INTERNATIONALIZATION OF TECHNICAL CHANGE AND THE INTERMEDIATE COUNTRIES. A preliminary approach from the experience of South European economies.

JOSE MOLERO.

Complutense University of Madrid.

Departamento Economia Aplicada II and Instituto de Analisis Industrial y Financiero

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Introduction.

One of the most attractive topics of the current literature dealing with international competitiveness has to do with the relationships between technological innovation and the changing internationalization of economic activity. In fact, in spite of the abundant research available on both subjects as separate matters, there is little investigation related to the interactions of the two trends. If, on the one hand, we find some studies highlighting the increasing globalization of the economy and, within it, the global organization of technological innovation, there is another cluster of research which has tried to clarify the limits of that tendency as well as the relations between internationalization and the role of national systems (Porter, 1990; Patel & Pavitt, 1991; Archibugi, 1995).

However, most available information and studies refer either to large multinational corporations (MNCS) or to

most developed countries, included in what has been called the "triad": USA, Japan and advanced European economies. Additionally, there are studies about the new role of underdeveloped areas or some new industrialized countries (Lall, 1992; Narula, 1996; Bell & Pavitt,1994). Nevertheless, there are few systematic studies concerning the less clear position and role of those countries which, without being part of the underdeveloped countries, are neither part of the core of the so called "triad".

The aim of this paper is to contribute to a better understanding of those cases from a twofold perspective: first, the consequences of the new international technological activity of MNCS for their respective economies, and especially their systems of innovation. Second, the particular circumstances determining the recent and very rapid process of international commitment of firms originating from those nations which follow different trajectories to those of large and "traditional" MNCS. Apart from the academic interest of this matter, it also has a political importance because some of the most clear "intermediate countries" (ICS) are in Europe: furthermore, part of the uneven situation of the process of European unification has to do with the asymmetric ways in which different actors participate in the new international scenario.

In the following pages we start with some clarifications of the concept of ICS (section 1.1). Afterwards we shall combine three complementary approaches to the central question: at the beginning (section 2) we offer some results of a typology established from the combination of different features of nine European economies regarding the relations between innovation, international expansion and productive structure. In section 3 we analyse the impacts of MNCs' activities in our group of countries, showing new evidence from the Spanish case which can enrich the current knowledge. Section 4 is devoted to the study of the opposite trend: the new opening up of firms of ICS, basically with evidence from Portugal, Italy and Spain. Finally, in the conclusions our intention is to discuss several ideas for a new dimension of technological policy both at national and European level.

1.1 What do we understand by "intermediate countries".

We do not want to develop a fundamental discussion about this concept; in fact any intermediate situation ought to be defined in relation to any comparative measure of the distance from some upward and downward limits. In a practical way we have selected three dimensions defining the sort of countries responding to the label; although no particular country will comply perfectly with the criteria, we think they can reflect some part of the European reality.

The first feature regards the **Productive System;** the countries we want to consider have a *less developed productive structure considering sectors of the highest level of technological complexity.* No matter which criteria we use for defining those sectors, the fact is there are economies with a higher deficit in these activities. This has two important implications: on the one hand, these nations have to import comparatively more goods and services related to those branches. On the other, the global coherence of the system is lower and can produce worse consequences, in particular international crisis, as in the 1970's.

Secondly, these countries *have a less intensive degree of internationalization via **outward FDI**.* In terms of

Dunning-Narula conceptualisation (Narula, 1996), they are basically concentrated in the third stage, where incoming flows are still greater than outward ones. Moreover, from a sectoral point of view, that desequilibrium affects most branches. According to Chesnais' categories (1997), most are "host sectors". However, these countries show a rapid process of increasing their outward FDI, which is one of the elements we bear in mind in arguing for their particular consideration.

Thirdly, and particularly important for our discussion, they have ***Systems of Innovation*** *characterised by a structural dualism.* From a quantitative point of view, these countries could be classified within a group of medium to low R&D effort or with a relatively low participation in world-wide patent data banks. However, more important is the fact that the sources of technological learning are less based on formal R&D structures, including large firms universities and public research centres. On the contrary, informal networks are more active and play a crucial role in the technological upgrading of small firms, in many cases belonging to traditional manufacturing branches. In addition, importation of technology still is a basic tool in the maintaining of competitive capacities of those firms and sectors.

Summing up the three features, it can be easily understood that firms from those economies usually participate in a particular way in the process of international expansion of technological activities. Logically, they will have less presence in the process of international creation of technology and act more through the international exploitation of technological capabilities. Moreover. these countries will depend more on international programmes (Framework Programme; EUREKA) for participating in international strategic alliances.

Although there are more countries which could be included in that category, in this paper we shall take into account basically the cases of Spain and Italy. The two have many historical and institutional similarities which allow us to make this group and perhaps to speak of a sort of "Mediterranean pattern". Portugal has a very similar model from many points of view, and so we shall include some evidence coming from this case; however, its smaller size and relative backwardness advise us to be more careful in establishing common conclusion in all the phases. As we have a deeper knowledge of the Spanish experience, we shall put this case in the middle of the debate, although the purpose is only to illustrate a more general analysis and political debate.

2.- Different patterns of relationships between technological specialisation and internationalization within European economies.

In this section we attempt to make a preliminary analysis of the relationships between countries' technological specialization (TS), their productive structure (PS) and some aspects of the international expansion (IN) they are experiencing.

To achieve that objective we have followed a two-phase procedure: In the first one, we use a number of sectoral statistics, at the highest degree of desagregation, in order to highlight the central characteristics concerning the three dimensions we want to relate : TS, PS and IN. In the second phase, we carry out a comparative analysis to make up a typology of cases which can support from a firmer ground the necessity

of differentiated studies for different cases. Furthermore, we can throw some light on the kinds of relationships which play the principal roles in each type of experience.

The empirical quantitative information used to analyse this phenomenon is a databank we are making with statistics collected from international databases, mainly the OECD ones. This information will be complemented, as far as possible, with national and international sources. This work requires, as a necessary condition, a homogeneity in the specification of the different productive branches whereas there is large diversity of sectoral classifications used by different international sources. Owing to this, and as a first step, the information about each variable has been reorganised according to the **International Standard Industrial Classification (ISIC), revision 2 .**

In the present situation of the study, we have found three main difficulties. Firstly, the complex problem of having desirable statistics with the same breakdown for all the countries and for the same period of time; this has reduced the number of cases included in this preliminary presentation. Secondly, concerning technological data, we have worked only with R&D sectoral information because we have not finished the transformation of patents data. Although in a global approach there is a strong coincidence of results obtained from both sources, we can not neglect the possibility of relevant bias which can be more important for ICS: Finally, and this is the most preoccupying point, statistics of FDI are the most restricting because they are not available for all the countries -especially when we try to use inward as well as outward FDI-; moreover, its sectoral detail is the poorest and makes us to reduce other statistics to 16 sectors, which, obviously, limits the accuracy of the analysis.

So, the results we shall show are necessarily provisional, albeit we think they are significant enough to orientate the discussion. Due to statistics shortages we have dealt only with nine countries -Germany, France, Italy, United Kingdom, Spain, Portugal, Denmark, Holland and Finland- and we have used averages of three years for each variable instead of a dynamic analysis. Variables included are: Value added, employment, R&D, exports, FDI outward and FDI inward. The two firsts are proxies of the ES and the three lasts are different ways of IN.

The methodology consists of the following steps:

A) we have calculated correlations among the six variables for each country. Instead of using only one kind of estimation we have calculated four coefficients: two are linear (Pearson) and measure the associations between sectoral percentages of the variables and international specialization indexes respectively. The other two are rank coefficients (Spearman) and have been estimated for the same two sets of variables. Thus, we have 38 correlations for each nation.

B) A second stage has been devoted to the organization of the information with the intention of proving the existence of different patterns of relationships among ES, TS and IN. We have used cluster analysis to classify correlations between R&D and internationalization, as they constitute our central objective. Results included in table 1, allow us to suggest there are three unlike groups of cases.

Table nº 1

Countries classification through Cluster analysis			
Correlations used	Group 1	Group 2	Group 3
R&D à internationalization. Percentages. Pearson	**Germany, France**, Denmark	**Spain, Italy**, UK, Holland.	**Portugal, Finland**.
R&D à internationalization. Specialization indexes. Pearson.	**France**	**Spain, Italy**, Germany, UK, Holland, Denmark.	**Portugal, Finland.**
R&D à internationalization. Percentages. Spearman	**Germany, France**, Denmark	**Spain, Italy**, UK, Holland.	**Portugal, Finland.**
R&D à internationalization. Specialization indexes. Spearman	**Germany, France**	**Spain, Italy**, Holland, Denmark, Finland	**Portugal**, UK
Note: Clusters has been estimated with K means method.			

Source: Own elaboration.

Clusters have been made with all coefficients, so in order to examine more closely the features of the groups, we have used only significant correlations. Table nº 2 includes together with those data -see first 12 columns-, all other significant associations calculated within IN variables and between them and PS .

