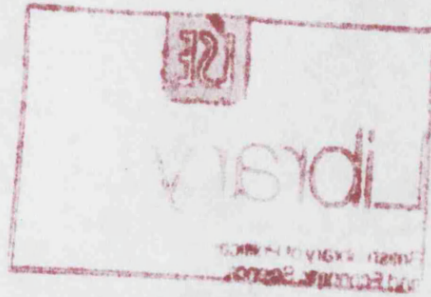


University of London



**TERRITORIAL COMPETITIVENESS IN A SYSTEMIC PERSPECTIVE.
EVIDENCE FROM TURIN'S TERRITORIAL PRODUCTIVE SYSTEMS.**

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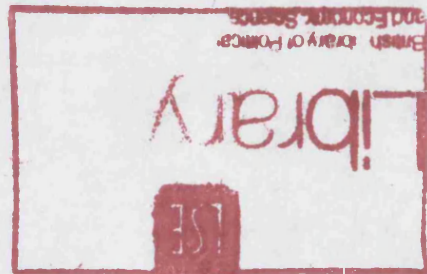
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ABSTRACT

The main focus of the research is on the concept of territorial competitiveness (TC). In TC literature, territory is assumed either as a set of locations that can be sold in a sort of market or as a set of assets that can influence firms' competitiveness. In both case, TC concept cannot be addressed without an explicit theorisation of the economic importance of territory.

The aim of this thesis, on a theoretical level, is to use autopoietic system theory as a framework for conceptualising the territory-economy linkage introducing the concept of Territorial Productive Systems (TPS). TPS can be defined as a set of components (mainly firms, but also public administration, research centres, universities, employers' and employees' associations, training centres etc.) systemically linked by relationships founded on territorial proximity, that is *both* organisational and physical proximity. What makes the TPS different from other geographical and economic objects – like industrial districts, clusters, mere agglomerations – is its explicit systemic construction, focusing on the differentiation between organisation (the basic set of processes that define the distinctiveness of a given TPS) and structure (the set of contingent characters).

In the second part of the dissertation, the TPS is applied to analyse Turin's economic and productive transformation. Though traditionally identified as one of the main cases for Fordist organisation in Europe, Turin has always escaped the traditional features of the one-company-town. Grounding on literature review, previous studies, and a survey of about 400 face-to-face interviews we will try to describe how Fiat's supply-chain has been changing over the last decades, setting local sub-systems free to follow new development and learning patterns. In particular, we will be claiming that the existence of continuity over time does not imply the existence of a unique development path and a reification of the territory, but rather the fact that continuity can cope with variety and change in an evolutionary perspective.

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Chapter 1: On the concept of territorial competitiveness.

Within the broader debate about the spatial and territorial dimensions of economic activities, during the last two decades, the issue of territorial competition and competitiveness spread among both scholars and practitioners interested in regional development processes and policies¹. Because of the complex overlapping with other emerging streams of research and praxis – globalization, local development, governance, rescaling of both political and economical power, industrial clusters and districts etc. – the concept of territorial competitiveness became rapidly a fashionable short key for explaining the fast growth of “new places”, the decline of some old industrial areas and the resurgence of others.

In this first introductory chapter, our main purpose is to review the different contributions that compose the archipelago of the territorial competitiveness debate. Before entering the literature analysis, nevertheless, we would like to develop some reasoning about the concept and the definition themselves of “territorial competitiveness”.

1. Where everything begun: national competitiveness in question.

The concept of competitiveness relies, obviously, on that of competition. This quit tautological statement implies a number of risky issues about the consistency of the concept itself, as there is not a shared opinion about what economic competition is and how it is shaped by both economic and non-economic behaviours. Postponing the competition issue to a further development in next sections, we would like here to start with the meaning of the concept of territorial competitiveness in economics.

Considering a number of dictionaries of Economics, we can immediately observe two significant features of this concept:

¹ As a benchmark of the growing interest in territorial competitiveness we can refer to the monographic issues of some of the most important journals in Economics and Economic Geography, like *Urban Studies* (in 1999), *International Regional Science Review* (in 1996) and the *Oxford Review of Economic Policy* (in 1996).

- (i) it is ignored by most of the more prestigious dictionaries (e.g. the Palgrave Dictionary of Economics, which has not any entry for the word “competitiveness”);
- (ii) when present, the concept of “territorial competitiveness” is strictly identified with “national competitiveness”.

According to the Oxford Dictionary of Business, for instance, competitiveness is defined as:

The ability of an economy to supply increasing aggregate demand and maintain exports. A loss of competitiveness is usually signalled by increasing imports and falling exports. Competitiveness is often measured in a narrower sense by comparing relative inflation rates (Pallister and Isaacs, 2002, pp.112-113)

Despite this use of the word “competitiveness” establishes a clear link with its geographical dimension, its strict identification between competitiveness and the share of international market detained by a nation implies two stigmata, which accompany the fate of territorial competitiveness and create some misunderstanding in interpretation:

- (i) the first is the identification of the territorial dimension with the national scale. This is not the case for a coincidence, of course, but it rather mirrors the predominance of the national scale over different ways of being “territorial”;
- (ii) secondly, this definition with reference to market share bounds the issue of territorial competitiveness into the intellectual framework of International Trade Theory, ignoring other explanations and theories that can offer a more complex alternative view on this issue.

If we consider the definition of competitiveness found in a second dictionary, The Economist Dictionary of Economics, we can find how this interpretation may assume a deeply negative meaning:

A loose term, popularly used to reflect the ability of a nation to grow successfully, and to maintain its share of world trade. [...] It is used as though it refers to the state of the productive base of the economy, yet attempts to apply a precise definition have foundered. It either reduces to a measure how rich a country is, measured by its gross domestic product per head of population, or to a measure of the price or tradable goods expressed in foreign currency. Yet those who use the term appear to believe they are talking of a broader concept than either of these. Those who have criticised the growth in usage of the term, argue that basic

economic theory of international trade and comparative advantage makes clear that we should not view the world as a group of nations competing in a zero-sum game. (Bannock, Baxter and Davis, 2003, pp.65-66)

This definition echoes the negative judgement expressed by Paul Krugman about the concept of national competitiveness in his seminal "Making sense of the competitiveness debate" (Krugman, 1996):

the view that nations compete for world markets in the same way that corporations do, that a nation which fails to match other nations in productivity or technology will face the same kind of crisis as a company that cannot match the cost or products of its rivals. [...] While influential people have used the world 'competitiveness' to mean that countries compete just like companies, professional economists know very well that this is a poor metaphor. (pp. 17-18)

Apart from the usual display of rhetoric weapons, Krugman's argumentation deserves consideration. Krugman distinguish four different attitudes towards national competitiveness: the Mercantilist, the Classicist, the Strategist and the Realist. Even if many differences are considered between the four, the relevant categories are actually two: Mercantilist/Strategist versus Classicist/Realist. According to the first category, national competitiveness would be a meaningful concept to justify protectionism and strategic support to national producers against international competitors. Classicist-New-Trade-Theorist-Realist Paul Krugman's objections are quite clear (1996 and 1998):

- (i) unlike corporations, nations cannot fail as they will exist anyway, even under a loss of competitiveness;
- (ii) stressing the competition between nations in international markets implies a zero-sum view of international trade which is proved to be fake, according to the most elementary notions of comparative advantage classical theory;
- (iii) not necessarily an higher degree of export means an higher degree of common health;
- (iv) the major world economy – the USA – relies only marginally on export to secure its growth in living standards;
- (v) the growth of the other nations creates new demand also for national products;

Krugman's points have been challenged by a number of authors, focusing on his narrow interpretation of competitiveness (Camagni 2002) or on the limits of neoclassical both Old and New International Trade Theory (Dunning, 1995; Hämäläinen, 2003). Moreover, Krugman is very skilful in designing a caricatured definition of his target in order to emphasize the explanatory capability of classical/realist international trade theory. In

doing so, he deliberately misses that a large part of the territorial competitiveness debate is something more than a mercantilist defence of jobs and national champions: for instance he does not seem to consider at all the National Systems of Innovation literature, which gave in the last year a substantial contribution to the debate about territorial competitiveness (Lundvall, 1992a; Nelson, 1992).

Nevertheless, although there is an evident rhetoric oversimplification of his competitors' point of view (for instance he does not quote at all Michael Porter) and although he refers only to the concept of national competitiveness (which is actually quite marginal in the current debate about territorial competitiveness), Krugman's observations arise at least two issues that cannot be ignored for the purpose of our research.

The first issue is whether territories can be treated as having some form of *juridical personality*, which is whether collective actions can be attributed to a territory. In other terms, can a territory be treated as an actor, with its own objectives and strategies? And who is actually representing territories in competition? The government? The enterprises? The citizens? Fully addressing these questions would imply to open two broad research fields, somehow typically geographic, that is the issue of place and identity and the issue of local governance, but this is not the purpose of the present dissertation. More importantly the competitiveness metaphor implies that there is some degree of proximity and resemblance between a territory and an enterprise. To which extent this metaphor can be sustained? Are their goals and means similar? The concern about how to link together economic competitiveness and social cohesion has become one of the main issues in EU policy making (Lawton Smith, Tracey and Clark, 2003; Sharp, 1998). Analogously, many criticisms have been moved towards some neo-liberal implications of the need-to-be-competitive imperative, which are, in fact, a consequence of the entrepreneurial metaphor of the competing territories (Hudson, 2003). Another question related to territorial metaphors built on the ground of entrepreneurial analogies is given by the fact that a territory does not have only a single market or limited number of markets where to compete, like firms do. Within the territory there are many functions and activities that imply the existence of as many markets as they are. As Budd notices:

[...] one can conceive two types of territory [...]. The two types of territory are the urban agglomerations which comprise city-regions and the economic functions and/or specialisms which occur within the agglomeration. (Budd, 1998, p. 669)

In other terms, the issue of juridical personality arises the issue of the complexity of the territories, but it addresses it in an ambiguous way. On the one side, in fact, collective agency is meant to express exactly this complexity, postulating that the territories are more than the sum of the things that are localised in and hence that they possess emergent properties, such as competitiveness. On the other side, attributing competitiveness to a

territory implies that it behaves like a firm, with some homogeneity in interests, needs, purposes and strategies, which is actually a strong oversimplification of the complexity of territories.

The second point is the accusation to the *excessive emphasis on export* rather than on productivity that characterises the national competitiveness debate. The export bias is said to mismatch the real terms of national economic growth for three main reasons:

- (i) if the world market is fixed-size, then export competition will lead to a zero-sum game. If it is not, comparative advantage is said to guarantee the mutual benefit for engaging in trade. This is a sort of naturalisation of the economic development process, where it is a sort of spontaneous endowment to secure growth rather than a set of interests, purposes, and actions coordinated in a competition strategy;
- (ii) export competition is often considered as pure cost competition: to be competitive nations would be forced to lower their cost, mainly salary with a twofold consequence: on the one side, the lower cost of national exportations would make more expensive the imports, which according to Krugman are the real reason to engage in international trade; on the other side, according to Krugman, cost competition would cause a decrease in salaries and therefore a loss of public wealth, which is the opposite of the purpose that competitiveness literature claims to have;
- (iii) moreover, the export bias would lead to underestimate the importance of domestic markets and competition, which are often the main source of economic growth within the nation.

Although these criticisms need for further and bigger consideration in the competitiveness debate, Krugman does not consider that most of the contemporary literature considers export just as evidence, rather than the aim, of competitiveness. The focus is less and less on cost competition, but it is rather on quality, innovation and demand anticipation and satisfaction, that is, somehow, a broader interpretation of productivity (Camagni, 2002). As Hämäläinen pointed out:

we must distinguish between a competitive advantage that is based on non-price factors (such as quality, speed, design, colour, taste, performance, etc.) and that which is price and cost-dependent. We will term the former competitive advantage as 'real' competitiveness. (Hämäläinen, 2003, p. 6)

Moreover, the distinction between export and domestic market is an artificial boundary, which should be considered in a more dynamic and evolutionary perspective. In

his *The Competitive Advantage of Nations*, Porter shows clearly that there is a strong correlation between the export sector and its local supplier chain (Porter, 1998). As the example of the Italian tiles district in Carpi shows, the competitiveness shifts from the mere tiles production to the production of machine tools and equipments, which originally were purely domestically oriented and started successfully to compete in international markets themselves. Even more: in Porter's interpretation, the domestic market is explicitly one of the main features that determine national competitiveness.

2. Towards a definition of territorial competitiveness.

Although national competitiveness is a fundamental concept, most of the contemporary debate about competitiveness is centred on different scales rather than the national one. Regions and above all cities are now considered to be the "right" scale of territorial competitiveness.

2.1 From national competitiveness to territorial competitiveness.

In broadening the concept of territorial competition from its narrow meaning of national competitiveness, we shall adopt Cheshire and Gordon (1996), defining territorial competition – and subsequently competitiveness as the capability to behave successfully in competition – as:

a process through which groups, acting on behalf of a regional or sub-regional economy, seek to promote it as a location for economic activity either implicitly or explicitly in competition with other areas. In principle it involves both active local economic development measures of various kinds and a self-conscious strategy to guide policy-development and implementation, with regard both to the future economic role of the area concerned and to its principal competitors. Part of this competitive activity is inevitably addressed to the attraction of investment, sometimes with discrimination between more and less desirable activities to attract. But part can be concerned with enhancing the share (and social profitability) of existing local businesses in the market they serve and generating new businesses and markets. (Cheshire and Gordon, 1996, p. 385)

This definition of territorial competitiveness reverses somehow the terms in which national competitiveness has been conceptualised: the focus is not any more on export quotas for national manufacturers, but it is rather on investment attraction and local businesses' success², that is on regional growth and development.

² That is *also* about international markets share and not *only*: per se national markets quotas can be meaningful and fundamental to define competitiveness.

Moreover, rescaling the territorial competitiveness issue is central in encountering Krugman's criticism about the (mis)use of the 'competitiveness' metaphor. Even if cities or regions do not 'fail' like enterprises, nevertheless they 'pay' the consequences of their lack of competitiveness more than nations do. This for at least three reasons:

- (i) the first one is referred to the financial status of these scales, as cities and regions have limited but increasing financial autonomy. Devolution processes establish more and more forms of direct local taxing, while local and regional authorities cannot draw on traditional monetary policies: in particular regions and cities cannot freely manage public expenditure and difficulty they can access to international loan. These means that local finances are more likely than the national ones to encountering deep financial crisis, even if not failure;
- (ii) secondly, the decrease in competitiveness can cause an evident and immediate decline in the urban and regional structure, like emigration, loss of advanced functions, loss of real estate value. These phenomena are quite unlike to happen at the national scale, but at the regional and urban ones they can come out to be a deep crisis, comparable with firms failure (Norton 1979 and 1987; Teaford, 1993);
- (iii) finally, in the policy realm, the last twenty years witnessed the diffusion and growth of local development agencies, which should represent territories in global competition, enhancing new forms of 'territorial personification'.

The shift from national to sub-national scale, like the region, the city (or, better, the city-region) also has important implication with reference to other Krugman's criticisms. As Camagni pointed out:

unlike the case of countries, cities and regions compete in the international market for goods and production factors, on the basis of an absolute advantage principle, and not of a comparative advantage principle. This means that there is not efficient automatic mechanism to grant each territory some role in the international division of labour, whatever its relative performance. (Camagni 2002, p. 2407)

Camagni's argument is quite straightforward, focusing on the fact that at least three assumptions of the comparative advantages model do not apply to sub-national scales.

Signally:

- (i) it is not possible to assume as starting point the autarchy situation in which the two countries are in the Ricardo's original insight. Therefore there is not an automatic relationship between real wages and the level of productivity. Moreover, salaries are based on collective national contracts and related to an

average national level of productivity: as a consequence, the gap between regional productivity and national salaries can be turned into territorial competitive advantage;

- (ii) there are movement of factors of production between regions and cities. This implies that a deprived region can afford an imbalance in the trade balance through compensating the lack of export via other means: the income of commuting workers, selling or renting local assets to foreign residents (like tourists or retired people for instance), public and private transfer (like the remittances from emigrants). Secondly migration flows will be likely preventing wages shortage, impeding the convergence between productivity and salaries;
- (iii) at the sub-national scale, there is not a specific equivalent to national currency and therefore to exchange rate. This has two strong implications. First, national exchange rate represents an average between strong and weak regions, so that poor localities have to compete in a framework defined by a national exchange rate which does not mirror their economic conditions. Second, a locality should face an eventual decrease of its comparative advantages without being able to use the more common policy, that is devaluing the exchange rate.

There is also another important change to consider, if we reason in terms of territorial rather than national competitiveness: the emphasis on export radically changes meaning. In a broader sense, if we assume the point of view of a sub-national somehow bounded scale – like the city, the region or the functional local system – also national trade toward other regions or cities can be considered like “export”. Of course it is true that selling on international market involves different and maybe more sophisticated competences, facing different transaction costs, adapting to heteronomous competing rules, dealing with unknown cultural and economic institutions etc. Nevertheless, we might accept the metaphor that national purchase and sell are somehow “external” to the local economic base, and therefore they are somehow similar to export. In this perspective, what counts is that territories have to deal with other territories: whether they are internal or external to the national boundaries can be assumed as a secondary question. In the perspective of the creation of broader and broader free trade zone, the distinction between national and international markets might become weaker and weaker for city-regions and localities: to some extent, in facts, EU policies towards interregional cooperation – like in the Interreg programme – tend to vanish the difference between national and international competition. In this perspective the indifference between national and international markets can become more than a mere metaphor.

2.2 Direct and indirect territorial competition.

Some of the main problems of the “territorial competitiveness” literature arise from the fact that it is a multi-fold concept, where different meaning and interpretations – sometimes inconsistently – coexist. This complexity has been noticed already more than ten years ago by Richard Nelson (1992) who argued for existence of three different and sometimes conflicting cluster of approaches to the competitiveness issue³:

In one cluster of literature, individual firms are the object of inquiry. These authors are concerned with factors internal to firms that make them strong or weak. [...] A second cluster is almost exclusively the work of economists. Its focus is on the macroeconomic performance of national economies and on the factors that lie behind strong or weak economy-wide performance. [...] A third body of writing [...] is also concerned with government policies, but with microeconomic ones rather than macroeconomic policies, i.e. with “industrial policies”. Here the focus tends to be at the level of an industry. (Nelson, 1992, pp. 127-128)

More recently, Budd (1998) has distinguished between two different types of territorial competition:

The two types of territorial competition consist, first, of competition between the economic territories (activities or markets) which operate from city-regions, in other words, localisation economies, for example, competition between London and Paris airports for new international air services. Secondly, there is competition between the characteristics of city-regions and the social capital with which they are imbued, for example, provision of infrastructure and quality and availability of educated and trained specialist labour, in other words, urbanisation economies. (Budd, 1998, p. 669)

Analogously to Budd's typology, for the aims of the present work, we will distinguish between at least two kind of territorial competition, direct and indirect.

As far as the first is concerned, we can define “direct territorial competitiveness” as the degree of attractiveness of a certain territory with reference to targeted subjects, which time by time by time by time can be enterprises, residents, international organizations, workers, researchers etc. In this perspective, attractiveness – and therefore competitiveness – can be measured as the amount of newcomers localising into the territory. This kind of competition is named “direct” because the territories compete each against the others to gain access to scarce – or at least limited – resources and/or to “sell”

³ Although Nelson's concern is mainly focusing on explanations about the loss of competitiveness of the American production system, his typology refers quite properly to the general issues we have to deal with when considering territorial competitiveness.

successfully a product which, in this perspective, is “space” rather than “territory”. Territories compete basically to sell locations. Lever identifies at least five realms where cities and territories are competing directly each against the others (1999, p. 1029):

- (i) mobile investments, signally FDI, or employment-creating sectors;
- (ii) economic growth, measured as gross value added or gross domestic product;
- (iii) population, which can be assumed to represent human capital, income, political power and demand;
- (iv) public funds, both at the national level and at the international one (in particular for European funding);
- (v) hallmark events, like Olympic Games or international agencies brands, like UN sites or EU authorities.

Second, we can define the “indirect territorial competitiveness” as the capability of a territory to sustain the local firms involved into competition, through a set of territorial assets that confer local firms a competitive advantage. For territorial assets – or endowments – we mean those localised, place-specific, features that can influence firms’ behaviour and therefore productivity and competitiveness⁴. In this perspective, because of some kind of transitive property, competitive territories are those who can actively promote the competitiveness of the firms that are localised within their boundaries.

We have now to spend some words about the relationship between direct and indirect competitiveness. Of course there are some similarities between the two. First of all, there is some like a circular causation between direct and indirect competitiveness. As economic processes show a tendency towards concentration and localisation (Malecki, 1997; Storper, 1997), the existence of a specialised and competitive economic basis will attract new investments in those sectors, facilitating the duties of local development agencies involved in direct territorial competitiveness. At the same time, the attraction of newcomers will make the local basis more complete and diversified, enhancing the range of externalities locally available (Amin and Thrift, 1994).

Nevertheless, there are some differences that make it useful to maintain the distinction between direct and indirect territorial competitiveness. At a first sight, the first difference refers to their main focus: while direct territorial competitiveness is concerned with the process of regional or national development – that is what we might call a ‘macro focus’ –, indirect territorial competitiveness is more biased towards the firm’s behaviour and how territories’ features affect it – that is a ‘micro focus’. Also, the effect of direct

⁴ In chapter 4 this concept will be reworked in a systemic perspective, distinguishing different kinds of territorial assets.

competition on indirect one is ambiguous and difficult to forecast: attracting FDI always opens possibilities to free-riders seeking for resources exploitation. Finally, the main difference can be drawn with reference to the different attitude towards location theory. While direct territorial competitiveness is explicitly a location problem, in that consider prevalently one firm's behaviour, the location choice, indirect one is concerned with the whole relationship between enterprises and territories, also with those aspects that are not explicitly considered during the location process and with those that last after the choice of a location. This difference is also mirrored by the different attitude toward location factors. Like traditional location theory, direct territorial competitiveness literature consider a broader set of location factors, both traditional (such as infrastructures, accessibility, real estate market etc.) and contemporary, like research centres, quality of life, institutions (Cheshire and Gordon, 1996; D'Arcy and Keogh, 1998). On the opposite, indirect territorial competitiveness scholars focus on concept like regional innovation system (Cooke, 2003) or *milieux innovateurs* (Rallet et Torret, 1995), underestimating the set of factors inherited by location theory and regional science, or, better put, stressing the importance of territorialisation – that is the way the territorial assets are put into work through a network of untraded interdependencies – rather than the location.

2.3 The role of indirect territorial competitiveness.

In the following chapters, the focus will be exclusively on *indirect territorial competitiveness*, that is on the broader relationship between territorial assets and firms' competitiveness. The reason for this choice is that only a broader comprehension of the relationship between territories and firms can avoid the zero sum trap which is implicit both in national competitiveness (Krugman, 1998) and in direct territorial competitiveness (Cheshire and Gordon, 1996).

The problem arises, in fact, from being both national competitiveness and direct territorial competitiveness related to a closed system interpretation of the world, in which territories compete to gain a bigger quota of scarce resources – respectively market shares and different kinds of flows. Within such a framework there is no space for that degree of freedom and novelty that only can guarantee the production of new value and not just the sharing of a given amount of wealth. As Cheshire and Gordon noticed:

The activity may be pure waste even at the local level, either because gains achieved by some local businesses/developers displace activity in others, or because it is totally misdirected in terms of the real demands of firms [...]. Some policies, however, may represent only gain to the system as a whole. An example might be policies which effectively help to foster new businesses in a locality from amongst the existing population. (Cheshire and Gordon, 1996, p. 396)

On the contrary, the concept of indirect territorial competitiveness does not engage directly in resources competition, to focus rather on the growth mechanisms that link territories and firms, and therefore on the creation of new business opportunity. The meaning of questioning about indirect territorial competitiveness echoes the questions arisen about territorial competitiveness by Gordon:

[there are] two aspects of the question of whether cities as such actually compete, that need to be distinguished. On the one hand, there is the (economic) issue of how important, if at all, urban or locational attributes are to the success and failure of businesses based, or operating, in particular places, within modern economies. On the other hand, there are (more political) questions as to: how meaningful the notion of a collective urban economic interest is, whether in particular cases local integration ensures that gains to key sectors benefit all; and how the priorities of competitive strategies are actually constructed. (Gordon 1999, p. 1002)

This two questions mirror the reason why it might be useful focusing on indirect territorial competitiveness. First of all, indirect territorial competitiveness claims for more realism, focusing on the existing set of specializations and competencies which already exist, rather than on the policy book of dreams. The fact that most of the current policies are very often limited to the mantra of ICT, biosciences and hi-tech fantasies (Massey, 1992) can be an example of how policy makers forgot the importance of continuity and path-dependence in favour of a stereotypical notion of diversification of the local economic specialisation⁵.

