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THE COMPETITIVE REPOSITIONING OF AUTOMOTIVE FIRMS IN TURIN: INNOVATION, INTERNATIONALISATION AND THE ROLE OF ICT

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Abstract

Following the increasing competitive pressure and the emergence of new industrial poles within the auto industry, Italian firms have been the protagonists of an intense reorganisation, which is still ongoing. This case-study involves 13 supplier firms, operating in the automotive industry, localised in Turin, that have adopted a series of strategies aimed at improving their international competitiveness. The empirical findings show that there is a particularly strong innovative drive for the interviewed firms to position themselves in activities with greater added value and to undertake internationalisation strategies, from the "lighter" to the more "complex" forms, coupled with a use of information and communication technologies epresents a case of excellence.

Key words: Innovation, Internationalisation, ICT, Automotive Industry
JEL code: O31, L62, L63, F23

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1 Introduction

As with other mature segments that are subject to increasing competition from emerging countries, the automotive sector is facing the new global context and the related adjustment processes.

The changes that have taken place in the past 20 years with the globalisation of the markets for intermediate and finished goods, the setting up of international production chains (*global production networks*, Arndt and Kierzkowski, 2001; Feenstra, 1998; Hummels *et al*., 2001), and the emergence of new outlet markets have radically transformed the very nature of the internationalisation of the automobile company. In addition, the organisation of the auto chain has substantially changed, developing into a multi-level structure and at the same time carrying out a careful "screening" of the number of suppliers.

In this context some firms that are lacking in the necessary organisational-entrepreneurial skills do not manage to react to the changes underway and are forced to exit the market. Others manage to use a series of strategic actions, rationalising internal organisation and production processes in order to lower production costs, investing in innovative activities to upgrade their products and relationships with customers, upgrading human capital, and introducing organisational innovations thanks to information and communication technologies.

The aim of this study is to describe the main strategies adopted by a group of firms from the province of Turin, belonging to different segments of the automotive production chain, in order to improve their competitive position. Particular attention was paid to internationalisation processes, which are frequently found to be cumulative (Helpman, Melitz and Yeaple, 2004; Greenaway and Kneller, 2007), and to the different modes adopted, bearing in mind that the degree of international involvement often depends on the characteristics of the firms (for Italy see the analyses by Basile *et al*., 2003; Baldwin *et al.*, 2007; Bugamelli *et al*., 2000; Castellani and Zanfei, 2007; and Sterlacchini 2002).

Also studied was the use of information technology (ICT, henceforth) to tackle international competition, an area in which the Italian automotive industry has been held up as an example of excellence since 2001 (Trento, Warglien 2003, Bardi 2001).

The case-study is based on a comprehensive analysis of 13 supplier firms of the automotive production chain, conducted by means of direct interviews[1] and the examination of their balance sheets; we also interviewed IVECO, a manufacturer of commercial and industrial vehicles, in order to provide a complete picture of the Turin supply chain.

The firms were identified from a database supplied by the Turin Chamber of Commerce, Industry, Agriculture and Handicrafts (CCIAAT), that collects information on a representative sample of 786 firms of the automotive chain, out of a universe of an estimated 3,500 firms[2]. The empirical findings that emerge from the direct survey were compared, whenever the information was available, to the average values in 2005 of the CCIAAT sample, taken as reference values[3]. As we shall see, overall the firms interviewed occupied higher than average positions in the segment.

The choice of interviewees was such that it included firms that pursued different internationalisation strategies and methods. In this work we have adopted the same breakdown of the auto chain into four segments as used by the CCIAAT[4], as a result the firms can be divided as follows: four firms belong to the Engineering and Design (ED) segment; two to the Systems Engineering and Module Makers (SM) segment; two to the Product Specialists (PS) segment and four to the Subcontractors (SB).

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[1] The interviews were carried out between June and September 2007.

[2] This sample comes from the study "Osservatorio sulla componentistica autoveicolare italiana", which the CCIAAT has published for 12 years.

[3] In the CCIAAT database there are 289 firms active in the province of Turin.

[4] The breakdown proposed by the CCIAAT in its "Osservatorio sulla componentistica autoveicolare italiana" was presented for the first time in the 2005 edition (CCIAAT, 2005).

The OEMs (Original Equipment Manufacturers) can be sub-divided into: *Systems Engineers* and *Module Makers*. The module makers are sub-assemblers of groups of parts that make up sub-assembled items that can be fitted to the vehicle in a single operation; the systems engineers are designers of complex systems of parts, which may pass through more than one module of the vehicle. They are essentially "Tier 1" suppliers for the car makers

The *Product specialists* are second level suppliers (Tier 2) that have their own research and development capacity and their products as used in the modules and systems of the OEM.

The *Subcontractors* are the third group (they are usually Tier 3) and they provide parts and simple processing for the Tier 1 and 2 suppliers. Lastly, the *E&D specialists* are suppliers of advanced services of product design, planning, prototyping and simulation.

The article is organised as follows: the first section briefly traces the evolution path of the Fiat Auto and the Turin district over the past 20 years; the second part analyses the main characteristics of the firms interviewed, while the third describes the strategic approaches that emerged from the interviews, with particular regard to internationalisation, innovation and the use of ICT. The conclusions follow.

2 The evolution of automotive organisation in Turin

The Turin automotive district was born with Fiat which, until the second half of the 70's, was a large, vertically integrated firm. Subsequently, with the crisis of the Fordist organisational paradigm, subcontracting and supplier firms developed, to which part of the production was outsourced. To a large degree these were spin-offs of former employees of Fiat, and in that period the firms of the related industries in the Turin area operated in a monopsonistic market ("the absolutism" of Fiat Auto discussed by Enrietti and Whitford, 2006), characterised by relationships of dominance (Michelsons, 2001, p. 121).

The 80's was a period of greater development for the most important Italian firm in the sector: Fiat Auto market share in Italy peaked at 59% in 1988, with a significant presence also in Europe (on average 15%). At the same time the process of vertical disintegration continued: in 1982, 50% of production was carried out by external firms, by 1992 this had risen to 65%. In this decade there was an evolution in the relationship between Fiat and its Turin suppliers, inasmuch as Fiat began to outsource strategic aspects of its production and of design, from 30% in 1982 to 45% in 1992 (Enrietti and Whitford, 2006). These are the years in which the Turin area was superior to all of the others thanks also to the participation of stylists such as Bertone, Giugiaro and Pininfarina; the know-how of the area increased thanks to more fruitful collaboration with the Turin universities. Together all these factors led to the upgrading of the area, which was no longer simply an industrial pole but had taken on the form typical of an industrial district (Balcet, 2002; Enrietti and Whitford, 2006).

The qualitative growth of outsourced activities to Piedmont firms was accompanied by a significant selection of the possible suppliers: between the 80's and the 90's, Fiat reduced the number of direct suppliers from over 1,200 to roughly 350 (Enrietti and Whitford 2006, p. 38), tending towards a Japanese-style supply chain model, characterised by fiduciary relationships and the sharing of risks and profits with the preferred suppliers who were promoted to the rank of top level suppliers (that is, suppliers who typically assemble the module or produce the system for the auto manufacturers, Bardi 2001)

2.1 The internationalisation process of the Fiat Group

Over the course of the 90's the automotive industry at a world level witnessed relevant processes of merge and concentration, as well as technological/organisational changes. Deverticalisation of production processes, reorganisation of supplies to a modular form and the introduction of the just-in-time model are the direct expression of the need to react to international competition, accompanied by a strong incentive towards productive internationalisation.

Fiat Auto also speeded up its internationalisation process during the 90's (Balcet, 2002). First there was the creation of a European regional industrial pole in Poland (the agreement signed with the state firm FSM in 1987 enabled it to launch production of the Fiat 500 model in 1991, and led to the subsequent acquisition of FSM in 1993); in the mid-90's Fiat extended its presence in the Mercosur area (Argentina and Brazil)[5], and then followed a partnership in Turkey. As a result, with increasing volumes of production provided by its foreign factories, the production of automobiles in Italy fell from roughly 91% of the total in 1989 to 64% in 1999 (Balcet and Enrietti 2002). In addition to the increasing importance of the phenomenon of internationalisation of production, the Turin area grew even smaller as an industrial pole due to the consolidation of the Group's investments in the South of Italy, which began at the end of 60's and culminated with the investment in the Melfi factory in 1993[6]; thus by 1999 the Turin area provided just 31% of the entire production of cars in Italy.

Fiat's foreign expansion, which is still ongoing[7], has played an important role for the internationalisation processes of the suppliers[8]. Also considered of relevance was the procurement strategy adopted by the foreign factories in the Fiat Group,

[5] Pursuing project 178 for the "world car", especially for emerging markets.

[6] Regarding Fiat in Melfi, cf. Svimez, 1993; Cersosimo, 1994; Mariotti and Treves; 1999; Florio and Giunta, 2002.

[7] FIAT has production plants in Argentina, Brazil and Poland and also produces through partnerships in France, Turkey, Egypt, South Africa, India and China, http://www.fiat.com/cgi-bin/pbrand.dll/FIAT_COM/home.jsp

[8] This appears to be confirmed also by the econometric estimates using the data from the CCIAAT representative sample, which show how the location of firms in the province of Turin had a positive impact on the probability of becoming internationalised, cfr. Bacchiocchi *et al*., 2008.

based on two fundamental criteria: the know-how of the suppliers and transportation cost. In fact to guarantee supplies of parts and components with a high technological content and with high logistic costs, Fiat was the driving force in encouraging its suppliers to relocate close to their foreign factories in order to ensure the same qualitative standard. On the other hand, the suppliers of standard products with a low know-how content and a large impact on transport costs were selected from among the local foreign producers. Lastly, for the purchases of products with a high technological content and low incidence of transport costs, Fiat follows the "global sourcing" logic, that is, identifying suppliers that can guarantee the best price-quality relation (Balcet, Enrietti 2002) [9]. For that matter, the interview with IVECO confirmed that the purchasing department had the "global market" as its reference point, and in every new location it is actively scouting for suppliers.

The geographical dispersion of the auto constructor thus led to many first tier suppliers decentralising their production, in the form of greenfield investments or joint ventures, and this process was also followed, at least in part, by second level suppliers [10].

In this context of reorganisation of production at a world level, the choices made by the leading producers of automobiles have necessitated (especially in the past decade) massive investments in ICT. The new technologies reduce the "friction" of space, thus rendering possible the management of transcontinental supply chains; the coordination between auto producers and the first level of the chain and then between them and the lower levels (Tiers 2 and 3). The policy of modularity calls for increased use of ICT (Kim et al., 2006). Furthermore, there is a need for a significant amount of information exchange and coordination also "downstream" in the chain, thanks to the current sales policy of make-and-deliver-to-order (Stecchetti and Volpato, 2003).

