEs in Navarre.

	<b>Respondents</b>	
	Nº	%
<b>No answer</b>	<b>40</b>	<b>41,7</b>
<b>Answer</b>		
R&D department	12	12,5
No R&D department	9	9,4
Punctual activities	20	20,8
No R&D at all	15	15,6
<b>Total</b>	<b>96</b>	<b>100</b>

Source: Own elaboration.

Secondly, a questionnaire was sent and due to the lack of responses, a new phone call was made. The respondents rate obtained finally is 32,3% (31 responses out of 96). Despite the questionnaire wasn't long or difficult to answer, 20% of respondents affirmed no time or interest to answer it.

Table 3: Respondents rate

Nº of respondents	N= 96	% of respondents
31		32,3%

Source: Own elaboration.

The main functions carried out by MNEs were firstly, production (100%) and training (61%). However, 45% of the enterprises do not perform any R&D activities, becoming exclusively production centres. Only for 25% of the firms R&D is one of their daily functions and for 30% they achieve R&D punctual actions.

It is important to know the R&D relationships among the different agents of the innovation system. Despite the co-operation in R&D is a qualitative indicator of the innovative process and it does not show precisely the configuration of the system, the systemic relations among the foreign-owned firms and the rest of the academic, technological and entrepreneurial organisations etc. of the region will illustrate, at least partially, how embedded the foreign-owned enterprises are in the regional system of innovation.

At regional level, it is observed that more than 50% of the foreign-owned firms located in Navarra co-operate in R&D matters with the technological centres, mainly CETENASA, and with the universities (UPNA and UN). It is remarkable that the co-operation grade with suppliers and consumers is very low (15%). At national level, the co-operation grade with suppliers and consumers is higher than at regional level (30%). In this sense, 30% of the foreign-owned firms collaborate with national universities and technological centres. At european level, the co-operation with the innovative agents is very scarce except for the relationship with suppliers (25%).

As it was mentioned before 45% of the enterprises affirmed not carrying out R&D activities in the region and for the rest it was not considered a principal function, so, in the next lines it will be analysed the constraints found by firms to execute R&D activities.

Table 4: Constraints to perform R&D activities

	% of respondents		% of respondents
Lack of financing	10%	Lack of information: support organisations	13%
Lack of time	23%	Lack of information: consumers needs	10%
No skilled workers	16%	Production of standarised products	10%
Expensive Personnel	13%	No necessity: R&D in central firm	26%
Lack of autonomy	58%		

Source: Own elaboration.

The main obstacle found by the foreign-owned firms to carry out R&D activities in the region is the lack of autonomy due to their filial condition (58%). Secondly, 26% of

the firms affirmed that they do not have necessity of performing R&D because they have it done in the central firm in Spain or in the country of origin. Thirdly, it will be the lack of time for the management (23%) followed by the lack of skilled personnel (16%).

It is remarkable that financing it is not a constraint for carrying out innovative activities (10%). Financing is the most important barrier found by endogenous enterprises to carry out R&D activities. Therefore, enterprises knew the support organisations that exist in the region so there is not a lack of information which is an important barrier for SMEs.

## 6. CONCLUSIONS AND POLICY IMPLICATIONS

The R&D activities of the multinational enterprises are mainly centralised in the country of origin (although it depends on countries and industries). In the last decades there has been an openness in this matter. Due to the globalisation, and step by step, R&D activities are being decentralised.

MNEs are very flexible to locate their production and R&D resources and to redistribute their productive and research activities in the most appropriate country. MNEs must find some advantages in the destiny country that makes them locate in that region. These advantages must flow from the system of innovation of the destiny country. A strong, articulated and without constraints system of innovation, in which all its elements are related and co-operate in innovation matters, will be a powerful attractive for the location of R&D centres or research laboratories of MNEs.

In the case of Navarre, the system of innovation has some insufficiencies that are the following:

- ❑ Disembedded universities. In the case of the UPNA, firms do not co-operate with the university in R&D activities. The more general and common causes for the non-fluid university-enterprise relationships are: the lack of trust towards the university research, the lack of confidentiality, the working rhythm in each of them, the interest conflicts, the lack of habit to co-operate with the productive sector, the incentives in the academic environment via curriculum and not monetary. Apart from them, in Navarre, there are more particular



reasons. Among these ones, there could be the relative youth of the university and the lack of a Scientific and Technological Plan. In the case of the UN that it is more active in the collaboration with enterprises due to lesser bureaucracy and bigger flexibility compared to the public university and the higher co-operation among the own departments of the University of Navarra which permits to offer more adapted services to the specific needs of firms. This University has worked with a relatively big amount of enterprises but mainly they were located outside the region, so the university it is not embedded in the regional innovation system.

❑ Not integrated laboratories or technological centres. CETENASA it is the only one that is more active in the relationship with firms due to its multisectorial character but it is not very intensive in R&D matters. Firms mainly look for analysis services, quality and training. Due to the strong specialisation of the sectorial centres, they are not very used by firms as support organisations. Also, the co-operation between universities and technological centres is not very intense as a result of their respective specialisation.

❑ Regional Innovation Strategy. The first measures were performed in 1982 when the public sector approved the R&D support regulation with several actions such as training for researchers, support for the equipment infrastructure, etc. It will not be until 1999, when the government of Navarre elaborated the “Technological Plan 2000-2003” which its main goal is to facilitate the access to new technologies for the SMEs, to support with financing the entrepreneurial innovation activities, to promote technological centres and the innovation fields of the multinational enterprises located in Navarre.

Nowadays, MNEs located in Navarre are production centres and they do not carry out R&D activities in the region. Also, they are lightly embedded in the system. MNEs co-operate (50%) in R&D matters with the multisectorial centres and with both universities. They do not collaborate with suppliers and consumers (15%) in the region.

With this panorama of the system of innovation in Navarre and with the main goal of improving the R&D activities in the region, keeping the MNEs in the region and turning them into innovative agents embedded in the regional system of innovation,

there are some policy implications observed:

- ❑ Prevent the escape of the endogenous R&D to the exterior, promoting the creation of necessary infrastructure for firms such as more complementary-to-firms technological centres.
- ❑ Reinforce the weak elements in the system and improve the interface elements among them such as regional development agencies committed in innovation, innovation agencies, consultancies, University-Enterprise Foundations, ILOs...
- ❑ Promote skilled labour, especially professionals of science, medicine and engineering.
- ❑ Once the “Technological Plan 2000-2003” is over, evaluate its results in order to find insufficiencies and to resolve them in the following plans that would be elaborated for the next years, which it means to have a continuous and committed Innovation Strategy for the region.
- ❑ Encourage the creation of Spin-off firms from the academic environment especially in pharmaceuticals and biomedical sciences in order to create university-based research centres with its own specialisation (Centres of Excellence). These centres will conduct innovative research and provide technical assistance (basic and applied research, technical consulting, training, product and process development) with the aims of creating new companies, strengthening existing companies and attracting foreign-owned R&D centres. In this sense, from these Centres of Excellence sectorial innovation systems would be created within the regional system of innovation.

## NOTES