Second, considering the territorial competition as an indirect competition precisely meets Krugman's criticism towards the metaphor of nations competing in world markets: firms are definitely the ones who compete to sell cars, software and shoes. Territorial competitiveness arises only secondarily as a result of firms' competitiveness, but at the same time is something more than the simple sum of individual firms' competitiveness. National or regional share of international market is the result of a process which is not guaranteed by the mere comparative advantage, but it depends on a more complex set of relationship between firms and localities. While national competitiveness approach is interested in the outcome – market shares – the indirect territorial competitiveness framework is more interested in the process itself.

Both these arguments lead us to consider another realm where the metaphor of juridical personality of territories becomes unsustainable: if territories have a clear economic identity then the identification of markets where actually territories compete is not a secondary one Which is the sector to invest in to increase territorial

⁵ In chapter 4 we shall try to address exactly this question, how variety and change can go together with continuity.

competitiveness? As Gordon notices, "it may be particularly problematic in large metropolis with diverse economic bases serving a variety of different market area" (1999, p. 1002).

This issue is strictly related with the role that specialisation plays in territorial competition, above all when we are dealing with cities and regions characterised by a former industrial splendour now declining⁶: is the ancient specialization worthy of new investments to restore its unflourishing competitiveness or might it better to concentrate the policy efforts on forefront sectors and activities, like financial services and ICT? This is truly one of the main Krugman's concern in addressing his criticism to the concept of territorial competitiveness and to related industrial policies aimed to choose those sectors supposed to be the engine of competitiveness and growth (Krugman 1996, pp. 23-24). Porter himself makes more or less a similar point to Krugman's one, in the updated introduction to his main book, where he notes:

The Competitive Advantage of Nations rejected industrial policy. All clusters can support prosperity if they can be productive. Instead of treating particular industries, all a nation's existing and emerging clusters deserve attention. Government should not get involved in the competitive process – its role is to improve the environment for productivity, for example, by improving the quality and efficiency of business inputs and infrastructure and creating policies and a regulatory context that stimulate upgrading and innovation. (Porter 1998, p. xxvii)

This is a very strong point that will deserve more attention in the rest of the present work⁷. For the time being, it is important to note that both Krugman and Porter would probably condemn the industrial policy-makers mantra about future scenario where a few knowledge-based sectors will be the key to national and regional success and wealth⁸ (Watkins 2003). Where the two authors probably conflict is rather the emphasis on productivity – an issue which will be discussed in next section.

As a consequence, focusing on indirect territorial competitiveness can enhance reflection on direct one. A better comprehension of the dynamics between territory and

⁶ The case study will be addressing specifically this question, with reference to Turin's Fordist heritage in the car production.

⁷ As we shall see in chapter 4, sectorial specialization and endowment will be considered very marginally as they will be assumed to be simply the structural evidence of a Territorial Productive System, that is a transitory manifestation of something deeper and more stable: the local organisation of the learning processes.

⁸ To be honest, it has been said that both World Bank and OECD display a more complex understanding of the knowledge-based economy than it is usually accustomed to local public managers and policy makers. For instance, in the WB account there has large room for low-tech and indigenous knowledge, even if in the last years there has been a clear shift towards more codified forms of high-tech scientific knowledge.

firms may help in differentiating policies and enhancing FDI and residents attraction. Unless there is more complex understanding of the processes behind the relationship between territorial assets and firms' competitiveness, the only policies suitable to give a positive sum effect are the infrastructure related ones, which will enhance the productivity indistinctly for all the firms localised in a given territory. But infrastructural policies are too generic in scope and can be fostered by any localities: this would improve the overall efficiency but it will never mark a difference in competitiveness. Designing specific policies requires a better knowledge about the ways territories and firms influence each others, that is working on indirect territorial competitiveness.

Secondly, in the perspective of indirect territorial competitiveness, FDI attraction policies can achieve unintended consequences. Attracting footloose trans-national corporations (TNCs) can get positive effect on employment rate in the short period, but it guarantees a positive effect neither on the local suppliers basis nor on the stability and durability of the location. The debate about the degree of embeddedness of the electronic sector in Scotland, strictly related to governmental attraction policies and consequent investments by TNCs (Turok, 1993; McCann, 1997, Turok, 1997) or about the inequality rise in developmentalist Ireland (Kirby, 2002; Coleman, 2003) clearly show that FDI attraction does not imply automatically the creation of a real common goods, but rather reinforces privileged shareholders rather than the whole community. Even in case of pre-existence of a competitive local specialization in some sectors, the attraction of new investment can come out to be a problematic issue: newcomers might not integrate in the existing production fabric or, on the contrary, might integrate too much, taking advantage of pecuniary externalities, knowledge spillovers and even public benefit, in order to exploit local resources as a free rider and to compete with local firms. Once again, only linking direct to indirect territorial competitiveness can help targeting the territorial policies in a consistent way. In fact, much of the contemporary literature about networking and trust – which is a consistent part of the indirect territorial competitiveness, as we will argue in next chapter – is focused on the control of opportunistic behaviours and the exploitation of local intangible resources by newcomers (Lazaric and Lorenz, 1989; Håkansson and Johanson, 1993).

3. Territorial competitiveness and productivity: conflict and convergence.

After considering Krugman's general criticism to the concept of national competitiveness and how shifting our attention to sub-national scales challenges profoundly his points, there is another key issue to address in order to clarify the meaning and the extent of the concept of territorial competitiveness. This is the productivity issue, that is comprehending how the discourse about territorial competitiveness relates to the concept of productivity.

Although Krugman's criticism about the lack of interest for productivity in the competitiveness debate, in fact, most of the current literature consider territorial competitiveness as strictly related to the productivity issue. This is particularly true for indirect territorial competitiveness, where the focus on the firms' necessarily implies some hypothesis on productivity to be addressed. Porter stated it very clearly:

The ability to do so (to produce a high and rising standard of living for its citizens) depends not on the amorphous notion of "competitiveness" but on the productivity with which a nation's resources (labour and capital) are employed. [...] The only meaningful concept of competitiveness at the national level is national productivity. (Porter, 1998, p.6)

Nevertheless, in the territorial competitiveness debate, the reference to productivity seems more to be a concession made to economists rather than a fully accepted and implemented notion. The misunderstanding about productivity arises, we suggest, from a sort of confusion between two uses of the term: productivity as a synonym of competitiveness or productivity as a means to achieve competitiveness.

In the first case, which is arguably Porter's case, productivity is the compendium of what can be interpreted to be competitiveness. In this perspective productivity can be treated as a better alternative to export to measure competitiveness. In fact, Porter seems to consider productivity in a technical way, as the main road to common wealth:

Productivity is the prime determinant in the long run of a nation's standard of living, for it is the root cause of national per capita income. The productivity of human resources determines their wages, while the productivity with which capital is employed determines the returns it earns for its holders. High productivity not only supports high level of income but also allows citizens the option of choosing more leisure instead of long working hours. It also creates the national income that is taxed to pay for public services which again boosts the standard of living. The capacity to be highly productive also allows a nation's firms to meet stringent social standards which improve the standard of living, such as in health and safety, equal opportunity and environmental impact. (*ibid.*)

On the contrary, some works refers to productivity as a *means* to increase territorial competitiveness. This approach is found in both the direct territorial competitiveness and the national competitiveness literatures and focuses exclusively on labour productivity, that is the value of the output produced by a unit of labour. In particular, some arguments have been arisen in favour of lowering wages policies. In a DTC perspective, a higher level of labour profitability obtained through cutting salaries is meant to have some power of attraction toward FDI. This has been particularly true explaining partially the growth of new industrialised countries like the Asea-3 (Malaysia, Thailand and Philippines) and more

recently China's economic growth (Rahmah and Ishak, 2003). Also in Europe, the Celtic Tiger's fast growth has been somehow related to existing wage differentials within EU (Mac Sherry, 2000; Coleman, 2003). It has also been proposed that allowing regional differences in the wage level might offer a solution to enhance competitiveness in Southern Italy. Analogously, on the national competitiveness side, labour productivity policies aimed to cutting nominal wages can be designed to modify the real exchange rate, adjust the external balance, reduce unemployment and therefore influence the national competitiveness.

In any case, salaries compression can work only in the short term: in the long run, in fact, those FDI that are more sensitive to labour cost are likely to become footloose and productivity will be seriously damaged by export-biased attitudes (Boltho, 1996). Moreover, Fagerberg has given some empirical evidence that lowering relative unit labour cost has little impact on competitiveness and that other factors, like technological improvement and competitiveness on delivery, have a more significant effect (Fagerberg, 1988). Moreover, there is some evidence that a convergence in factor costs is occurring within some countries of the EU, diminishing the possibility to consider labour cost as a competition leverage (Webber and White, 1993).

Also, the idea that competitiveness is inversely correlated to the cost of labour is an important part of the neo-liberal rhetoric of territorial competitiveness. Many of the discourses about the threats posed by the rise of international trade are centred on the argument that the lower labour costs in developing countries will mean the destruction of labour intensive sectors in old industrial economies (Thurow, 1992). The same argument is consequently used to prescribe free market policies dismantling totally or partially the welfare and work rigidities for the sake of competitiveness and globalization (Swyngedouw, 1992; Swyngedouw *et al.*, 2002).

4. Overcoming the competitiveness versus productivity dilemma.

As a consequence, the focus on productivity is fundamental but not essential, in the sense that it does not solve all the problems and the questions arisen by the concept of territorial competitiveness. If economic productivity – mainly labour one – has to be interpreted as a mean to achieve competitiveness, then territorial competitiveness becomes reduced to very poor theoretical and political insight. If, on the contrary, productivity is the aim – that is a synonym of competitiveness – the field become broader and there is room for further reflection. This widen, in fact, the range of economic factors influencing competitiveness: not only labour cost, but also labour skills, specialisation, technology and innovation must be considered as playing an important role in shaping both direct and national territorial competitiveness.

4.1 Porterian accounts of territorial competitiveness.

Porter's position about this issue is enlightening. As we noticed above, Porter makes continuous reference to productivity, but it seems to be a way to fulfil a compulsory duty to get audience and respect among economists, rather than an intellectual framework which encompasses his overall thought about competitiveness. His explanation does not rely, in fact, on labour productivity and factors endowment – which are the core of the main classic economic explanation for trade and international specialization, that is Ricardo's comparative advantages theory – and even less on macroeconomic conditions like trade balance or currency devaluation.

In fact, when it comes to describe the determinants of the competitive advantage, in his famous competitiveness diamond, Porter focuses on microeconomic explanations rather than macro ones. Even more significantly, only one of the four main determinants is somehow depending on and directly referable to the single firm – that is firm strategy and structure – and therefore eventually suitable to be analysed in the methodological individualistic framework. Two out of the three remaining factors (demand conditions and related and supporting industries) are, in fact, the outcome of a process which is not easily understandable in terms of productivity. Only one – factor conditions – can be drawn back to the factors endowment which is the cornerstone of comparative advantage explanation. Anyway, even in this case, Porter's account largely diverges from classic one: if we consider the list of factors he considers (human resources, physical resources, knowledge, capital and infrastructure), it appears clear that he is closer to Camagni's observation that resources, which territorial competitiveness is based on, are locally produced through policies rather than to Ricardo's – and partially Krugman's – believing they are endowed by chance. Moreover, Porter's account has two main features that will be central in the prosecution of this work:

- (i) his perspective on competition and value creation is not only strategic or managerial but also and moreover relational: at least two out of four determinants are in fact depending on the organization of relations outside the single firm;
- (ii) if we look carefully at the examples he makes and to his other writings, it is clear that this competitive set of relationships is internal to a geographical scale, that is to say that competitive businesses tend to concentrate.

It is therefore not surprising that many studies on territorial competitiveness draw on Porter's competitive advantage to address the issue of how territories compete and which elements enforce their competitiveness. For instance, in the framework of national competitiveness literature, Hämmäläinen tries to link an institutionalist account for market and government failures – which are mainly macroeconomic issues – together with an

account of the determinants of competitiveness clearly influenced by Porter⁹ (Hämäläinen 2003).

More related to the direct territorial competitiveness issues, Begg proposes a simplified model where he distinguishes three outcomes of territorial competitiveness and four inputs. On the outcome side there are not big surprises: productivity matters, but it is somehow made milder and smoother by the focus on the level of the standards of living (or quality of life) and of the employment rate, which are the ultimate goals of territorial competitiveness. Also, on the input side there are not big surprises. Drawing on Porter's competitive diamond, Begg identify four components influencing urban performance:

- (i) top-down sectoral trends and 'macro' influences;
- (ii) company characteristics;
- (iii) business environment;
- (iv) capacity for innovation and learning.

This classification mirrors the growing amount of literature about competitiveness focusing on other factors rather than simply on labour cost. This is of course the case for indirect territorial competitiveness, where large attention has been devoted to the issues of technology and innovation as linking territories, firms and competitiveness (Camagni, 2002). Nevertheless, also the literature about national competitiveness (Duchin, 1991; Dosi and Soete, 1991; Papadakis, 1995; Fagerberg, 1988) and direct territorial competitiveness (Klodt and Maurer, 137; Lever, 2002). Several others authors have been focusing on several different economic components determining territorial productivity and competitiveness, such as specialisation (Dollar and Wolff, 1993) and multinational enterprises' (MNEs) behaviour (Papanastassiou and Pearce, 1999).

More recently, some authors have proposed a more complete interpretative framework for understanding the complex articulation of territorial competitiveness (Gardiner *et al.*, 2004). Drawing mainly from Jensen-Butler's (1996) and Begg's (1999) writings, the authors identify a "pyramid model" of territorial competitiveness, distinguishing three levels of meaning:

- (i) the *target outcomes* are the quality of life and the standard of living, coherently with the "public good" nature of territorial competitiveness (Cheshire and Gordon, 1996);

⁹ Signally, Hämäläinen identify seven determinants: productive resources, technological innovation and diffusion, organizational efficiency, product markets characteristics, international business activities, institutional framework and government role.

- (ii) *revealed competitiveness*, that is the set of territorial performances which give evidence of a strong or weak competitiveness: gross regional product, labour productivity and employment rate.
- (iii) *sources of competitiveness*, finally, are all those factors which are suitable to enhance territorial competitiveness.

Focusing on the sources on competitiveness, the authors distinguish two layer of factors:

- (i) those influencing directly the three outcomes: research and technological development, SME development, FDI activity, infrastructure and human capital, institution and social capital;
- (ii) those more related to the territorial assets, laying in the background and influencing the evolution of the first layer: economic structure, innovative activity, regional accessibility, and skills of workforce, environment, decision centres, social structures and regional culture.

This account for territorial competitiveness implies two main consequences, relevant for the purpose of this review. First of all it claims for a better understanding of the relationship between the three layer of the competitiveness issue and, above all, between the two levels of factors. In other terms, it emerges that a deeper account of indirect territorial competitiveness is somehow needed to address the question of the relationship between scale, competitiveness and productivity. Secondly, it is clear that the discussion about productivity and economic factors is only a part of the tale: territorial competitiveness necessarily relies also on social factors, in that they both affect directly competitiveness and are part of the target outcomes, that is regional and urban wealth.

4.1 Relational and social influence on territorial competitiveness debate.

The second strand – but anyway strictly related to Porter’s ‘relationality’ of business activities – of reflection broadening the reflection about territorial competitiveness is related to the social capital and relational economy debates and marks, since the 90s, a clear shift towards “soft” social factors – like social and human capital, cohesion, identity etc – rather than “hard” economic ones. This shift mirrors somehow that occurred in contemporary Economic Geography, focusing on the cultural turn – that is the believing that many

economic factors are socially and culturally defined rather than purely economically determined¹⁰.

In the territorial competitiveness debate, the concern for social factors affecting economic performance and the attraction of FDI has focused around the concept of social cohesion, like competitiveness and productivity, another fuzzy idea quite spread in both the academic and the political realms.

Within direct territorial competitiveness literature, at a first sight, we can distinguish at least two meanings of cohesion:

- (i) *between territories*, that is about avoiding excesses of competition which might lead to a zero- or even negative-sum result for the overall economy;
- (ii) *within territories*, that is about the relationship between internal social cohesion and external competitiveness.

Cohesion between territories is strictly related to the literature about regional convergence in the EU (Rodriguez-Pose, 1998; Hudson, 2003). The "between" cohesion debate is mainly related to the fear that focusing on competitiveness will enhance rather than reduce disparities across regions and localities across the EU (Sharp, 1998). Also it might be claimed that the entrepreneurial metaphor inherent in territorial competitiveness does not extend to the cooperation: despite the amount of literature concerned with the importance of networking between firms in order to get economic success, the idea that inter-regional cooperation as well is important is misrepresented in comparison to the competitive obsession (McCarthy, 2003).

More relevant for the purpose of the research, the concept of internal cohesion, that is the existence of good social performances within the locality (Cooke et al., 2005). Again, like for productivity, there are two cases for considering social cohesion with reference to territorial competitiveness. First of all, as stated in most of the literature, the creation of social wealth is considered to be the purpose of engaging territorial competition (Cheshire and Gordon, 1996; Begg, 1999; Gardiner *et al.*, 2004). Several measure of social cohesion are therefore adopted as a measure for assessing the urban success, for instance trough the related concept of social inclusion/exclusion (Boddy, 2002). Secondly, local social cohesion is said to be an important factor enhancing territorial competitiveness: drawing on the communitarian framework, the sharing of interests and aims, the inter-classes cooperation, the Unions' participation together with the entrepreneurs associations etc would create a positive atmosphere for

¹⁰ The issue will be discussed in-depth in next chapter. For a general account see the edited books: Barnes and Gertler, 1999 and Lee and Wills, 1997.

business development and success. Even if it has been argued that there is not a clear positive correlation between social inclusion and FDI attraction (Boddy, 2002) the social cohesion argument is widespread in the literature. For instance, Johnson proposed a model where six kinds of capital are said to determine overall community competitiveness: polity capital, financial capital, physical capital, human capital, cultural capital and social capital (Johnson, 2002). Analogously, but more critically, Potts (2002) identify six contact points between territorial competitiveness and the 'social fabric' which deserve more attention by the scholars: clusters and business network; labour markets and social ties; work quality and egalitarianism; employment; educational inclusion; social order and corporate community ties.

Also, cohesion is often associated with the idea that territorial competitiveness is related to the issue of *governance*. Recalling the definition given by Cheshire and Gordon, territorial competition is always fostered by groups within the locality (1996). The underlying idea is that territorial competitiveness, as it is enhanced by social cohesion, can only be implemented through a widespread participation of the greatest number of stakeholders: public-private partnerships, real-estate developers, agencies for the attraction of FDI, unions, entrepreneurs association, chambers of commerce, influential civic personalities and so on. This broad and diffuse network of urban and regional actors are supposed to support local administrative authorities in the process of creating new forms of political representation which might/should replace traditional national competences about regional economic development. The passage of the concept of "social cohesion" from a "passive" role as investment attractor to a proactive leadership as development engine is no doubt important for developing a consistent conceptualisation of territorial competitiveness. Signally, this process of local empowerment is extremely important to address one of the main issues arisen by the concept of territorial competitiveness, that of juridical personality of territories. Governance, in fact, is often presented as one of the main – if not the main – outcome of collective actions which found the possibility to identify territories like competing each against the others (Camagni, 2001 and 2002). At the same time, the governance process as been significantly blamed by some critics as collective "inaction" rather than action in that it comes out to strengthen existing influential groups of power¹¹ within cities and regions (Amin et al., 2000).

¹¹ This is often the case, as an example, for a specifically spatial factor which is usually associated with the issue of territorial competitiveness, that is real-estate market (D'Arcy and Keogh, 1998 and 1999). Although the important role of real estate developers, their prominence can be assumed as an example of the more than realistic possibility that a specific group of shareholders within the set of stakeholders get

5. Open issues for further discussion.

As a conclusion we might quote Camagni's own conclusions:

if individual firms and individual people undertake collective activities, facilitated by (and creators of) trust and local social capital; and if significant cognitive synergies, readily apparent in the local milieu, result from their various interactions; and, finally, if these actions and these processes draw additional vitality from cooperation with local public administrations; then it appears justifiable to go beyond methodological individualism – which regards only single firms as operating and competing – arguing the logical validity of a 'collective' concept such as that of *territory*, and to affirm that territories compete among themselves, using the creation of collective strategies as their instruments. (Camagni 2002, p. 2406)

The point is that this depiction of the territory as something shared and collective is far from being plain and unproblematic. Even if we do not push our reasoning so far to refer to a supposed juridical personality of territories, we must recognise that territorial competitiveness debate seems to be trapped into a cumulative causation of misunderstanding. Advocates of territorial competitiveness often refer to territorial collective agency as mean of recognising the complexity of territories, that is affirming that the territory possesses collective agency as an emergent character which cannot be reduced to the agency of the individual agents, hence blaming methodological individualism. At the same time, despite their better wishes, collective agency relies often on cohesion and idealised communitarian values, legitimating some sort of monolithic narration of the territory. In other term, while seeking for territorial complexity, territorial competitiveness literature produces an oversimplification of the territory.

Starting our analysis from the concept of territorial competitiveness put us in front of the most extreme conceptualisation of the relationship between firms and territories, as it assumes some sort of a transfer between the economic and the territorial, where the latter category is described and analysed as it were severely overlapping with the former. This helped to focus some of the unsolved questions in Economic Geography, signally oversimplification of the territory itself. Hence, the main purpose of this dissertation is to rework the concept of indirect territorial competitiveness taking into account the complexity of the territory, in particular the possibility that the *variety* of patterns and fortunes – which is always present in a given moment of the history of a territory – goes together with some form of *continuity* – which guarantee that there is a file rouge running across this history. In

the control or at least the more direct benefits of the territorial competition in order to enhance their private wealth rather than the overall governance process.

order to do so we have to broaden twice the realm of our discourse. First, in chapter 2, we shall consider how the two main streams currently operating within Economic Geography – that is Krugman and fellows' New Economic Geography and geographers' New Industrial Geography – treat the broad issue of the relationships between economic activities and territories. Second, in chapter 3, we will shift the centre of gravity of our analysis on a more theoretical and epistemological realm, claiming that to address the complexity of the territory we cannot rely on reductionism and oversimplification but we need a paradigmatic change. The new paradigm we shall adopt is that of complexity theory, with special reference to Varela and Maturana's account of autopoietic systems.

This twofold aperture will allow us to refocus on our main issue in chapter 4, where we shall address the possibility to build a systemic interpretation of the relationship between the territory and the economic activities that are taking place in it. This perspective will take us to introduce the concept of Territorial Productive System (TPS) as an interface between the micro level of the individual firms and the macro level of the territory. The TPS will represent, in other terms, the space where firms and territory coevolve. More precisely, this approach will allow to distinguish between different kinds of territorialisation and embeddedness, facilitating our task of addressing the questions of variety and continuity. Hence chapter 4 represents the climax of our theoretical reflection about the territorialisation of economic activities, at the same time opening to methodological and empirical issues about the operationalisation of the TPS. Introducing a new concept, in fact, implies not only situating it within the broader disciplinary debate, but also and above all to put it at work on explanation of real world phenomena. In this perspective, chapter 4 ends by introducing the choice of the case study, concerning the issue of the analysis and the representation of Turin manufacturing fabric, that will be the object of the second part of the present thesis.