2.2 The evolution of the automotive chain of Turin

The prolonged phase of difficulty experienced by Fiat, from which it would appear to have emerged only in March 2005, took place against a background of a radical and structural change in the supply chain. This had strong repercussions on firms in the automotive chain and, especially, on those in the province of Turin, bringing about the reorganisation of the chain and an intense screening, ousting out of the market a large number of firms of the district, especially the smaller ones, also in the period of reference of the present study.

From the mid-90's the automotive production chain developed increasingly towards a pyramid structure made up of a number of sections or levels ("tiers"), following the *producer-driven commodity chain* model (Gereffi 1999), at the top of which is the leader firm that has the power to impose procedural standards and organisational methods on the other players in the value chain.

In the section immediately below the car manufacturers there is a small group of selected suppliers that carry out specific investments (thus with a high *switching-cost*). In order to satisfy requests fromcar manufacturers, the Tier 1 suppliers, in turn, organise their own subcontracting networks, and so on, down the line through the different levels of the production chain. This type of division of labour among firms combines the centralisation of responsibilities – at each level of the value chain, the principal deals with a limited number of agents – with the dispersion of production.

In the new system of division of labour, the supplier firms are required to extend their operative scope to tackle complicated tasks: as regards the activities they undertake, the firms involved in the value chain increasingly take charge of complex production that is outsourced by the car manufacturer in his aim to concentrate on his core activities. Moreover they are also required to strengthen their ability to relate to other players given that, with the exception of the final assembler, they accomplish the dual role of supplier and client firm(Giunta and Scalera, 2007).

The stratification of the supply chain into different levels is closely linked to the criterion of modularity (Frigant and Lung, 2002; Larsson, 2002; Sturgeon, 2002) representing a process of development and assembly based on the outsourcing of groups of components that are "close" in physical or technological nature, rather than the externalisation of single components (Bardi, 2001). Modularity, on the one hand, increases the integration between customer and supplier (Arrighetti and Traù, 2007); on

[9] For example, the Tychy factory in Poland (5,000 workers) is located in an area where the local related industries offer a choice of 337 suppliers, which in turn account for a further 5,000 workers, cfr. "Un trampolino per l'Est", Il Sole 24 Ore, 29 April 2008.

[10] "*As Turin OEMs are going to follow the foreign growth of Fiat, by investing in Latin America, Poland, Turkey, Russia, India, China, the second tier suppliers are strongly affected by this kind of growth pattern. If OEMs do not find good suppliers in those countries, they will support the relocation of small suppliers from Piedmont towards new markets. Within this context the OEMs' main goal is to replicate in the new market the same organization that was successful in Piedmont*", Vitali, 2000.

the other, it requires the supplier of modules to carry out functions that were traditionally the responsibility of the client firm, such as design, the production of components and assembly: the deverticalisation process of the car makers has therefore been accompanied by the growth of the top level suppliers (Sturgeon and Florida, 2000).

3 The firms interviewed: the main characteristics

The firms considered in this case study are all Italian (apart from one), the majority of them (53%) do not belong to a group and, to a large degree, they are family owned ; they are also firms that have been active for a long time (the youngest was created in 1989).
Their size varies considerably, however, there is a net predominance of medium-large firms, both in terms of employees (the majority have a workforce of between 100 and 500) and of turnover (53% record a turnover in Italy of between €10 million and €50 million and 23% record higher levels) (tables 1 and 2) .

Tab. 1 Companies by size

	Number of companies	Percentage values
1-19	0	0.0%
20-49	2	15.4%
50-99	2	15.4%
100-249	5	38.5%
250-499	2	15.4%
500 and more	2	15.4%
Total	**13**	**100%**

Source: Authors' computation based on data from direct interviews

Tab. 2 Companies by turnover in 2005

	Number of companies	Percentage values
<1 mln €	0	0.0%
1-5 mln €	0	0.0%
5-10 mln €	3	23.1%
10-50 mln €	7	53.8%
50-150 mln €	1	7.7%
150-250 mln €	0	0.0%
250-500 mln €	1	7.7%
>500 mln €	1	7.7%
Total	**13**	**100%**

Source: Authors' computation based on data from direct interviews

The firms studied boast a wide variety of functions within their organisations, even when they are subsidiaries, and over the period considered there were no significant changes in the distribution of employees per function (table 3), except for a slight drop in the number of workers involved in manufacturing, nor were there any changes in the staff ratio[11] (table 4), which shows a net predominance of white-collar workers and managers among the employees of the Engineering and Design firms (54%), compared to other segments (that record shares of between 25% and 34%).

[11] The *staff ratio* is the share of white-collar workers and managers of total employment.

Tab. 3 Distribution of employment by company function and segment of production(%)

Production Segment	Year	Engineering and design	R&S	Production	Marketing	Purchase	Financial Management	Total
ED	2000*	42.5	1	41.8	7.3	2.8	4.8	100
	2005*	37	0.5	44	9.3	3.75	5.5	100
SM	2000	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	2005	5	7.3	78.8	3.7	1.7	3.5	100
PS	2000	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	2005	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SB	2000**	4	1	83.7	4.5	3.7	3.2	100
	2005	7.7	4.9	73	5.1	3.9	5.4	100

** Average values calculated for a total of two out of four firms*

*** Average values calculated for a total of three out of five firms*

Source: Authors' computation based on data from direct interviews

Tab. 4 Employment by position and production segment (%)

Production Segment	Year	Entrepre-neurs	Relative Managers	Managers outside the family	Managerial Staff	White-collar workers	Workers	Total
ED	2000*	0.3	2.2	0.8	1.5	47	48.1	100
	2005*	0.3	3.3	0.8	1.8	47.7	46	100
SM	2000	ND	ND	ND	ND	ND	ND	
	2005	0.3	0	1.9	4	22.2	71.6	100
PS	2000	ND	ND	ND	ND	ND	ND	
	2005	4.7	0.3	0.3	0	20.5	74.3	100
SB	2000**	2.8	0.1	1.2	2.1	29.4	64.4	100
	2005	2.2	0.1	1.7	5	24.8	66.2	100

** Average values calculated for a total of three out of four firms*

*** Average values calculated for a total of four out of five firms*

Source: Authors' computation based on data from direct interviews

As regards human capital, overall the group of firms recorded a large percentage of graduate workers[12] (table 5), with a higher quota in the Engineering and Design segment (18%) and among the Systems Engineers-Module Makers (12.2%). In general, no particular changes were recorded at a company level over the period considered, except for the case of one firm (systems-modules) that considerably increased its quota of employees with a high school or university education as a result of its greater commitment to design and development and of the increasing technological content of products required by new customers.

Moreover, it should be noted, as the exerpt shows, that over the period 2000-2005 various firms with a higher quota of graduates on the payroll recorded comparatively faster growth in turnover.

> *"There was a technological evolution from the moment that the firm started to work a lot with BMW and Mercedes, because we had to equip ourselves with different skills, inasmuch as the products called for the adoption of new electronic technologies. Therefore its was necessary to find differently qualified staff, both electronic technicians due to the greater weight of electronic components in the products, and other professionals for the planning and development stages that had become "far more demanding".*

[12] Only three firms reported a quota of graduates of between 1% and 2%.

Tab. 5 Distribution of employment by school degree and production segment (%)

Production Segment	Year	Compulsory education	School-leaving certificate	Degree certificate	Total
ED	2005*	46.7	35.3	18	100
SM	2005	40.9	46.9	12.2	100
PS	2005	76.5	15	8.5	100
SB	2005	60.5	33.9	5.6	100

** Average values calculated for a total of three out of four firms*

Source: Authors' computation based on data from direct interviews

The productive activities are of various types and include the design and realisation of whole production plants (machinery, handling systems, automated warehouses); the design and production of systems (for example devices dedicated to absorbing vibrations) and the realisation of single components for motor vehicles (for lighting, electro mechanics, aluminium objects for Powertrain) (table 6). The majority of firms (eight out of 13) considered their products to be "mature" with good profit margins, while only three firms claimed to have an innovative product in their portfolio.

As regards their role in the automotive value chain, a large part of the firms directly supply both auto constructors[13] and the "first tier" (10 out of 13). Thus, overall, the group is positioned in the top section of the pyramid, given that only a few of the firms (also) serve the second tier (four out of 13).

In keeping with this positioning, the relationships with the customer firms are based to a large extent (and without any noticeable differences according to the segment of the chain) not only on a hierarchical relationship, but also on co-operation and co-makership, which is a qualifier of their activity, and one to which the firms are leaning, since it enables them to develop products with greater added value. Generally speaking, we can say that the firms are not part of the "weaker" group of suppliers that is more at risk from crowding out by competitors from emerging countries, or from being excluded from the market because they simply make products "to order".

Operating in the "upper" part of the subcontracting pyramid means that, in order to comply with the demands from customers, the firms find themselves at the head of their own supply networks, to which they outsource the less profitable activities. This is shown by the level of vertical integration that, in 2005, fell within a range from 22.3% to 44.4%, and which did not vary to any great extent over the five year period considered[14] (table 7).

[13] "*The location along the supply chain does not strictly mean that there is a unique and hierarchical link between the suppliers, according to their level: some SME's of the second tier can be car maker suppliers too, even if their main customer belongs to the first-tier",* Vitali, 2000.

"*The first level assembles the module (or produces the system) while the second and third levels are related directly to the first for the supply of sub-components. The producer of modules and systems is typically a Tier 1 supplier. Direct suppliers are another thing, while they work directly with the OEM constructors; they may not produce modules and systems but just components/details/working. In this case they are direct suppliers, but not of the first level.*", Bardi , 2001.

[14] With the exception of one firm in the Subcontracting segment that drastically reduced its degree of vertical integration over the five years.