Without forgetting the provisional character of the findings we think they are a valid first step in establishing a typology of cases. Three patterns of relating TS and IN can be identified, although some countries do not fit well into any of them. We are going to describe their highlighting features, starting from relationships between TS and IN. In a further phase we shall add comments on the internal connection among different forms of the process of internationalization as well as other significant associations. Figure nº1 illustrates well our exposition.

Case A: "Integrated pattern".

Here we include Germany and France. *They are the only two cases in which there are significant correlations between TS and internationalization via outward FDI* (FDIO). They show significant associations between TS and inward FDI (FDII), although it is more relevant for France. Moreover, regarding other ways of internationalization we find significant correlation between TS and exports, being extremely strong

in the German case.

On considering internal associations among forms of internationalization we find that Germany shows a good correlation structure between exports and FDIO, creating a kind of "virtuous" circle among TS-FDIO-Exports. France has not the same organization; its most outstanding feature is the strong association between FDII and FDIO.

	SIGNIFICANT RELATIONSHIPS BETWEEN INNOVATION, INTERNATIONALIZATION AND PRODUCTIVE STRUCTURE																																	
	INNOVATION-INTERNATIONALIZATION												RELATIONS WITHIN INTERNATIONALIZATION												PRODUCTION - INTERNATIONALIZATION											
	SECTORS %						SPECIALIZATION						SECTORS %						SPECIALIZATION						SECTORS %						SPECIALIZATION					
	LINEAR			RANK			LINEAR			RANK			LINEAR			RANK			LINEAR			RANK			LINEAR			RANK			LINEAR			RANK		
	X	FDI	FDIO	X	FDI	FDIO	X	FDI	FDIO	X	FDI	FDIO	1	2	3	1	2	3	1	2	3	1	2	3	X	FDI	FDIO	X	FDI	FDIO	X	FDI	FDIO	X	FDI	FDIO
GERMANY	**S**		**S**	**S**		**S**	**S**	**S**				**S**		**S**			**S**	**S**	**S**				**S**			**S**		**S**	**S**		**S**	**S**			**S**		
FRANCE		**S**	**S**	**S**	**S**	**S**		**S**	**S**		**S**	**S**			**S**			**S**			**S**			**S**	**S**			**S**	**S**			**S (-)**	**S (-)**		**S**	**S (-)**	
U.K.	**S**			**S**			**S**			**S**									**S (-)**			**S (-)**			**S**	**S**		**S**							**S**	**S**
HOLLAND										**S**				**S**					**S**						**S**	**S**	**S**	**S**		**S**				**S**		
DENMARK		**S**		**S**	**S**					**S**				**S**											**S**		**S**	**S**		**S**	**S**			**S**		
FINLAND				**S**			**S**										**S (-)**	**S**							**S**		**S(-)**	**S**			**S**			**S**		
PORTUGAL				**S**				**S (-)**		**S**				**S**					**S (-)**	**S (-)**		**S (-)**			**S (-)**		**S**	**S**		**S (-)**	**S**		**S(-)**	**S**	**S (-)**	
ITALY																									**S**						**S**			**S**		
SPAIN				**S**						**S**								**S**													**S**			**S**	**S**	

Notes: x= exports, fdi= foreign direct investment; fdio= foreign direct investment abroad. 1= relation x-fdi; 2= relation x-fdio, 3= relation fdi-fdio

SOURCE: OWN ELABORATION

The high degree of coherence of Germany is reinforced by the existence of significant correlation linking the productive structure PS and the international expansion of its exports and FDIO. The coherence of the French case comes from associations of its PS and FDII. Finally, Germany also has positive and strong associations between TS and PS, while France shows a weak connection in this field.

Summarising we can state both counties have the greatest number of correlations and are the only examples with positive association between TS and FDIO. The main difference between them is that Germany shows a particularly strong coherence among of the indicators with the sole exception of FDII. For France it is necessary to make explicit the association between FDIO and FDII.

Case B: "disintegrated pattern".

Cluster analysis includes in the same group four countries: Spain, Italy, UK and Holland. However, a deeper consideration allows us to separate them into two subgroups insofar as the label can be properly used for Spain and Italy. The central characteristic of the two is easily identified: there is not significant correlation between TS and IN nor among different ways of internationalization.

The cases of UK and Holland constitute a separate group. In both countries the relations between TS and IN are poor, albeit there are stronger associations between their PS and the process of internationalization and among different procedures of internationalizing the economy.

Case C: "Unstable pattern"

The analysis groups Finland and Portugal. The two have no significant correlation either between TS and internationalization via FDI, although there are some links with export structure. Looking at the significant correlation, the label of "unstable" might be used particularly for Portugal and the fundamental argument is that this country has a very considerable number of negative associations, making it very difficult to find a clear explanation of its patterns; in our opinion, the basic factor is the relatively less developed character of its process of outward internationalization (Simoes, 1997).

To conclude this section, the preliminary analysis carried out helps us to define the existence of different models among European examples of relationships between internationalization and technological structure. Especially relevant for us is the similarity shown by Spain and Italy as well as the "inverse coherence" of Portugal. In spite of not being evidence to state definitively the relations of this behaviour with the "intermediate" character previously defined, we think these findings can enrich the way of understanding the meaning we confer to that concept in the present discussion of internationalization and its connection with technical change.

3. MNCS technology production and ICS.

Certainly the analysis of the consequences of that MNCS activity has on host ICS is a very complex matter . In

fact our aim is relatively modest because our contribution will be based on a twofold approach. On the one hand, we will take into account the heterogeneity of elements involved, gathering a relevant part of available information -unfortunately, not always does such information apply to ICS insofar as they are not usually considered as a separate group in most current research. On the other, we shall use the findings of recent research carried out about the Spanish case, combining national and foreign firms.

When we underline the limited character of these pages we bear in mind at least three main difficulties which surround the analysis. First, the multiple aspects involved in the relationships of MNCs' subsidiaries and local systems. There are, of course, direct relations, such as the resources devoted to technological activities, the links with parent companies and other affiliated firms and the connection with local suppliers or users. Nevertheless, there are many other indirect relations with economic and innovation

Figure nº 1

SPAIN ITALY

R&D R&D

FDII FDIO X FDII FDIO X

PS PS

UNITED KINGDOM HOLLAND

R&D R&D

FDII FDIO X FDII FDIO X

PS PS

FINLAND PORTUGAL

R&D R&D

FDII FDIO X FDII FDIO X

PS PS

GERMANY FRANCE

R&D R&D

FDII FDIO X FDII FDIO X

PS PS

3 or 4 significant correlations 2 significant correlations

1 significant correlation negative significant correlations

Source: own elaboration

systems including institutional agreements, demonstration effects and so on. Particularly important are those established through competitive mechanisms with other companies.

A second main difficulty arises from the fact that any country is actually a single experience which means any generalisation simplifies the reality . The complex picture of connections derived from the kind of relations above mentioned explains the significance of the differences even when considering nations whose development levels are not very different. In our case we wish to remark that there are some important dissimilarities in per capita income, industrial structure and degree of opening to external competition between Spain, Portugal and Italy; from many perspectives, Portugal and Italy are the extremes and Spain normally has an intermediate position. Therefore, any common pattern established for them must be only relative.

A third crucial element is the above mentioned deficit of empirical research in this field for the kind of countries in which we are interested here. The fact is it makes it very complicated to arrive at general conclusions and for that reason we have to reiterate the provisional character of the following pages.

Another aspect to take into account is the existence of "old" and "new" topics when analysing the impacts of the internationalization of the technological activity of MNCs. Thus, under the label of "old" we can consider part of the debate organised around the concept of "technology transfer" and the role of MNCs. As far as today's

issues are concerned, two are the relevant subjects to bring to the discussion: costs of technology transfer and the process of learning operating from that moment onwards. Regarding costs, the debate differentiates two types: direct and indirect (Stewart, 1981). The first referred to payments for technology while the second has to do with clauses and conditions imposed by the suppliers.

Inter-firm technology transfer between subsidiaries and parent companies is more significant than others taking place between independent parties as indicated by the high proportion of payment coming from affiliates (UNCTAD, 1987). This was a reflection of the preferences of technology suppliers towards fully controlling the assets transferred to overseas establishments (Chudnovsky,1991). Traditional studies of technological behaviour of affiliates was mostly focused on the question of payments. In addition to these explicit costs for the use of technological assets, other channels to transfer funds, like manipulation of the prices in which intra-firms trade took place, intra-firm loans and interest payments, divididends and the capitalization of technological assets or second hand machinery, etc., were found in several countries (Vaitsos, 1974, Chudnovsky, 1974, UNCTAD, 1972)

From a more general analytical perspective a debate was established over the conditions in which the effects of imported technology on the welfare of the importing countries would be higher than the costs paid for the technology. Katz (1976) arrived at the conclusion that the balance tended to be more positive when a) technology transferred has a significant effect on the level of domestics costs; b) final demand is less inelastic and c) the local subsidiary has a greater bargaining power.