The aim of addressing both variety and continuity in the context of a given territory has some strong implications for methodology. Assessing continuity implies that a historical approach is used to give an idea about the *long durée* of a manufacturing tradition in Turin province, while the issue of variety claims for a more synchronic view of how different behaviours can coevolve given a set of shared institutions. These two different methodologies, although impossible to clearly separate from each other, are respectively applied in chapter 5 and chapter 7. In chapter 5 we will be challenging the consolidated image of Turin as a Fordist one-company-town, centred on the presence of Fiat, the main Italian car producer and, for a long time, the biggest private enterprise in Italy. Our hypothesis will be that rather than a monolithic oversimplified case for Fordist top-down territorialisation, Fiat and Turin coevolved in a more complex way. In particular we shall show how even in the culminating age of Fordist organisation there was some continuity with pre-Fordist processes of collective learning, which survived underground

not only in small suppliers but also in the main core of the systems, Fiat itself. Chapter 7 will deal with the hypothesis that in the turn of the millennium this continuity was still present but evolved following different, if not divergent, patterns. We shall follow this process of differentiation through direct observation – by the mean of face-to-face questionnaire – of a sample of about 400 firms belonging to the mechanical and electrotechnical tradition, moving from the micro scale of the individual firms to the meso scale of the TPS. The analysis will end in drawing a TPS radically different from the Fiat-centred one we described in chapter 5, where effectively continuity seems to cope with variety. Chapter 6 will work as *trait d'union* between chapter 5 and chapter 7, highlighting how the crisis in the organisation of the Fiat-centred TPS played the fundamental role of freeing resources which would have been organised in the new emerging XXI century TPS.

Finally, the conclusions will sum up together an evaluation of the value added offered by the TPS approach within the broader debate in Economic Geography and an assessment of the limits of the model itself. We shall end by addressing some possibilities for further theoretical speculation and empirical research to be conducted in order to reduce the inescapable simplification of territorial complexity which is still present in the TPS model.

Chapter 2: Agglomeration reconsidered.

In the first chapter, attention has been focused on the concept of territorial competitiveness, distinguishing between direct and indirect territorial competitiveness. It has also been argued that the concept itself risks being quite fuzzy and confusing, raising some questions which cannot find uncontroversial solution in the existing literature (e.g. the issue of juridical personality of territories). However, the point has been made that by only focusing on indirect territorial competitiveness – that is the set of possible relationships between geographical entities and firms – we can grasp a more general understanding of the limits and the extents of the concept itself of territorial competitiveness.

The aim of this second chapter is to concentrate on the ongoing debate in Geography and in Economics on how geographical and economic phenomena are interrelated and interacting each with the other, which is the very base of any discourse about indirect territorial competitiveness. More precisely this chapter is dealing with the issue of agglomeration as the cornerstone of any contemporary discourse in Economic Geography. Rather than the locational choice of the single ideal typical firm, the important question is why economic activities are concentrated in some specific places and territories. Agglomeration is the key point in addressing the differentiation of abstract space into territories that follow different development path. The fact that firms are more often agglomerated rather than randomly dispersed is probably the most important stylised fact in Economic Geography. Moreover, the fact that some agglomerations "survive" to the loss of the specific locational factors that push them into existence suggests the idea that agglomeration has some deal with the complexity of the territory, that with the passing of time the destiny of the territory and that of the economic activities somehow converge and melt. At the same time agglomeration implies a various range of possible shapes and structures, a set of types which goes from basic co-localisation to more complex forms of territorial and economic organisation, like industrial district or innovation systems. Finally, the evidence that many firms come together in the same place seems to confirm that territory – or at least space – counts in explaining firms' performances and behaviours.

This strict relationship between agglomeration and territory is also well understood – and sometimes misunderstood – by policy makers who are increasingly founding their local and regional development strategies on the implementation and eventually green field creation of clusters or agglomeration.

Hence, we can specify that agglomeration is the perspective from which we are considering the issue of indirect territorial competitiveness. Nevertheless we are not interested in just reconsidering the agglomeration literature, a debate that is some how lost in setting typologies and producing new labels. We shall rather be focusing on the two main streams working on the concept of agglomeration today, that is Krugman's New Economic Geography and geographers' Economic Geography.

This task implies that we spend a few lines explaining what we mean by geographers' Economic Geography. In fact, there are so many geographies of economies¹² that it is quite difficult to summon together the different strands in a shared and unambiguous notion of Economic Geography¹³. We will concentrate only on the so-called New Industrial Geography (henceforth NIG) as it is the branch of Economic Geography which has most focused on the relationship between territories and firms' behaviour¹⁴. Nevertheless, the NIG stream has growth and diversified so much in its almost 20 years long life that it now ranges – often in same author's scientific production – from neo-Marxian regulationist approaches (Amin, 1994) to institutionalistic nuances (Amin and Thrift, 1994; Amin, 1999 and 2001) till cultural post-structuralist turns (Amin and Thrift, 2000).

Our account of the history of NIG is necessarily a simplified one and it will mainly focus on the impact of the Californian school of Economic Geography on the debate internal to the discipline. Hence we can identify three epochal moments in the evolution of the New Industrial Geography. The foundation, in the end of the 80s, was deeply influenced by Piore and Sabel's account (Piore and Sabel, 1984) of a new, massive, industrial divide, assuming the demise of the Galbraithian Corporation and the rise of a new order based on flexible specialisation and networks of SME (Scott, 1988; Storper and Walker, 1989). Also the French regulationist school (Boyer, 1986), Williamson's theory of

¹² In the last ten years at least three edited books have tried to match with the increasing varieties of approaches and orientations in Economic Geography (Clark *et al.*, 2000; Lee and Wills, 1997; Sheppard and Barnes, 2000). To these we have to add two important readers (Bryson *et al.*, 1999; Barnes *et al.*, 2004).

¹³ NEG as well is becoming a more and more articulated set of theories and approaches. As it has been argued (Martin and Sunley, 1996) apart the agglomeration/location studies stream, there is at least another important flood in NEG, that is regional convergence.

¹⁴ An alternative gaze if offered by Sheppard which match Geographical Economics – considering both Krugman's NEG and Arthur's complex Evolutionary Economics – with Regional Political Economy (Sheppard, 2000a).

transaction cost (Williamson, 1985) and the (re)discovery of Italian industrial districts (Pyke *et al.*, 1990) played a fundamental role in influencing the destiny of NIG in its early stage. The second stage can be probably traced back to the influence of Granovetter's work on the strength of weak ties (Granovetter, 1985; Granovetter and Swedberg, 1985), introducing in the geographical debate the concept of embeddedness (Grabher, 1993). This embeddedness issue represented a fundamental shift in NIG, moving the focus from the initial economic perspective to a narrative more sensitive to the social dimension of the relationships between territories and economic activities, summarised by Storper's well-known notion of untraded relationships (Storper, 1995). In the same period, another important source of inspiration intersected and completed the issue of embeddedness, that is the spread of the debate on the knowledge-based economy (Lundvall, 1992; OECD, 1996 and 1997), bringing to the forefront concepts such as learning region and *milieu innovateur* (Florida, 1995; Maskell *et al.*, 1998). In this perspective, the strict relationship between territory and tacit knowledge and the consequent existence of territorialised learning processes have been read as one of the main explanation of the link between territorial embeddedness and firms' performance. Finally, in the turn of the millennium, the book edited by Lee and Wills (1997), *Geographies of Economies*, made explicit the debate about a deeper break with mainstream Economics, searching for alternative references in the history of Economic thought. This process had its peak in the so called cultural turn, that is the idea that cultural categories are at least as important as pure economic ones in the explanation of the relationship between territory and economic activities (Crang, 1997; Amin and Thrift, 2000; Bathelt and Glückler, 2003). Another proof of evidence of this need for establishing a distance between NIG and neo-classical economics is the sympathy for Old Institutional Economics, which emerged in the same period (Amin, 1999 and 2001).

What is relevant to our discourse is noticing that this intellectual development within NIG can be read as a move from the mere research of alternative economic explanation of the agglomeration process, which to an extent might be consistent with mainstream Economics – such as Williamson's account of transaction costs – to an increasing weight of social explanation that escapes the pure economic categories, and then to a stronger and stronger mistrust of the explanatory power of methodological individualism with the consequent emergence of more cultural and post-structuralist narratives of the territorial and the economic. In the next section we shall compare NEG and NIG accounts of agglomeration with reference to the first two issues – i.e. the role of economic and social categories – while in section 2.2 we will show that the reason why we can get no satisfaction from the NEG account of the links between territorial and economic phenomena is not a deficit of explanation but lies in its meta-theoretical foundation, i.e. Neoclassical Economics. Finally, in the conclusion will deal with the need for a change in

scientific paradigm we build our economic geographies on, and signally that we should consider a shift from the dominance of physics-centred metaphors to biological ones.

2.1 Economics and Geography: infinitive facets of agglomeration.

Agglomeration was no doubt one of the central issues in the history of Economic Geography, long before 1991, the date of publication of Krugman's seminal *Geography and Trade*. Location theory textbooks have traditionally assigned extensive room to the process of co-localisation that brings the birth and growth of agglomeration. One of Krugman's main accusations to geographers is exactly that of having abandoned this tradition, started with classical spatial analysis and revitalised by the quantitative revolution in Geography and the emergence of Regional Science. What Krugman misses in his criticism is the fact that the change of direction which occurred in Geography – and largely in Regional Science and Regional and Urban Economics as well – was not meant to dismiss the involvement in agglomeration studies. It was rather a shift towards different explanation and methodology, as Scott's account of the history of Economic Geography clearly shows (Scott, 2000). What we are going to consider here is how NEG theories about location and agglomeration differ from geographers' ones and how the latter can take advantage from Krugman's analysis. In other terms, we are facing now a problem of theoretical consistency – that is, whether the theories are good enough to explain their own stylised facts – between theories formulated in two different disciplinary realms, Economics and Geography.

2.1.1 *New Economic Geography versus New Industrial Geography*

Following Martin and Sunley (1996), we can identify three main sources of divergence between NEG and NIG. The first point is the account of industrial and market organisation. On the one side, Krugman's approach largely relies on a Chamberlinian account of monopolistic competition, the hypothesis that imperfect competition can last in time and allow the exploitation of increasing returns. Slight differences in products that are not perfect substitutes allow producers to behave as if they were "monopolist". On the opposite side, NIG has always paid tribute to the idea that the flexible specialisation divide (Piore and Sabel, 1984) has meant a clear break with the corporation *à la* Galbraith towards a perfect competition model, at least within the agglomeration. Therefore emphasis has traditionally been put on external rather than internal economies of scale, neglecting the role that internal economies and large firms still play in the World Economy. The second difference can be driven back to the different account of externalities: while NEG is mainly concerned with pecuniary externalities and signally with market-size effects, NIG is more concentrated on transactions costs and, above all, on technological spillovers. The third rift is likely to be the most important, as it refers to the question of non-market

transactions. NIG has progressively broadened its understanding of agglomeration economies to consider what Storper calls untraded interdependencies (Storper, 1995 and 1997a). This meant to be a shift towards a more comprehensive and full understanding of the whole set of ties which link firms to each other in a local economy. Starting from transaction costs and technological spillovers, NIG developed a geographical understanding on how networks work as an alternative/complement to hierarchies and markets. This entails taking into account a large set of links which are not easy to reduce to market interactions: trust, social capital, shared languages, knowledge and values, cultural and political institutions are all seen as elements which explain the relationship between territories and firms, embedding the latter in the former.

Therefore even if starting from a common set of stylised fact and relative questions NEG and Economic Geography developed two quite distant sets of interpretations and theories which explain at least partially geographers' scepticism in welcoming Krugman's supposed novelties.

2.1.2 Lessons to be learned by geographers

Nevertheless, if we consider these divergences between NEG and NIG on a purely theoretical level – that is as two theories offering different gazes on some stylised facts – there is room for cross-fertilisation, as Martin and Sunley are willing to recognise:

It would be wrong to be so readily dismissive however; Krugman's work is not as simplistic as Johnson and others have suggested [...]. For it perhaps less the specific results of Krugman's analysis that are important for economic geography than the general stimulus they provide for further inquiry. [...] The challenge, as we see it, is to pursue a closer exchange between Krugman's "geographical economics" and the new industrial and economic geography. Neither can claim to have a monopoly of insight, but an exchange of ideas between the two worlds, we believe, is beneficial. (1996, p. 285)

We believe this beneficial influence mainly refers to the need for a better insight of the relationship between competition structure and agglomeration, as it is a very central point in our interpretation of the linkages between geographical and economic phenomena, that is a key issue in understanding the extent of indirect territorial competitiveness. This stimulus is threefold.

2.1.2.1 Rethinking the organization of competition

The first issue is no doubt that of perfect/imperfect competition. As noticed before, NIG has been for a long time committed to the 'homecoming' of atomised small economic actors involved in almost perfect competition within the agglomeration. Also industrial

district authors have been paying tribute to this account: the production chain is dispersed in many small independent plants engaged in mutual competition¹⁵. Somehow this devotion to production system made of concurrent micro-enterprises has caused some limitations, for instance in understanding the dynamics of industrial districts themselves, characterised by processes of delocalisation and/or infiltrated by larger firms. Above all, the bias towards perfect competition has important effects on how we conceive territorial competitiveness: if the influence of location and agglomeration is limited to the case of fragmented small producers (like in part of the clusters and industrial district literature), therefore small room is left for territorial competitiveness as an explanatory framework, as it would apply to a limited portion of economic reality. Nevertheless, NIG is not necessarily bounded to perfect competition and firms' size in its explanation. We think that at least two features of NIG literature can free it from the size constraints. The first is the emphasis on production niches: in fact, serving highly specialised demand segments allows also small firms to behave somehow like Chamberlinian monopolists. Not by chance a huge part of NIG empirical evidence draws on intermediate goods and machine tools sectors, where small and medium firms work on the basis of on-demand tailor-made purchases by a limited number of customers. The second feature is the existence in most of the NIG literature of a further level of economic analysis between the micro-level of the firm and the macro of the economy as a whole, which is precisely the cluster (or the district, or the *milieu innovateur*, etc.). In other term, we can overcome the constraints put by the size of the single hypothesizing a sort of systemic effect that make of many firms one collective actor (this view is particularly spread in Italian industrial district literature). In this perspective it might be less important to state a clear hypothesis about the size of the single firms locally interacting. Also, the idea of interpreting the agglomeration like a collective actor blurs the boundaries between internal and external economies: both internal and external economies (with reference to the single firms) are anyway internal to the cluster, which is the relevant unit of analysis. This solution to overcome the size and competition matter has also important consequence on the territorial competitiveness issue. In the first chapter we have underlined the dilemma of the juridical personality of territories, which somehow sounds similar to the possibility of considering the agglomeration as a collective action. In other terms, the 'collective firm' framework offers some suggestions and impressions for overcoming the impossibility of thinking a territory as a collective action. Of course this relation is a delicate one, as we cannot just equating economic collective action to territorial personality, as the latter is a more complex phenomenon than the joint action of a number of firms. As we shall do in next chapters,

¹⁵ Of course this is only one side of the tale, as the industrial district literature emphasises as well cooperation and not only concurrence.

these two metaphors must be contextualised in a more complex and complete epistemological framework.

2.1.2.2 Rethinking externalities and agglomeration

The second question highlighted by Krugman's sharp claim for rigorous modelling is the need of a more careful use of externalities argument. As he argues:

[...] it is desirable to put some distance between the assumptions and the conclusions – to avoid something that looks too much like the assertion that agglomeration takes place because of agglomeration economies. This especially true because much of the analysis we will want to undertake involves asking how a changing economic environment alters economic geography. This will be an ill-defined task if the forces producing that geography are inside a black box labelled 'external effects'. (Krugman, 1998b, p. 9)

NIG literature, on this point, often runs the risk of confusion – being confused and making confusion – as its account of agglomeration economies has been shifting more and more towards intangible and untraded set of external economies (Storper and Salais, 1997). Also the ongoing cultural turn has broadened the range of agglomeration economies considered to be suitable for explaining the influence that particular locations have on the competitiveness of businesses run there. At the same time, as Martin and Sunley properly noticed, NIG consider a limited subset of the conceptualisation of external economies available in economic literature, hence mirroring NEG which is correctly under accusation for considering only market-size related externalities. The proliferation of different ill-defined accounts for external economies can be without doubts seen as an evidence of the Markusen's "fuzzy concept, scanty evidence, policy distance" accusation to regional science and economic geography (Markusen, 2003).

Nevertheless, the solution for Economic Geography cannot be an escape back to oversimplification, like in Krugman's account, but rather putting some order and consequentiality in the forest of concepts which have been developed since the end of the 80es. This is the case for the development of new taxonomies of the different kinds of agglomeration which are often confused under a number of overlapping labels (Markusen, 1996; Gordon and McCann, 2000; Martin and Sunley, 2003; McCann and Sheppard, 2003).

On the NEG side, Krugman himself recognises that the emphasis on the relationship between agglomeration and market-size effect might be a reductive and overestimated explanation:

It would be not surprising if it turns out that the market-size effect emphasized by the current generation of new geography models are a less important source of

agglomeration, at least at the level of urban areas, than other kinds of external economies. [...] big cities may be sustained by increasing returns that are due to thick labour markets, or to localized knowledge spillovers, rather than those that emerge from the interaction of transport costs and scale economies at the plant level. (Krugman, 1991a, p. 172)

This is not an 'auto da fé' or a demission of NEG purpose and achievements. On the contrary, it is a rather a statement about the unavoidable link between NEG and Neoclassical Economics: Krugman and his fellow dismiss the importance of knowledge spillovers and non-pecuniary externalities on the basis of a twofold argument: on the one side, it is said that these externalities are not "universal" but specific of just some sectors and industries; on the other side, the reason is more "technical", it is because it is not possible to model them within the hypothesis of mainstream Economics.

The gap is therefore between geographers and Neoclassical Economics. This is likely to be the root of misunderstanding and lack of communication between economic geographers and geographical economists: Krugman cannot figure out why geographers have missed the occasion to enter the economic mainstream, while geographers stare at Krugman's reductionism and methodological individualism like a dungeon which they have just escaped from. The radicalisation of the opposition is quite evident in Martin's last writing about Geographical Economics, where the target is not any more Krugman's account but the possibility of dialogue with Neoclassical Economics¹⁶ itself (Martin, 1999).

By way of conclusion, I argue that the 'new geographical economics' represents a case of mistaken identity: it is not that new, and it most certainly is not geography. (Martin 1999, p. 67)

2.2 Neoclassical Economics and territorial competitiveness.

The ontologisation of the conflict shifts the perspective from the theoretical to the meta-theoretical level: the issue is not any more the explanatory power of Geographical Economics theories versus Economic Geography ones and the consequent possibilities for correction and mutual hybridisation on the ground of the theories and their explanatory power, but it is rather which kind of economic thought – that is, a meta-theory – is more suitable to build comprehensive theories about the relationships between territories and economic phenomena. In other terms, if we want to use agglomeration as a shortcut to explain indirect territorial competitiveness, Neoclassical Economics – and therefore

¹⁶ Krugman's lack of interest in geographers' criticisms is almost proverbial, somewhat like a general equilibrium between marginal arrogance and autism: it is somehow meaningful that, in 2000, called to contribute to the Oxford Handbook of Economic Geography he even does not quote any of the many geographers' article on NEG (Krugman, 2000), just limiting himself to repeating the usual mantra.

Geographical Economics – cannot offer an exhaustive framework for the task. We have therefore to shift our attention from the relations between NEG and NIG to which kind of Economics is more likely to address contemporary geographical questions. We are therefore at the opposite of Krugman's conclusion: the reason for not considering 'maximisation+equilibrium' models in Economic Geography is not technical, but epistemological.

The question about to what extent mainstream economics is suitable for investigating agglomeration and territorial competitiveness can be effectively summarised by Martin's strong statement about a deep epistemological divide between Geographical Economics and Economic Geography:

Krugman is wrong in his explanation of the 'five lost traditions' of economic geography. These had largely disappeared from geography in the late 70s not because of geographers' 'failure to understand how far short of the ideal were falling'. Rather, they were deliberately abandoned on philosophical and epistemological grounds, as part of the large-scale movement away from logical positivism that occurred at that time. [...] The key point is that the work of economic geographers and the new 'geographical economics' represent quite distinct methodological and epistemological genres. [...] At the heart of the difference between economic geography and the 'new geographical economics', therefore, is a fundamental difference of view about 'theory' and modes of theorising. 'Theory' in the 'new geographical economics' is assumed to be synonymous with formal, mathematical model building: the method is one of deductivist, mathematical demonstration. In much of economic geography, the dominant mode of theorising is one of discursive persuasion. (Martin 1999, pp. 81-82)

Actually this bias is specifically an epistemological one and it mirrors the strength and the weakness of the neoclassical mainstream where NEG is deeply embedded. That is, there are severe doubts that Neoclassical Economics can offer a consistent meta-theory to draw on in order to build theories about agglomeration and territorial competitiveness.

Quite paradoxically, the two main reasons to exclude any serious possibility of finding a neoclassical foundation for Economic Geography are just the two issues which Krugman's NEG is praised for, that is:

- i. the focus on intermediate level of analysis between the single firm and the economy as a whole;
- ii. the explanation of *dynamic* economic geographies of business uneven distribution, that is why history counts.

2.2.1 NEG and the scale issue

First we have to consider the question of intermediate levels of economic analysis between the micro and the macro. By no doubts, Krugman has shown a serious concern with the uneven distribution of economic activities: his New Trade Theory is actually largely based on the fact that specialisation occurs *within* the nation, let us say at the regional or the urban scale. Moreover, the consequent emphasis he puts on location and agglomeration seems to be the clear demonstration of his willing to introduce spatial fragmentation in the realm of Neoclassical Economics. Agglomeration itself, in fact, implies that there is a third layer of analysis with own emerging properties. Nevertheless, this comes out to be an illusion rather than an effective achievement. The problem is that Krugman's explanation is *scaleless*. Once again, Martin is extremely sharp in identifying the issue:

So cavalier is the treatment of space and place that the same model is often used to explain spatial agglomeration and specialisation at vastly different scales, from the international level, to broad core-periphery patterns within nations, to local urban concentrations, and even intra-urban neighbourhoods. Processes are thus assumed to be largely scale-independent. For economic geographers, however, the issue of spatial scale is central. (Martin 1999, p. 78)

We have to be aware that this is not only the usual geographers' lament about the impossibility to reduce the complexity of places through logic mathematical models. Here the issue is another: the impossibility of conceptualising places and scales descends directly from methodological individualism, that is the belief that economic reality can be draw back to atomistic economic actors (*homo oeconomicus*): the passage from the micro (the individual) to the macro (the economic system as a whole) is just a matter of composition of individual preferences and behaviours. Even if we introduce intermediate economic entities (like agglomeration and clusters) or even geographical ones (like regions and cities) there are not significant changes in the logical order which drives economy from the individual to the whole. The homology between scales – that is the obedience to the same laws and principles – is total and therefore there is not any qualitative difference between them, but only quantitative (that is, spatial). But the real meaning of scale is to differentiate space, as different scales imply different forces, strategies and behaviours. We are therefore facing the impossibility of explaining the emergence of something really new, as the different scales are nothing more than the mathematical and functional composition of the existing properties at the lower levels. To the extent to which methodological individualism is a fundamental feature of Neoclassical

Economics, the latter is incompatible with a serious account of intermediate economic object.

This case is quite sympathetic with Olsen's rationale about the units of Geographical Economics (Olsen, 2002). According to Olsen, NEG failure to explain scale-based organisation of the production realm depend on the fact that the focus on geographical objects like cities and regions is just illusionary. The real units of Krugman's line of reasoning are the firms, the industries and the whole economy: spatial entities are just derived by the interaction of this economic trinity. This would explain the perfect matching between the original economic units and the derived geographical ones: the city is little more than the agglomeration of firms seeking to exploit market-size advantages, while the region is the space where industrial pecuniary externalities take place and the nations still coincide with the economy itself. The derived nature of geographical scales is even more evident if we consider the fact that their existence is a privilege that can be suspended if the economic state-reason requires it:

Depending of what we are trying to model, it is sometimes convenient to think of the economy as consisting of a finite set of locations (regions or countries), sometimes to think of it as spread across a continuous space. (Fujita et al. 1999, p. 49)

Now it is easy to argument that this prominence of economic units over geographical units is another facet of the supremacy of methodological individualism in NEG. The linkages between firms, industry and the whole economy is in fact built upon the assumption of MI which guarantee that the knowledge we possess of the basic unit is enough to build a knowledge of the upper layers. When NEG pretends to explain inter-scalar dynamics with the dynamics between the three main economic units it is simply using methodological individualism in a geographical discourse.

Of course this project is fated to failure, as geographical entities are far more complex than economic ones and also economic units are more complex in reality than the simplistic way they are mirrored by mainstream Economics.

2.2.2 NEG and the issue of place

This leads us to consider the second epistemological oversight which undermines NEG suitability, the fact that it is an intrinsically *placeless* approach. This failure to catch the meaning of place and territory is strictly related to NEG account of history and time, which was one of Krugman's 'delight' in his late 90s apologetic writings (1998a and 1998b).