Tab. 6 Firms according to production segment, products and type of customer

Segment of the chain	Firm	Products	Type of customer
Engineering and Design Specialists (ED)	ED1	Production of: - machinery for processing - handling systems - automated warehouses Provision of services of: - maintenance and re-equipping of machinery - product studies - process studies	Car Manufacturer Tier 1 suppliers
	ED2	Design and creation of motor test chambers. Sale of instrumentation for industrial automation from the parent company. It offers: - testing instruments and systems, - systems for the end of the production line, - Powertrain engineering, - product engineering & integration.	Car Manufacturer
	ED3	Design, development and production of: - boot covering systems (rear shelves, boot covers) - sun-protection systems (lateral/rear sunshades) - safety systems for separating the passenger area (nets for separation/restraint of luggage)	Car Manufacturer Tier 1 suppliers
	ED4	Creation of production means and systems. In particular this area of business involves: - product and process engineering, - mechanical processing and mounting, - dies for metal and moulds for plastic, - assembly and welding of the body, - final assembly, robotics, - maintenance services.	Car Manufacturer Tier 1 suppliers
Systems-Module Makers (SM)	SM1	Design and realisation of components for lighting, such as: rear lights, number plate lights and interior lights	Car Manufacturer Tier 2 suppliers
	SM2	Production of coverings for the interior, the boot and the exterior wheel guards whose function is to improve acoustic comfort	Car Manufacturer Tier 1 suppliers
Product Specialists (PS)	PS1	- Production of components for the automotive sector (die-casting of aluminium/zama alloy). - Assistance to customers for the adaptation and modification of components. - Design of moulds.	Car Manufacturer Tier 1 suppliers and Tier 2 suppliers
	PS2	Production of electromechanical components for motor vehicles, industrial vehicles and motorcycles, particularly switches, sensors, electro/valves and actuators.	Car Manufacturer Tier 1 suppliers Spares market
Subcontractors (SB)	SB1	Production of a range of oil, air, diesel and petrol filters, for motor vehicles and industrial vehicles	Spares market (80%) Car Manufacturer(10%) Tier 1 suppliers (10%)
	SB2	Supply of complete systems production, in which the handling equipment is integrated with technologies for painting, assembly machinery, moulding presses, testing equipment and control of production.	Car Manufacturer Tier 1 suppliers
	SB3	- Production equipment dedicated to absorbing vibrations: isolators and elastic joints, tampons for suspension and leaf springs, engine supports, differential clutch, plugs for stabilising bars. - Service of engineering for the design and construction of co-moulded articles in metal-elastomer.	Car Manufacturer Tier 1 suppliers Tier 2 suppliers Spares market
	SB4	The main productive activities are cold presswork, welding, bending tubes and mechanical processing on the basis of which many products are developed: beds for cabins of industrial vehicles, suspension arms, steering columns, differential groups, seats, leverisms, braking groups and oil cups.	Commercial vehicle manufacturer Tier 1 suppliers and Tier 2 suppliers
	SB5	Production of items in aluminium for Powertrain, mainly big ends and bases	Car Manufacturer

Source: Authors' computation based on data from direct interviews

Tab. 7 Dynamics of vertical integration per single firm (%)

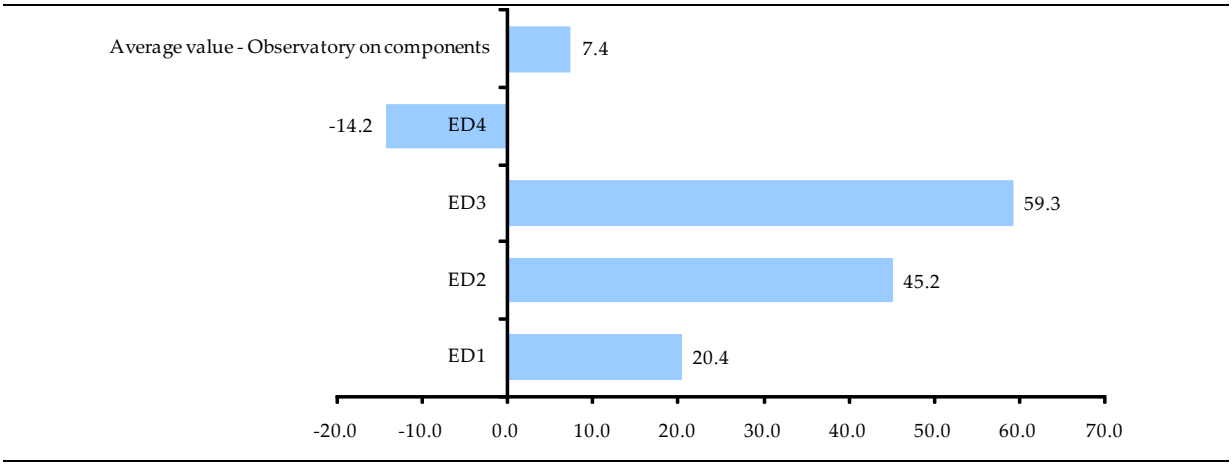
Production Segment	Companies	2000	2001	2002	2003	2004	2005	% changes between last and first available year
ED	ED1	21.1	20.3	24.6	29.3	23.6	27.6	6.6
	ED2	26	29.2	31.7	28.1	28.1	23.2	-2.8
	ED3	38.4	40.9	47.5	49.6	47	42.8	4.4
	ED4	22.7	42.6	28.3	32.1	34.8	27.5	4.9
SM	SM1	36.8	30.6	30.2	30.3	28.6	26.7	-10
	SM2	26.7	32.5	35.3	30.5	27.4	28.7	2
PS	PS1	22.9	21.4	23.9	24.2	23	23.1	0.2
	PS2	34	35.7	37.7	36.5	41.3	44.4	10.4
SB	SB1	38.9	41.1	41.3	42.1	42.5	38.8	-0.2
	SB2	65.9	53.1	53	47.1	33.3	37.1	-28.8
	SB3	47.5	51.2	54.9	56.7	52.6	55	7.5
	SB4	31.8	29.1	25.7	27.5	25.5	27	-4.8
	SB5	ND	ND	30.4	20.1	27	22.4	-8

Source: Authors' computation based on data from direct interviews

By and large the group of firms interviewed recorded good performances over the period 2000-2005, marked, however, by the worst crisis ever for Fiat Auto in over a hundred years of activity.

In the majority of cases the growth in turnover recorded in 2005 by the firms interviewed was above the average for the CCIAAT sample (5.6%)[15] (Figures 1-4); it should also be noted that growth has been persistent, with positive dynamics for six firms out of 13 since 2003.

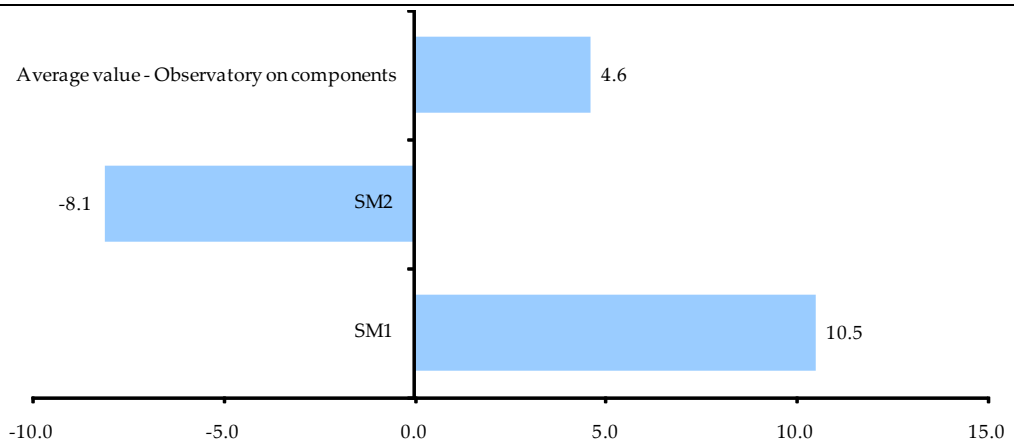
Figure 1 Comparison of the rate of growth in turnover by single firm in the Engineering & Design segment, 2005



Source: CCIAAT, 2005

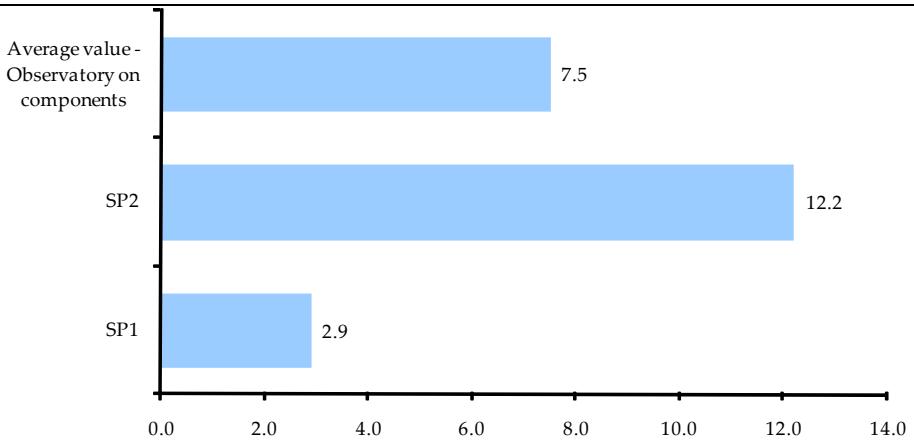
[15] Considering the CCIAAT sample, in 2005 average growth in turnover was 5.6%, with sizeable differences within the various segments that make up the auto chain; 16% of firms recorded growth of a top performer, that is, over 15% in just one year.

Figure 2 *Comparison of the rate of growth in turnover by single firm in the Systems-Module Makers segment, 2005*



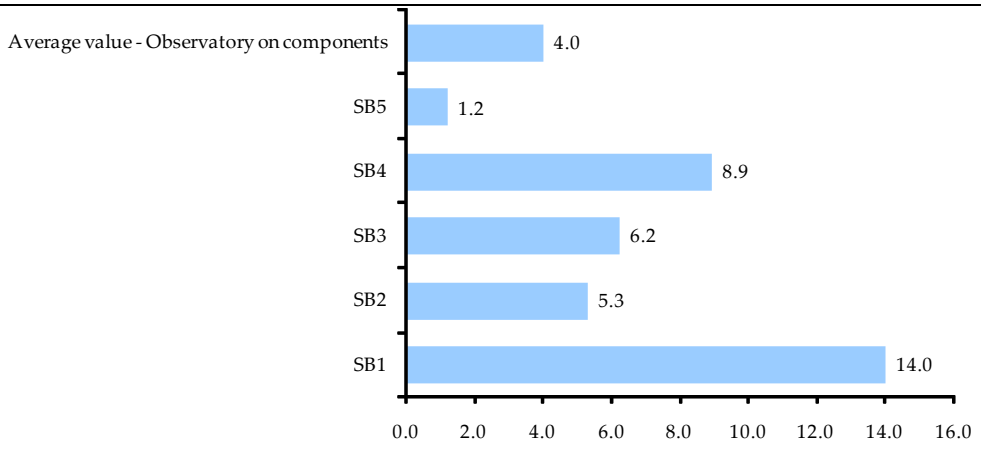
Source: CCIAAT, 2005

Figure 3 *Comparison of the rate of growth in turnover by single firm in the Product Specialists segment, 2005*



Source: CCIAAT, 2005

Figure 4 *Comparison of the rate of growth in turnover by single firm in the Subcontractors 2005*



Source: CCIAAT, 2005

Furthermore, taking the level of employment in 2000 as a reference point, in seven cases out of 13 the increase in turnover was accompanied with a rise in employment levels, while in two cases there was a contraction in both turnover and employment[16] (Table 8).