A second part of the debate dealt with the learning process which follows the acquisition

of technology. The central question has to do with the discussion of the conditions which lead to a catching up dynamic (Katz, 1976). The crucial point is the complementary relationships between technology imports and local technology accumulation. The experience of East Asian NICs is relevant to underline the importance of using international transfer as a channel for actively investing in learning (Bell & Pavitt, 1994). This learning is more and more distinct from just "by doing" activity as a consequence of the increasing importance of other more complex ways of learning. Hence, we might derive a new force from the growing need of the subsidiaries' explicit R&D activities in spite of the fact that they receive the basic technology flow from parent companies.

3.1 Global data on the importance of MNCs' technological presence in ICS.

From several investigations we can approach some general features of the impact MNCs produce for ICS' economies. As far as the innovation process is concerned there are several points to remark.

* R&D statistics are not very useful because official ones usually do not give information broken down by kind of capital. Furthermore, general data on the weight of foreign firms versus domestic ones does not necessarily show an accurate picture, insofar as it depends on the importance of R&D in the respective systems of innovations. As we have suggested before, sometimes MNCs can be more important as importers of

both embodied (capital goods, intermediate matterials,etc) and disembodied (contracts, licences, etc.) technology. Nonetheless, we can state that MNCs constitute a very relevant part of national systems of innovations as can be deduced from separate data such as the followings: in Spain, firms controlled by foreign capital contribute with more than 50% to total business financed R&D, they also have more than 40% of the personnel devoted to those tasks (INE, 1997a). In Italy, MNCs are extremely important in the R&D activity of technology intensive sectors (Malerba, Orsenigo, 1995) - as in Spain (Molero, Buesa, Casado, 1995)- and in Portugal they are the central element in the process of foreign technology importation (Simoes, 1996) -in Spain too (Sanchez, 1984; Casado, 1995, Molero, 1996). Although with differences among the cases, a qualitative characteristic of MNCs' presence is that they are much more important for host countries in their process of technology creation than what these countries represent generally for international groups.

* Another piece of information to advance in the same kind of considerations is available in some studies which have collected data on the distribution of MNCs' R&D laboratories outside the home country. Thus, using the study of Warrant (1991) we can summarize some interesting findings. From a total of 618 R&D laboratories of industrial groups established abroad, Italy hosted 23 (3,7%) and Spain 12 (1,9%). In addition, Italy was the home for 13 of those centres while Spain was not home for any of them. Portugal has no representation in any of the statistics. In order to compare previous data, we can mention that France was host for 8% of the laboratories, UK 10,7%, Germany 12%, Belgium 1,9%, Holland 4,2%, Ireland 0,2% and Denmark 0,5%.

* Patents offer a more detailed possibility to draw a general picture, although the main problem is that only Italy is included in most available studies. There are different works to be considered, including seminal contributions by Patel and Pavitt, using US patent data (Patel, Pavitt,1991; Patel, 1995, Pavitt, 1997) and others which have used data from the European Patent Office (Barré, 1996). In all of them the relevant issue is how important are technological activities of foreign actors in the national systems; thus, with USA information, we know foreign firms represent 11,9% of national technological activity during 1990-1994 (Patel, Vega, 1997) and in Italy it is below that average with only 9,6%; European data show a relatively lesser importance of foreign firms because they only patent 4.9% of national totals in 1991-1993 (Barrè, 1996). While in Italy the percentage is a little higher, 6,2%.

As has been said (Patel, Pavitt, 1991; Patel, 1995, Pavitt, 1997), the degree of foreign participation -as well as the participation of foreign subsidiaries of local multinationals- is associated with the size of the country, so small ones like Belgium or Netherlands usually show the higher importance of foreign technological activity, while Germany or France - not to mention USA or Japan with even lower levels of "internationalization"- have a lesser proportion of their national patents made by foreign multinationals. However, size is not the only variable we want to take into account in this paper, so we have found very useful the index calculated by Barrè (1996). He considers simultaneously percentages of patents by resident inventors for foreign firms (INW-IIN) and those of patents by foreign inventors among total patents controlled by domestic firms (Outward IIN). This indicator "compares the volume of foreign networks in the country to the volume of networks controlled but located abroad. Ratios under 1 mean the country is a net importer and ratios over 1 mean it is a net exporter. From the countries analysed he arrives at the conclusion that "only three countries - Netherlands Switzerland and United States are net importers(...) on the other side, Italy, Canada and Belgium are the larger exporters of technology". (Ibid., page, 214). Italy, in fact, has the highest ratio: 3,1; domestic inventors give three times more to MNCs than what Italian MNCs get from laboratories abroad.

In the same direction Barré makes a further step. His aim is to analyse the mutual influence of MNCs and national systems. For that purpose he correlates technological indexes of specialisation (revealed technological advantages) of the countries (nDOM) with technological specialisation of foreign MNCs operating in a country (nINW) and technological specialisation of MNCs of a country operating abroad (nOUT). The estimation of different regressions between the three vectors of technological specialisation gives very interesting results which allow us to establish a typology of the cases among the 12 cases studied. Thus, as table 3 indicates, there are four major types of country profiles (Barré, 1996. Page 217):

* Type A. (UK. Canada, Belgium, Italy). "Has very significant inward IIN. It is so embedded in the NSI that its technological orientation is highly correlated with it. The volume of inward IIN is much higher than that of outward IIN, indicating significant exports of technological activities". The case of Italy as Subtype A2 is important because its differs in the scarce use it makes of outward IIN. For both cases Barrè raises the question of long term internal coherence of NSI.

* Type B. (Netherlands, Switzerland, Sweden). "Has important outward IIN which constitutes an extension of the NSI. Foreign MNCs have only small INN in the country.

* Type C. "Has very limited (subtype C1- Japan) or rather limited (subtype C2- Germany, France, EU) IIN in relation to the size of the NSI. This type exhibits balanced or moderately oversized IINs. The inward IIN are not correlated with NSI. This tends to show that foreign MNCs have a strategy of local adaptation or limited home country centralisation in this countries.

* Type D. (USA) "has limited inward IINc, developed with strategy of international division of labour (see footnote 6) by foreign MNCs, and significant outward IINs, developed witP>

Coming to the European cases, and remembering our findings of section 2, We wish to underline the coherence of Germany and France again as the only European examples of a relation with technological internationalization and the especially weak situation of Italy. As in our analysis it is more difficult to reach clear conclusions for other types of countries, especially those whose small size determines their international position in a considerable proportion.

Table nº 3

Country types with respect to the technological strategies of MNEs

	Countries as **host** of subsidiaries of foreign MNEs	Countries as **home** of MNEs with affiliates abroad	Balance of volumes	Countries

	Volume	Correlation of specialisation	Volume	Correlation of specialisation		
Type A1	++	++	+	+	++	UK, Canada, Belgium
Type A2	++	++	-	+/none	++	Italy
Type B1	+	+/none	++	++	-	Netherlands, Switzerland
Type B2	+	+	+	++	0	Sweden
Type C1	-	none	-	+	+	Japan
Type C2	+/-	none	-	+/none	0/+	Germany, France., EU
Type D	-	+	+	none	-	United States

Source: Barré, 1996.

3.2 .Analysis of MNCs' technological behaviour at firms' level.

There are interesting studies carried out to explore the technological activities of R&D laboratories abroad, as well as the kind of factors influencing either the decision to establish those centres in other countries or the type of activities to develop (Pearce, Singh, 1992; Casson, 1991; Granstrand, Hakanson, Sjolander, 1993, Papanastassiou and Pearce, 1994). Thus, from the contradictory forces which operates, factors related with local demands or products adaptation are more important for a majority of firms in a majority of countries, while supply factors like the availability of technological resources, are more uncommon. However, from the perspective of this paper, there is little research done from host countries. Thus in the following pages we are going to summarize some findings of different studies carried out in Spain about the technological activity of MNCs.

To achieve it we have two complementary kinds of studies: one related to different strategies followed by MNCs' affiliates and another one in which we compare those strategies with those of domestic firms. The first allows us to know the diversity of situations among affiliates and to map the patterns of differences which determine their influence on national systems; the second will help us in the understanding of that influence through the establishing of those principal differences foreign affiliates have vis-a-vis domestic innovatory firms.

3.2.1 Technological strategies of MNCs.

Within the first type of discussion, we wish to underline as a fundamental fact, that affiliates behave very differently among themselves. The investigations we have made on German and Dutch subsidiaries (GS, DS)

led us to the following general conclusions (Molero, Buesa, Casado, 1995):

1.- Parent companies are the main suppliers of product technology. As far as process technology is concerned, the position is more balanced between parent companies and subsidiaries. That close technological relationship is not extended to firms outside the group. It is especially true with regard to other Spanish firms and a little more pronounced in the case of DS.

2.- There is a majority of Spanish subsidiaries which do not develop R&D programmes. Nonetheless, the number of firms with this sort of task is not negligible: in both cases it is close to 44% of the corresponding samples.