In Krugman's view agglomeration and uneven development start when transport costs decrease enough to allow centripetal forces – essentially related to market-size

effects as we noted several times – to win over centrifugal ones – the uneven distribution of scarcely mobile resources – and to start an agglomeration process. Also, this process is said to be cumulative and to establish some form of path-dependency, which Krugman – following David – names the QWERTY effect. The idea is that, once a cumulative process begins, then it is locked in the places where it occurred the first time. The 'where', on its side, is largely determined by fate, depending on the random distribution of resources or other factors which remain exogenous.

Of course, this position can be challenged on a purely theoretical level, arguing for instance that other – and more complex – accounts for cumulative growth can be found in heterodox economic tradition, like in Perroux's and Myrdal's ones (Meardon, 2001). Also it can be maintained that the 'iceberg' treatment of transport costs¹⁷ – which is substantial to the modelling of NEG – can be rejected in favour of more realistic and equally compatible with neoclassical framework, like McCann's logistic cost approach (McCann, 1998).

Nevertheless there is a more subtle and radical critique that can be made of NEG emphasis on history: here history is just the result of *random resources distribution* plus *cumulative lock-in* plus *eventual shocks* – just to secure the possibility of interrupting circular causation mechanism. What really interests geographical economists is the *moment* in which centripetal forces balance and overwhelm centrifugal forces. This is the phenomenon which drives spatial economy to an equilibrium. Path-dependency just counts to justify that there are several possible equilibriums. Therefore, NEG is mainly interested in *points in space* (the places where agglomeration randomly occurs) and *in time* (the moment when centripetal forces win). 'Real' geography and 'real' history are just ancillary: they are the black box where to put what cannot be easily modelled.

Again, it is not just question of time – necessary time to find new technical trick which allow a better modelling of previously disdained bits of reality – but of epistemological failure: the neoclassical failure to bring life back to economics (Lawson, 1997). In this case, it is the impossibility to grasp the complexity of real places and territories: these are produced by – and in turn produce – a broader range of human agency than the one accepted by methodological individualism.

The 'history' referred to is not real history: there is no sense of the real and the context-specific periods of time over which actual spatial agglomerations have evolved (and, in many cases, dissolved). Instead, in the logical model of the new economic geography the notion of time employed is that of abstract logical, or simulation, time. Likewise, 'path dependence' is simply a simulation or solution

¹⁷ This is one of the four trick which according to Krugman allow to model geographical economic phenomena: it simply consists in the hypothesis that a *fixed* percentage of the traded goods 'melt' during transportation and that this summarise consistently all the matters about transportation costs.

sequence in which the degree and regional pattern of 'path dependence' is determined solely by the specific initial conditions and parameters of the location model, rather than by a real, complex, locally-embedded and emergent socio-historical process of technological, institutional and social evolution. (Martin 1999, p. 76)

With reference to the issues of history and place, NEG shares some of the limits of location theory and the territorial competitiveness literature – above all that concerned with direct forms of competition and the attraction of foreign investments. The main limit is here an excessive focus on the moment in which enterprises decide about where to locate their activities, passing over what keeps firms there once they have settled. Krugman's perspective also misses how new businesses arise from previously different specialisations. Finally, this emphasis on the location choice fails to give an account of how geography influences the competitiveness of small firms agglomerated in clusters or industrial district: here the location choice is often very simple – business arises there because the entrepreneur is born there – and all the competitiveness issue is shifted to successive periods.

It is clear that no account of territorial competitiveness can be given in such a framework: speaking properly of territorial competitiveness means establishing a clear interaction between a territory with something like a juridical personality and the firms which are localised in. NEG failures on both the terms of the discourse are evident. In a neoclassical account, territories are boxes *without boundaries* (as scales are not differentiated) and *without content* (as places are not univocally and uniquely defined). At the same time the array of firms which are located in is generically classified as 'agglomeration' without any understanding of its organisational order (Gordon and McCann, 2000).

It is worth to insist again on the nature of this failure: it is not a theoretical failure but an epistemological one, as it refers to the meta-theory on which NEG theories are built. As Sheppard shows brilliantly, the riddle is not 'the maths' – as Krugman usually suggests¹⁸ – because the problem is not just a methodological one, between quantitative and qualitative methods advocates. The problem is about how economists and geographers set their own critical assumptions. In this perspective, NEG turns out to be incompatible with Geography even for those geographers which are keener on modelling spatial and economic phenomena (Sheppard, 1995, 2000a and 2001). This also limits harshly the possibility of amending Geographical Economics of its faults. Before moving to the higher

¹⁸ His usual reply to critics and detractors sounds usual quite paternalistic and annoying: geographers – as well as competitiveness scholars – ignore and dislike mathematics: this is, in Krugman's world, the only feasible reason for disdaining Neoclassical Economics and NEG.

epistemological level – that of paradigms – to find a proper foundation for territorial competitiveness, it is worthwhile to focus on the current debate about economic meta-theory which best suits economic geographers' needs.

2.2.3 Institutional Economics and the Cultural Turn: redefining the Economics in Economic Geography.

The refusal of Neoclassical Economics – well founded on epistemological controversies rather than simply on defensive disciplinary boundaries – has always been present, even if subterranean and unconscious in Economic Geography, but there are no doubts the NEG 'aggression' has contributed in catalysing the attention on this important issue since the late 90s, when some seminal collective works and provocative papers have marked the evolution of the debate. The two main events have by no doubt been Lee's and Will's edited book *Geographies of Economies* (Lee and Wills, 1997) and, some years later, the challenging article by Amin and Thrift on *Antipode*, followed by a various and heterogeneous debate on a successive issue of the journal (Amin and Thrift, 2000).

Most part of the debate have been focusing on the availability of several streams of economic thought which might better suit the needs and the vocations of Geography's epistemological and social status in explaining the contemporary world, and therefore also economy. Moreover the debate had been going radical following the provocative article by Amin and Thrift, with their doubtless rejection of any form of economicism, hiding – according to their critics – a more deep-seated refusal of rationality, logic and empirical accuracy (Rodriguez-Pose, 2001). In this section we will address sketchily the debate, with special reference to the attention largely paid by geographers to (Old) Institutional Economics as a comprehensive framework, alternative to Neoclassical Economics.

After the demise of the quantitative revolution in the 70s geographers have been spontaneously moving backwards in search of different unorthodox economic thought to rely on in their research: Marx, Sraffa and Ricardo have become in different waves the economic referents for economic geographers trying to build up a Regional Political Economy . Nevertheless, to be quite simplistic, all these approaches maintained the eminence of economic concepts and explanations (like values, production, innovation) over social and cultural ones in order to explain economic and geographical phenomena. Extending Marxian categories improperly to different theoretical realms, we might summarise the issue saying that Economic Geography has been so long structuralist, although not neoclassical. Things changed progressively in the 80s with the diffusion of Derrida's deconstructivism in Human and Cultural Geography and the proliferation of post-prefixed branches in contemporary social sciences . Barnes has giftedly followed the red line of a demise of the Enlightenment and Modernity project throughout much of the Economic Geography literature since the 80s – considering Harvey's Marxism, Sayer's

Realism, Cooke's locality debate and Scott's and Storper's flexible accumulation – praising for a stronger break with reductionism (Barnes, 1996). Nevertheless, Barnes' *Economic Geography* is still *Economic Geography*: the fracture is essentially epistemological and methodological, but the economic realm is still, at least theoretically, distinct from the cultural one and the reference to the tradition of economic thought is still clear and indubitable.

In the more recent debate, on the opposite, not only the boundaries between the economic and the cultural have blurred but also the hierarchy between these two realms within Economic Geography has been reversed. As Amin and Thrift sustained in an outrageously provocative paper, bringing the cultural turn to its extreme severe consequences might imply a dramatic methodological reversal from somehow 'codified' economic knowledge towards discursive forms of economic story-telling, based on an unclear non-economists' economics (Amin and Thrift, 2000). Although not accepting their violent attack against the dialogue with academic economists fellows, we must recognise that current developments in Economic Geography put on the edge the issue of the interface between the economic and the cultural realms. Just limiting us to a corner of the ongoing debate about competitiveness, the NIG literature focusing on the knowledge-based economy and the competence theory of the firm implies some kind of contact with cultural explanation. Analogously, untraded relations between firms need 'immaterial infrastructures' that are largely culturally constructed: trust, values and habits are not just social (in that are built through social interactions), but also cultural (as they are shaped, changed, improved and destroyed by the collective and individual representation of these linkages).

The fact that some of the 'materials' that represent the input and the output of an economy are culturally constructed rather than and before being economically produced is true. Nevertheless, this does not allow the generalisation that the whole economy is made of cultural materials. Also within the framework of consumption studies culture cannot explain the whole process going on:

[...] most of the work in the new geography of consumption has had to do with perceptions, embodiment, performativity, and the identities of consumers and with the (postmodern) discourse of consumption, but not much at all with the basic socio-economic and political issue of the income inequalities which underpin and result from consumer behaviour and differential access to the process and places of consumption. (Martin and Sunley, 2001, p. 156)

The second realm, where – less dramatically than in the case of the cultural turn – geographers have been looking for an alternative economic meta-theory, is given by Institutional and Evolutionary Economics. In the last ten years, a branch of the rebellion

against quantitative, models-based and neoclassic Restoration praised by NEG has clearly turned itself towards Institutional Economics (IE), usually linked with Evolutionary Economics, in search for an authoritative alternative economic doctrine to dialogue with and to found on. Institutionalism largely spread in Economic Geography in a quasi-perfect identification with the issues of New Industrial Geography (Barnes and Gertler, 1999).

In opposition to the NEG account for territorial competitiveness, New Industrial Geography marriage with Institutional Economics offers some undoubted advantages. Basically, Institutional Economic Geography is necessarily scale- and place-sensitive, rather than space-committed. Institutions are in fact scaled in that:

- (i) institutions are the expression of social groups which are often concentrated spatially;
- (ii) institutions exercise some form of authority on a bounded space, that is, a scale;
- (iii) different tiers of institution are not isolated but linked by many kinds of complex interrelations, in a sort of transcalarity.

Also, institutional analysis offers some advantage with reference to the place issue, as we can consider place as 'filled' with institutions instead of things and people. To be more precise we can interpret institutions as a balance between social structuration and human agency that can confer places something like an identity. This argument will be developed in the next chapter: here it is just to suggest that institutions can work as the shortcut towards considering places' agency and territorial juridical personality, which is one of the key issues of our analysis.

Nevertheless, IEG present some troubles which make it hard to build a consistent theory of territorial competitiveness on it. These limitations, I will argue, are strictly related to what we considered to be the cultural turn in Economic Geography. We can monitor this ambiguity through one of the most fortunate concepts in IEG – that is, *institutional thickness* (Amin and Thrift, 1994). 'Institutional thickness' – that is an densification of institutions which often takes place at the local/regional scale – can offer a sharp way to identify places where territorial competitiveness occurs and to justify the use of the metaphor of juridical personality of territories, in that the institutional thickness might be read as the expression of this personality. Moreover, we can notice that IEG offers a framework to continue the interrupted discourse arising in localities studies about the possibility to consider places as agents – that is the issue of juridical personality of territories – with their own identity (Cox and Mair, 1991; Hayter, 2004).

At the same time, the concept of 'institutional thickness' seems to be undermined by some tautological weaknesses which it shares with most of the 'cultural turn' literature

and that we might name 'taken-for-granted' and 'everything-goes' syndromes. The former refers to the fact that it is often taken for granted that cultural institutions are more democratic and therefore better than economic ones. This leads to an overdose of cultural turn in the explanation of institutional behaviours and an excess of optimism in making 'institutional thickness' a normative rather than analytical concept. This also can conduct IEG to an 'everything-goes' position which is often carped by those scholars who are particularly unsympathetic with 'cultural turn'. As almost everything existing on earth surface can be interpreted as an institution, simply relying on 'institutional thickness' without any serious criterion of choice among institutions might cause a critical loss in their explanatory power. As Martin notices:

Although highly suggestive, the term still lacks definitional and theoretical precision [...]. Neither case-by-case examples nor somehow tautological definitions are substitutes for a general conceptualization of how 'institutional thickness' emerges at the regional and local level and what precise role it plays in regional economic development. (Martin 2000, p. 88)

These ambiguities are even more important with respect to 'territorial competitiveness' template. Making *institutional enhancement* a policy before defining a clear theory and methodology of *institutional analysis* boosts the risk of making territorial competitiveness a pink voluntarism where institutional consensus alleviates the harms of competition, flying over the structures of power that benefit some groups rather than others *within* the local community (Cheshire and Gordon, 1996; Cumbers *et al.*, 2003).

Also, focusing on local institutional assets might turn out as a sort of 'regional fetishism' – with the risk of privileging the local/regional scale at the expenses of other important scale of institutional production, like the national one, and of disembedding regional destinies from more general and ampler socio-economic trend (Cumbers *et al.*, 2003).

It is important to recognise that the introduction of some cultural and institutional account of the socio-economic phenomena might help NIG in addressing the issue of agglomeration, while avoiding the excess of simplification that characterised many of the NIG-oriented interpretations of the territory. To a certain extent we might that the more economic *coté* of NIG is still paying for some sort of primary sin, in being largely influenced in its very foundation by rigid narratives which introduced into NIG a strong emphasis toward dualism and black and white contrasted pictures. Fordism versus post-Fordism, vertical integration versus flexible specialisation, hierarchy versus market are all dichotomised juxtapositions that lay at the very bottom of all the theories that NIG developed in the following twenty years. This led to an oversimplification of the territory, hiding the rich tones of grey that make a good B&W picture. More specifically, this

oversimplification, as we shall see in chapter 4, took the form of a dramatic reduction of the variety we can find within a territory, in order to privilege a more comparative account of the variety between territories, each of them to some extent frozen in some dualistic categories. In this perspective, addressing the richness of cultural meanings and institutional arrangements that can be found in a given place helps in moving the *variety* of territory to the forefront of our reasoning. Even more important is the fact that (Old) Institutional Economics, with its traditional historical approach to the explanation of economic phenomena, and Evolutionary Economics, with its emphasis on path-dependence and coevolution, can offer a fruitful contribution in addressing the second issue we are interested in, that is *continuity* within a territory.

At the same time, we should recognise that, while avoiding the oversimplification of the territory, cultural and institutional turns in Economic Geography produce an overcomplexification of the economy, dismissing together with methodological individualism also the fact that economic agents have some economic purpose. In other terms, cultural and institutional consider agglomeration mainly in the perspective of the richness of cultural and institutional arrangements that produce these territorial assets, considering less and less the economic side of the tale, that is why and how firms are attracted by such territorial endowments.

The reason for this fuzziness probably lies in what we might the 'epistemological multiscalarity' of Institutionalism, that is the fact that institutional turn can be read at least three different epistemic levels: thematic, methodological and ontological (Jessop, 2001).

The first, and simplest, can be called the *thematic turn*, that is, the intuition, hypothesis, or discovery that various institutional aspects of social life should be included among the key themes of social enquiries. [...] The second can be named a *methodological turn*, that is, the intuition, hypothesis, or discovery that the institutional aspects of social life provide a fruitful [...] entry point for exploring and explaining the social world [...]. The third can be described as an *ontological turn*, that is, the intuition, hypothesis, or discovery that institutions constitute the essential foundations of social existence. (Jessop 2001, p. 1214)

Most of the concerns about IEG vagueness arise at the thematic level (when institutional turn just equates cultural turn in wildly broadening the realm of enquiry of Economic Geography) and at the methodological one (when the usefulness of institutions in making a sense of otherwise contradictory concepts¹⁹ creates an euphoric excess of

¹⁹ Jessop lists an amazing number of dichotomies which can be rewardingly approached using an institutional methodology: structure versus agency; holism versus individualism; necessity versus contingency; abstract versus concrete; simple versus complex; idiographic versus nomothetic; anascopic versus katascopic; global versus local (Jessop 2001, p. 1216). In next chapter we will argue that

expectations about Institutionalism). The solution must therefore be found at the ontological level, that is, about the paradigmatic foundations of the relationship between Economics and Geography, which will be next point in our analysis.

2.3 Conclusions: the need for a new paradigm.

In this chapter we have considered the issue of the economic and geographical foundation of an exhaustive theory about indirect territorial competitiveness. The first line of reasoning has been that *agglomeration* represents the necessary starting point if we want to consider how geographical entities shape economic phenomena and, specifically, the competitiveness of businesses which are located in some places. Mirroring the structure of the first chapter, we have introduced first Krugman's NEG: Occam's razor principle in fact suggests that if can find a simpler consistent explanation of a set of stylised facts we should privilege that elegant laconic vindication. Nevertheless we have argued that matching NEG account for agglomeration with NIG one account for agglomeration and territorial competitiveness shows Krugman and fellows economists having some trouble in giving an account of world's geographical and economic complexity. We therefore moved to consider in a meta-theoretical perspective the relationship between Economics and Geography. Here emerged that NEG neoclassical foundation throws up some difficulties with the concept of agglomeration which is relevant for geographers: being ontologically scaleless and placeless, Neoclassical Economics will hardly offer a comprehensive account for territorial competitiveness, at least a suitable for geographers' representation, identity and performativity.

Our point is that in addressing the issue of agglomeration, both NIG and NEG produce an oversimplification of the complexity of the territory and of its multiple possibilities for coevolving together with economic activities. Moreover, we shall also argue that when NIG comes into considering territorial complexity, it just falls in the opposite trap: a sort of overdose of cultural and institutional inspirations make justice of the complexity of place and territory but, in doing so, it reduces the possibility of a clear understanding of the relationship between territory and firms' competitiveness, creating some problems in addressing the issue of territorial competitiveness.

In this section we will try to argue that we have to move a step further in our epistemological chain. Theories and meta-theories are not enough: we must rely on a paradigmatic foundation. The issues arisen in the previous sections on both NEG and NIG side cannot be solved only with reference to the meta-theoretical level, substituting a set of economic hypotheses and frameworks with another, that is, shifting from Neoclassical to

Institutional Theories shares this uncommon explanatory power with 'System Theory'. Moreover, we will try to argue that 'System Theory' is no less than the paradigmatic template where Institutional methodologies and theories are rooted in.

Institutional Economics. How these alternative economic meta-theories are founded on a superior level deserves some attention. In other terms, before proceeding in building an interpretative framework for territorial competitiveness, we must enter the highest level of epistemological significance of the territorial competitiveness template, that is, the paradigmatic one²⁰.

In doing so, we will start from sharp epistemological analyses by Barnes (Barnes, 1996; 1997 and 1999) and Sheppard (Plummer and Sheppard, 2001; Sheppard, 2000b and 2001), who distinguish the use of physical and biological metaphors in Economic Geography.

The concept of *competitiveness* descends without any possible doubt from that of *competition* and therefore it inherits some innate bias towards biologic metaphors. Sheppard's account of territorial competitiveness can offer a profitable starting point to consider the relationship between biological metaphors and economic explanation:

Competition is not only a foundational idea in economic and social theory, but also in biological evolutionary theory. Indeed, over the last century social scientists have frequently appealed the notions of struggle and selection in Darwinian evolutionary theory to justify the centrality of competition in human societies. [...] In fact, Darwin borrowed the idea from economics. He was inspired to make struggle and competition central to his evolutionary theory by the economist (as well as population theorist and priest) Thomas Malthus. Darwinian evolutionary theory remains controversial among biologists. [...] Alternatives can be conceived. The geographer Kropotkin was among the first to argue that cooperation is pervasive among animals. [...] Within economic thinking the discourse of competition is that market-driven (capitalist) competition is generally economically and socially beneficial. This has been articulated through two prevalent metaphors expressing how competition works. The first and dominant one is *competition as invisible hand*. [...] The second is *competition as evolutionary progress*. (Sheppard 2000b, p. 169-170, original emphasis)

Sheppard is doubtlessly right in identifying the come-and-go reciprocal influence between Economics and Biology, as well as in refusing social Darwinism and in stressing the role of cooperation in economic and social life (Cooke and Morgan, 1998). Nevertheless, there are some weak points which make him miss the paradigmatic shift

²⁰ Following Kuhn's work we can define paradigm as a *set of norms and rules* that (we) is shared by the large majority of scientific disciplines in a given time and that (ii) shapes the single disciplines epistemologies – that is, what we previously named meta-theories – which (iii) afterwards the specific theories are built on (Kuhn, 1962).

intrinsic to the adoption of biological metaphors. This is because he drives Evolutionary Economics back to the Neoclassical epistemological realm: if it were like this, there would be no feasible escape from the meta-theoretical dilemma we highlighted in the previous chapter. Exactly as in the case of Williamson's and Coase's New Institutional Economics, it is true that there is a huge part of Evolutionary Economics committed with Game Theory and Rational Choice framework – that are mainly Neoclassical branches. It is also evident in Krugman's attempt to link his NEG to an evolutionary account of competition rather to the invisible hand one. Nevertheless this is only one part of the tale. For instance, drawing Nelson's and Winter's work back to Neoclassic Economic – as Sheppard confidently does (2000b, p. 170) – is quite a plucky task, as they are commonly seen as two of the main pioneers of the renewal of the Old Institutional School (Samuels, 1988; Hodgson, 1999, part three in particular). Also Krugman's reference to evolution is proved to be quite a caricature of institutional Evolutionary Economics: as we noted in section 3.1.2, in Geographical Economics evolution and history just matter in influencing which of the multiple possible equilibriums will take place.

Moreover, this negative interpretation conceals the most important fact, that using biological metaphors instead of physical ones deeply influences how we build our meta-theories, that is, the paradigm our geographies live by. Trevor Barnes is beyond question the contemporary geographer who most has worked on the metaphoric contribution of other sciences to geographical knowledge. A huge literature in philosophy and history of economic thought is now available that shows how Neoclassical Economics has been deeply shaped by the willingness to establish itself as a science through the sharing of the same paradigm with natural science, above all with classical physics (Georgescu-Roegen, 1971; Hodgson, 1999; Lawson, 1997; Mirowski, 1988). Although it happened some decades later, the same influence largely operated on Economic Geography during the quantitative revolution the discipline knew in the 50s. Barnes' research has broadly documented the spread of classical physical and mechanistic metaphors in geography – the most (in)famous example is the geographical application of the Newtonian spatial gravitation model (Barnes, 1996, ch. 5). More recently, Barnes has highlighted in positive terms the parallel rise of biological metaphors in Economics and Geography. In particular, he addresses three potential stream of biological inspiration in Economics: Marxist and regulationist theories of reproduction, Evolutionary and Institutional Economics' reliance on the notions of acquired characteristics and inheritance and, finally post-Keynesian emphasis on holism and organicism (Barnes, 1999).

In our perspective it is important to notice that the same dialectic between physical and biological metaphors is central in the territorial competitiveness debate. Apart the fact that 'competitiveness' and 'competition' are explicitly biology-biased concepts, there is a large use of biological metaphors: from the holism of the concept of juridical personality of

territories to the organicism underlying the reference to social cohesion. Also the relative explanations from both New Industrial Geography and Geographical Economics make large use of biological metaphors. We have already stressed Krugman's claim for complexity and evolution, but all NEG is characterised by a wishy-washy misuse of biological metaphors. As Sheppard notices in his review of *The Spatial Economy* (Fujita *et al.*, 1999; Sheppard, 2001):

There is much use in *The Spatial Economy* of concepts favored by complex theory, such as path dependence and phase diagrams, and commendably a concern for determining the stability of equilibriums and a willingness to simulate when the equations cannot be solved. Yet the viewpoint of this work remains far from that of complexity theory. (Sheppard 2001, p. 134)

Also the NIG frame is cut all the way through by the reference to biological metaphors – see for instance how Storper contextualised his account of the relational regional economy in the metaphors of path-dependence and co-evolution among different scales (Storper, 1997b). Nevertheless we cannot fully realise the strength of this metaphorical shift if we cannot move away from the cultural trap and we consider it as the expression of a paradigmatic shift. The cultural trap would keep us on the surface, inferring that as we largely rely on metaphors we cannot distinguish the economic from the cultural. The paradigmatic shift, instead, might allow us to reconstitute the economic on a different basis.

In next chapter, we will address the issue of how complexity can be taken into account in order to build a framework for the analysis of agglomeration and territorial competitiveness without either oversimplifying the territory or overcomplexifying the economy. In particular we shall be working on system theory approach, and in particular on Varela and Maturana's autopoiesis account, as a framework which allows to make some simplification without being reductionist.