Tab. 8 Employees and annual rate of growth in employment per single firm (years 2000-2005)

Segment level	Company	Employees (2000)	Employees (2005)	Average annual growth rate (%)				
				2001	2002	2003	2004	2005
ED	ED1	n.a.	40	28	21.7	−6.8	−21	20.4
	ED2	55	73	7.8	−5.1	25.6	−18.6	45.2
	ED3	n.a.	120	−2.2	−2.9	−26.2	−1	59.3
	ED4	2,999	2,695	25.5	25.9	11.1	−37.2	−14.2
SM	SM1	270	450	18.6	15	7.7	11.3	10.5
	SM2	335	298	−10.9	−8.4	14.8	−9.2	−8.1
PS	PS1	n.a.	150	18.5	3	5.9	10.9	2.9
	PS2	30	41	7.8	2.5	−0.3	21.2	12.2
SB)	SB1	140	170	9	−2.3	−5.7	6.7	14
	SB2	45	50	25.1	−39.1	68.9	40.1	5.3
	SB3	110	116	−26.0	15.2	5	9.2	6.2
	SB4	120	150	25.7	4.1	2.6	9	8.9
	SB5	n.a.	1,300	n.a.	n.a.	−35.5	25.5	1.2

Source: Authors' computation based on data from direct interviews

Tab. 9 MOP/Gross Operating Profit by production segment

Production Segment	2000	2001	2002	2003	2004	2005	% changes 2000-05
ED	2	5.1	4.4	3.4	8.1	3	1
SM	12.4	13.3	14.1	13.2	11	11.5	0.8
PS	8	7.5	9.2	9.8	11	11.3	3.2
SB	9.5	9.7	2.8	7.7	7.4	4.4	5.2
Manufacturer	7.2	6	4.5	4.9	9	6.9	-0.3

Source: CSIL processing of balance sheet data

As far as other performance indicators are concerned, it should be noted that in 2005 the Systems Engineers-Module Makers and the Product Specialists recorded the highest pre-tax profits (EBITDA), respectively of +11.5% and +11.3%; for the subcontracting firms the quota was 4.4%, and for the Engineering and Design firms it was in the region of 3% (Table 9). The ROI (return on capital invested or Return on Investments) also shows a wide range of values in 2005, from a maximum of 7.8% for the Product Specialists to a minimum of -0.8% for the subcontracting firms. There are enormous variations in performance within the segment itself: we find cases in which the sustained increase in turnover between 2000 and 2005 was accompanied by a – more or less marked - decrease in profitability; and other cases where satisfactory profitability was maintained despite discontinuous growth and moderate rates of expansion.

For the whole period considered the Product Specialists recorded positive trends in their ROI, which were accompanied, in both cases, by an increase in turnover. Similar considerations can be made for the ROE (index of profitability of own capital, Return on Equity), which was extremely positive in all years and amounted to 22.3% in 2005 although in one case this was the result of extraordinary earnings for the years 2002 – 2003 (Tables 10-11).

[16] No information is available for employment in 2000 for the other four cases.

Tab. 10 ROI by production segment

Producion Segment l	2000	2001	2002	2003	2004	2005	% changes 2000-05
ED	-0.4	1.8	-4.7	0	3.6	0.1	48.1
SM	3.9	3.9	3.9	3.7	3.1	4.5	57.8
PS	4.7	5.2	4.9	5.4	7.4	7.8	309.9
SB	3.5	1.4	-3.5	-6	1.3	-0.8	436.6
Manufacturer	4.6	2.7	-0.7	-1.2	3.9	0.4	-4.3

Source: CSIL processing of balance sheet data

Tab. 11 ROE by production segment

Segment level	2000	2001	2002	2003	2004	2005	% changes 2000-05
ED	-20.2	-22.5	236.5	-154.4	-8.5	-33.6	-13.4
SM	6.9	-2.9	-2.3	1.8	17.3	4.3	-2.6
PS	7.1	19.4	30.7	19.2	23.6	22.3	15.1
SB	-3.3	-0.1	-83.6	-99.7	-13.6	-39.2	-36
Manufacturer	14.8	-18.8	-114.6	-44.1	15.2	-20.9	-35.6

Source: CSIL processing of balance sheet data

The trend in labour productivity, that is the ratio between the added value at current prices and the number of workers, shows sustained dynamics in the subcontractor group of firms, with growth of 38.7% between 2000 and 2005, despite an even higher rise in the unit cost of labour of +46% (Tables 12-13). On the other hand, the increase in productivity over the period (+26%) was greater than that of the cost of labour (+22.7%) for firms in the Engineering and Design segment, and also for the Product Specialists, who witnessed an increase in productivity of 20.1% compared to a far more modest increase in the cost of labour of +3.8%.

Tab. 12 Value added per worker by production segment

Production Segment	2000	2001	2002	2003	2004	2005	% changes 2000-05
ED	49,325	48,167	37,523	51,770	46,255	62,136	26
SM	60,380	52,502	58,431	60,134	55,046	56,032	-7.2
PS	43,138	43,872	47,356	48,198	51,666	51,819	20.1
SB	36,208	40,077	42,295	33,309	60,923	50,235	38.7

Source: CSIL processing of balance sheet data

Tab. 13 Unit cost of labour by production segment

Production Segment	2000	2001	2002	2003	2004	2005	% changes 2000-05
ED	-45,186	-42,395	-42,760	-46,401	-49,812	-55,440	22.7
SM	-32,827	-30,285	-33,004	-34,107	-33,487	-32,440	-1.2
PS	-29,280	-30,095	-30,885	-30,181	-30,083	-30,384	3.8
SB	-28,581	-29,866	-39,722	-38,695	-41,295	-41,736	46

Source: CSIL processing of balance sheet data

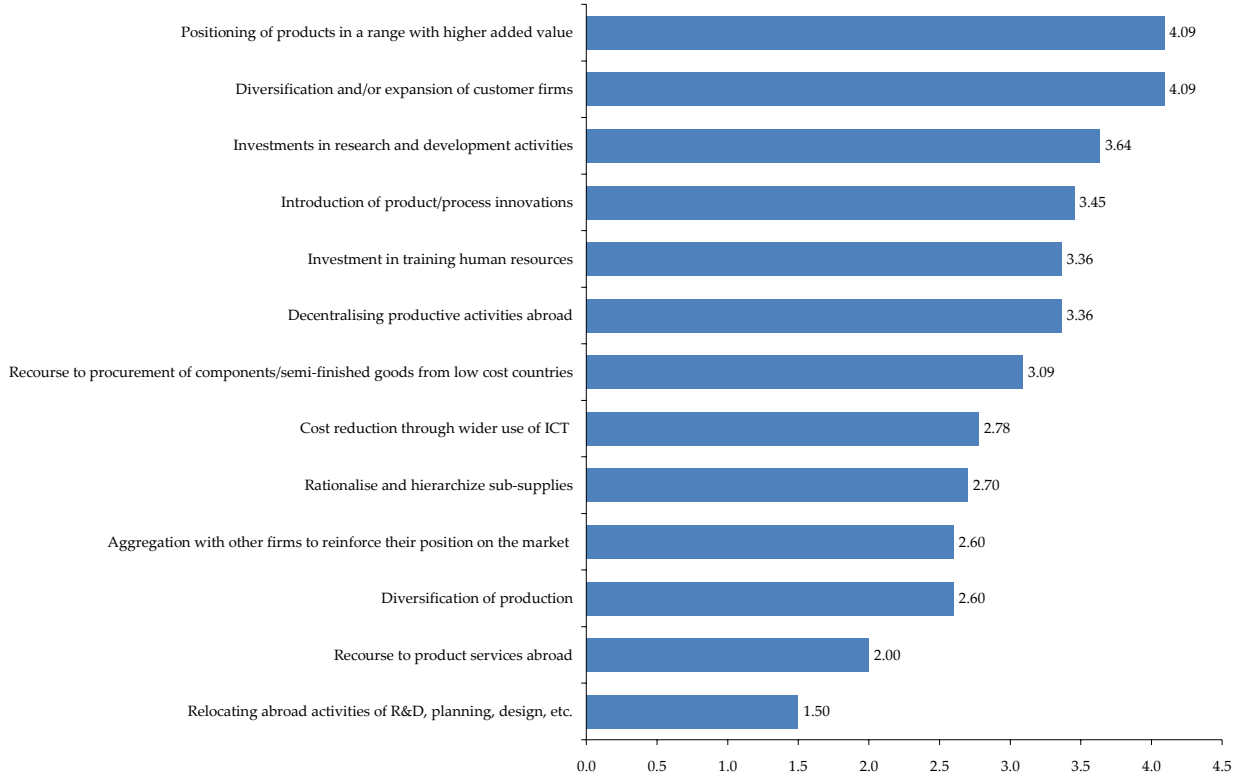
4 The strategies of the firms

When considering the main strategies adopted by the firms to tackle global competition, particular attention was paid to aspects linked to internationalisation (including procurement policies), innovation and ICT adoption[17].

Figure 5 lists the strategies according to the importance given to them during the interviews[18]. The picture that emerges is coherent with what we have outlined so far: in fact the firms' priorities were the diversification and the expansion of their clients (where the internationalisation process plays a determining role) as well as pursuing the "high road" to development, that is the best positioning in the automotive global value chain through product upgrading, which they have also pursued, as we have seen, by means of activities of co-makership with customers.

The decentralisation of production to other countries was, at least by some firms, considered to be relatively less important than the strategies linked to research and development and to innovation. However, it should also be mentioned that client diversification and relocation of production are interconnected strategies, at least in part, inasmuch as there is a need to position oneself near to the carmakers in the new regional industrial poles, where there are a number of auto manufacturers and multinational firms producing components, locations that would enable them to further expand their customer portfolio.

Figure 5 Strategies for coping with international competition



Source: Authors' computation based on data from direct interviews

[17] Of the other strategies mentioned, some firms thought it is important to invest in training their human resources, for the purposes both of innovation and of increasing their degree of internationalisation; other specifically stressed the importance of diversifying production into related sectors. On the other hand, strategies of aggregation among firms, for example to create consortia to reinforce their market position by producing club goods (like a sales brand, export consortia, acquiring quality certification, contractual scale economies in accessing bank credit) were considered less important. Occasionally, while understanding the advantages of a cooperative solution, there was an obvious problem of coordination, hence it seems plausible to presume that at a regional level there is a margin of manoeuvre in the industrial policy that can be exploited.

[18] The evaluation scale was from 1 to 5, where 1 = unimportant strategy and 5 = very important strategy.

4.1 Innovation

Given the competitive pressure from emerging countries, it is not surprising that the main strategies were to undertake greater investments in R&D and to introduce innovations, which are necessary if firms are to position themselves in activities with higher added value. This appears to be confirmed from the considerable quota of turnover that firms destined for Research and Development activities in 2005, which varied from 3% to 5% (one firm actually invested 10% of its turnover), compared to an average figure for the CCIAAT sample of 3.2%. Moreover, nine firms out of 13 declared that they had introduced innovations in products and/or processes in the reference period.