3. The estimated average level of R&D effort is 1.86% of sales volume for GS and a little lower for DS: 1.5%. In both cases, it is clearly higher than the average behaviour of local firms (Molero & Buesa, 1993). However we do not see a parallel higher level of resources as far as personnel is concerned. In cases for which there are available comparative data, we have proved that effort is significantly lower than that of other subsidiaries in most advanced counties (Wortman, 1991).

4. About R&D objectives, both studies show a very similar pattern followed by DS and GS; the highest emphasis is put on product development and improvement while other tasks related to process technologies or imported technology adaptation occupy secondary positions.

5. Both GS and DS are quite active in introducing products and processes (see Molero, Buesa, Casado, 1995. Table 4). DS are even more dynamic, which puts them in a very different position among all studied cases. From a general point of view, two features summarize the behaviour of our two samples. First, they confirm the greater technological activity of MNCS in comparison to large Spanish firms. Secondly, DS and GS behave very similarly to most active Spanish companies. One must be cautious in drawing conclusions. In fact we think a twofold interpretation can be proposed. On the one hand, those results confirm the crucial role of MNCS in the current technological pattern. On the other hand, one must emphasise that the consequences for the Spanish system of innovation are different, depending on the way in which innovations are produced. If the Spanish subsidiary only plays a passive role in incorporating product or process innovations, the faster dynamism they present can have a much lower impact on our technological capabilities than the one derived from a local activity even though it is slower.

6. In spite of the basic similarities we have commented on, there are some by no means negligible differences between both collectives regarding their degree of innovativeness. We suggest three arguments to explain the differences we have pointed out.

1) The sectoral distribution of the firms which directly affects technological opportunities and their degree of appropriability.

2) The technological strategies adopted by firms that may belong to the same sector.

3) The propensity to import. Because through imports some products or processes not available from inside the firm can be incorporated.

7. To finish this section we want to make some comments on the typology we made for delving deeper into the GS variety. It was possible because we had regular information from a substantial number of parent companies which not only complemented information coming from our questionnaires and interviews, but also helps us in qualifying the answers of the subsidiaries (Molero & Buesa, 1993). First, the degree of internationalization of subsidiary production. We approached it through the company participation in the production of the group, complemented by considerations on the technological level of the company and the origin of the technology they use; see lines 1 to 4 of table nº 4.

Secondly, we used data on the company dynamism in incorporating new products and processes. As table nº 4 shows (see line 5), there is a sort of inverse relationship between the speed of innovation incorporation and the technological effort made by the subsidiary.

The third element refers to market positions, either domestic markets or exports (see lines 6 and 7 of Table 4). The outstanding relation arises between the rate of new incorporations and domestic market positions. The higher the first, the lower is the second.

Adding other complementary information, we reach a taxonomy in which three basic traits can be outlined.

* One is the very particular case of subsidiaries having a Partial Technology Autonomy; any attempt at analysing them as a homogeneous totality is condemned to misunderstand their complex position.

* A second basic trait is reflected in the Passive Adaptation type. They operate on the basis of an external flow which allows them to incorporate innovation rapidly. Nevertheless, the technological level and effort are low. Thus, in spite of the possibility of new incorporations, their market positions are modest in comparison to that of other subsidiaries.

* Finally, the greater the technological effort and level, the higher is the participation in group activities and the stronger are the market shares.

3.2.2. A comparative analysis of MNCs versus domestic firms.

In a previous study (Molero, Buesa, Casado, 1995) we made a first attempt at comparison between foreign and domestic firms in their way of creating, using and transferring technology. Then we used a sample of 151 innovatory companies from the Madrid region, 27 of which were controlled by foreign capital. Some provisional results showed in most aspects the corresponding behaviour presents a great similarity; thus, the contrasts we established were based on qualitative shades of a relatively similar pattern. Nonetheless, we had in mind some restrictions of the analysis, mainly the small number of foreign firms which eluded any comparison broken down by size or sectors.

Now we have the opportunity to reinforce that methodology because we have had access to a greater database of innovatory firms, this time corresponding to 1354 firms which during a period of 10 years (1984-1994)

had financial support from the CDTI (the largest Spanish agency for technological development). This sample, although it is not a random one, collected a great part of Spanish innovatory firms. The survey was answered by 545 firms, 99 of which (18,2%) are foreign, and allow us to carry out analysis with subgroups of firms. In the survey we included a rather large number of questions related to technological activities of the firms as well as to the importance they give to significant parts of that activity; Molero et al (1997b) explains in detail the content of the survey.

In order to improve the reliability of the results of the former work we have followed a three-step method:

* First, we have classified all answers in separate groups (National -N- and Multinational -MN) and we have estimated statistical measures (X^2) of the similarities of corresponding distributions. Thus, we can have a preliminary approach to the kind of items which appear to be different for the two clusters.

* Second, we have estimated Discriminant models between N and MN firms. Variables incorporated in the models are those which were significant in the first stage, plus some others of especial interest in this work; this method allows us to filter the very large number of variables included formerly. Afterwards we calculated other Discriminants for groups of N and MN firms according to their size and sector. The aim is to control the effect of these two variables on the behaviour of the companies.

* Finally, in order to have a more powerful analysis, we have estimated Logistic regressions (LOGIT) between the same groups used in the previous step and with variables which Discriminant analysis have selected. In the presentation of the results we shall show these Logit models insofar as they always confirm Discriminants, although with some secondary modification.

Results of the first step are shown in table 5 in which we list all variables with their statistical significance level. In the third column we comment on the real meaning of statistically verified differences; additionally we mark *same* if the result goes in the same direction of the previous one obtained in Molero, Buesa, Casado (1995).

Two general findings are highlighted from table 5. First, there are not many variables which can suggest the existence of radically different patterns among innovatory firms in spite of the kind of ownership. In fact, as we advanced in 1995, the general pattern is very similar in the two subgroups; in other words, we state MNCs subsidiaries perform a model of technological change very similar to Spanish innovatory companies, perhaps exploiting similar institutional and economic advantages. Second, a large number of the differences confirm what we obtained in other research.

The most interesting differences can be summarized as follow:

* Regarding *structural and economic variables*, foreign innovatory firms are clearly larger, older and more open to international competition, have better international competitive positions and different sectoral distribution.

* *Technology sources* are more oriented to internal learning in national companies, especially in product technology. Design activities show higher importance in MNCs' subsidiaries. National firms usually have smaller innovation teams although they made a more intense financial effort.

* *Objectives of innovation* are very similar, although national firms have greater interest in improving existing products. Users and suppliers seem to play similar roles in the process of innovation of both clusters. With regard to types in R&D, national firms carry out basic research more often. Collaboration with firms of the group is higher in MNCs' subsidiaries while domestic companies collaborate more with other kind of firms and with public universities or public research centres.

* There are not significant differences in the *rate of introducing innovations.* Similarly there is a great parallelism in the kind of innovation obtained; the exception is that foreign firms get more products after modifying existing ones. Activities of transferring technology to other Spanish firms is very similar, albeit national companies seem more active in licensing "utility models". Regarding other foreign firms, national group show a less active activity in selling capital goods.

Table nº 5

COMPARATIVE ANALYSIS BETWEEN NATIONAL AND FOREIGN FIRMS

	VARIABLES	**X2 TEST**	**COMMENTS**	
	Size	**Significant ***	Foreign firms are larger than Spanish (same)	
	Sector	**Significant ***	National and foreign innovatory firms have different sectoral presence (same)	
	Year of firm's establishment	**Significant ***	Foreign firms are older (same)	
	Year of control by present partners			
VERSUS	Products quality	not significant		
NATIONAL	Price of the products	not significant		
COMPETITORS	Services to the customers	not significant		
	Sales position	**Significant #**	Foreign firms have better commercial positions	
	Technological level	not significant		
VERSUS	Products quality	not significant		
FOREIGN	Price of the products	**Significant ****	Foreign firms have better prices than nationals	
COMPETITORS	Services to the customers	not significant		
	Sales position	**Significant ***	Foreign firms have better commercial positions	
	Technological level	**Significant ****	Foreign firms have better technological level (same)	

	Leadership in his market	not significant		
	Product technology autonomy	**Significant #**	National firms are less dependent on external sources (same)	
	Process technology autonomy	not significant		
KIND OF	R&D activities	not significant		
INNOVATORY	Industrial design activities	not significant		
ACTIVITIES	Production engineering activities	not significant		
	R&D activities	not significant		
IMPORTANCE OF...	Industrial design activities	**Significant #**	Foreign firms give more importance to Design as a source of technological learning (same)	
	Production engineering activities	not significant		
	Industrial experience & learning	not significant		
	R&D effort (on sales)	**Significant #**	National firms devoted more resources	
EFFORT IN	Other innovatory activities effort	**Significant #**	National firms devoted more resources	
INNOVATION	R&D personnel	**Significant ***	Foreign firms have more personnel	
	Personnel in other innov. activities	**Significant #**	Foreign firms have more personnel	
OBJECTIVES OF	Development of new products	not significant		
INNOVATION	Improve in existing products	**Significant ***	Foreign firms give less importance to product improvement	
(IMPORTANCE OF...)	Development in new processes	not significant		
	Improve in existing processes	not significant		
	Adaptation of acquired technology	not significant		
	Other objectives	not significant		
ROLE OF...	Users role in innovatory activities	not significant		
	Suppliers role in innovatory activities	not significant		
	Basic research	**Significant #**	National firms carry out more basic research	
IMPORTANCE OF...	Applied research	not significant		
	Technological development	not significant		
	Only in the firm	not significant		
IMPORTANCE OF...	Collaboration with public institutions	**Significant ***	National firms collaborate more frequently (same)	
	Collaboration with firms of the group	**Significant ***	Foreign firms collaborate more actively within the group (same)	
	Collaboration with other firms	**Significant ****	National firms collaborate more frequently (same)	