Chapter 3: The emergence of relational complexity.

In this chapter we shall address the paradigmatic issues arisen in chapter 2. In particular we will try to demonstrate that the limits inherent to Neoclassical Economics and therefore to New Economic Geography's explanation depend on a very fundamental feature of the paradigm they are inspired by, that is to say, Reductionism. If we introduce complexity – that is unpredictability and emergence – the founding hypotheses of Reductionism loose much of their explanation power. Also in this chapter we will discuss the fundamental feature of one of the main branch of complexity theories, that is, System Theory and, specifically, autopoiesis.

3.1 Entities and relationships: introducing complexity.

It is possible to start from an extremely generic consideration: our understanding of life on earth cannot ignore *both* the simultaneous existence of many entities – objects, parts – *and* the relationships that are established between parts. In every instant, billions of relationships take place simultaneously linking billion of entities. Even the simplest event like the movement of an object on the earth's surface can be seen in relational terms, in the sense that it relates two distinct points to each other. The theory of gravity is perhaps the clearest example of this principle: each mass, by existing, exercises an attraction towards any other mass and thus establishes a relationship with it.

The example of the gravity law is twofold: on the one side, it help us in recognising that real world is made by relationships and not only by objects, on the other side it shows how objects and relationship can be put together in an elegant, formal, universal and simple model which explain at least some features of "real world". Social sciences, and geography among them, have always aspired to the formulation of necessary and universal laws like that of gravity (Wilson, 1969; Barnes, 1996). However, their task is made thankless by a concept that is anything but negligible in contemporary science: *complexity*.

"Complexity" is, without doubts, one of the key words in contemporary scientific debate. Complexity is actually an encompassing concept which is somehow emerging as a

supposed-to-be new paradigm for natural and social sciences, overcoming the distinction itself between the natural and the social realms (Katz, 1986 and 1989; Waldrop, 1994). Moreover, under the label of “complexity theories” we can find a huge range of different streams, from chaos theories to Artificial Intelligence experiments, from system theories to cybernetics, until some mystical drifts like Capra’s mix of popular science and eastern religiousness (Stewart, 2001).

Although – or because of – the widespread use of this concept in different fields of enquiry, it is extremely difficult to define it in a satisfactory way, making complexity a slippery shortcut through the boundless territories of scientific mythology rather than epistemology, above when applied to the realm of social rather than natural sciences (Eve et al., 1997; Kiel and Elliot, 1996). Also it must be observed a convergence between complexity theories and post-modern ones under the common target of dismissing modern epistemologies founded on truth and objectivity²¹ (Cilliers, 1998).

3.1.1 Complexity as unpredictability.

In order to define complexity, we can start from some closed concept that can narrow the semantic meaning of complexity which will be relevant in our discourse. First of all complexity is referred to some idea of *unpredictability* and *freedom*: the evolution of a complex system²² is not predictable starting from the behaviour of its elements. This does not mean that it is purely casual or messy: an order might be emerging during the evolution of the system, but it is not the outcome of deterministic and mechanistic causal relationships. In other terms, given a set of inputs, the outputs is not determined *a priori*²³. Moreover, the dismissal of causal mechanism is now a shared opinion also in Physics, that is the realm of causal determination in modern Cartesian science: after the quantistic and relativistic revolution also Physics laws are defined in terms of probability rather than certainty. To be more precise, explanations which are assumed to be true and evident – like the gravity law – are sub-cases of wider explanations that can be defined only in probabilistic terms. We can therefore identify an important consequence of unpredictability, that is, the mistrust in universality: there are not general rules which apply to all complex systems and even the same system, under the same conditions, can show different

²¹ Nevertheless, complex theories are now largely dismissed by the more critical streams of postmodernism as a “conservative”, if not “reactionary”, epistemology, about all in Luhmann’s more organicistic account (Grundmann, 1990; Zolo, 1992).

²² For the time being, by “system” I mean simply a set of entities linked by relationships. In next pages, the concept of system will be contextualised within the framework of System Theory and will acquire consequently a stricter meaning.

²³ As we will discuss later, this implies severe consequences for methodological individualism which assumes that the overall dynamics are reducible to the feature of representative individuals.

behaviour. The issue of unpredictability of complex systems is strictly related to the irreversibility of development patterns in space and time. Irreversibility in complexity theories arises from three main elements: the sensitivity to initial conditions, the presence of feedback – that is, of nonlinear rather than linear relationships between elements – and the treatment of time.

One of the main outcomes of quantum revolution and Einstein's relativity is, in fact, that initial conditions of a process may be irrecoverable, given the exponential number of possible originating status and of combinations between them. If we add to the irreversibility (the fact that slight differences in initial conditions can produce diverging final outcomes) we find as a result that it is impossible to assume the forecasting effectiveness of an explanation as proof of its validity, and that any claim for universality should be "translated" in mere probabilistic terms. There is a point that must be clearly stated here. Complexity does not imply legitimating of post-modern "everything goes": even if an event is not predictable, after it happens it becomes retrodictable in that it makes sense. More precisely, the dismissal of predictability it is not equivalent to the dismissal of causality: elements have still the capability to determine or at least influence other elements within the system. The turning point is that this causal chain is not given once and for all and therefore it is not fully predictable.

Moreover, unpredictability does not depend only on the sensitivity to initial conditions, but also on the second fundamental feature of complex systems: the presence of feedbacks and circular causation. As we shall see in next sections, the normal presence of feedback-like relationships among the elements of a system not only increases the number of relationships to be taken in account in our explanation, but also may change the properties and the status of the previous layers of elements originating changes in the causal chain which are not detectable *a priori*.

The dependence on initial conditions and the presence of circular causality evokes a third element of unpredictability, that is the conception of time. Traditionally, modern Cartesian science sees time as reversible, that is to say as irrelevant : time can be reversed like a chronometer to the starting point and it is therefore possible to remake the experiment from the beginning at the same conditions in order to achieve empirical evidence of a phenomenon. In complexity theories, on the contrary, as initial conditions cannot be achieved any more and continuous feedbacks continuously change the status of the system, time matters. To this respect, complexity theories come somehow to a philosophical *παντα ρει*: it is not possible to immerse in the same water, or, in other terms, to repeat the same experience of reality. There is no surprise, therefore, that contemporary natural and social sciences show a substantial similitude with the main achievement of

phenomenological philosophies²⁴: this is the consequence of a rediscovery of experiential time – and we would like to add, as it will be discussed in the next section, of experiential space, that is, place.

3.1.2 Complexity as emergence.

Another way to consider the unpredictability of complex systems is given by the issue of *emergence*, which we can define as the fact that

Patterns or global-level structures arise from interactive local-level processes. This “structure” or “pattern” cannot be understood or predicted from the behaviour or properties of the component units alone. (Mihata 1997, p. 31)

More generically, emergence is interpreted in complexity theories as the fact that novel structures and properties emerge at different levels through the interaction of the elements the system is made by. Lawson defines emergency putting that:

[...] an entity or aspect found at some level of organisation can be said to be emergent if there is a sense in which it has arisen out of some “lower” level, being conditioned by and dependent upon, but not predictable from, the properties found at the lower level. (Lawson, 1997, p. 176)

Furthermore, emergence goes beyond simple unpredictability as it puts more hypotheses about how the elements are linked each other. Drawing on Stephan’s account (1992, quoted in Mihata, 1997) we can distinguish three features which define emergence as something more than simple unpredictability:

- (i) *nonadditivity*: emergent properties are not the “sum” of the properties, that is to say, there is not an equation whose result is a property of the overall system;
- (ii) *novelty*: although the judgement of novelty is largely subjective and depends on the observer’s perceptions and values, emergent properties are new when they can influence the transformation of the system in a new system;
- (iii) *nondeducibility*: saying that emergence is unpredictable means something more than mere sensitivity to the initial conditions, as it refers to the impossibility to logically deduce laws or rules describing macro-properties of a system from laws or rules that produce the properties of its microparts.

²⁴ About the relationship between complexity theories and philosophical phenomenology, it is worth noticing that two of the most important theorists of autopoietic systems, the Chilean biologists Varela and Maturana, developed, in the latter developments of their thought, an explicit similitude with phenomenology (Mingers, 1995; Varela *et al.*, 1991).

In concluding our basic review of concepts associated with complexity we have to make a clear standpoint: complexity is not a matter of single methodologies and theories, but a paradigmatic affair. The issue here is not about questioning specific hypotheses and explanations, it is not about improvement in forecasting abilities or in becoming “more realistic”. A paradigmatic shift is about changing the deeper relationships which link reality with the way we build our theories. For instance, as we stated in the previous chapter, dismissing New Economic Geography and, generally speaking, Mainstream Economics is not *ipso facto* a refusal of mathematics or quantitative methods in name of a complexity of the real world which can not be grasped through formal modelling. As Sheppard wittily noticed, within complex theories there is a large use of maths and formalisation: quantitative methodologies are not *per se* deterministic (Sheppard, 2001; Plummer and Sheppard, 2001). The divide is ontological, that is, concerning the epistemological hypothesis, or, better put, the paradigmatic level. For instance, neural networks – a simulation technique which is often used in modelling Artificial Intelligence and Life – can be used in the design of forecasting models contravening somehow the principle of unpredictability of complex systems. Analogously, preaching for a paradigmatic shift transcends dissatisfaction with specific hypothesis of a specific theory, e.g. Neoclassical full rationality of individuals, or maximising behaviour. Complexity implies unpredictability not because of a lack of rationality, but because of the way relationships link the elements of the system – i.e. the three features of sensitivity to initial condition, presence of circular causation and irreversibility of time. In complexity theories, reality is still made of mechanistic relationship, without any need to introduce bounded rationality and imperfect information in order to justify unpredictability. Better put, complexity is beyond actors’ intentionality: the latter can *enhance*, but *not create*, the complexity of social realm with respect to that of physical realm. Otherwise, it would be a matter of theoretical or methodological choice, and not a paradigmatic shift.

3.1.3 Complexity in Social Sciences.

To understand how complexity affects social theorising, we must distinguish two main kinds of complexity which are recurrent in the literature: algorithmic complexity and organisative complexity (Stewart, 2001). *Algorithmic complexity* can be synthetically described as the quantity of information needed to *describe* a system.

In these cases, no general explanations, formulae, or equations can adequately describe the relevant process; explanation must have recourse to the specific causative configuration (such as particular arrangement of DNA or the particular circumstances that caused a traffic accident), which must in turn be largely explained through their unique history and evolution. Through these unique and

specific histories these processes select a course through unimaginable large sequence spaces. (Stewart, 2001, p. 326)

For instance, one might mention the estimated figure of $10^{2,400,000}$ microstates in sequence space for the bacterial genome: this number, if compared with the estimated number of particles in the universe (about 10^{81}) gives an idea about the importance of the history and the unique structure of particular DNA configurations.

Moreover, as we stated before there is another kind of complexity, that is, *organisational complexity*, which relates to surprising behaviour and its analysis. This approach explores complexity primarily through the notion of the progressive emergence of far-from-equilibrium dissipative, autopoietic, or self-steering systems in evolutionary space. Increasing complexity is displayed in more complex self-steering forms and in ecosystem environments (and their logical analogues), which increase in complexity as their component systems coevolve.

The kind of complexity that social sciences have to face is both algorithmic and organisational:

- (i) *algorithmic* in that the infinitiveness of relationships which constitute societies gives an existential uniqueness to the position of any event in time and space;
- (ii) *organisational* as a social system is characterised by the existence of multiple levels of organisation which are reciprocally interdependent.

When dealing with social rather than merely physical systems, we have to take into account a third kind of complexity, which arises from the fact that people have their own intentions and motivations, perceptions and representation, which create multiple layers of *meaning* in social order. In other terms, this means that all individuals perceive and deliberately try to modify the flow of relationships in which they are involved. Following one of the main streams in contemporary social sciences debate, we label this third source of complexity as “reflexive complexity”. Reflexive complexity implies that we have to take into account the existence and the role of a situated observer who is not any more located closed to God’s eye, uprooted from the reality he is observing and describing. Reflectivity has been progressively shifting from the outside to the inside and is now part of the system’s complexity. To use Giddens’s terminology, in late modernity reflexivity is not distinguishable from self-reflexivity. Better put, social systems are made by acting entities – the agents, the individual – who attribute a meaning to their action, that is who reflect on the multiplicity of the relationship they are entangle in and on the order they can make out of them.

3.2 Complexity and simplification in social sciences.

To understand how the social sciences deal with social complexity, the starting point of social analysis must be represented by all the reciprocal relationships between individuals. The problem for the social sciences is to understand how the multitude of relationships between a multitude of individuals – that is, *algorithmic complexity* – receive a meaning – i.e. *reflexive complexity* – and are organised in such a way as to constitute stable communities and societies – that is, *organisational complexity*. In every instant, some relationships deteriorate, whilst others strengthen. Despite this continuous process of selection and transformation, society does not disappear but conserves its identity while changing.

It follows that the task of the social sciences is to understand how human societies change in the unceasing flow of relationships and, in doing it, they need simplification. The nexus between free human agency and historically and geographically embedded social structures is well known in the social sciences as the “structuration issue”. The process of structuring synthesizes many of the questions that social scientists pose about the subject of their enquiry. Is there a relationship of determination between society and the economy? Can territories and communities, crossed by uncontrollable flows of goods and capital, influence their own destiny in some way? How do the continuity and stability of social structures co-exist with the endless drive towards change intrinsic to historical transformation?

As we have said, each individual is at the centre of an inextricable network of places, people and organizations that represent his world, the world in which he formulates desires and plans action. The constitution and maintenance of a society implies the consolidation of a set of relationships which defines the common heritage of the individuals of which it is composed, the context to which self-perception and perception of the world refer. A society can, in practice, be underpinned by a constitution or by simple routines. Moreover, the formation of a society can be interpreted as the expression of a fundamental need of man as a “social animal”, or as the mere result of utilitarian and individualistic desires. In this context, however, it is not the form taken by the society or the reasons that determine its formation that matter, but the process through which complexity is organised to give a relatively stable output, society.

In general, while individual's experience is composed of all the relationships that he/she build around him/herself in lifetime, the identification of the *social* is possible only by starting from a selection of the infinitive relationships between individuals. The relational bulk that form the foundations of a community or society must, in contrast to reciprocal individual relationships, possess a number of characteristics: they must, first of all, be shared by the members, but must also be stable, so as to reduce the uncertainty of those who are part of it, and defined, in order to fix boundaries and exclude actors and

relationships which do not belong to it. In other terms, structuration can be interpreted as a process of both complexification and simplification. Passing from individual relationality to social relationality implies an increase in complexity at different level:

- (i) algorithmic complexity, as the multiplicity of individuals enhance the exponential growth of possible relationships which become active;
- (ii) organisational complexity, as the levels of organisation are multiplied by the circular causality between the increased number of components (individuals);
- (iii) reflexive complexity, as the same events receive different meanings and interpretation.

At the same time, this complexity must be reduced, that is, simplified: an order – i.e. sharing a stable and sustainable organisation of the constitutive relationships – must emerge. When a social science defines its object, it does nothing other than express its judgment about which of these relationships really count in order to identify the society it intends to consider. It makes a fundamental simplification, choosing and reducing the multitude and wealth of bonds and relationships between individuals. This is a process of evaluation of the relationships considered to be significant; they are artificially isolated – as they are not in the real world – from other relationships and variables judged to be emotional, marginal, residual, insignificant or distorting.

3.2.1 Theories as simplification: the legacy of reductionism.

This observation leads us to consider how our knowledge cannot be taken for granted, but must be some how deconstructed in order to assess the extent of the relationship between these two main components of reality: entities and relationships. Paradigms and epistemologies are always built on some kind of balance between these two elements and, most of the times, focusing on the one rather than the other.

To a very general extent, reductionism can be defined as a methodology which privileges components' features over relationships in explaining the formations of social structures. Better put, reductionism admits that a given reality can be divided in simple elements and that analysing the features and the behaviours of these components we can subsequently come back to the explanation of the overall system. It is important to notice that reductionism works on a double set of hypothesis:

- (i) the first hypothesis is exactly that the components are simpler than the whole, i.e. that individuals are simpler than society – it is clear that, in our framework, this hypothesis works as a reduction of organisational complexity. Also this hypothesis is usually accompanied by the corollary that the components

share some common features, or even that they are identical, reducing therefore algorithmic complexity, in that we reduce the number of possible conditions that the elements can assume. This first set of hypotheses leads to the possibility to fully describe and understand the features of the components which are consequently perfectly known;

- (ii) the second set of hypothesis refers to the relational organisation that links the elements identified at the previous step. Here reductionism is mainly aimed to reduce organisational complexity, putting some basic hypothesis about how relationships are established between components in order to reconstitute the lost whole. Typically, the main reductionist hypothesis here is the linearity of the causal chain and the one-directionality of input-output relationships²⁵. In the case of social science, some hypotheses are also due to reduce reflexive complexity, excluding meaning and intentionality from the explanation of social phenomena. Usually this goal is achieved in two different, but related, ways: excluding intentionality from the model²⁶ and hypothesizing the existence of the God's-eye observer – the scientist. Through this double exclusive movement, reflexivity is pushed away from the system.

Methodological individualism (MI) is probably the currently most well established and diffused form of scientific reductionism in social sciences, particularly in Economics. If we roughly, but meaningfully, define MI as the belief that we can explain the formation of an economic system

- (i) focusing on the characters of the individual economic actors,
- (ii) hypothesising – more importantly – that the multiplicity of actors can be brought back to a common model of behaviour – homo oeconomicus – and
- (iii) assuming that the relationships between individuals are stylised through a narrow set of rules – maximisation, rational behaviour etc – subject to be modelled in formal equations, then

²⁵ Here, “input-output relationships” must be interpreted in a cybernetic meaning rather than economical and it refers simply to the predictability of the output given the input.

²⁶ This is typically the case of the hypothesis of “revealed preferences” in Mainstream Economics: no matter how needs and desired are produced and possess a meaning, what really counts is that they are expressed in a consistent and elegant set of clearly defined and unambiguous preferences. The world itself, “preference”, avoid any reference to the realm of meaning and motivations, to focus just on the capability to choice and therefore establish a linear order in individual’s actions. In other terms, preferences are given – reduction of reflexive complexity – and ordered – reduction of organisational complexity.

it becomes clear that MI is a powerful and attractive way of reducing social and economic complexity.

Moreover, we have to notice that hypotheses and assumptions under point (iii) are not the key issue here: neoclassical economists – just to quote the main representative of MI in contemporary science – are no doubt involved in a serious attempt to make their hypotheses more “realistic”, introducing for instance sub-optimal behaviour and bounded rationality in the models. This attempt is nevertheless meaningless for the purposes of dealing with complexity as it is mainly concentrated in technical improvement of their calculation skills. To use the language of complexity, we might say that at its best Neoclassical Economics can deal with some aspects of algorithmic complexity, but not at all with organisational and reflexive complexities. We can exemplify this point with reference to two of the main issues which are often contested to Neoclassical Economics. The first one is the “general equilibrium obsession”, which drives a huge research mainstream within contemporary orthodox economic thought: apart from the criticism about the unrealistic pretension that all the markets can be simultaneously on equilibrium and maintain it, it is enough to introduce some elements of organisational complexity – such as feedbacks and circular causation – and it will become impossible to satisfy all the necessary conditions for general equilibrium to happen and if it happens – as a sort of temporary chaotic order – it would be unpredictable. The second example we can consider is the question of innovation and creativity. One of the main criticism to mainstream Economics refers to its difficulties in addressing how creativity plays a role in shaping economic processes and, specifically, how innovation arises in a given economic system. In most of neoclassical theories innovation is either purely exogenous or is a linear, simple consequence of some economic behaviour, that is, innovation is function of the amount of investments which economic actors allocate in each period. This failure can be traced back to methodological individualism or, in other terms, to the focus put on elementary units (individuals) rather than on relationships: if one assume that the behaviour of the whole economic system can be explained with exclusive reference to the characters and the behaviours of atomised components, therefore he misses the relational dimension of innovation, that is the fact that creativity and innovation arise from a rich humus of relationships and interactions²⁷ (Antonelli, 1999a). Translated in complexity language, this

²⁷ Quite surprisingly the same criticism can be moved against Schumpeter’s account of creativity and innovation, which is often assumed as a starting point of non-neoclassical account for innovative processes. Nevertheless, if it is true that Schumpeterian theory of innovation question the possibility of such a thing like general equilibrium, it is as much true that his emphasis on the entrepreneur’s creativity as engine of innovation and economic development is no doubt methodologically individualist and neglect the relational dimension of innovation. For a more detailed account of Schumpeter’s reductionism and “physicism”, see Hodgson (1999, pp. 131-136). On the opposite, we might reconsider Hayek’s supposed

inability to grasp with innovation and creativity can be interpreted as the impossibility to reconcile methodological individualism and the property of emergence which characterises complex systems.

It is fundamental to get what really matters: the point here is neither the quantification nor the “modellification”. The point here is how the reduction of complexity, which is somehow necessary, happened. The need for a reduction does not advocate reductionism. The aim of the following analysis is to consider to what extent we can reduce complexity without being reductionist or, in other terms, how to maintain complexity without going post-modern.

3.2.2 Reducing complexity in social sciences .

The methodology of reductionism can be spread – at least on the theoretical level – in two different processes:

- (i) the invention of *abstract relational spaces*, that introduce a progressive separation of the different types of relationships, each of which is studied and analysed separately from the others. This turns out mainly in a reduction of algorithmic complexity;
- (ii) the *annihilation of time and space*, in which human relationships happen incessantly, to make them the stage of linear causation and direct determination, in order to reduce organisational and reflexive complexity.

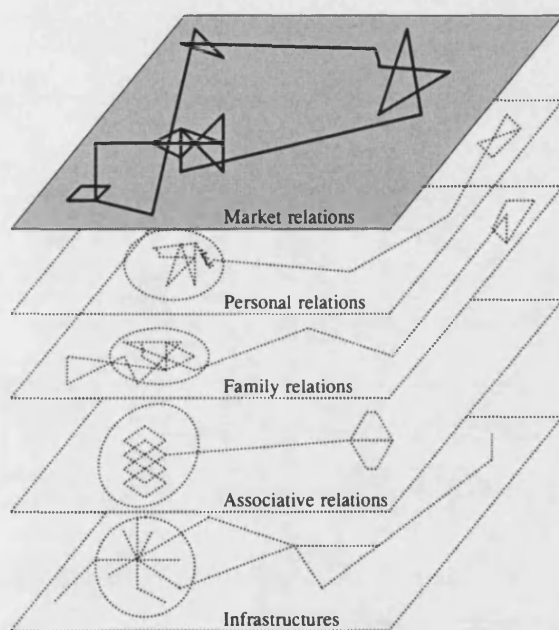
Before proceeding to consider how System Theory can provide an alternative framework in order to reduce complexity – that is, make it intelligible – avoiding the reductionist trap, we need to consider how reductionism works when dealing with spatiality.

3.2.2.1 Reducing complexity I: inventing abstract relational spaces

In their attempt to move closer to the “exact” sciences, social scientists identify abstract spaces where various types of relationships occur and can be analysed. There is thus an economic space, where the economic relationships between individuals are artificially isolated from other human relationships. Similarly, there are social, cultural, family and political spaces in which the different individual relationships are placed. Although the breakdown of human agency into separate fields facilitates analysis of an otherwise complex and composite reality, this entails, nevertheless, numerous difficulties.

Each individual acts simultaneously, in fact, in all these relational spaces, but this simplification does not capture the unitary nature of the action, in that the relationships between different spaces are almost never considered, if not marginally. Splitting human agency in different realms is, no doubt, the foundation of the disciplinary division of social sciences, in that any layer defines the object of enquiry of a specific academic discipline: Economics, Sociology, Political Science, Anthropology and so on. Of course this separation, in simplifying the interaction between different levels of relationships enhance the possibility of treating social complexity in a more simple and predictive way, but it poses some problems in explaining the process of structuration of societies, which is an outcome of all the levels.

Figure 3.1 - The hierarchy of abstract relational spaces of Neoclassical Economy



In the case of neo-classical economics, the simplification has been particularly serious and definitive, establishing a net separation between the economic and the other layers and fixing somehow a hierarchy among those relational spaces, with the superimposing of economic. The only relationships considered are those that happen within a market where perfectly rational and informed individuals make the choice to maximize their utility in a context of perfect competition. At the centre of reflection is, in fact, the economic actor, described purely on the basis of its internal characteristics, without making reference to the many concrete relationships in which it is involved. It follows that the passage from the microeconomic dimension to a general interpretation of society (macroeconomics) appears more a question of mathematical mastery than of socio-philosophical thinking.