Evidence of the drive towards innovation can be found, in addition to the high level of human capital in the firms, also in the number of employees in the R&D department, and in the cooperation with local universities in support of innovative activities (one of the forms of public support that firms most often fall back on). In addition to the *intra muros* research, the Italian universities and the public research centres seem to constitute important fertilisation channels.

4.2 Internationalisation

The firms interviewed are higly internationalised: exports account for large quotas of turnover, they averaged about 45% in 2005 (higher than the average in the CCIAAT sample, which was 39.4%), with peaks of 60%-70% (table 14). In 2000, as was still the case in 2005, for a large part of the firms the main foreign markets were the first 15 countries of the European Union which, irrespective of the segment of the supply chain, absorbed more than half of the firms' exports. The remainder was destined mainly for countries in Central and Eastern Europe, which attract growing quotas of exports due to their roles as industrial poles and export platforms (table 15).

Tab. 14 Exports by single firm, 2000-2005 (% on turnover)

Production Segment	Company	Exports 2000	Exports 2005	Δ
ED	ED1	18.8	2.4	-16.4
	ED2	18	20	2
	ED3	15	42.5	27.5
	ED4	n.a.	n.a.	n.a.
SM	SM1	30	63	33
	SM2*	51.6	52.4	0.8
PS	PS1	n.a.	72.5	n.a.
	PS2	40	40	0
SB	SB1	75	66	-9
	SB2	40	60	20
	SB3	35	43	8
	SB4	22.5	41	18.5
	SB5	n.a.	41	n.a.
	Average	**34.6**	**45.3**	**10.7**

** Data refer to 2003 and 2005*

Source: Authors' computation based on data from direct interviews

Tab. 15 Geographical breakdown of exports by segment (%)

	Engineering and Design Specialists		Systems-Module Makers		Product Specialists		Subcontractors	
	2000***	2000	2000	2005	2000	2005	2000***	2005***
EU15*	45.0	41.7	79.1	77.1	71.0	68.5	84.6	70.6
New Eu members in 2004**	25.0	25.0	4.9	9.9	0.0	2.0	6.9	10.5
Russia, Turkey and other European Countries	0.0	0.0	1.0	0.1	16.5	17.0	0.6	7.5
Africa	0.0	0.0	0.0	0.0	5.0	4.0	3.8	1.4
Asia (excluding China)	0.0	16.7	0.0	0.5	3.0	2.0	0.0	2.3
China	0.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0
Usa & Canada	0.0	0.0	3.6	2.0	0.5	3.0	1.9	5.5
Brail and Argentina	30.0	0.0	6.0	10.0	2.0	1.5	0.9	1.1
Australia and Oceania	0.0	0.0	0.5	0.5	0.0	0.0	0.8	0.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

** EU-15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom*

*** Countries that joined the EU in 2004: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia*

**** Average values calculated for a total of three out of four firms*

***** Average values calculated for a total of four out of five firms*

****** Excluding Brazil and Argentina*

Source: Authors' computation based on data from direct interviews

By and large foreign sales recorded considerable growth compared to 2000, a trend that was obviously linked to the strategies for diversifying their customer base, given that the firms actively sought alternative outlets to reduce their dependence on the Fiat Group[19]. Besides, in 2005 almost half the firms interviewed (six out of 13) stated that they depended on Fiat for less than 25% of their turnover and only in two cases were firms more than 50% dependent on Fiat.

As a result the firms have increased their degree of internationalisation, through both exports and more complex forms, as mentioned by Bacchiocchi *et al*. (2008) with reference to the CCIAAT sample. This process is still ongoing, and appears to be confirmed by the increase in the number of foreign customers over the course of 2005 (table 16).

> *"A third of turnover comes from sales to the Fiat Group, which is considered a good customer and punctual in payments, with whom we have developed an excellent relationship of cooperation for the development of new products. Compared to 2000, our customer portfolio has increased in numerical terms, thanks to the inclusion of new customers in Eastern Europe, an area where many of our old customers have relocated part of their production. Once you become a supplier for a specific vehicle, you remain so for the whole of the vehicle's life cycle, on average about five years, because auto manufacturers are unlikely to change suppliers mid-stream"*

> *"The firm is internationalized from both the commercial and the productive points of view. Exports increased substantially between 2000 and 2005, from 15% of turnover to 40-45%. The main reason was the diversification of customers in order to become less dependent on Fiat that was experiencing a crisis. Previously 80% of our turnover came from Fiat, and currently only 50%; now we serve the whole Volkswagen Group. Rather than for reasons pertaining to the economic situation in general, the increase in exports was due to the strategy of finding new customers abroad that was implemented some years ago and is now bearing fruit."*

[19] As we have seen, the prolonged crisis of Fiat Auto meant that the supplier firms had to accelerate their strategies of diversification of their customer portfolios in order to reduce their monopsonistic dependence. According to CCIAAT data (2006), 75% of the firms do not depend on Fiat for more than 25% of their turnover, the segment showing the highest level of dependence was the Systems Engineers and Module Makers.

Tab. 16 Change in the number of customer firms located in Italy and abroad

Segment level	Company	Percentage changes on 2000	
		Italia	Estero
ED	ED1	=	+
	ED2	n.a.	+
	ED3	=	+
	ED4	n.a.	+
SM	SM1	–	+
	SM2	n.a.	+
PS	PS1	+	++
	PS2	=	=
SB	SB1	+	+
	SB2	=	+
	SB3	n.a.	n.a.
	SB4	=	=
	SB5	n.a.	+

Source: Authors' computation based on data from direct interviews

4.2.1 The "light" forms of internationalisation

Internationalisation processes can involve different methods, differing degrees of risk, organisational and relational complexity, and costs. In addition to serving international markets through exports from the country of origin or in an indirect form through agents or representatives, firms can in fact invest in distribution and commercial penetration abroad (commercial FDIs that do away with or reduce the intermediary roles of foreign importers-wholesalers, for example the setting up of commercial branches, warehouses, technical assistance centres).

We shall now take a look at the different forms adopted by the firms interviewed (table 17): beginning with the more simple ones, during the reference period four firms' only activity was exports (directly from Italy or through agents/representatives). Apart from the branch of a foreign group (whose target is the national market and some others, to which it exports from Italy), for some this choice is based on motivations linked to the product's low added value, which would not justify a direct commercial presence, or on the fact that the product, while not being particularly innovative, is a niche product, thus the firm has few competitors.

A further four firms chose to support their foreign sales by opening commercial offices in a number of countries.

Of these, two firms also have productive activities and avail themselves of local suppliers (in India, Brazil and Turkey), thus choosing a "lighter" form of internationalisation compared to the setting up of a joint venture or productive branches. In fact, as an alternative to carrying out "internalised" activities through foreign branches, which is costly, firms can outsource part of their production abroad by means of contractual agreements (arm's length contracts).

Tab. 17 Internationalisation modes by production segment

Production Segment	Sales abroad	Commercial FDIs	FDIs or JVs for productive activities	Arm's Length Contracts	Future prospects
ED1	Exports from Italy; agent in Germany	Technical-commercial base in India (2000)		production through suppliers managed by the office in India	Evaluating the possibility of setting up a factory in India
ED2	Only exports from Italy(*)				
ED3	Exports from Italy		FDI in Poland (2003); JV in Mexico (2005)		Will consider whether to relocate more production abroad
ED4	Exports from Italy	Technical-commercial base	FDIs in 19 countries including Brazil, Argentina, Australia, United States, Canada, Mexico, China, Russia, India, South Africa and a number of European countries (Spain, France, Germany, Poland, Romania, Sweden, Belgium, United Kingdom). All takeovers except for the greenfield FDI in China.		Consolidate current activities
SB1	Only exports from Italy				
SB2	Exports from Italy; representative in Spain	Commercial offices in Turkey and Brazil		The offices in Turkey and Brazil manage purchases and the local suppliers	Will consider whether to carry out design and planning abroad
SB3	Exports from Italy	Branches in the United Kingdom	FDI with the acquisition of a firm in China (2007)		
SB4	Exports from Italy		greenfield FDI in France (2006)		Plans to open a production unit in Bulgaria
SB5	Exports from Italy		50% JV in China; greenfield FDI in USA; FDI with the purchase of existing firms (France, Poland, Mexico, Brazil)		Plans for an agreement in India for the transfer of know-how
SM1	Exports from Italy		50% JV in Brazil (1999); greenfield FDI in Poland (2006)		
SM2	Exports from Italy		greenfield FDI in Mexico (2001)		Plans for a JV in Poland
SP1	Only exports from Italy				Plans to open a factory and a commercial unit in Eastern Europe in 2008; is also considering the possibility of building a factory in China, relocating some production to Brazil and forming a JV with an Indian partner
SP2	Only exports from Italy				

(*) Multinational with operations in various countries; it produces for the Italian market and for some other countries that it serves from Italy.

Source: Authors' computation based on data from direct interviews

Although launching costs are lower, these types of internationalisation can nevertheless be disadvantageous in terms of the cost of transactions, imperfect information and contractual incompleteness (Barba Navaretti, Venables 2004)[20].

One in particular pursued this strategy with a medium-long term view, specifically dedicating Italian personnel to the management and training of the local suppliers: the orders are carried out *in loco* (and also on neighbouring markets) on the basis of the firm's design specifications, incorporating both the parts exported from Italy and the components produced locally.

[20] Barba Navaretti, Venables (2004), p.99: *"For example, in the case of North-South production networks in areas such as textiles, automotive products and electronics, a considerable share of the labour intensive activities is outsourced by Northern firms to Southern producers"*; p.124: *"The basic trade-off is between the higher costs involved in setting up and running wholly owned operations and the market failures affecting the contractual relationship with local firms".*

"I would like to explain that at the moment our strategy is not one of opening production plants abroad. Our office on the ground helps us with contractual aspects and the management of purchases and local suppliers - part of the supplies are made here, and part directly there. To the question of whether we have decentralised part of our activities, I would answer yes, but it does not involve production…I would say that we have decentralised the management of local suppliers, through our own offices."

4.2.2 The "complex" forms of internationalisation

The more complex forms of internationalisation involve FDIs to produce directly on the local market (and possibly to export elsewhere, including back to the domestic market), with a geographical dispersion and "fragmentation" of production, through greenfield investments, mergers/acquisitions of firms, and also through intermediate forms of "internalisation" (joint ventures with local partners or other investors).