	New products (% of sales)	not significant		
	New processes (% of sales)	not significant		
	New products (% of exports)	**Significant #**	Foreign firms incorporate more proportion of new products in their exports	
	New processes (% of exports)	not significant		
	Totally new products	not significant		
INNOVATIONS	Totally new processes	not significant		
OBTAINED	New products for the firm but not for	not significant		
IN THE LAST	the market			
FIVE YEARS	Modified products	**Significant ****	Foreign firms get more modified products	
	Modified processes	not significant		
	VARIABLES			
	Patents	not significant		
	Brands, designs	**Significant #**	National firms give more licences (same)	
TECHNOLOGY	Technical assistance	not significant		
TRANSFER TO	Installations and factories	not significant		
NATIONAL	Equipment goods	not significant		
FIRMS	Software	not significant		
	Others	not significant		
	Patents	not significant		
	Brands, designs	not significant		
TECHNOLOGY	Technical assistance	not significant		
TRANSFER TO	Installations and factories	not significant		
FOREIGN	Equipment goods	**Significant ****	Foreign firms sell more capital goods (same)	
FIRMS	Software	not significant		
	Others	not significant		
INDUSTRIAL	Number of patents	not significant		
PROPERTY IN THE	Number of models	not significant		
LAST 5 YEARS	Number of brands	**Significant #**	Foreign firms register brands more frequently (same)	
	Number of industrial design	not significant		
	Patents	not significant		

IMPORTANCE OF	Utility models	not significant		
FOR APPROPRIATING	Brands	not significant		
TECHNOLOGICAL	Industrial designs	not significant		
RESULTS	Industrial secrecy	not significant		
	Regularity on innovation	not significant		
	FDI	not significant		
	Number of sales subsidiaries	not significant		
INTERNATINALIZATION	Number of production subsidiaries	not significant		
VARIABLES	Licensing to foreign firms	not significant		
	Technical assistance to foreign firms	not significant		
	R&D centres in other countries	**Significant ***	Foreign firms have more R&D centres abroad	
	Participation in internat. programmes	not significant		
	Export propensity	**Significant ***	Foreign firms are more open to foreign trade(same)	

Note: *= significant at 0.01: ** significant at 0.05: # significant at 0.10

Source: own elaboration

* There is also considerable similarity in activities of *protecting industrial rights*; only foreign ones are more active in registering "utility models". When considering the importance of different ways of appropriating the results of innovation, national firms give less importance to regularity than MNCs' subsidiaries.

After this first analysis, it was the opportunity for an in depth study in a twofold direction. On the one hand, it is important to know how previous variables behave when they are taken together; this can be approached through multivariate techniques such as Discriminant and Logit. On the other, we have to try to isolate the effect of sector and size on the differences. If, as has been expounded, the two groups differ considerably in these two features, it is probable that a part of general differences are due to sectoral or size effects. To deal with it, we have divided the sample into several subsamples according to the sector of activity or the size of the firms. Thus, the analysis carried out for the global sample has been repeated for large, small or medium companies and for different branches.

Variables used in Discriminant analysis come from the association study plus some others which, although they were not significant in that analysis have a considerable importance for knowing the relation of the firms with the system; that is the case of variables measuring collaboration or patenting. They are listed in table nº 6. As we said, results from these discriminants have been validated through later logistic regressions which give us a causal approach and does not restrict the linear condition imposed by the discriminant. Results are shown in tables 7 to 15. The basic considerations we can make are the following:

From 42 variables only 7 discriminate the belonging of the companies to the groups. As a general consideration, this confirms what has been said with regard to the similarities of the innovatory activities in these clusters of firms. Logits keeps the significance of the variables, so table 7 allows us to state that MNCs' subsidiaries differ from national because they collaborate more with other firms of a group and they are more active in transferring technology to foreign firms via selling capital goods. On the contrary, domestic innovatory firms expend more resources in R&D, look more actively for product improvements, collaborate more with firms not belonging to the same group and give more importance to the transfer of technology to Spanish companies via non-patent licences and to other foreign ones via plant building.

The analysis by sizes reveals there are no significative differences in the group when considering firms under 250 employees, either considered as a single group or if we break down the sample in groups (less than 100 and from 100 to 250 employees).

Nevertheless, there are signficative differences on analysing medium firms (250 to 500) and, particularly, when we take into account only large companies (more than 500). Two common elements can be emphasized: first, the more concrete the analysis is, the lower is the number of discriminating variables and, second, the list of variables, with some exceptions, changes from one case to another. In our opinion it is a reflection of the importance of the sector in unifying innovation conditions and it is a confirmation of the already exposed "relative" -instead of "absolute"- character of the differences.

With regard to size, we can underline that medium firms are much more similar than large ones. In fact only three variables explain the activity of foreign versus national firms: in two cases - the collaboration with universities and public centres and the existence of production engineering activities as part of the innovatory process- domestic companies are more active than subsidiaries of MNCs. However, the latter ones collaborate more often with group's firms.

Table nº 6

Variables included in multivariate analysis

VARIABLE	**DESCRIPTION**
DESIGN	Industrial design activities carried out in the firm
INGPRO	Production engineering carried out in the firm

RDREL	Relevance of R&D activities
DESIGNREL	Relevance of design activities
INGPROREL	Relevance of production engineering activities
EXPEREL	Relevance of industrial experience
RDEXPEND	R&D expenditures over sales (%)
OTHEXPEND	Other innovation expenditures over sales (%)
NEWPROD	New product as objective of innovatory activities
PRODIMPROV	Product improvement as objective of innovatory activities
USERS	Relevance of users for innovation
SUPPLIERS	Relevance of suppliers for innovation
UNIVCOLL	Relevance of collaboration with universities or public laboratories
GROUPCOLL	Relevance of collaboration with firms of the group
OTHERCOLL	Relevance of collaboration with other firms not belonging to the group
NPRODINT	% of new products on total sales
NPROCINT	% of products made with new processes on sales
NPRODEXP	% of new products on exports
NPROCEXP	% of products made with new processes on sales
WORLDPROD	World level new product in the last 5 years (yes or no)
WORLDPROC	World level new process in the last 5 years (yes or no)
FIRMPROD	Firm level new product in the last 5 years (yes or no)
MODPROD	Essentially modified product
MODPROC	Essentially modified processes
PATLICEN1	Patents licences to national firms
OTHLICENC1	Other licences to national firms
ASSISTANCE1	Technical assistance to national firms
PLANTBUILD1	Plants construction for national firms
CAPGOOD1	Capital goods supply to national firms

SOFTWARE1	Software supply to national firms
PATLICEN2	Patents licences to foreign firms
OTHLICENC2	Other licences to foreign firms
ASSISTANCE2	Technical assistance to foreign firms
PLANTBUILD2	Plant construction for foreign firms
CAPGOOD2	Capital goods supply to foreign firms
SOFTWARE2	Software supply to foreign firms
NOPAT	Number of patents in the last 5 years. Normalised by sector mean.
PATREL	Relevance of patents for results appropriation
SECRETREL	Relevance of secrets for results appropriation
REGULAREL	Relevance of regularity for results appropriation
PRODAUT	Product technological autonomy
PROCAUT	Process technological autonomy

The situation is different among large firms. Within this size, clusters are the most clearly differentiated. Two characteristics linked to technology transfer have the most powerful discriminating strength: in one case -technical assistance to other foreign firms- national firms have stronger positions while in the other - software to national companies- subsidiaries give more importance to that way of transferring technical knowledge. With less force, albeit significantly enough, we have another variable in which foreign firms are more active - the role of users in innovation- and another three showing higher results for national firms - expenditures in non R&D innovatory activities, collaboration with firms outside the group and product technological autonomy.