Thus, if reality can be seen as a weft of overlapping relational spaces, the orthodox economic vision limits itself to considering only the level made up of market relationships and completely ignores the fact that each economic agent is at the same time involved in a network of relationships of other kinds (Figure 3.1).

In this sense, the separation of economic relationships from the broader set of links which build up social structure, even if it has been the most obvious and powerful simplification used to explain reality, it is not enough to explain the complexity of social life. Focusing on economic ties only, in fact, works out as a *reduction gear for algorithmic complexity*, trimming down the number of interconnections which are relevant for the explanation of social and economic phenomena. Although reducing algorithmic complexity we also downsize the potential for organisational and reflexive complexities, reductionism in social science goes far beyond just cutting the number of bonds, working directly on the organisation and meaning of relationships.

3.2.2.2 Reducing complexity II: breaking down space and time

What holds the different relational spaces together is geographical space and historical time, in the sense that the different relationships co-exist because they occur at the same time and in the same place. In order to master reality, it is also necessary, therefore, to control space and time, and conceptualise them in abstract and closed forms. From the point of view of the individual actor (whether an individual or a company), space and time are continuous. The actor in fact moves without breaks in time and space in a continuum that goes from the instant of its birth to that of its death. This continuum defines the bio-geographies of each actor and these can also be represented graphically as paths in time and space (Hagerstrand, 1970 and 1982; Thrift, 1983).

This restless floating has always been in contrast with a second simplification which tends towards selected breaks in time and space, identifying periods and scales. The historical period and the geographical scale set temporal and spatial limits in which the individual bio-geographies are contained and can be interpreted clearly and unambiguously. In other terms, period and scale present unvarying and common characteristics that allow social scientists "to say something" about human agency without being forced to reconstruct the single spatial-temporal paths of individual actors.

Think of the division of human history into great astrological eras in which the domination of given astral influences constitutes the time of the destiny that it contains and gives a sense to the individual destinies that occur in the measurable time of bio-geographies. Or we could think of the geological eras that identify long periods within which the single movements of the earth's crust can be interpreted.

The same procedure of dividing space and time applies to social sciences. One example is the division into periods of capitalist development by Kondrat'ev and

Schumpeter. The history of capitalism is divided into long cycles lasting approximately 45-60 years, each of them inaugurated by an epoch-making technological innovation which leaves its mark on both the organization of production and that of the territory and society. According to this perspective, it is not necessary to reconstruct the existential development of individual actors in order to understand the history of capitalism. It is enough to define the general features of the cycle in which the individual actor operates.

In a similar way, the concept of Fordism identifies a period and a scale within which common laws are valid that suspend the flow of time and the unceasing movement in space of individual destinies. In this case, the period lasts about forty years (roughly from the great depression to the seventies) while the scale is represented by the nation state. In this period, it is thus assumed that a predominant system of accumulation existed, based on economies of scale, mass production and the functional and spatial division of labour. Corresponding to this is a specific form of social regulation, based on the intervention of the nation state to guarantee an adequate level of social welfare and to prevent inevitable social tensions.

In this way, period and scale define a portion of time and space that it is possible to analyse and interpret leaving out of consideration the individual biographies and destinies. This also implies that for each period and each scale a main scientific discourse asserts itself, entrusted with defining the major features and laws of the various historical cycles.

From the geographical point of view, the processes through which a meaning is attributed to the territory (territorialisation) have been studied with reference to some preferred scales. For example, Peter Taylor identifies three main scales to which capitalist modernity has attributed particular significance, the home, the city and the nation state (Taylor, 1999). Moreover, the theme of the spatial heterogeneity typical of the process of capitalist development has been analysed essentially on the regional scale, with the creation of fictitiously homogeneous scales, such as the dualism between the Italian "industrial triangle" and Mezzogiorno or between the Sunbelt and the Rustbelt. For a long time this impeded observation of their composite and differentiated nature in single places. Similarly, the problem of uneven development has been tackled by turning to the contrast between two macroscales, opposing the North and South of the world in a dialectic between centre and periphery where local identities and differences were hidden.

3.3 A typology of geographies .

By crystallising time and space we can reduce organisational complexity in that we introduce repeatability, reversibility and therefore predictability – all features that, as we have argued in the previous sections are antithetic to the notion itself of complexity. Figure 3.2 tries to summarise who different economic theories can be arrayed in a typology according to their treatment of temporal and spatial complexity.

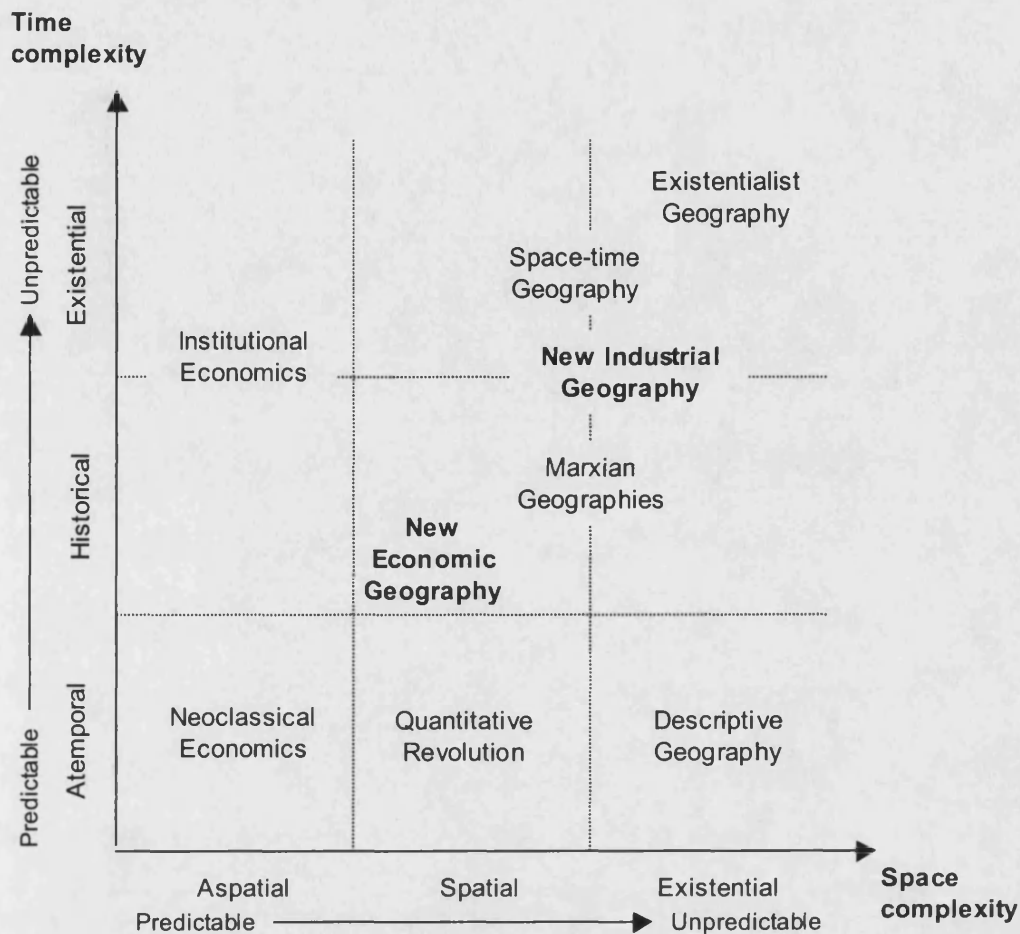
We can, in fact, distinguish a continuous growth of complexity in both space and time, from a condition of full predictability to the other extreme of the impossibility of accurate forecasting. The lowest level of complexity is given by the total annihilation of time and space, which become absent from the scientific explanation in social sciences. In this atemporal and aspatial spaces, relationships are reversible and therefore the laws that social sciences discover can be assumed to be universal, that is, valid in any time and in any place. Also according to what we said in the previous pages, canonical Neoclassical Economics can be assumed as the main example of this kind of scientific enquiry, as it ignores largely the complex organisation of ties which build up uniqueness in time and space.

On the other extreme, we have the maximum of complexity when we consider the existential value of time and space, that is the full set of relationships which are unwrapped during the lifetime. In this phenomenological perspective, every instant of time in space is unique and the life is made by the continuous flow. Here all the three kinds of complexity are at their zenith:

- (i) *algorithmic complexity*, as we assume as fundamental the whole succession of experiences (i.e. of relationships) which make the uniqueness of individual experience;
- (ii) *organisational complexity*, as in such an overlapping and intertwining of ties it becomes impossible to detect clearly the organisation of relationships, that is the plot of circular causation and feedbacks that tie the economic with the social, the cultural with the political and so on;
- (iii) *reflexive complexity*, as we are now dealing with the fact that this skein of bonds and links make sense only to the individual who lives (in) it, who gives a meaning to that succession of events in time and space – and sometimes he cannot even. In other terms, psychic complexity is here maximised as there is no room for an external observer which can make sense of this reality.

The main example of geographical approach dealing with existential time and space is, probably, American Cultural Geography as it has been developed in the 70s by scholars like Yi-Fu Tuan (1977) and Relph (1976) and which is still represented in the work of Robert Sack (1997).

Figure 3.2 – Accounts of complexity and the space of geographical theorisation



The main output that Phenomenological Cultural Geographies have achieved in terms of time-space complexity is no doubt the concept of *place*, which is a unique combination of individual and collective meanings that time and space receive through experience at different level of reflexive complexity – personal daily meaning, cognitive, mythical, mystical and so on. Therefore place is something unique, something that we can interpret only *ex post*, as it does not present regularities and orders which are recurrent over time and space. As a consequence Geography is not based on analysis, but rather on synthesis and even on intuition, sensitivity, as the task is to suggest and evoke rather than describing. The real essence of place can be grasped only through experience and it is difficult to codify it in a consistent scientific language. Tuan's major work seems to suggest us that there are better languages which can give us back the meaning of place: poetry, mythology, art, psychoanalysis and religion all concur to catch something of a place essence and identity. The geographer's work – or geographer's art – is to collect these fragments of meaning and bring them together in a hint rather than an explanation of space.

In the between we can find a somehow “average” account of time-space complexity, what we could term respectively the “historical” and the “spatial”. Although there is not a perfect symmetry between these two categories²⁸, in our account of social complexity, these concepts indicate a situation in which we introduce time and space, but in such a way that there is some room left for prediction and simple – or, better put, simplified – order. According to the various degree of relational complexity which is attributed to time and space, we can place in this framework the different social theories. Just limiting to a few examples of some interest for geographers, we can consider for instance Hagerstrand’s and Thrift time-space geographies as an account of complexity for many aspects closed to that diffused in Phenomenological Cultural Geography, but still maintaining some room for the definition of shared patterns and therefore for comparison and some degree of generalization.

To move closer to our interests, we can consider how New Economic Geography and New Industrial Geography remain in this meta-theoretical frame. There are some analogies between NEG and complexity theories, above all in the use of the QWERTY effect and in the concept of path dependence. Both complexity theories and NEG advocate the sensitivity of the “final” order to initial conditions. Nevertheless this similitude is superficial and does not sustain a deeper analysis. The main difference is that NEG account regards initial conditions as taken for granted, exogenous, that is, they are not internalised in the explanation. This has a series of severe consequences that get NEG further from complexity theories. First, initial conditions are treated as simply as they were a random distribution of playing card, *before* starting the game. This means that, *after* setting initial conditions, we can play thoughtlessly according to the game’s rules, which can be reductionism and oversimplification of reality. Second – and consequently – NEG’s account for time is actually assuming history as “prehistory”: if history is something we can learn by, initial conditions for NEG are prehistorical, in that they lay beyond the rules which manage the game: as initial conditions are randomly given they do not really contribute to tuning the process which produce the final order. The third and most important consequence is that, while the importance of initial conditions in complexity theory leads to unpredictability, NEG still maintain an ambition to define universal spatial laws and rules about location and agglomeration. These are the reasons why NEG can be placed in a position which is still much closed to aspatial and atemporal Neoclassical Economics, even if we must acknowledge that it marks at least an attempt to introduce space and history in mainstream Economics, slightly increasing explanation complexity.

²⁸ In fact, space is much more “reversible” than history. Nevertheless, both share the opinion that there is a clear and identifiable meaning in human events. This takes the form, respectively, of teleology and spatial determination in many social theories, mostly of Marxian matrix.

As far as NIG is concerned we can easily recognize that it has represented an important step in introducing complexity – albeit in a rather unconscious manner – in Economic Geography. One of the main features of NIG is, in point of fact,

- (i) its relational nature (Bathelt and Glückler, 2003), that is,
- (ii) the awareness that economic behaviours leading to good performances are embedded in a broad set of relationships (Grabher, 1993)
- (iii) which are interconnected through processes of mutual causation, many of those have not an economic nature and establish untraded interdependencies (Storper, 1995).

What it is more important in our account of complexity is that NIG has been quite successful in establishing as a domain for economic inquiry a specific spatial realm that we might name the territorial/local. These two concepts will be developed in next chapter when trying to build up a systemic and institutional interpretation of geographical investigation. For the time being it is enough to note that the concepts of territorial and local must be thought in our framework as something intermediate between NEG's abstract space and existential place which characterized the work of cultural geographers. When NIG refers to the concept of territory (and similar concepts like local or regional economy, localities etc.) it usually means a geographical entity that is:

- (i) *more complex than space*, in that it is made by specific relationships which tie together the economic and the non-economic. In other terms, the concept of territory implies an higher degree of organizational and reflective complexity which, as we noted earlier, is incompatible with Neoclassical reductionism;
- (ii) *less complex than place*, as it is used in the cultural tradition within Geography. Territories are characterised by a kind of order which is less unique than the experiential order of place, where only the experienced individual(s) - that is, the dwellers – can attribute a meaning (whether personal or collective).

In other terms, the concept of territory leaves some room for soft generalisation: though in territories development is not fully reversible and predictable like in space, NIG

recognises that there are some forces above places which allow recognising some ordered structure in the organisation of industrial and economic relations²⁹.

At present, nevertheless, New Industrial Geography is made of a quite broad set of influences and sources, which ranges from Economic Sociology (e.g. the concepts of embeddedness and network) to the Economics of Innovation (national and regional innovation systems), to managerial organization (learning organization and knowledge based economy). Even if these blocks of theoretical contributions show some clear points of contact – we might say that they share a relational nature –, NIG still seems to be a quite chaotic and messy overlapping of concepts and labels, lacking the consistent meta-theoretical background which NEG, reversibly, possesses – Neoclassical Economics and its strong connection to Classical Physics' epistemology.

The issue in this chapter is to define a paradigm, alternative to that of reductionism, which allows a systematic comprehension of the issues arisen by NIG and somehow able to counterbalance the powerful Physics-derived epistemology of NEG.

3.4 An introduction to System Theory.

Systems theory is a new methodology that enables the organization of knowledge in view of higher effectiveness of action”, setting itself up as an alternative but also a complement to the traditional analytical reductionist approach. As we have seen in the previous pages, reductionism is epitomised by a cognitive strategy based on the reduction of reality to simple elements, which can be analysed separately from the whole to which they belong. This also entails the division of knowledge into different disciplinary areas. The systemic approach responds to this “reductionist” and simplifying strategy with the idea of the whole, assuming phenomena as elements in reciprocal interaction. The systemic approach is therefore a combination procedure (or methodology), aimed at organising knowledge and the object of knowledge itself. Talking of “system”, the reference is to both the way in which the phenomenon is observed – which cannot be explained by the use of a predetermined and objective model – and to the phenomenon itself. The latter, assumed as a reality composed of a high number of elements and of relationships between these elements, cannot be broken down or simplified, without losing sight of its essential feature, complexity.

More in particular, by defining a system starting from its essential components – the elements (i.e. a set of objects, but also of concepts, characterised by their own properties and attributes) and relationships (flows of energy and/or information between

²⁹ Of course, by “industrial relations” we just mean the set of generic relationships that constitute a production system, whether individual (the single firm) or collective (e.g. the cluster). In other terms, it does not refer specifically to the relationship between labour and capital.

both the elements of the system and between the system and the environment) – a leading role is given to the dynamic and complex character of reality, which could not reasonably be inferred from the functionalist cognitive schemes.

Following Ahlemeyer (2001, pp. 60-61) we can identify three features which characterise complex systems:

- (i) “a system is complex for an observer when it is neither in a state of complete order nor of complete disorder, that is to say it represents a mixture of redundancy and variety”. Redundancy plays a major role in making an order to emerge, through repletion and reproduction of peculiar relationships, while variety guarantee the emergence of novelty within the system and therefore making impossible to rely on forecasting. This is to say that even in presence of complexity is meaningful to speak about organisation and structure, which will be two of the main concepts we will introduce in the next pages;
- (ii) “a system is observed as complex when it contains more elements than can be connected completely. This imply that only some elements can be bound to some other elements by specific relations”. The consequence is that the status of the system is contingent, that is, the selection of ties which came into existence is only one set of the possible ones. In other terms, even if the evolution of the system is path-dependent, in that as we saw it is highly sensitive to initial conditions, there is not only one development pattern for the system, but a plurality;
- (iii) “complexity is a notion without a difference. There is no longer a counternotion to complexity, such as simplicity or transparency. Today everything can be recognised as complex. You only have to look close enough”;

Before defining out interpretation of complexity and system theory, it might be useful clarify two main ambiguities which often hamper the comprehension of systemic thought. The first is the tie that connect system theory and functionalism, while the second is the question whether systems are real objects or a mere framework constructed by an observer.

3.4.1 The ambiguous legacy of Functionalism.

The emergence of Functionalism in XX century represented an important novelty as a method of scientific enquiry. In contrast to the simplifying method so in vogue in the 19th century, aimed at breaking down reality into increasingly simpler elements on which to then proceed with detailed investigations, an attempt was now made to explain society

as a set of elements and relationships. Reality is, in other words, represented as an organism, and explained by taking the scheme of physiology as a model. And as for biological systems, a social system is seen to operate for the satisfaction of collective needs. It follows that the various members possess, by extension, a common system of values which reflects the values present in the society.

The organism – society – is thus seen as a structure, an organic whole, or a set of roles (or functions) linked to each other by communication flows (Boulding, 1972): it follows that the organization and transformations of society will be explained by starting from the position that the various elements occupy within society itself.

The roots of this style of thinking are found in the British cultural anthropology of Redcliffe-Brown and Malinowski and, above all, in the work of one of the 20th century's most influential sociologists, the American Talcott Parsons. It was the latter, in particular, who was responsible for the representation of the social system as structured in a set of relationships. Its life – the continuity of a social structure, in the same way as for an organism – is preserved thanks to its functional continuity, i.e. the activities and interactions that are activated between human beings and the organised groups of which the society is composed. In extreme synthesis, functionalism appears as a logical scheme aimed at explaining social structures, not on the basis of their historical origin or their geographical particularity, but because of the different functions which jointly confer on the system its proper working order understood as the achievement of collective goals.

In reality, the functionalist proposal possesses significant ideological contents. The assumption of an adequate social order cannot be separated from the inspiring principles of strategies and policies aimed at correcting the mode of functioning of modern society, which finds cohesion in the efficiency of the state, in the Fordist corporation and in appropriate economic planning activities. To grow, the system demands an order in which roles and functions can be clearly identified and planned and where disturbing social factors can be eliminated through appropriate social engineering.

Extending these concepts to economic and territorial sciences, space is thus represented as a set of relationships: a city, a region or a country-system are explained in terms of a space whose cohesion depends on the relationships that connect the elements of which it is composed. A spatial system will thus be a rationally structured "whole" whose elements, reciprocally linked by more or less close-knit relationships, assume the meaning that is attributed to them by the functions that they play in relationship to a vaster space. It follows that the terms "spatial structure" and "spatial system" adequately express the geographical transfer of Parsons' structural functionalism.

The (regional, national) space is thus interpreted in terms of relationships between the parts, which become complementary to each other, integrated into a more or less ordered and cohesive whole. It follows that its structuring depends not on its intrinsic

features (social-historical and physical-environmental) but on the complex play of bonds and complementarities between its elements. Spatial order will depend on the “natural” play between the parts (between core and periphery, between “strong” regions and “weak” ones), while the pole, through its driving, propulsive and dominating function, will integrate and organise all the elements of which it is made up.

Functionalism is relevant here not only because it had a large influence in the conceptualisation of space and territories, but – more relevant here – it can be interpreted as the epistemological breakpoint between methodological individualism's reductionism and system theory, in that it introduces some of the main features - both strong and weak points – of systemic theories, while maintaining a scent of reductionist simplification. The relationship between functionalism and system theory need therefore some clarifications, as very often the two approaches are confused. Functionalism marks, in fact, the passage from the use of physical metaphors to biological ones in social sciences, introducing the concept of organic whole and therefore the notion of a social structure which goes beyond individual agency. In other terms, interactions between the elements of the system are not as simple as in physical reductionism, as some organisational complexity is introduced which bring together the parts in an organic whole which is more than the sum of the parts. At the same time, functionalism still shares some of the features of reductionism, in particular when it put forward the hypothesis that the links between the parts are dictated by the functions that each part holds in the overall organisation of the system. In other terms, the complexity of possible relationship among the elements is reduced to the set of given functions which pledge the functioning of the social “organism”.

Moreover this mix of reductionism and organicism leads to some unintended consequences, specifically the accusation of *teleology* which is often addressed against systemic approaches to social rather than natural entities. In other terms, the interpretation of functions *within* an overall organism can lead to introduce some finality or necessity in the organisation society. Hence the accusation of conservatism which have been often addressed to Luhmann's application of system theory to sociological studies (Zolo, 1992).

In order to solve the question of teleology we must answer to the question whether systems are real objects or subjective construction of an observer.

3.4.2 Realistic and constructivist System Theory.

It is, in fact, possible and necessary to tackle a fundamental distinction that characterises the systemic approach, breaking it down into two different interpretations, realistic and constructivist.

According to the first interpretation, a system is an object of knowledge with certain characteristics. In this light, a system is an analytical instrument of representation of reality, yet very different to the objects and phenomena dealt with by traditional

mechanistic science. As a “concrete totality”, a system can be broken down into parts which will also be systems themselves, in turn organised in sub-systems whose complexity will be equal to or higher than that of the system they belong to. This is a fundamental methodological principle and not a metaphysical thesis: if reality is of an irreducible complexity, for cognitive purposes a system cannot be dismantled into elements (and thus simplified), but only into other systems. To explain certain observed phenomena or facts, it will be possible to analytically distinguish different systems which will not, however, be concrete parts of the “whole”, but abstractions made by the observer with his own cognitive ends and needs (Morin, 1977, p. 139). In this perspective, systems exist apart and independently from the observer.

This introduces the constructivist meaning, according to which the system is nothing other than a mental construct created by an observer of an object, a phenomenon, a concrete case. In this light, the systemic approach is a unifying and integrating scheme of knowledge. The systemic approach opposes the reductionism of the traditional analytical method with a holistic approach, as Le Moigne says, “a unitary conception of the world [...] a general theory of the universe” (Le Moigne, 1977, p. 59). In this sense, systems theory is a general framework (or General System Theory, in Ludwig von Bertalanffy’s insight), which envisages a breakdown of knowledge that transcends the division between sciences. It springs from the following consideration: if it is impossible to uphold the existence of a single theory of the universality of phenomena, it is however true that all phenomena have something in common that can be traced back to a conventional scheme (the General System) which analyses each phenomenon individually. The system is not, therefore, an objective concept, but an instrumental cognitive concept aimed at integrating many dimensions of reality: as Morin states, systemic thought has established itself in order to explain complexity.

What is important is that, in the practice of everyday scientific research, distinguishing “real” and “constructed” systems is not an easy task and it is not a fundamental one, as we can use system theory as a constructionist framework to analyse entities, regardless the fact that the object is “really” a system or it is simply “constructed” as a system by the observer. More precisely, because of reflexive complexity it might happen frequently that we cannot evaluate the “systemicness” of the object of our inquiry, but it might be useful nevertheless to treat it as if it were a real system, in a heuristic way. This leads us to two major considerations. The first one is that any teleology is in observer’s eyes rather than in the system. We can use teleology and self-organisation as metaphors or as analytical tools, but we must keep in mind that they are constructed by our description and therefore must be subject to critical revision. The second reflection is that reflexive complexity is also present, even when we are considering “natural” and biological system, and not only social ones. The epistemological impact is explosive. The

construction of knowledge thus belongs to the observing subject, in permanent interaction with the phenomena perceived and conceived: the cognitive process will thus be given by a circular relationship between reality and subject, which becomes an active and inseparable part of the process of construction of knowledge.