In literature we find a distinction between horizontal and vertical FDIs: the former is when the firm replicates in another country the production process that it carries out in the country of origin, while maintaining in the home country the headquarters and various functions (financial management, R&D, marketing.). Vertical FDIs, on the other hand, involve the geographical separation and dispersion of the different stages of production, by means of the fragmentation of the value chain, and are typically carried out in countries where production costs are lower. Consequently the factors that determine the choice of whether to make investments of the first or second type are also different: for horizontal FDIs the main motivations are linked to the size or the access of the market (market-seeking) and to the "trade costs" (packaging and transport, communication and co-ordination costs, import duties etc.), while for vertical FDIs the determinants are mainly cost-saving and resource-seeking. However, in reality, the distinction is not always that clear (Barba Navaretti, Venables, 2004).

Between 2000 and 2005 seven of the 13 firms had carried out foreign direct investments both through acquisitions (the majority) and in the form of greenfield investments (in China, Poland, Mexico, France and the USA); in a number of cases there were also joint ventures with partners in loco (in Mexico, Poland, Brazil, China and France). It should also be noted that the drive towards productive internationalisation continues to be as strong as ever, as we can see from the future plans of the firms (some of them only exporters), aimed at building production facilities (in India, Bulgaria, Poland and other Eastern European countries, China and Brazil) (table 17).

Firms' heterogeneity may help to explain the different degrees of international involvement and various company characteristics are associated with the adoption of more complex forms of internationalisation[21]. Considering the group interviewed, productive internationalisation by means of FDIs would appear to be clearly correlated to the size of the firm (measured by the level of turnover and the number of workers), due to the high fixed costs for entry. The two large firms (with over 1,000 and 2,000 workers, respectively) distinguish themselves from the rest for having set up a production network in many countries, both developed and emerging; in the other cases, the firms are medium-sized (between 100 and 500 workers) and they have a productive presence in one or two countries abroad (table 18).

[21] Baldwin et al. (2007), p. 96, identify the company characteristics that are correlated to the complexity of the international activities: size, productivity, intensity of human capital, investment in innovative activities and in ICT, ownership structure and financial structure.

Tab. 18 Internationalisation modes by and firm size and production segment

Production Segment	Size	Class of turnover	Exports	Commercial FDIs	FDIs or JVs for productive activities	Arm's Length Contracts
ED1	20-49	5 mln-10 mln €	x	x		x
ED2	50-99	10 mln-50 mln €	x			
ED3	100-249	10 mln-50 mln €	x		x	
ED4	oltre 500	oltre 500 mln €	x	x	x	
SB1	100-249	10 mln-50 mln €	x			
SB2	50-99	5 mln-10 mln €	x	x		x
SB3	100-249	5 mln-10 mln €	x	x	x	
SB4	100-249	10 mln-50 mln €	x		x	
SB5	oltre 500	250 mln-500 mln €	x		x	
SM1	250-499	50 mln-150 mln €	x		x	
SM2	250-499	10 mln-50 mln €	x		x	
SP1	100-249	10 mln-50 mln €	x			
SP2	20-49	10 mln-50 mln €	x			

Source: Authors' computation based on data from direct interviews

Four of the firms that made productive investments (and are larger in size) are not family businesses, which is a characteristic frequently associated with the more complex forms of internationalisation. The other firms - having only one or two foreign plants – and the two companies that produce through international outsourcing are all family-run firms. It should also be noted that, in order to finance the productive investments, almost all of the interviewed firms had used their own capital (unlike one of the firms whose foreign production is outsourced, which was partly financed by bank credit). This is proof of their capacity for self-financing, another factor that weighs on the adoption of more complex modes of internationalisation.

Furthermore, as we have mentioned, the majority of firms that carried out FDIs over the period 2000-05 invested considerable percentages of turnover in R&D in the last year considered, in line with the findings of Bacchiocchi *et al*. (2008), which showed a positive correlation between investments in R&D and the more complex forms of internationalisation. However, it should be remembered that sizeable shares of turnover (3% and 5%) were also invested in R&D by the two firms that only export (table 19).

Tab. 19 Internationalisation modes and expenditure on R&D

	Share of turnover invested in R&S 2005	Exports 2005	Exports	Commercial FDIs	FDIs or JVs for productive activities	Arm's Length Contracts
ED1	ND	2.38	x	x		x
ED2	0.7	20	x			
ED3	10	42.5	x		x	
ED4	ND	ND	x	x	x	
SB1	1.5	66	x			
SB2	ND	60	x	x		x
SB3	5	43	x	x	x	
SB4	ND	41	x		x	
SB5	0.8	41	x		x	
SM1	2.5	63	x		x	
SM2	3	52.4	x		x	
SP1	3	72.5	x			
SP2	5	40	x			

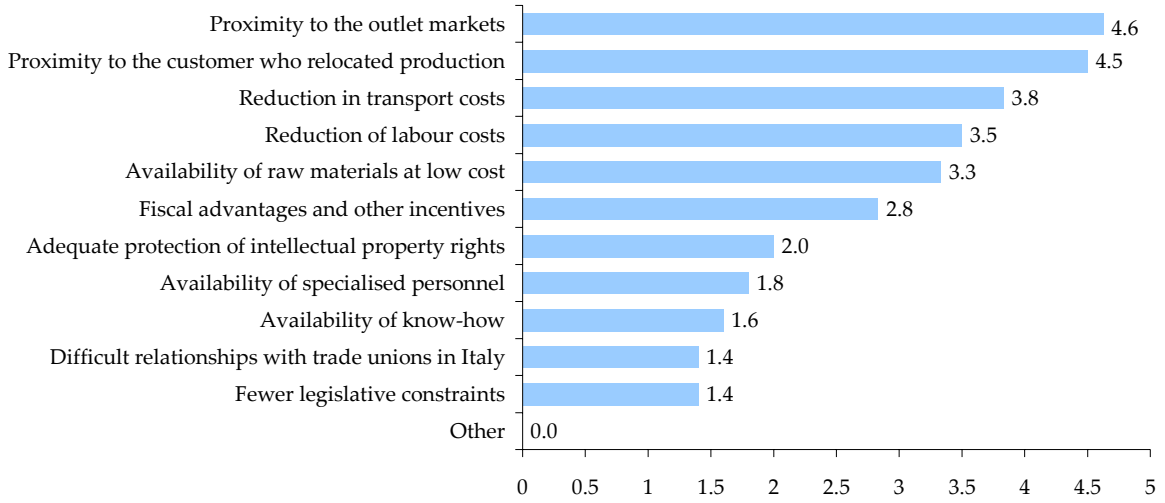
Source: Authors' computation based on data from direct interviews

With regard to which functions and phases of production are usually decentralised, we find that the design and R&D activities are still carried out (entirely or for the most part) in Italy; however some firms do not exclude the possibility of transferring part of these functions abroad.

The production carried out in the foreign factories has often been defined as “analogous to that in Italy”: the duplication of productive activities in different locations would suggest the existence of horizontal investments, despite the fact that FDIs are often established in emerging countries. Sometimes the purpose of decentralisation is to carry out the simpler and more labour-intensive phases, while the majority of value added and more automated processes are performed in Italy.
Analysing the factors that determine the choice of productive internationalisation, we found that proximity to outlet markets and co-location (being close to the auto constructors that decentralised their activities to industrial poles from which they serve entire regions) are the most important motivations, followed by reducing transport costs, which precede the relative advantages of the lower cost of labour.

Figure 6 also suggests that there is a prevalence of horizontal direct investments, although this is not always clear, given that some firms considered motivations linked to the market proximity and to cost factors to be equally important.

Figure 6 Determinants of productive internationalisation



Source: Authors' computation based on data from direct interviews

> *"The main motivations for investing in Mexico were: proximity to the car maker (Volkswagen), that relocated production and thus proximity to the outlet markets, the reduction of transport costs and the lower cost of labour. As regards future plans, we shall shortly be launching a joint venture with an existing company in Poland so that we may be present in the heart of what is becoming a very important European centre for the auto industry. It is necessary to position oneself close to the end customer in order to reduce transport costs given the specificity of a product that is very light, but also very voluminous, like for example the covering of the tyres. The customers are also pushing their suppliers, not only those in the first tier, but also those in the second, to move closer and become more concentrated in the same area so that they may have punctual deliveries and not have to maintain huge warehouses".*

> *"The first reason that pushed the firm to find a partner in Brazil was to be close to the customer that had relocated its production, in this case Fiat. However, in time other auto constructors (in particular Volkswagen) that came to Brazil began to get their supplies from us and to become customers of our firm in Brazil."*

Little importance is, however, given to the presence of skilled human resources or to the accessibility of specific technical know-how in loco. If anything, the low level of human capital in the new countries is considered a limitation by the firms, which have difficulty finding sufficiently trained local personnel, and often have to resort to bringing in personnel from the parent company.

Lastly, looking at the trend in turnover for the period 2000-2005, we can see that the largest increases were achieved by the firm that chose to produce in the emerging markets through arm's length contracts, followed by one firm that operates through a joint venture in Brazil and that has recently carried out an FDI in Poland. On the other hand, considerable growth was achieved also by two firms that (at least for the moment) serve foreign markets only by means of exports (table 20).

Tab. 20 Internationalisation modes and growth in turnover

	Turnover growth 2000-2005	Exports 2000	Exports 2005	Exports	Commercial fdis	Fdis or jvs for productive activities	Arm's length contracts
ED1	38	18.8	2.38	x	x		x
ED2	52	18	20	x			
ED3	10.6	15	42.5	x		x	
ED4	-5	ND	ND	x	x	x	
SB1	22	75	66	x			
SB2	90	40	60	x	x		x
SB3	3.8	35	43	x	x	x	
SB4	59	22.5	41	x		x	
SB5	ND	ND	41	x		x	
SM1	81	30	63	x		x	
SM2	-22	51.6	52.4	x		x	
SP1	48	ND	72.5	x			
SP2	50	40	40	x			

(1) Five of the firms stated that they operated through "complex" forms of internationalisation (FDIs, JVs) over the period 2000-2005

Source: Authors' computation based on data from direct interviews

4.2.3 Procurement

One of the strategies that can be employed to cope with the increasing international competition is the so-called "strategic" procurement, that is, the purchase of components and semi-finished goods from foreign suppliers with lower labour cost . From the interviews it emerges that the quotas of purchases from foreign subcontractors are low (less than 25% of the total), without any sizeable differences compared to 2000, with the exception of one firm, whose externalisation strategy obviously coincided with a greater recourse to foreign markets (table 21).

This would appear to be explained by the fact that foreign suppliers are often not considered capable of meeting the high qualitative standards required. Vice versa, local subcontracting is still a privileged supply channel thanks to the qualitative levels reached by the firms in the region; also the research links that firms have forged with local universities, with the development of cooperation projects, give firms access to technical-scientific know-how that is more profitable than the results they would have achieved just with *intra muros* research.

As a result, firms' exchange is strongly localised within the region, demand from firms is directed at the surrounding network and thus, so far, there have been no crowding out, at least as far as the "top" segment of supplier is concerned.