TABLE Nº 7

LOGIT BETWEEN FOREIGN AND NATIONAL FIRMS **(TOTAL)**

VARIABLES	ß	SIGNIFICANCE
RDEXPEND	-0.27	0.010
PRODIMPROV	-0.22	0.011
GROUPCOLL	0.62	0.000
OTHERCOLL	-0.17	0.040
OTHLICEN1	-2.08	0.050
PLANTBUILD2	-1.15	0.019
CAPGOOD2	1.29	0.002

Chi Square= 104.905 significance= 0.000 % cases correctly classified= 83.49

TABLE Nº 8

LOGIT BETWEEN FOREIGN AND NATIONAL FIRMS (**LARGE**)

VARIABLES	ß	SIGNIFICANCE
OTHEXPEND	-1.26	0.011

USERS 1.34 0.002

OTHERCOLL -1.38 0.001

ASSISTANCE2 -5.02 0.001

PRODAUT -0.06 0.005

Chi square= 47.075 significance= 0.000 % cases correctly classified= 88.06

TABLE Nº 9

LOGIT BETWEEN FOREIGN AND NATIONAL FIRMS (**MEDIUM**)

VARIABLES ß SIGNIFICANCE

INGPRO -1.25 0.025

UNIVCOLL -0.72 0.0004

GROUPCOLL 0.69 0.0011

Chi square= 32.857 significance= 0.0000 % cases correctly classified= 85.33

TABLE Nº 10

LOGIT BETWEEN FOREIGN AND NATIONAL FIRMS (**CHEMICALS**)

VARIABLES	ß	SIGNIFICANCE
PRODIMPROV	-1.84	0.04
GROUPCOLL	0.82	0.02

Chi square= 26.812 significance= 0.0000 % cases correctly classified = 85.37

Sectoral analysis confirms very definitely the statement of the existence of greater similarities within any branch. In fact, no more than three variables discriminate well in each case. A general view of the findings can be given:

* From all variables related to technological autonomy and different ways of developing the inner technology only PROAUT discriminate between groups in Mechanical Machinery and Equipment, with a greater value for domestic companies.

* In two cases variables related to innovation effort appear as significant. OTHEREXPEND is more important in foreign firms within the Electronic Industry and RDEXPEND has higher value in the national group of Services to Firms.

* Those variables measuring the importance of several innovation goals perform similarly within the groups except in Chemicals and Pharmacy in which the improvement of existing products (PRODIMPROV) has a more important presence within national firms.

* Users and suppliers seem to play similar roles in all the cases.

* Variables related to collaboration are among the ones with higher discriminating power. In fact, the more active collaborative attitude of foreign firms with other companies of the group (GROUPCOLL) is significant in 4 of the 6 cases. To a considerable extent it is a simple consequence of their more frequent belonging to a group. Moreover, OTHERCOLL -collaboration with other firms- separate well the groups in Pharmacy where domestic companies carry out this activity more frequently.

* Results of innovative activity appear as significantly different in Food and Beverages. In this sector, the introduction of products made with new processes (NPROCINT) is more important in Spanish firms. In addition, the importance of new products on sales (NPRODINT) is more relevant for national companies.

* Types of innovations actually achieved do not differentiate the groups in any of the sectors.

* Activities for transferring technology to other foreign organizations have some differences between the clusters. Thus, MNCs' subsidiaries are more active than national ones in selling capital goods (CAPGOOD2) in Electronics and in selling software (SOFTWARE2) in Services.

* Regarding patenting, only in Pharmaceuticals, foreign firms show greater levels (PATENTS). With regard to methods of appropriation, only in Food and Beverages is keeping secrets (SECRETREL) more valued by MNCs subsidiaries.

TABLE Nº 11

LOGIT BETWEEN FOREIGN AND NATIONAL FIRMS (**PHARMACY**)

VARIABLES	ß	SIGNIFICANCE
PRODIMPROV	-1.46	0.01
OTHERCOLL	-1.04	0.08
PATENTS	1.04	0.09

Chi square= 20.436 significance= 0.0001 % cases correctly classified= 84.85

TABLE Nº 12

LOGIT BETWEEEN FOREIGN AND NATIONAL FIRMS (**MECHANICAL MACHINERY AND EQUIPMENT**)

VARIABLES	ß	SIGNIFICANCE
GROUPCOLL	0.55	0.07
PRODAUT	-0.05	0.03

Chi square= 16.06 significance= 0.0003 % cases correctly classified= 93.75

Chi square= 29.99 significance= 0.0000 % cases correctly classified= 88.57

TABLE Nº 14

LOGIT BETWEEN FOREIGN AND NATIONAL FIRMS (**FOOD & BEVERAGES**)

VARIABLES	ß	SIGNIFICANCE
GROUPCOLL	0.81	0.009
NPROCINT	-1.45	0.01
SECRETREL	1.02	0.005

Chi square= 22.88 significance= 0.0000 % cases correctly classified= 90.16

TABLE Nº 15

LOGIT BETWEEN FOREIGN AND NATIONAL FIRMS (**SERVICES TO FIRMS)**

VARIABLES	ß	SIGNIFICANCE
RDEXPEND	-1.20	0.04
NPRODINT	-1.55	0.07
SOFTWARE2	4.87	0.01

Chi square= 22.44 significance= 0.002 % cases correctly classified= 90.48

4.- Technological capabilities and internationalization of ICS' companies.

Certainly the discussion we have had would be incomplete if we do not devote some attention to what we see as the other side of the coin: the process on international expansion of ICS' firms and the role played by technological capabilities. As we underlined before, we must take into account the existence of important differences in the level of internationalization on establishing parallelisms. To discuss this particular topic we shall begin by summarising some of available findings from several research on Portugal, Spain and Italy and will continue with some recent material on the Spanish case.

The Portuguese case has been well studied by Simoes who in two recent works (1996, 1997) dealt with the process of internationalization of Portuguese enterprises. He combined a larger statistical study from an important survey carried out by Portuguese industrial association (Simoes ,1997) with a longitudinal research done with 21 firms selected with sectoral representation criteria (Simoes, 1996). For the purposes of our debate, the main conclusions are the followings:

a) Portuguese firms are in the take-off of their internationalization processes and an increasing number of SMEs is becoming engaged in more complex international business operations, including investments abroad. The issues faced by an experienced multinational enterprise in the management of international assets are, in most instances, substantially different from those of an SME in this first stages. To a great extent, SMEs can not carry out this process with their only resources, so international cooperation achieves a considerable importance for many enterprises to enter into that new world, although this that not mean that cooperative agreements are always beneficial for the SMEs.

b) The analysis of 21 single experiences shows a clear association between attitudes towards internationalization and pro-active attitudes towards innovation, either in general or with regard to commercial innovations. Nevertheless, there is an important group of firms which are very active in the area of innovation but exhibit a very low degree of international involvement. As the author says "it appears that their small size and the scarcity of resources (financial and human, especially in the marketing area) significantly undermine their capability to engage in international business operations" (page 11)

c) The longitudinal analysis of each case shows there are very different patterns of internationaliztion without an easy way of establishing stages or sequences all firms follow. On the contrary, there are trajectories which combine in different ways different opportunities of international markets with firms' capabilities.

d) A crucial factor in allowing international expansion has been the access to foreign technology through different mechanisms. It has been demonstrated learning from that importation has played a crucial role in some Portuguese firms in their process of internationalization, particularly among firms exporting some licences or technological services (Simoes, 1997). However, not all importations followed the same path so it is very important to know some of the factors explaining the success of learning in some firms versus others. Among other issues, two are explicitly quoted by the author. Thus, the (almost) absence of territorial restrictions on the commercialization of the products enabled some firms to enter international markets. Additionally, "the establishment of a positive link between the supplier and local customer; it this happens, the relationships may be replicated in foreign environments. The mutual knowledge and the trust accumulated though a lasting cooperation in the domestic market generates bonds between the two organisations" (Simoes, 1997. page 20).

On researching systematically the influence of technological factors on internationalization decisions, results are not very definitive. In fact, a majority of firms give only a medium importance to that factor. Two important elements are implicit there: first, many technologically intensive SMEs are not included in the sample (it only covers largest firms) so, their experience is not well captured; second, respondent firms have a basic experience in which internationalization has to do much more with other elements of companies' capabilities; technology is so much embedded that makes very difficult to make explicit its influence on other competitive advantages.

For the Italian case there is a recent study by Archibugi et al (1997) in which he deals directly with the issue of internationalization from a data base of 3852 manufacturing Italian firms. Three forms of internationalization are considered: commerce, FDI (outward and inward) and collaboration agreements. Two aspects highlight from this research. One refers to the analysis of the behaviour of innovatory versus non-innovatory firms within each form of international activity. The second has to do with relationships existing among all innovation and internationalization variables.

As far as the first point is concerned, several important findings arise from the research.

A) The relationship between innovation and exportation is well sustained by the data. Thus, the statistical association -measured by the Q of Yule- is highly significant. However, the importance of a group of innovatory firms which do not export is not negligible: 811 companies from a total of 3190 (25.4%). Additionally, the sectoral break down of that association reveals the link is stronger in high technology branches such as Pharmaceuticals or Telecommunications and it is less strong in traditional sectors. Moreover, the analysis by sources of innovation shows the association is more significant for R&D à exports than for Patents&brands à exports and Investment à exports .