We are therefore able to summarise the main theoretical and operational consequences underlying a systemic epistemology:

- (i) with the rejection of the postulate of pure objectivity of the positivist tradition, knowledge is no longer conceived as predetermined, but is understood to develop from the interaction between the subject and object of knowledge;
- (ii) this leads to the challenging of the idea of a linear progress of knowledge and based on what Isabelle Stengers defines as the “reassuring function” of a neutral and privileged point of observation, given by a defined set of laws, assumptions and methodologies;
- (iii) the idea of a unitary and neutral scientific language thus disappears. Reality is, in fact, multidimensional, made up of a plurality, if not an infinity, of relationships and dimensions, and for this reason it cannot be fully known;
- (iv) it will thus be the observer-subject, according to its own decisions and points of view, that breaks down observable reality (the system). In conclusion, the object of knowledge does not exist as an autonomous reality, but only as part of a system that also contains the subject.

We have defined all the epistemological tools we need to introduce the concept of *autopoietic systems*, which will constitute the skeleton of our systemic interpretation of territorial competitiveness to be outlined in next chapters.

3.5 Autopoietic complex systems.

This theory of autonomous systems, already suggested in the post-war cybernetics by N. Wiener (1956) and later reformulated by H. Atlan (1972) and H. von Foerster (1982), owes its most mature structuring to Humberto Maturana and Francisco Varela (1980 and 1987. See also Varela, 1979). The two Chilean neurobiologists are recognised as having had the merit of introducing the concept of *autopoiesis*: this indicates the capacity of the system to plan and reproduce itself through the reproduction of its components.

The starting point is the clear distinction between heteronomous and autonomous systems, on which we need to pause briefly in order to understand better the overall theoretical structure. The former are characterised by an evolution according to the structure of the external world and are capable of moulding the internal organization of the system. Autonomous systems are, instead, endowed with organisational closure, where

the external world acts purely as a factor of disturbance. They thus appear independent of the forms of the outside world, with the exception of the flows that assume importance for the self-reproduction and survival of the system. The inputs to which the system is subjected thus constitute disturbances which induce modifications in the structure of the system without changing the logic and the dynamic of its organization. The relationships of reciprocal interaction between the system and the environment (with other active systems) are defined in terms of co-evolution, which is achieved when the system, because it is closed from the organisational point of view, selects the disturbances from the outside, continuously modifying its own status. Autopoiesis thus expresses a circular process which reproduces the elements and the relationships between elements by modifying them.

3.5.1. *Autopoietic systems at work: organisation and structure.*

In order to understand how an autopoietic system works, we have to recall a fundamental distinction which is central in Varela and Maturana's account of systems theory, that between structure and organisation. To distinguish more clearly the organization of the structure, we can turn at this point to the valuable lucidity of Maturana and Varela:

Organization is understood as being the set of relationships that must exist between the components of something such that it can be considered as belonging to a particular class. By the structure of something, we mean the set of components and relationships which, in practice, constitute a particular unit in the realisation of its organization (Maturana and Varela, 1987, p. 62).

The *structure* is the set of elements and relationships between the elements which have a special characteristic, feedback, aimed at describing a situation in which an element (or a system or subsystem) influences itself. The structure of a system (the set of elements and relationships between elements) is, in other words, subject to continuous modifications through feedback processes. On its own, however, it is not enough to make a system intelligible. It is, in fact, *organization* which defines the set of processes described above.

Only introducing the concepts of organisation and structure it is possible understand of two of the main features of autopoietic systems, that is the fact that they are structure-determined and organisationally closed. *Structural determination* means that the actual changes that the system undergoes depend on the structure itself, that is to say that any change must refer to the structure rather than to the organisation.

In general then, everything that happens in a composite unity is a structural change, and every structural change occurs in a composite unity determined at every instant by its structure at that instant. [...] It follows from all this that

composite unites are structure determined system in the sense that everything is determined by their structure. (Maturana, quoted in Mingers, 1995, p. 30)

The fundamental point here is whether and how the changes in structure affect the organisation of the system: according to autopoiesis theory, if there are changes in the organisation subsequently to a change in the structure the system cease to exist or, at least, to be the same entity. For instance, when a caterpillar develops into a butterfly or an egg into a chick we are facing a structural determined change – there is a physical transformation in the caterpillar which is determined by caterpillar’s structural features themselves – which turns out into an organisational change: the butterfly and the chick are “another thing”. Maturana and Varela address the question of the relationship between structural change and organisation through the concept of *organisational closure*. This concept refers to the fact that the system is closed with reference to the maintaining of its organisation, that is, that the activity of the system generates more activity. Better put, organisational closure means that the autopoietic system is closed on its organisation: the organisation re-produce the organisation itself. In other terms, an autopoietic is not an input-output system: the organisation is not determined by external input and it does not produce output. The input are produced by the system itself and its output are directed to reproduce the organisation itself. As we shall see in the next chapter, this means that the organisation is also closed “against” the observer and therefore it is very difficult to observe, describe and explain the organisation: what we observe is generally the structure of a system, that is its phenomenology. Of course, the fact that the autopoietic systems are operationally closed does not imply that they are completely isolated from their environment and from other systems. As this is a common misunderstanding, it is worthwhile spend some words about how autopoietic system cope with the surrounding environment.

Before proceeding, we must settle a precise use of the terms “organisation” and “structure” as codified by Varela and Maturana’s theories. Organisation can in fact denote at least three differently concepts, all referring to relationships, so that we will use the following terminology:

- (i) “institution” to indicate organisation as a *set of relationships ordered into a process*. When we talk about industrial organisation we point out simply an order among subsequent activities which lead to configure a production process. Also when we talk about institutional proximity we mean this meaning of “organisation”;
- (ii) “Organisation” – with capital “O” – will be used only in a systemic meaning, to indicate the *set of relationship which define the identity of a system*: this is the

meaning of organisation that we have been developing in the previous chapter with reference to autopoiesis theory³⁰;

- (iii) "organisation" will indicate a *set of relationship which are formally established through a collective subject* (Mingers, 1997). A club, a church, a State, a firm are all examples of organisations.

The use of adjectives deriving from the term "organisation" will follow an analogous distinction: as it is referred in the common sense to any generic institution or organisation we will prefer to use "institutional" or "organisational" (institutional proximity, institutional learning), using instead "organisative" when referring to autopoietic Organisation.

The concept of "structure" raises analogous problem as it has a long history in social sciences. In general terms, both in social and natural sciences, "structure" refers to a relatively stable set of relationship, but it also gets specific meanings, like the Marxian concepts of structure and superstructure or the interaction between structure and agency in many of contemporary sociological theories. Here, "Structure" will be used only in a systemic connotation, as the set of relationship which express the contingent forms of the system's Organisation, while "structure" will apply to the other sets meanings that this word connotes.

3.5.2 The system and its environment: coevolution and structural coupling.

Different views and perspectives are so numerous and controversial in systems theory that any attempt at systematisation would impoverish the problem excessively. Nevertheless, if we want to understand how autopoiesis theory treats the fundamental question of the system-environment connection, we must distinguish at least three possible situations.

The first concerns *closed systems* – closed with respect to their environment. In line with the principles of classic 19th century thermodynamics, a closed system has no exchanges of either energy or matter with the outside. It inevitably evolves towards a state of equilibrium, so there will be no net incoming or outgoing flow of energy or matter. This means that a system evolves from more or less complex states of organization to increasingly simple states and, at the most, to equilibrium. The second revolutionary stage started out from the work of an Austrian biologist, Ludwig von Bertalanffy. The basic

³⁰ We might solve the dilemma naming autopoietic Organisation "identity", but it might lead to some misunderstanding as the usual sense of identity implies emergent properties like self-consciousness, willing, reflexivity, responsibility etc., which are not actually meant by systems theory. As one of the main issue is whether territories posses such a thing like "personality" – even just in a metaphorical sense – and therefore an identity, it seems to be advisable to generate such a confusion assuming identity as a given and taken for granted feature of territories and territorial systems.

concept is that of *open systems* which evolve along a temporal trajectory and are transformed in their constant relationship (openness) with the environment and in relationship to the objectives they set: this is thus a conception of reality in evolutive and teleological terms. The object of the General System Theory (Bertalanffy von, 1972) was a reality described and imagined in terms of holistic systems, i.e. conceived globally in their relationships with the outside. The organism is thus a system, in other words a “dynamic order of [complex and partly unknown] parts and processes in mutual interaction”. It follows that the object of the discourse is no longer the causal relationship on which Cartesian logic was founded, but the Structure, i.e. the complex play of relationships between the elements that, according to its objective and the relationships with its environment, produces the behaviour and the evolution of the system.

Thirdly and finally, systemic thought in the last decades of the 20th century aspired to the elimination of the duality between closed systems and open systems. More in particular, starting from the distinction between passive open systems, dependent to some degree on the environment, and active open systems, capable of regulating their own exchanges with the outside, contemporary systems theory radically modifies the construction created by von Bertalanffy. Autopoiesis theory, with its concept of organisative closure, represents probably the most successful attempt to keep together closure and openness. The environment is represented by other systems, with respect to which a system is more or less open (or more or less closed). It is obvious, in fact, that an entirely closed or entirely open system can only be an extreme concept: the first could not, in reality, be an object of knowledge, it would be a box in which nothing enters and nothing leaves; the second would not be identifiable or separable from its environment. The openness of a system is defined by the degree to which the system itself acts on other systems and reacts to their action. The interaction between different systems is manifested in flows of matter, energy and information which stimulate its internal processes, providing the resources it needs, or on the contrary, disturbing its organization and creating constraints. Therefore instead of input/output it is more correct to talk about a perturbation/compensation model, where the environment continuously solicits the system and the system reacts through changes in its Structure according to its Organisation.

To put in other words, we can say that the system is *autonomous rather than isolated*. In its relationships with the environment, a system can, at a first glance, be represented as a whole that embraces incoming flows and from which outgoing flows depart. However, these can not be assumed indiscriminately, in that the system does not allow the entry of everything that arrives from the environment. To the degree to which it selects the disturbances of exogenous origin, an open system will also be relatively closed. The concept of autonomy therefore refers to the fact that the processes internal to a system do not produce only outgoing flows towards the environment, but also flows

within the system itself and its own organization. This means that a system is both open and closed at the same time. It is open to the extent to which the system is not, as we have seen, independent of the environment. However, it is closed as it selects constraints and disturbances that arrive from the environment, and reacts to them through internal organisative and re-organisative processes. Attention thus shifts to the capacity of the system, subject to incessant exchanges of energy and information with the outside, to conserve or develop its own identity.

All the theory here is built on the distinction between Organisation and Structure. It is not, therefore, only openness that enables a system to evolve, but the fact that the system has an "active" character, as it is capable of organization. In this case, the system will not be destroyed or disorganised, but will react to the stimuli from the environment: the system is, therefore, self-referential and self-organising. In this way, one of the fundamental concepts defined earlier, that of autonomy, becomes fully intelligible: autonomy refers to the closure of the system in an organisative sense, in that a system is responsible for its own behaviour. The recognition of the property of self-organization of systems is of vital importance. In fact, by introducing organization as an autonomous concept (and assuming that it is this that allows the identification of the system) it follows that the Structure, as the means of manifestation of the system itself, is susceptible to modifications in the course of its evolution over time. The invariability will thus belong to the organization, which reproduces the system's identity and autonomy.

At the same time, autonomy does not mean separation or isolation, but rather *coevolution*. Each system coevolve together with the environment, and more importantly, together with other systems, the evolution path depending on both the Structure and the Organisation. Maturana and Varela refer to this process as *structural coupling*, that is to say that systems interact between them and with the environment modifying their Structure and more precisely sharing some features of their Structure, that is, creating some common structural overlapping. The adaptation happens therefore among Structures, which adapt each other, and not between Organisations, which stay beyond coupling and somehow dictates the rules. Of course this is not to say that there is a spontaneous order which arise pacifically respecting reciprocal identity and Organisation: as everybody can notice the structural coupling between a virus and a cell or between a cancerous cell and the organism is everything but pacific and must end with the destruction of one of the two Organisations. Structural coupling has in itself some scent of power relationship which we must keep in mind when discussing the application of complexity and autopoiesis to social phenomena.

3.6 Conclusion and aperture: System Theory and social sciences.

Moving from its application in biology, complexity theories and in particular autopoiesis have been assumed in this chapter meta-theoretically, that is, as the foundation of an anti-reductionist paradigm applicable to social systems to the extent to which they are self-organised systems. In reality, a human and social system (cities, companies, production systems, regions, countries etc.) has characteristics epistemologically analogous to those of other living systems: in other words, it is capable of reproducing and adapting itself, conserving itself either passively or actively. A social system possesses, in other terms, autonomy. Nevertheless, applying System Theory to social systems is not painless and it risks making most of social scientists dissatisfied:

- (i) reductionism advocates will blame System Theory for its lack of forecasting power, also because predictability has some consolatory power and political appeal;
- (ii) post-modern and cultural-turned scholars, on the opposite side, will reproach “systemic” colleagues for being still lured by grand-theory overwhelming explanation.

Moreover, applying complexity theories in social realms implies some serious methodological problem. Some scientists advocate for a “homological” computational approach to complexity in social systems, developing a methodology founded on experimental computer-based models, like cellular automata and neural networks, capable to “imitate” the life of complex systems without reductionism, hence the term of Artificial Life. Others sustain a more “metaphorical” approach, just using biological complexity theories as a starting point and a reservoir of metaphors and images to substitute old physics-based ones (Hodgson, 1999). In next chapter, we will address some basic issue about a systemic interpretation of social realities, with specific reference to the question of the relationship between territories and economic activities.

Chapter 4: Defining Territorial Productive Systems.

Chapters 1 to 2 have discussed in-depth the implication of the broader and broader debate in both Geography and Economics, struggling for a satisfactory conceptualisation of the relationships between firms' competitiveness and territorial one. Chapter 3 has been focusing on the theoretical construction of a system-based approach to social sciences, with specific reference to Varela and Maturana autopoiesis theory and to Luhmann's application to sociology and political studies.

In this chapter, we will address the issue of systemic interpretation of territories, that is, whether or not territories can be interpreted through the lenses of systems theory. A system is an object which possesses a high degree of cohesion and organic oneness (represented by its Organisation), while even the simpler territory has manifold facets which are impossible to draw back to a univocal interpretation. More specifically, the territory, unlike a generic autopoietic system, is not the outcome of a limited set of internal processes that creates a sort of organic harmony among its components³¹: too many social, economic and cultural groups act within a territory in order to drive its transformation according to their rationalities, needs, desires and strategies. Hence, even if we can be influenced by the continuity in time of certain territories, to say that this continuity is prevailing over change and that it is produced solely by territory's Organisation is a weird statement to be defended.

In order to overcome this theoretical constraint, the first question we are going to address is the role played by geographical proximity in economic systems genesis and evolution. Our position will be that considering proximity makes a difference in considering systems' behaviour, highlighting a specific systemic process that is territorialisation³².

³¹ This issue echoes the question whether or not territories have their own identity and how it can be detached from contingent internal and external events.

³² By territorialisation we mean a twofold process: on the one side, territorialisation indicate the fact that economic processes become territorial, on the other side, it denotes the fact that in becoming "territorial" economic agents contribute to build the territory itself. By embeddedness we refer to the outcome of a territorialisation process.

Drawing on this role of differentiation, we shall see that we can conceptualise territories in a twofold systemic perspective: on the one hand, we can consider the territory as the simple outcome of structural coupling between systems, on the other hand we can imagine that sometimes interaction between systems and their environment goes beyond structural coupling, producing the emergence of a more complex systems, labelled Territorial Productive System (TPS), with a stronger relationship with the territory (section 4.1). Afterwards, we will see how this new kinds of systems can be conceptualised and operationalised in economic terms: we shall do it with reference to one of the main strands in New Industrial Geography, namely learning regions approach to productive agglomeration. To this purpose we shall see how our systemic standpoint allows us to consider two different kinds of embeddedness, a structural one and an organisative one (section 4.2). Third, we shall be considering the possible added value of the TPS approach in the debate about the relationships between territories and economic activities. We shall address this issue with reference to the issues of dynamic transformation of TPS and of the variety of systems that can coexist within a territory (section 4.3). Finally, we shall be introducing some methodological observations about using TPS as a framework for empirical research and, in doing so, we shall introduce the case study we are going to develop in the second part of the dissertation (section 4.4).

4.1. The role of proximity in systemic interaction.

Before introducing our systemic interpretation of territory, we must spend some words on the generic interaction between systems and the role that proximity plays in it. To this purpose we can assume that social actors can be represented as elementary systems. These systems vary in role, size and purposes:

- (i) they can be individual or collective (people, groups of people, associations, firms, clusters of firms etc.);
- (ii) they can be either private (firms and businesses of various kind) or public (e.g. the local administration) or a mix (like the education system or some development agencies);
- (iii) some of them will be codified in organisations (e.g. trade unions, NGO, churches or entrepreneurial associations) while others are based on more informal institutions, like ethnic groups, sexual or social identities;
- (iv) some elementary systems will be profit-maximising, while others can have different purposes (such as class struggle or unemployment reduction).

The main standpoint is that these elementary systems are always defined in terms of *proximity*. Proximity is what gives each system its own cohesion and make it distinct

from other analogous systems. In this perspective, we can say that every system is a local system. This is equivalent to say that, as a system must possess an “inside”, it must be characterised by some form of proximity. Therefore all systems are logically local. The point is that this proximity can be institutional, geographical or both. Subsequently, “local” is not a synonym of “geographical” or “territorial”. Local is to be interpreted – closely to its mathematical meaning – as a property of a set which emerge from some sort of proximity which eventually can be only institutional and not necessarily physical/geographical.

Hence, systemic interaction can be observed without reference to its spatial dimension. In this perspective, a *hierarchy* can be interpreted as a system where the components (plants, sites and people) share some features of institutional proximity, even in absence of physical proximity, and are linked to each other by recursive loops of interaction. As a consequence of institutional proximity and organisative synthesis, we can argue that that a Transnational Corporation (TNC) possesses an identity³³ which is not just juridical, but also cognitive and eventually emotional – see for instance the broad literature about institutional learning (Nonaka, 1991) and the process of identification between Japanese corporation and the workforce they employ. Also some forms of *network* might be explained in terms of systemic interaction: the functioning of contemporary global stock market might be assumed as an example: different systems – that is, different national financial systems – have been so intensively tied in the last decades that the outcomes is a global system of financial exchange with its own Organisation and emergent properties. For instance, we might consider contemporary speculative financial crisis as an emergent property of global stock market.

In our perspective, nevertheless, we can understand to which systemic analysis can be useful in investigating socio-economic processes when we consider territorial proximity as a convergence of geographical and institutional proximity in a given territory. In this case, in fact, the concept of coevolution becomes a central issue (see section 4 in chapter 3). When geographical proximity comes together with institutional proximity, some questions become important. The fact that different systems evolve in the same bounded space, sometimes converging and sometimes diverging, is actually a central issue in Economic Geography. The point here is whether they simply evolve near each other, in some sort of aspatial and loosely relational process, or if they coevolve, together and with the territory where they are located. In the latter case, we are facing some sort of territorial coevolution that entitles us to talk about territorial embeddedness.

Our point will be that the distinction between Organisation and Structure is fundamental in order to distinguish territorialised systemic processes. In particular we will

³³ The establishment of a Transnational Corporation like Ford which is organised in three different bodies with a larger degree of autonomy but at the same time deeply tied each with the others can be an example of this kind of interaction.

introduce a two step process to introduce system theory into the conceptualisation of territory:

- (i) in the first step, we shall consider the territory as the environment where different elementary systems intermingle and we will represent it as the outcome of this systemic interaction occurring between Structures;
- (ii) as a second and more important step, we will consider the possibility that second level systems – i.e. systems made of systems – exist and that they can highlight some emerging properties of the interaction between economic activities and territories.

4.1.1 Structural territorialisation: the territory as environment.

The first possibility is that the elementary systems co-localised in a bounded space interact territorially – that is, according to both institutional and geographical proximity – through a process of structural coupling³⁴. When we are in presence of a location process, we can figure out that there is an ongoing process of structural coupling between different systems (one or more firms, the local labour force, the public administration etc.) where

Organisation (like for instance labour system, education system or the public administration, local SMEs networks) while others can be based on disembodied forms of institutional proximity (international agencies, world-level research centres, transnational corporations, *filières* etc.).

In order to operationalise this concept, we can imagine having four elementary systems – [A, B, C, D]. Each of these four systems is based on a set of relationships which guarantee the preservation of its Organisation and by another set of ties that represent its Structure. In order to coevolve together with the others, each of these elementary systems get involved in some structural coupling, that is, it shares part of its structural features with the other systems. For our purposes we can imagine the territory as the outcomes of many processes of structural coupling overlapping in time and space.

Figure 4.1 expresses only the spatial dimension of this process of multiple structural coupling, that is the Structure of structural couplings in a given moment *i*. To get the full image of how territory emerges from inter-systems interaction we should add the temporal dimension of the process: structural change, in fact, occurs over time in order to match stimuli to change with organisative closure of the system. As a consequence, as elementary systems' Structure changes over time, also structural coupling will be changing following the mutations that take place in the individual structures. Hence, also that particular structural coupling that produces the territory will be changing over time³⁵.

If we accept this broad interpretation of territory as the output of structural coupling between different elementary systems, there is room for different theoretical and methodological approaches which will be in charge of opening and dismantling the systemic black boxes. For instance, some New Industrial Geography explanation of Marshallian and externalities and flexible specialisation, as well New Economic Geography models on agglomeration and urban economy, will offer useful insight about the structural coupling between economic activities and the other systems which are present in a given territory. Maybe the former will be focusing more on the relational institutions while the latter will draw attention to the role of market related institutional proximity. Hence this

³⁵ This account of territory might show some superficial similarities with localities studies and specifically with Doreen Massey's geomorphologic metaphor of territory as a stratification of different layers left as "tangible" residues of subsequent stages of capitalistic development (Massey, 1984). Nevertheless, differences are deep and more important than assonances. The most important dissonance is that in localities explanation there is a net prevalence on external influence – specifically, territorial structures are determined by successive rounds of capitalist accumulation, by processes which are neither local nor territorial, except in their consequences. On the contrary, in our perspective, even if territories are not systems, nevertheless they are defined through the interaction of local and supralocal, territorial and aterritorial systems. Moreover, the proposed systemic account is also more dynamic, in that there is a continuous change in the boundaries and in the outcomes of territorialisation, with a process of reciprocal cross-fertilisation between the territory and the systems which live in.

modality of territorial interaction covers a broad range of economic geographical processes, from the single firm's location choice to more structured agglomeration, like the different kinds of clusters spread over the economic and geographical literature during the last twenty years³⁶. Typically a TNC's localisation process reflects this kind of territorial interaction, searching for specific structural elements – resources – which are present in the territory and that the firm want to exploit. Also, most of the territorial competitiveness policies are comprised in this category: policies for the attraction of footloose FDI – like the creation of a call centre or an assembling plant – are just aimed to find some sort of structural coupling with international capital flows in order to temporarily reduce some local emergencies. This structural coupling is what the local administration will call “low unemployment” and the TNC managing board “low cost of labour”. Also more network-like of unsophisticated cluster, such as Markusen's *hub-and-spoke districts* and *satellite industrial platform* might be interpreted in terms of structural territorial interaction (Markusen, 1996): in these cases the relationships between the economic agents and the territory are richer and stronger than in the case of the single footloose TNC, but nevertheless they do not move beyond the limits of structural coupling. This point will be further developed in next sections of this chapter, when considering the added value of the proposed systemic approach, but we can start to suggest that most of the literature about territorial embeddedness might be more precisely defined in terms of structural coupling (structural embeddedness).

4.1.3 Organisative territorialisation: the territory and TPS.

We can imagine that, in some cases, the interaction takes place involving both Structure and Organisation and with reference to both institutional and geographical proximity. It is the case when different systems mix their Organisation to the extent that you could difficultly establish clear boundaries between them. In this case, besides and together with the structural territorialisation, there is a second process of systemic coupling where Organisation – and not only Structure – is somehow mixed together producing a more complex system, that we shall name Territorial Productive Systems (TPS).