> *"We are currently evaluating the possibility of a new entry from Turkey, which has not yet given us sufficient guarantees in terms of qualitative standards. The automobile industry is one in which quality is of primary importance. Our company's error threshold is 25 pieces per million, if this limit is reached, in addition to penalties such as being charged for the defective pieces, the firm is also penalised in terms of image. If a firm is no longer considered reliable, the customer goes elsewhere. For this reason the production of all items is observed not only by our own technical staff, but also by representatives of the customer who certify the product".*

The supplies necessary for the production in the foreign plants are partly acquired from local suppliers. Similarly to the procurement strategy pursued by Fiat, the firms interviewed avail themselves of local suppliers for some simpler components, but the more complex ones and those with a greater technological content, if found in loco, are supplied by multinational firms – Italian or foreign – that have internationalised their activities in the same area.

> *"Local suppliers in developing countries are merely the leading firms of the major industrialised countries that have opened new branches; it is not easy to create a new firm due to the specific requirements of the product. There are six or seven of us in the sector; for this product all the firms active abroad are affiliates of European firms. It may happen that you find local suppliers, but only for the less specialised, more generic products".*

Tab. 21 Incidence of imports on total purchases (%)

Production Segment	Firm	2000	2005
ED	ED1	n.a.	n.a.
	ED2	26-50	26-50
	ED3	n.a.	n.a.
	ED4	10	16
SM	SM1	10	1-2
	SM2	n.a.	n.a.
PS	PS1	n.a.	n.a.
	PS2	2	2
SB	SB1	0	0
	SB2	1-25	26-50
	SB3	1-25	1-25
	SB4	1-25	1-25
	SB5	n.a.	5

Source: Authors' computation based on data from direct interviews

4.3 The role of ICT in internationalisation processes

The automotive industry is a case of excellence as regards the use of information and communication technologies (ICT), which was slow to catch on in Italian industry, to the point where the low rate of adoption of ICT on the part of firms was considered to be one of the causes of the drop in total factor productivity between 1995 and 2005 (Rossi, 2003). While Italian manufacturing firms recorded only low levels of ICT use (personal computers, e-mail and, sometimes, the presence of a "showcase" website), and had not yet undertaken any significant reorganisation to fully exploit the productivity potential linked to the new technologies (Giunta and Trivieri, 2007), already in 2001 the automobile industry had adopted "evolved" ICT making use of software applications for interface and coordination such as EDI[22], ERP, MRP[23] (Trento and Warglien, 2003).
The presence in the Turin district of a large firm was a determining factor in the faster spread of information and communication technologies. Fiat played the role of standard maker, having the hierarchical power to impose on the different segments of the chain the applications they must adopt to make the exchange of information less costly at every level of the supply chain[24]. Subsequently, with the diversification of customers, the drivers were also other auto constructors, even though this meant that the suppliers had to adopt a different series of standards.

The group of firms interwieved made investments in ICT (even considerable ones) over the period considered and boast a full endowment (Figure 7). Empirical analyses have also shown that a greater propensity to adopt and use ICT is correlated with size, the presence of an R&D function and of a skilled workforce, due to the need to be able to reorganise the information flows, to encode the information so that it can be transmitted and, in general, to "absorb" the change required by the new technological paradigm. Furthermore, the probability of adopting ICT increases for the exporting firms and for those with co-operation agreements (Giunta, Trivieri 2007). As we have seen in previous paragraphs, for the most part the firms interviewed possessed all of these elements.

In addition to the endowment of technologies of a general nature (Internet/Intranet), all the firms stated that they used management applications (software for administrative management, logistics, warehousing management, and the control/monitoring of production[25], adopting mainly the ERP systems of leading international firms), and the majority are also equipped with technologies for the electronic exchange of information between firms (EDI or web-EDI, used by eight firms out of 13).

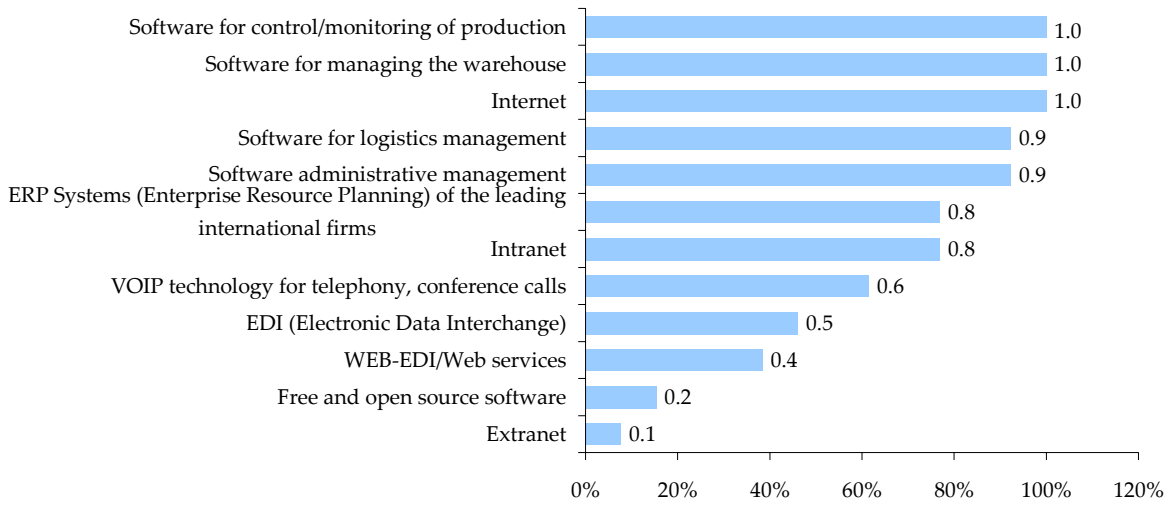
[22] Electronic Data Interchange (EDI) allows for the electronic exchange of documents with protocols agreed within one or a group of firms; the extension of the EDI networks to trading partners with volumes of information to exchange that do not justify involvement based on traditional EDI has been made possible thanks to hybrid systems like Web-EDI, Balocco et al., 2006.

[23] The Enterprise Resource Planning (ERP) system provides IT support for the management of all the activities like planning production and the purchase of raw materials, Bianchi and Pini, 2006.

[24] "On the suppliers front, the choice of investments in ICT depends to a large extent on the needs for coordination with the choices made by other firms in the chain. This externality of the network reduces uncertainties about the standards that should be adopted, thus making investments less risky", Trento and Warglien, 2003.

[25] The firms mostly use proprietary software, with only marginal recourse to open source programmes.

Figure 7 IT endowment



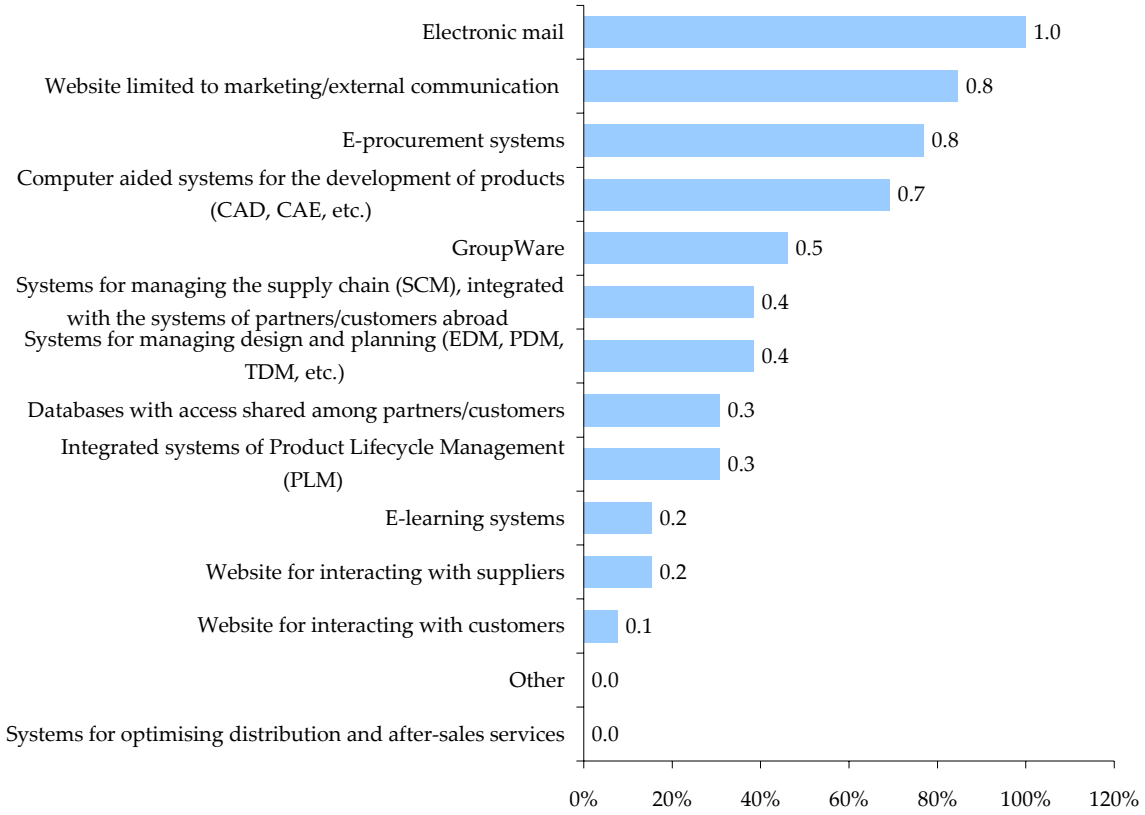
Source: Authors' computation based on data from direct interviews

In addition to facilitating communication with suppliers and customers and to improving internal efficiency (production, financial management, stock management, and logistics) ICT allows for organisational innovations, and its use can facilitate internationalisation processes and the organisation of the economic activities located in different countries. In the automotive sector, business-to-business systems (B2B) may act as a support to the purchasing function, to the activities related to co-design, engineering and product development, and to the management of the supply chain (Supply Chain Management - SCM[26]) (Bardi 2001), also at a transnational level.

On the purchasing front, systems of e-procurement and on-line auctions[27] allow for the virtual meeting of customers and suppliers for the conferral of the orders. These are systems promoted by auto constructors that allow potential suppliers from the global market to participate, thus guaranteeing themselves greater choice and reducing the costs linked to finding new partners. These ICT tools (which are used by 10 firms out of 13, see Figure 8) are often not very well received by the supplier firms for the simple reason that they require rather complex procedures (not always considered to be transparent); moreover they mainly involve the purchase of standardised, simple intermediate goods, while in other cases direct face to face transactions are preferred.