B) The comparison of innovation with FDI also confirms the existence of a positive and significative association, although the value of the Q is lesser than is the case of commerce. In this example the number of innovatory companies without this form of internationalization is greater; up to 86,5% of innovatory firms does not have subsidiaries abroad. As in the case of exports the association is better when it is calculated for firms doing R&D activities and worse for firms innovating through other sources.

C) Relationships between innovation and collaboration agreements are also important and statistically significant. Here the number of innovatory firms which does not carry out this activity is even higher; up to 87.8% of innovative companies do not develop any technical-productive agreement.

As in the Portuguese case, associations are extremely good if we consider the number of firms carrying out any form of internationalization; in all cases a great majority of companies involved in international activities develops innovatory taks. The opposite not always is true; we have pointed out that a non negligible number of innovatory enterprises is not engaged in pro-active international strategies. Further on we shall prove how this is the case in Spain too.

The simultaneous consideration of all variables confirms the good association of the two processes, and put a rather important question for policy maker insofar as it is a common phenomenon in all cases included in this essay. Furthermore, Archibugi underlines the importance of the association between R&D and exports

which means that also for Italian innovative companies foreign trade has been the most relevant form of entering into international competitiveness and for exploiting their technological capabilities (Archibugi et al, 1997, page, 277).

Regarding the Spanish case, there are different studies showing how R&D effort is a significant factor explaining the internationalization of Spanish economy via outward FDI either from a global perspective or analysing the sectoral behaviour (Martin &Velazquez, 1996; Molero, 1996). Very frequently that fact is exposed as the confirmation of the eclectic approach insofar as R&D is assimilated to a proxy of company' advantages. Despite there is little research done at the firm level, there is useful research as far as commercial expansion is concerned; thus Alonso & Donoso (1994) indicates R&D does not discriminate well among firms when we try to analyse their behaviour towards exportation; as they say, still today many exporting Spanish companies do not consider technological effort as an strategical variable. Moreover, technological learning is operated in a majority of cases via other non R&D ways, so that indicator does not meet adequately the technological upgrading of the firms in a recent period. Other research done at company level had to do with technology exports and they found a close link between technological effort - even measured by R&D- and exportation of technology in different ways (Sanchez & Vicens, 1991).

In spite of this partial evidence we had not comprehensive studies. In a recent paper (Molero, 1997) we tried to approach that subject in a monographic research with a sample of innovatory firms from Madrid region to which we sent an specific questionnaire about their international activities, including commerce, investment and technology. Basic findings of that work allow us to have a preliminary knowledge on the relationships between innovation and internationalization. Unfortunately we had not a complementary sample of non-innovatory firms, so we can not compare the activity of technologically active firms versus non active firms; what we are able to analyse is the behaviour of innovatory firms in different aspects of the internationalization. Let us comment briefly the outstanding facts.

A) First of all, there is a considerable number of innovative companies which are not enagaged in any international activity. As table nº 16 shows it can be confirmed with a more recent and larger sample: up to near 20%. As in Italy and even more in Portugal, this is an important phenomenon to consider: why some firms with valuable technological capabilities are not involved in active processes of international expansion.

B) In a more concrete form, we have compared systematically clusters of firms according to different levels of internationalization. Using multivariate techniques, we have found significant factors discriminating the belonging to opposed groups. Among others, technological dynamism plays a relevant role in upgrading the level of internationalization of the firms, what allow us to reafirm the existence of a positive relationships between those two central variables (Molero, 1997).

Table nº 16

INTERNATIONALIZATION OF SPANISH INNOVATORY FIRMS*

Firms' size (nº of employees)	Probability to export	Probability to FDI**	Probability to licensing	Probability to technical assistance	Probability to R&D laboratories	Probability to interantional R&D Prog.
Up to 50	65.30	15.10	7.80	30.10	1.80	23.70
51 to 250	87.00	28.80	13.00	34.20	2.70	29.90
251 to 500	93.30	48.00	22.70	54.70	10.70	42.70
more than 500	91.00	47.80	22.40	55.20	7.50	61.20
TOTAL	79.60	28.30	13.40	37.90	4.00	33.00

* = Number of firms doing each activity/ total number of firms, in percentages.

**= Included commercial and productive subsidiaries

Source: own elaboration

C) The hypothesis of the existence of a learning process in the internationalization -as the Upsala school and others assert- cannot be confirmed if we consider it in a restricted perspective. However, if we have a more flexible approach in which the existence of trajectories of internationalization does not imply the following of particular paths by every firm, the results confirm, at least partially, that thesis.

A further step on the same direction is the undergoing research we are doing within the TSER programme (Molero et al , 1997b). In this current work we are using the sample we mentioned before, referred to CDTI's innovatory firms. As we have information for their international activity we can compare several aspects. Although we do not have final results we can advance some interesting findings in two aspects: the relations between innovative intensity and different ways of enterprises' internationalization and the differences among firms according to their membership of national or foreign clusters.

With regard to the first point, we have estimated χ^2 tests among the distribution of internationalization variables according to the levels of intensity either of R&D or other innovation tasks. As table 17 clearly shows there are two way of firms' internationalization mechanisms which are very closely related to the explicit effort of the companies: export propensity and participation in international R&D programmes. To a considerable extent, these findings reinforces two aspects of Spanish and other ICS' firms: the most clear method of entering into the international economy and exploiting their technological capabilities is through commerce; moreover, the participation in collaborative programmes is another crucial way of increasing the international commitment of the firms because it helps them in solving the difficulties SMEs have to be involved in internationalisation operations.

Other variables are related but only with one of the two effort measures. Thus, the level of R&D resources is well associated with two mechanisms of transferring technology to foreign countries: licences and technical assistance, so firms devoting more R&D resources are more often engaged in those forms of internationalizating their capabilities. Similarly, the level of economic resources assigned to innovation tasks distinct from R&D is well associated with the experience of investing abroad. The only variable measuring international activity not related to any effort variables is the existence of R&D laboratories abroad. As table 16 shows it is the less frequent way of accessing to international developments.

Table nº 17

RELATIONS AMONG INNOVATION EFFORT AND WAYS OF INTERNATIONALIZATION		
INTERNATIONALIZATION VARIABLES	ASSOCIATION WITH INTENSITY IN R&D EFFORT	ASSOCIATION WITH INTENSITY IN OTHER INNOVATION EFFORTS
Export Propensity	Significant (0.023). Linear	Significant (0.000). Linear
Foreign Direct Investment	Not significant	Significant (0.001). Linear
Licences to Foreign Firms	Significant (0.001). Linear	Not significant
Technical Assistance	Significant (0.002). Linear	Not significant
R&D Laboratories	Not significant	Not significant
Participation in International R&D programmes	Significant (0.000). Linear	Significant (0.008). Linear

Note: Associations measured with X^2 Tests

Source: own elaboration

The last point under consideration is the extent to which the fact one firm is a pure domestic company influences its international activity in comparison with the same behaviour within the group of MNCs subsidiaries. To deal with this we have estimated a logistic regression between all internationalization variables and the dichotomyc one of belonging to each of the clusters. Results of table 18 allow us to assert the presence of foreign capital within innovative firms implies a higher level of commitment in export

activities, while the opposite is true for the propensity to invest and to participate in international R&D programmes; however, there is not any significative difference in the behaviour of the two groups regarding other ways of internationalization via

Table nº 18

LOGIT between internationalization in national and foreign innovative firms.

Independent variables	ß (significance)	comment
Export propensity	0.669 (0.04)	Higher in foreign firms
FDI abroad	-1.535 (0.03)	higher in national firms
Licenses	0.968 (0.29)	Not significant
Technical assistance	-8.865 (0.26)	Not significant
R&D laboratories	8.472 (0.74)	Not significant
International R&D programmes	-1.450 (0.02)	higher in national firms
χ^2 = 27.180 significance = 0.0001 % cases correctly classified = 76.12%		
Source: Own elaboration		

technological activities outside. In other words, the paths followed by innovatory firms in their internationalization processes are influenced by the presence of foreign capital although only in one aspect -percentage of exports on sales- this influence seems to accelerate the outward internationalization.

5.- Conclusions, policy implications and recommendations.

In previous pages we have proved the existence of different patterns of participating in the general process on internationalization of firms' technology production: We have argued it is a fundamental point to think about the future of policy options. Furthermore, those differences are qualitative and do not depend only on the size of the country; in fact we have seen how similar nations have unlike models of behaviour. Undoubtedly, size is a relevant factor, albeit there are many others related to the economic and institutional structure. In order to introduce some clarification, the establishment of taxonomies of cases is a practical step in the way of discussing policies and instruments. In this sense, the consideration of "intermediate countries" (ICS) can be a fruitful exercise and the rather common experience of South-European economies is a good example to analyse.

Regarding the impact of MNCs' technological activity inside the countries, there is evidence to support the assertion they are an important piece for National Systems of Innovation in those cases. Moreover, one of the characteristics of the secondary position of ICS is there positive contribution to MNCs global management of technological assets while they get considerably less from the activities of their firms outside. This overall

view also allows us to remark some qualitative differences from the role those firms play within other countries. Thus, these companies carry out a lower technologial effort, especailly as far as R&D is concern; secondly, there is an unbalanced situation between their inner contribultion with the benefits local firms can get from technological activities abroad; finally, the presence of MNCs and their technological contribution has some characteristics of exclusivenees in H-T sectors less open to competition, due to the absence of local firms.

On evaluating MNCs' contribution to ICS we must bear in mind not only the new dimensions of international R&D laboratories, but the role of those firms in foreign technology importation and in the learning of local companies. As has been said, the exploration of the factors which influence positively that learning process is a very important issue for policy makers. We also must take into account that a great part of the repercussion for host countries lies in fundamental features of MNCs, such as their size, sectoral sitting and external opening; this last fact has had a crucial importance for countries in which the international integration has not been very strong until recent years.

On the contrary, other qualitative aspects of their behaviour is very similar to the one of domestic innovative firms, what makes us to think they adapt to national conditions and institutions as domestic companies do. Thus, the improvement of national assets and institutions is a necessary condition for obtaining a greater contribution of MNCs to national economies. Moreover, the way in which MNCs' subsidiaries organize their technological activity in ICS responds to different patterns, with diverse effects on national resources and firms; therefore, there is place for policy options with differentiated effects on MNCs decisions.

The other side of the coin also reveals interesting facts to be weighted. Generally speaking, a majority of firms of ICS are not involved in international commitments and, even more important, firms with considerable technological capabilities either do not operate outside the country or they only carry out commercial activities. Insofar as there is a clear positive relationship between international expansion and pro-active technological activities, this unfinished process is a crucial issue for the near future.

Nevertheless, the international expansion does not follow a single common pattern. To a considerable extent, SMEs of those countries develop dissimilar strategies compared to the ones followed by large MNCs. Moreover, they show considerable differences among them. The ideal model of gradual engagement in transnational activities is by no means general, if we think exports are the first step for further investments and so on. What is an actual fact is the relatively scarce number of innovatory firms which do other international activities apart from exporting.

Finally, we wish to underline the fact that a majority of enterprises enter into international activities through commerce and inter-firm co-operation, including both classic linkages -such as contracts of technology transfer- and more recent ones, like the participation in international R&D programmes . Therefore, part of the policy options must be oriented to these mechanisms.

Now, with regard to policy recommendations, we must start with a declaration of modesty: we are in front of a quite complex problem such as to improve the possibilities of EU to obtaining fruits from the new international panorama. Furthermore, countries like ICS are even more heterogeneous that the frequently studied "Triad" ones. Thus, it is even more difficult to define recommendations.

First, we have to mention general policies which are on the basis of other more concrete actions. Thus, as other documents of this group also support, it is important to increase the level of resources - financial and human- devoted to innovative activities, with especial attention paid to R&D, insofar as it provides basic knowledge and skills for the system as a whole. Additionally we must remember the importance of improving the interactions within the System of Innovation by firmly pushing relationships among different parts of the structure such as between universities and research centres and the productive system. Of course, education ought to occupy a central place in technological policy and, very especially, in vocational training. These lines of actions are especially important for ICS due to two basic considerations: on the one hand, the lesser volume of resources involved in R&D and the also less developed tradition of collaboration among different parts of the system. Nevertheless, we wish to remark it applies basically for the formal part of the system while the informal one have other incentives.

Having said that, our work has been oriented to highlight the existence of differences, so there is a necessity of renewing policies with the aim of bringing them nearer to the reality. We do not forget this approach makes more complex the process of elaborating policies and give them a higher level of risk.

With regard to the first side of the problem, the repercussion of MNCs operating in ICS, several ideas can be sustained.

Firstly, it is important to upgrade those factors of host countries which allow them to have a better position in order to receive more (and of higher quality) FDI in the new context of MNCs' division of technological labour. These firms need more and more heterogeneous inputs, at the time that they carry out strategies of some production specialization. These facts open new opportunities for local companies with good technological capabilities which must receive greater attention from public organisms to improve their possibilities. Here it is a clear niche for policies. Moreover, the internationalization of technology is more advanced in sectors technologically less intensive; the relative better position of ICS in this sectors and some of the technologies associated, reinforced the possibilities for an active policy in this field.

A final consideration within this point is the necessity of rethinking national policies which explicitly or tacitly exclude MNCs when they put in operation many instruments. Within the framework of intending to obtain better fruits from their presence and stronger associations with the national system, MNCs might play a new role in future decisions.

Regarding the increasing outward internationalization of ICS' companies, our basic suggestion is to reinforce that process by helping the firms either to start this way or to enter into more advanced phases of it. As we have shown, there is valuable potential in those firms which can be a substantial push for EU movement towards better international positions. The incorporation of that "reserve" can be a remarkable help for the EU to meet new competitiveness challenges.

This general suggestion can be divided into several actions. Thus, in the first place, we have to pay attention to the needs of those firms without any international experience but with technological capabilities. Additionally, we could develop instruments for those firms which although they have international experience though

commerce, they have other possibilities for carrying out other more complex activities -such as investments, collaborative agreements or technology exports- which would improve their possibilities of upgrading and exploiting their capabilities.

For many firms, EU has been the inevitable first reference for their international expansion, which usually has been very positive. However, given the present competitive conditions, the reduction to the European context can be a brake for the future evolution of ICS' companies. Thus, it must be supported the idea of opening the space in which those firms collaborate, for example through the consideration of programmes which were especially referred to this collaboration. Among others, East Asia and Latin America areas are two clear candidates to be considered.

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RESUMEN

El presente trabajo analiza la situación de los países intermedios - y particularmente España - en el actual proceso de internacionalización de la tecnología y de la innovación tecnológica. Para ello, se combinan tres procedimientos. Primero, se efectua un estudio tipológico de experiencias europeas que confiere especial significado al concepto de "Países intermedios". Segundo, se estudia el papel de las empresas Multinacionales en la creación de tecnología de estos países. Finalmente, se analiza el proceso de salida al exterior de empresas innovadoras de aquellos. En las conclusiones se hace un sucinto debate sobre la Política Tecnológica.

PALABRAS CLAVE : Tecnología, Internacionalización, Empresa Multinacional

ABSTRACT

The aim of this paper is to contribute to a better understanding of those cases from a twofold perspective: first, the consequences of the new international technological activity of MNCS for their respective economies, and especially their systems of innovation. Second, the particular circumstances determining the recent and very rapid process of international commitment of firms originating from those nations which follow different trajectories to those of large and "traditional" MNCS. Apart from the academic interest of this matter, it also has a political importance because some of the most clear "intermediate countries" (ICS) are in Europe: furthermore, part of the uneven situation of the process of European unification has to do with the asymmetric ways in which different actors participate in the new international scenario.

KEY WORDS : Technology, Internationalization, Multinational Firms.

2 Up to today the data-bank includes seventeen countries, the fifteen that make up the European Union plus Norway and Switzerland. The time coverage is, in general, 1970-1992. More details are available in Molero et al. (1997a).

3 Here we use simultaneously Value added and employment because they are usually nearly perfectly correlated.

4 It is important to say Denmark is one of the especial cases. It has correlation between TS and FDII, although the fact of not having TS-FDIO relations prevents it being included in the "pure" A group.

5 Another factor justifying the separate consideration of those two clusters lies in the fact that the UK and Holland show a "balance" in their FDIO-FDII expansion whereas Spain and Italy have in most sectors a clear characteristic of "host" country. See Molero et al (1997a).

6 The interest of the index made me think of the possibility of using its results as a way of classifying countries; as a very preliminary suggestion I should say ICS will have a higher level in this ratio. This has two complementary consequences; on the one hand - as has been said- they are net contributors to the MNCs but, simultaneously, they are part of their systems although in a secondary position.

7 It is important to explain what the author understands as basic technological strategies of MNCs. He distinguishes three types. A: home-based R&D and local adaptation networks. B: networks based in the host country. C: division of labour networks.

8 In fact, the topics analysed were: Sectoral distribution and size. Export orientation. Ways and means of acquiring technological inputs from other sources. Ways of creating own technological resources. Product and process innovation incorporation. Technological level in relation to national or foreign competitors. Technology transfer to other firms. Forms of protecting technological knowledge. R&D activity, including intensity, types and organization.

9 The Spanish Innovatory Survey, corresponding to the European Survey on Innovation, indicates there are 1783 firms which have regular R&D activites. The CDTI database included nearly 2000 firms, although for different reasons, the questionnaire was sent only to 1354. More information can be obtained in Molero et al (1997b). The rate of response is rather high, so we have great confidence in the representative nature of the results, without forgetting the problems of statistical representativeness of CDTI databe over the unknown collective of innovatory firms.

10 In fact, althogh we had the possiibility of breaking down the sample in a very detailed sectoral classification, we have reduced this analysis to sectors in which the number of firms is higher than 25, in order to avoid statistical instability. Unfortunately we had lo leave sectors like Electrical machinery, Vehicles and Rubber and Plastics.