[26] Supply Chain Management (SCM) systems help firms to optimise the different levels of the supply chain.
[27] For example through the COVISINT and SupplyOn portals:
http://www.covisint.com/about/
http://www.supplyon.com/gen_root_en.html

Figure 8 Computer applications



Source: Authors' computation based on data from direct interviews

For a certain period of time our company participated in the online auctions of our customers, but then this tool was abandoned because it was considered disadvantageous in terms of time and cost and also because there was the suspicion that among the participants was the customer itself. We also abandoned the auctions our company organised for its procurement, because we felt it was too risky to purchase from unknown suppliers.

About 3-4 years ago the company participated in a system of e-procurement (online auctions), but we gave that up because the procedure was too complicated and expensive, preferring to go and contact possible customers directly in the traditional way.

Another sphere of use for IT tools is the design and development of products, an activity that can be carried out in locations that are different from those of production, thanks to the possibility of transmitting and sharing digital documents. In this way the division of labour between the head office and foreign production sites is facilitated, potentially allowing also for recourse to international outsourcing.

The applications used for these purposes are CAD (Computer Aided Design), CAE (Computer Aided Engineering) and other similar programmes, which are used by nine firms out of the 13 in our study. Product data management systems (PDM[28]) are relatively less common (present in five firms) and the same can be said for the more advanced integrated applications like PLM[29] (that are used by four firms out of 13). The diffusion of these systems within the chain varies greatly from segment to segment, also according to how involved they are in projecting activities.

[28] Product Data Management is a tool for the management of product data during the design and engineering processes , Balocco et al., 2006.

[29] Product Lifecycle Management systems refer to the integration of different ICT solutions that generate and use product data, from the design systems (CAD) to the software supporting the management of design and engineering processes (PDM), to systems for document management, to ERP and similar applications, Balocco, et al., 2006.

The third sphere in which computer applications play an important role is managing the supply chain, through Supply Chain Management (SCM) systems that facilitate the organisation of networks of firms (in loco and abroad) enabling them to link their management systems (orders, production, warehouse, payments, shipping) among the factories located in different countries or to interface with suppliers and customers. From the interviews we discovered that this type of application is used by five firms out of 13: in some cases they are of strategic importance in managing the entire production chain, especially for those firms that deliver products to the customer's factory following a policy of "make and deliver to order".

> *"Naturally we use e-mail. Our website is limited to communication, it is a showcase site, and we do not sell over the Internet. As regards our customers, almost all auto constructors have websites with sections dedicated to suppliers: we use their websites, which are protected, to sell according to the requests for tenders and online auctions. For example, we work with the Volkswagen Group that has its own system of online auctions. We do not operate through online auctions with our suppliers, but we are implementing a website in order to interact with them.*
> *Obviously we have CAD systems and together with our customers we can design at a distance. We also use design management systems like PDM and are beginning to implement more sophisticated tools likePLM systems.*
> *We are improving out information systems on a regular basis and we shall continue to do so, we have a number of dedicated high speed lines (ISDN) for our customers. This is necessary because otherwise the whole system would stop: design, planning, and the productive processes and logistics of the various factories. With these systems we can insert and download production data and manage the warehouse from any place."*

> *"In the past 10 years the need has arisen for tools that manage the system efficiently also at an international level (at least at a European level).*
> *We have some projects for interacting with our customers; with our suppliers we hold on-line auctions (e-procurement), for which we have a dedicated company. We use a "groupware" type software and computer-aided systems (CAD) for the cooperative development of products and for the management of design documents (PDM etc.) among the factories in the different countries. We also have integrated Product Lifecycle Management systems and are users of many shared databases; we have one of our own for internal management, which is not shared with customers or suppliers.*
> *We have supply chain management systems and also use software to manage the after-sales service and a kind of technical distance learning, linked to the machine shops in other countries, in order to provide technical support."*

Conclusions

In this section, we will summarise the main conclusions of the work, starting the examination by the considerations on firms' organization, since heterogeneity among firms is quite high and firms' characteristics do matter in firms foreign expansion.

Organisational structures: the internal and the external one

The enterprises we interviewed present a rather wide and rich functional articulation, even when they are subsidiaries. Within the activities carried out, the Research and Development function is important (particularly for enterprises of the Engineering and Design segments and product specialists). This may be inferred both from the number of employees and from the level of investments in R&D, as well as from the relationships developed with local universities in support of their development activity. Thus, apart from *intra muros* research, Italian universities and public research centres are also important fertilisation channels.

As regards external relationships, in order to fulfil the customers' requests, the interviewed enterprises have organised, in turn, a close network of exchanges with other enterprises (subcontractors of the suppliers) in support of their productive activity, thus setting up an organisational model that we have defined "production fragmentation with centralisation of responsibilities". There are no particular elements of novelty in this model, as the car supply chain industry has been a forerunner of this peculiar organisation model.

According to us, the interesting fact is rather that exchanges are strongly localised in the region, the demand of enterprises is aimed at the surrounding context and therefore to this date, no worrying crowding-out effects are observed under the profile of multiplicative effects. Turin enterprises still rely on subcontractors of the region because of their better quality, whereas *low-cost* ones still present performances below the standards required in the industry, and therefore they cause an increase in all inspection and quality control costs for outsourced stages.

Internationalisation is a cumulative process, chosen for the internationalisation of activities on foreign markets and to become independent from Fiat auto.

From the interviews and data relevant to the 13 enterprises we have met, which, as already said, were selected from a representative sample of the Turin chamber of Commerce (CCIAAT), using as criterion the exposure on foreign markets, it has emerged that the enterprises having an exclusively commercial internationalisation, i.e. those that do exclusively exports, are only four. Their strategy may be explained, in certain cases, with the low value of the product, in respect of which it is not worth incurring the costs of a commercial network abroad and making other forms of investment; one of them is a controlled enterprise within an Austrian group, where the most advanced internationalisation procedures are devolved to the parent company. All four companies, however, experienced steady dynamics in the period 2000-05 both with regard to both turnover and to employment. The corresponding values of the CCIAAT representative sample, kept as constant reference throughout our analysis, show that a very high proportion of companies, i.e. 39.3%, is present in foreign markets only through exports and, even more worryingly for future firms'survival, 37% of them have the domestic market as their sole outlet.

A large majority of the enterprises we have interviewed follows several internationalisation modes at a time: in two cases, exports are associated with commercial and/or technical agreements or, for seven enterprises out of thirteen, exports are accompanied by direct investments, either as *greenfield* establishments or as *joint venture*, or as acquisition of foreign enterprises. The two polar forms of internationalisation thus seem to have characters of complementarity in our case, rather than of substitutability. Also, data show that enterprises prefer to internationalise foreign businesses through direct investments, mergers and joint ventures, which might be a sign that international market transaction costs still show considerable levels, higher that the internal production and coordination costs.

The geographic extension of the international production confirms the prevalence of areas of new productive location, such as Poland, the attraction exercised by China, and the presence of Latin-American markets, which are among the main expansion areas of Fiat Auto. The need to find a location near the client and at the same time, the closeness to the outlet markets are the two principal reasons behind investments abroad. This is hardly surprising, seeing that the car-vehicle supply chain industry has anticipated the synchronic supply, the *just in time*, and the co-localisation abates the uncertainty inherent in the long-distance delivery (Harrigan and Venables, 2004). A third determinant motive of the production internationalisation is the lower labour cost, a classic and recurring explanation for the choice to invest in countries with labour costs considerably lower.

Internationalisation can be seen as a preferential channel for emancipation from the monopsonistic dependence on Fiat, and therefore for diversification of the customer portfolio. Such result is also repeated in the broader CCIAAT sample, more specifically, the search for a client other than Fiat Auto has a positive and quite significant impact on the foreign markets projection, as is also confirmed, moreover, by the declarations of the managers we interviewed.

This is an important result for the automotive supply chain in its whole, which has in large part showed capacity of autonomy, ensuring positive performance on the markets during the years of Fiat crisis. With regard to the enterprises we interviewed, it has been seen that the growth in last year's turnover has been largely higher than the average value of the broader sample: this result, given the characteristics of our sample, brings about – but does not solve – the question of the direction of the causal relationship between internationalisation and growth. Is internationalisation the drive behind growth? Or, rather, enterprises are able to carry out strategies of exposure abroad when they are on the up?

ICT adoption: a widespread and necessary choice

The car industry appears as an exception in the scenario of the Italian industry, which shows a considerable delay in the adoption of ICT, with negative effects on total factor productivity. In the enterprises we have interviewed, advanced interface and coordination applications, such as EDI, ERP, MRP, are quite widespread. The explanation proposed in this article is that the decision to avail ICT has been largely brought about by the fact that a "visible hand" was present at each segment of the *supply chain*, which imposed communication standards and forced other enterprises to follow.

ICT result to have had a role of “enabling technologies”, they have removed the space “friction”, enabling the management of the long chains in which the automotive industry production has subdivided; and moreover, they have also concurred in a better coordination of production and communication processes within each enterprise.

Enterprises complain of two major impediments in the process for the adoption of new technologies: lack of infrastructure - in certain areas of the Turin province there is not even the broadband; and reorganisation, both internal and of the relationships with other enterprises. This is a rather common aspect: there is in fact a “micro complementarity” regarding the close, inseparable relationship between the adoption of ICT and the changes due to reorganisation, both internal and in the relationships with other enterprises” (Bresnahan *et al*., 2002; Brynjolfsson, Hitt, 2000; for Italy, Bugamelli, Pagano, 2001; Lucchetti, Sterlacchini, 2001; Trento, Warglien, 2003; Giunta and Trivieri, 2007). Organisational changes are essential to fully benefit from the increase of productivity potentially allowed by ICT.

The industrial district effect?

Lastly, we will develop a few considerations on the role of the province in modelling and influencing current and future behaviours of the Turin enterprises in the automotive supply chain. Although this aspect was not one of the research report objectives, the findings of the direct investigation allow to propose a few forecasts, subject to a stricter, future verification. The fabric of local interactions, in Turin and throughout Piedmont, does not seem to be impoverished by the competitive scenarios, at least as concerns the “high” exchange segment.

We have seen that the local subcontractors still are the privileged supply channel, thanks to the quality levels achieved by the enterprises of the region; the relationships established by enterprises with the local universities for research purposes, through the development of projects in collaboration, allow access to a technical-scientific knowledge more profitable than would be achieved only by the *intra muros* research. Finally, local institutions have permitted the acquisition of information on foreign markets, a support to marketing activities and to the labour training processes.

At different level, the University and the Polytechnic of Turin, and a few local institutions – first of all the Chamber of Commerce and the Municipality – can therefore be seen as important actors ensuring “offer externality” to the enterprises we have interviewed. Thus, there still seems to be in this area a broader “industrial district effect” which, together with the recovery of Fiat and with the reactive strategies of the supply chain enterprises, casts new light on the sustainability and the future dynamics of the specialisation of automotive industry in the Turin area.

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