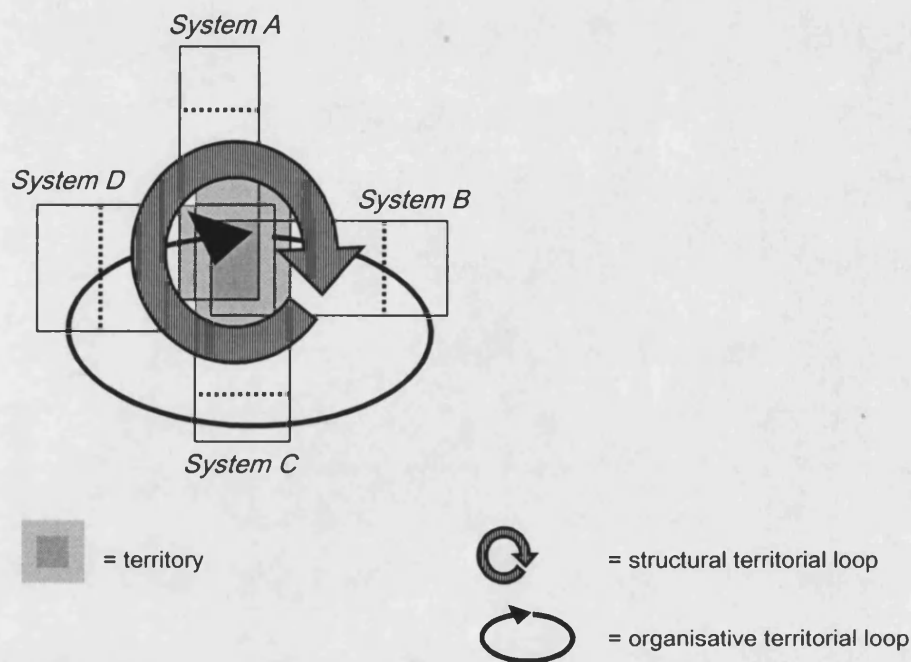
If we think about our initial set of systems $\{A, B, C, D\}$, we can imagine that among a subset of them $\{B, C, D\}$ there is a process of organisative synthesis. In other terms, the three systems become involved in some sort of organisative interaction (figure 4.2), bringing to the emergence of a second order system (the TPS). A is still part of the population of the territory – it is structurally embedded in the territory – but it does not

³⁶ For a comprehensive debate about different typologies of agglomerations/clusters see: Markusen, 1996; Martin and Sunley, 2003.

share any feature of its Organisation with the newborn TPS. For instance, we can suppose that:

- (i) "A" is a TNC;
- (ii) "B" is a cluster of small and medium enterprises $[b_1, b_2 \dots b_n]$;
- (iii) "C" is the local pool of labour force and
- (iv) "D" is the local higher education system (secondary schools and university).

Figure 4.2 – From structural to organisative territorial interaction



When we say that the sub-set of systems $[B, C, D]$ is organised into a TPS, we mean that a synthesis occurred among the single systems' Organisations and that this organisative synthesis leads to the Organisation of a new system, the TPS. What it is important to notice is that we do not have to think that the single systems $[B, C, D]$ ceased to exist or that they lost their autonomy, neither can we say that the TPS' Organisation is determined by its components. In both cases we would not be facing systems. Also we can more properly imagine that a given TPS can survive as a system even in presence of changes in its elements. For instance, a given TPS might continue to exist even if part of the system of SME "B" delocalise part of the production. What is more important is that we do not have any *a priori* guarantee that the TPS will survive dramatic change in the interaction between the composing systems. At the same time, we have to consider that the single elements $[B, C, D]$ maintain their systemic autonomy and they might be

involved in other processes of systemic interaction, for instance getting involved in some structural coupling with system "A": the cluster of SME can be a supplier of the TNC localised in the territory, the labour system will supply workforce and the education system will contribute to train TNC's workers. This is a fundamental point that we shall be treating more in-depth in next section, when considering the issue of systemic boundaries.

Among the well-known categories of agglomerations and clusters, industrial districts, learning regions and *milieux innovateurs*³⁷ are probably the closest to what we mean by TPS. In such agglomerations, institutional and geographical proximity are so strictly tied that we pass from mere structural coupling to organisative synthesis. For instance, in an industrial district, the network of firms' Organisation becomes narrowly related to the Organisation of the labour system: in that context, social mobility ceases to be an element of structural coupling between capital and labour and becomes an emergent property of the Organisation of a different system, namely the industrial district.

Before defining in details the dialectic between Organisation and Structure, we have to make some general statement about the relationship between the elementary systems and the TPS and between the TPS and the territory:

- (i) *TPS is neither a cage nor a sect*: there is not any form of exclusive belonging linking the elementary systems and the TPS. Each of the elementary systems maintain its own Organisation and Structure as differentiated from TPS' ones. The fact that some SME are clusterised into a TPS does not imply that they fully loose their possibility to enter in some structural coupling with other systems which are not part of the TPS, for instance supplying a TNC located in the same territory or being part of a global supply-chain;
- (ii) *TPS is not the territory*: there is not an exclusive relationship between TPS and territory, While a TPS is defined with respect to the fact that some organisative synthesis is happening within a territory, the opposite does not apply. In some cases, like Italian industrial district, the TPS is a good proxy of the whole territory. In other cases, the territory is too complex to be simply represented through a single TPS.

In other terms, TPS is not an exhaustive representation of the relationship between firms and between firms and territory. It is rather an interface between economic activities and territories, a prism through which we can read some features of the ties linking firms and territory. As a prism, of course, the image we shall get will depend on the standpoint

³⁷ More generically, the reference here is to the kind of clusters that Gordon and McCann (2000) name "social networks", when different realms are intertwined and therefore we are facing something more than mere geographical proximity.

we are looking from. These caveat will return time by time during our presentation of the TPS framework, particularly when dealing with the issues of TPS boundaries (section 4.2.2), the variety of the territory and its resistance to categorisation (section 4.3.2) and finally the methodological aspects and the choice of the case study (section 4.4).

4.1.3 Territorialised learning as Organisative territorialisation.

Introducing autopoietic systems theory in the previous chapter, we have seen that a system is made of components and relationships. In particular, the Organisation is made only by relationships, while the Structure is composed by both relationships and components.

- (i) Organisation = { relationships }
- (ii) Structure = { components; relationships }

With reference to our conceptualisation of the TPS we can say that it is made by different components (the elementary systems) tied to each other by several relationships (territorial interactions). Some of these territorial interactions are purely structural (that means they are the outcome of structural coupling processes), while other are inherent to the TPS Organisation (they are the outcome of organisative synthesis). Across process of territorialisation there is some like a threshold where territorial interaction passes from being mere structural embeddedness to being organisative embeddedness. It is important to notice that the difference is neither quantitative nor qualitative, but ontological: the passage from structural coupling to organisative synthesis depend neither on the intensity of the relationships, nor on some quality the relationship possesses but on a different nature of the interaction. We cannot say that a more intense cooperation or the presence of trust mechanically produce organisative embeddedness³⁸. The point here is exactly to understand which might be the nature of this ontological shift allowing us to jump to a higher degree in territorial interaction and systemic complexity. The first thing we know about organisative interaction is hence that it relies on a different kind of relationships than structural interaction, and not on a mere intensification of territory-bounded relationships. Hence we can write that:

- (iii) Organisation = { organisative territorialisation }
- (iv) Structure = { elementary systems; structural territorialisation }

³⁸ This issue will be in-depth addressed in section 4.3 when dealing with the issues distinguishing TPS from other NIG approaches.

Another feature we can derive from previous discourses, is that such processes of organisative interaction must be somehow recursive and cumulative, in the sense that PTS' Organisation reproduces itself over time. This also means that organisative interaction is dynamic, as it reworks incessantly its previous states in order to maintain some sort of internal consistence. Structural territorialisation on the contrary is more static, as it simply produces the contingent condition, in a given space and a given time, for the Organisation autopoietic process.

$$(v) \quad \text{Organisation} = f(\text{Organisation} \mid \text{Structure})$$

Merging (iii)-(v) we might say that organisative territorialisation is a function that produces Organisation working on some previous process of structural territorialisation. In other terms, we can imagine that the emergence of a TPS start with some process of structural territorialisation among the elementary systems co-localised in the same territory. Starting from this primitive Structure, the eventual process of organisative territorialisation produces the Organisation and consequently the emerging TPS.

$$(vi) \quad \text{Organisative territorialisation} = f(\text{Organisation} \mid \text{structural territorialisation})$$

In order to understand organisative territorialisation we are hence forced to start with clarifying the process of structural territorialisation. From our previous statements (see section 4.1.2), structural territorialisation can be defined as the process through which different elementary systems interrelate to each other and to the territory by sharing some features of the territory where they are localised (territorial endowment, or territorial assets):

$$(vii) \quad \text{Structural territorialisation} = g(\text{territorial assets})$$

Hence, proposition (vi) can be rewritten as follows:

$$(viii) \quad \text{Organisative territorialisation} = f[g(\text{territorial assets})]$$

The function f , which is now our central point, can be interpreted, in our perspective as some forms of territorialised learning, that is the reproduction of a peculiar knowledge that is proper of a given territory and that is continuously reworked by the TPS in order to maintain its Organisation. This solution mirrors Luhmann's approach to social systems but with a fundamental difference: while in Luhmann the main content of social systems was

information and therefore the autopoiesis consists in a communication process, in the case of TPS the organisative substance is knowledge and the process is therefore learning.

The main point in distinguishing between structural territorialisation and organisative learning is that it immediately suggests that the TPS is both about continuity and transformation: through a continuous territorialised learning, TPS can maintain its Organisative over decades and sometimes over centuries, passing through a long series of contingent structural territorialisation processes. More specifically, organisative learning will guarantee some form of duration and continuity to the Organisation, while producing at the same time new territorial assets which will be suitable to generate new structural embeddedness. More important, in the case of Organisation, continuity does not imply staying identical, but keeping a link, a *file rouge* with the past³⁹. As an example, we might consider Porter's narration about how competitive advantage changed in Sassuolo's industrial district (Porter, 1989): tiles production, in fact, started in pre-modern times and evolved mixing local knowledge produced within the TPS with epochal innovation such as engine and electronic. Not only the traditional knowledge has been preserved, but it also has been used to create a competitive advantage in emergent sectors, like the production of machine tools related to tiles production. Hence, territorialised learning (re)produce the TPS' Organisation by (re)producing the some set of knowledge which is inherited from the past, melting it with contemporary technological knowledge.

The point hence is which kind of knowledge is the object of territorialised learning? The answer depends essentially on the kind of TPS we have constructed, that is, the perspective from which we are observing a given territory and the questions we are asking. If we are investigating the pre-modern Siberian sciamanic community, the knowledge in question will be likely a sort of magic gnosis about the relationship between mundane and super-mundane realities. On the contrary, if the object of the analysis is a manufacturing system like an Italian industrial district the knowledge in question might be some technical know-how mixed up with aesthetic values inherited by the past. If instead we are grasping with a *milieu innovateur*, we will be probably interested in identifying a mix of scientific high-tech knowledge and know-how competences. This implies that organisative learning is not an exclusive concept, but an inclusive one. It is not simply about hi-tech fantasies (Massey, 1992), but neither it is concerning exclusively traditional

³⁹ Our account of continuity is sympathetic with Braudel's notion of *longue durée* (Braudel, 1979), where some common features of a territory are reworked along time in order to reproduce some sort of continuity with the previous age across an unceasing process of historical transformations. For a theoretical account of contemporary implication of Braudel's systemisation, with particular reference to the concept of "longue durée", see the most recent Wallerstein's work "The Uncertainties of Knowledge" (Wallerstein, 2004) where Braudel's account of duration is reinterpreted in the light of complexity theorist Ilya Prigogine' thought.

obsolete knowledge dating back to Italian flourishing Renaissance. The major point is that the relevant knowledge which is reproduced through territorialised learning can be identified only case by case, according to the historical and the present features of the territory we are interested in. Nevertheless, some general statements and categorisation can be made about knowledge and learning – such as the importance of tacit knowledge or the role of social habits and routines in enhancing collective learning within a territory. Organisative knowledge is always characterised by a strong component of tacit knowledge, implicit in routines and habits and therefore not fully expressed in codes and texts (Polanyi, 1958 and 1967). As it has been largely recognised by NIG, it is the tacit dimension which keeps this knowledge rooted in territories and impede the direct and exclusive appropriation by individuals and organisations (Amin and Wilkinson, 2004; Amin and Cohendet, 2004; Maskell and Malmberg, 1999; Malmberg and Maskell, 2006). Tacit knowledge plays hence a twofold role in the organisative learning. On the one side, it roots the learning process in the territory as it depends on the sharing of procedures and it can be produced mainly through face-to-face interaction across time. In this sense, tacit knowledge is related to the issue of continuity exactly because it takes time to be synthesised. On the other hand, tacit knowledge works as a sort of protection for the TPS, as it cannot be easily codified and transferred across distance and the actors which do not belong to the TPS can be excluded from access to local tacit knowledge. Also, in this sense tacit knowledge is related to the issue of continuity, in that it helps in maintaining the TPS competitive advantage over time, producing some sort of imperfect competition and making imitation more difficult, albeit not impossible (Maskell and Malmberg, 1999).

4.2 Operationalising the Territorial Productive System.

Before considering the overall implications of this systemic view on the debate about economy-territory links and territorial competitiveness, we must define in a better way how to operationalise the concept of TPS. In a simplified way, questioning how a PTS comes out from different elementary systems implies addressing two fundamental issues:

- (i) when observing contingent territories and agents within them, which behaviours can be referred to TPS' Organisation and which to its Structure?
- (ii) which is the geographic scale fitting the best to the possibility of observing TPS behaviour?

4.2.1 Distinguishing structural and organisative embeddedness.

Since the 80s a broader renewed interest in firm-territory emerged, by the consciousness that firms boundaries cannot offer a full explanation of competitiveness dynamics in OECD countries. Californian school of Geography, dealing mainly with

transaction costs and flexible specialisation (Scott, 1988; Storper and Walker, 1989), and Granovetter's conceptualisation of embeddedness (Granovetter, 1985) have been probably the turning points, opening a new era in Industrial Geography. A few years ago, the interest in the spatial and territorial dimension of economic behaviours spread largely also among other disciplines, like organisation studies (Porter, 1990) and mainstream neoclassical economics (Krugman, 1991a).

This debate has produced a comprehensive, albeit conflictual⁴⁰, understanding of the embeddedness of economic activities, that is the relationship between territorial assets and firms' competitiveness, varying from the more neoclassical explanation to more relational and cultural views. Nevertheless, most of the analysis about territorial endowment is simply about structural territorialisation and structural embeddedness. Only occasionally, within the learning regions literature, the distinction between structural and organisative territorialisation is somehow implicitly outlined. For instance, Cooke and Schienstock notice that:

It is therefore useful to distinguish between the knowledge structure and the learning capability of the system, where the knowledge structure is determined by examining the region's knowledge potential in terms of science and technology infrastructure, educational and training system and research capacity. On the other hand, the learning system represents the cluster structure of regional industry, production system, institutions and organizations generating and transferring knowledge and the innovation support infrastructure. (Cooke and Schienstock, 2000, p. 274)

Also Malmberg and Maskell (2006) keep a clear distinction between localized capabilities and interactive learning: while the former are mainly interpreted as territorial assets (or territorial endowments, or location factors) and therefore might be more referred to our notion of Structure, the latter is clearly a dynamic cognitive process, where knowledge is produced and re-produced through local relationships and interaction.

Despite this implicit distinction, the difference between Structure and Organisation is blurred into generic discourses, where it is not clear where to cut between territorial assets and territorialised learning, i.e. between structural embeddedness and organisative one. The main purpose of this section will be hence to try to operationalise the difference between TPS' Structure and Organisation. Despite, the TPS is a quite general idealtype that can be fully operationalised through its empirical assessment, we can nevertheless trace a sketch of its main features.

⁴⁰ See chapter 2 for a general overview of the NEG versus NIG controversial debate.

In our account we shall consider the relationships between firms and territorial endowments as expression of structural embeddedness, independently from their nature. Hence, we can envisage three main groups of territorial assets:

- (i) *pecuniary*, that is all those externalities which can produce a direct reduction in firm's costs (infrastructure, availability of cheap estates, labour costs, local taxes, availability of credit and venture capital, etc.);
- (ii) *institutional*, that is the set of relationships with local public and private organisations (association, consortia, trade unions, public administration, development agencies, chambers of commerce, etc.);
- (iii) *relational*, that is all those externalities which come from the establishment of relationships with other local subjects (customers and suppliers, labour force, universities).

Although relational territorial assets can also be interpreted in terms of reduction of transaction costs and therefore, in firm view, they are pecuniary as well, we are most interested in their cultural dimension. This category, in fact, is something like a bridge between structural embeddedness and organisative embeddedness. In other terms, being embedded in vertical relationships with other local firms or establishing cooperation with local universities is a first step toward establishing interactive learning processes. To this respect, it is important to notice, as we mentioned above, that most of both the NEG and NIG literature are somehow unified under the flag of territorial assets and structural territorialisation: of course the explanations are quite different between the two, but nevertheless they share the idea that embeddedness (or simple agglomeration in NEG account) relies on a set of well-established territorial characters that enter in some kind of relationships with economic agents.

When it comes to organisative embeddedness we shall distinguish three levels of territorialised learning which represent an increase in learning intensity. The first degree of territorialised learning is *buzz*. Following Storper and Venables (2004) and Malmberg and Maskell (2006) occasional and informal exchange of information between acquaintances is a fundamental source of localised interactive learning.

Buzz thus refers to the information and communication ecology created by numerous face-to-face contacts as people and firms within the same industry collocate in the same city, district, or region. This buzz consists of specific information and continuous updates of this information; intended and unanticipated learning processes in organized and accidental meetings; the application of the same interpretative schemes and mutual understanding of new knowledge and

technologies; as well as shared cultural traditions and habits, which taken together make interaction and learning less costly (Malmberg and Maskell, 2006, p. 7).

Buzz is of course the less structured and systematic form of territorialised learning, because of its character of occasionality and extreme informality. More precisely, buzz is more about information exchange than knowledge reproduction and, in this sense, it works out as a sort of interface between structural and organisative embeddedness.

The second step in territorialised learning is *inter-firm cooperation*. We can imagine that, sometimes, buzz evolves toward a more structured and long-term form of mutual commitment and cooperation. This is clearly a higher form of interactive learning as it stabilizes the whole learning process, enhancing both the exchange of information and their transformation into new knowledge, suitable to be transformed into a competitive advantage. Inter-firms cooperation can be both informal, problem solving, cooperation and formalised, contractual, interaction (such as joint venture, consortia or EU projects). Also cooperation can involve a set of different tasks, e.g. getting joint orders from some shared customer, lobbying in order to protect common interests, or pursuing joint research and development tasks.

It is clear that cooperation is somehow a necessary but not sufficient condition for the last and higher level of territorialised learning, which is *cognitive synthesis*, being established. This is highest level of territorialised learning, where cooperation is so strict that the new knowledge is not any more produced within single firm's boundaries but it is synthesised in the territory and controlled through the territory. The point here is to focus on cognitive process through which a knowledge rooted into a place-specific manufacturing tradition is socialised generation after generation and renewed through the hybridization with codified knowledge produced inside or outside the TPS. Know-how and learning-by-producing is hence central, but the real focus is learning-by-interacting, involving a broad range of actors: skilled workers, academic researchers, trained technicians and schumpeterian entrepreneurs are all part of the territorialised learning. Another fundamental methodological point, here, is that we can only refer to the generic operational process which constitutes cognitive synthesis, we cannot specify the contents of the learning process once and for all TPS. The point here is procedural, that is to define the broad character of the territorialised learning: what the learning is about is something that can be defined only respect to the specific historically and geographically contextualised TPS. Either it is an ancient gold-working tradition or a hi-tech sophisticated engineering process, we cannot define a priori the object of the cognitive synthesis: it must be identified case by case, basically through an in-depth historical assessment of the local industrial tradition.

4.2.2 Identifying TPS' boundaries.

The second issue concerns the geographical scale to which the TPS can be identified and analysed. This question, in our analysis, is twice important, as it has a systemic relevance and a geographical one. On the systemic side, the definition of the boundaries of any system is essential for the existence of the system: the idea itself of system implies that it must be possible to distinguish it from the environment and other systems, establishing a principle which controls the processes of inclusion and exclusion – i.e. the belonging – into and from the system. Every time we hear talking about proximity, the issue of borders squats in the forefront. At the same time, when talking about a territory, identifying the scale of social and economic phenomena – that is the boundaries within which such events happen and, hopefully, can be explained – is one of the fundamental questions Geography is dealing with since its foundation as a modern science. This is not, of course, the place to discuss the endless literature about scale, territory and place⁴¹. For the purpose of our work, the issue of boundaries assumes two specific meanings:

- (i) *material boundaries*: there must be a bounded area within which the TPS spreads its Organisation and Structure and behind which systemic Organisation loses its control over territorial structuration;
- (ii) *immaterial boundaries*: as we have seen, territorial proximity encompasses both institutional and geographical proximity, which are not perfectly overlapping. In other terms, dwelling within the material borders of a TPS does not automatically implies being part of it. At the same time, elementary systems participating to a given TPS do not necessarily exhaust their relational life within the geographical boundaries of the territory where the TPS is embedded.

In other terms, even is we define a methodology to identify TPS material boundaries, we cannot affirm either that such a system is completely bounded or that the mere location within these boundaries implies belonging to the TPS. In a different way, we can say that identifying material boundaries is necessary, but not sufficient to identify the TPS. Let us start with the first issue.

⁴¹ We shall just limit to give some indication about the most recent reflection on these concepts. For an account of how scale can highlight our conceptualisation of places and regions, see Paasi (2004). For a general account of how the concepts of place and territory have been treated in Anglo-Saxon Geography see respectively Creswell (2004) and Delaney (2005). For a discussion on the plural meanings that the scale assume in geographical debate see Sheppard and McMaster (2002). Finally, the theme of how scale is continuously rebuilt and reconceptualised by hegemonic actors is broadly considered by Brenner (2004).

When dealing with the issue of local economies, the problem of defining their boundaries is a crucial one, in that from this it follows the identification itself of the object to be analysed⁴². The idea is that traditional fixed scales of political geography are not suitable for the understanding of economic phenomena⁴³ and that the boundaries should emerge from within the locality and not be imposed from above⁴⁴. Hence, we have paid attention to a growing set of studies devoted to the classification of boundaries using *functional methods*,

that is, those methods which are specifically designed to create boundaries from the analysis of datasets on commuting migration flows, or other forms of *interaction* between areas. (Coombes 2000, p. 1502, *original emphasis*)

Functional methods offer the scholars the advantage of an exhaustive regionalisation at the sub-national scale – no territories are left behind – which emerge from some characters or phenomena “really happening” in the locality (like the commuting-to-work flows). Also, it is a variable geometry method, in that localities boundaries can be calculated again when new data become available. Nevertheless there are some features which make functional methods hardly applicable to the definition of TPS’ boundaries. Apart the obvious limitation that commuting flows approach neglects other important features⁴⁵ – like demographic, institutional, cultural and economic ones – there are at some specific constraints when it comes to TPS, and they depend on the importance of immaterial boundaries.

The main issue is that there is not a one-to-one correspondence between TPS and territory, in that, as we mentioned above, many TPS can coexist in the same territory. Hence, functional methods can identify the boundaries of a TPS when we are in presence of relatively simple territory, where there is likely only one TPS. This is the reason why “local labour market areas” have been working properly for the identification of Italian industrial districts: because, as we have seen, in industrial districts TPS tend to be identifiable with the territory itself, therefore commuting relationships come out to be a

⁴² The sensitiveness of the boundaries issue came at the forefront in 90s with localities studies (Massey, 1984).

⁴³ Although it cannot be discussed here, recent works by Neil Brenner show how the concept of rescaling can be helpful in linking together traditional scales like the national and emergent scales of power restructuring (Brenner, 2004).

⁴⁴ For a complete review of the locality boundaries definition see Coombes, 2000.

⁴⁵ Coombes (2000) has recently proposed a more complex and complete approach keeping together different aspects (institutions, demography, economy, facilities and landscape): although this perspective represents a completion of traditional functional methods centred on commuting flows, it does not solve the theoretical problems arisen in defining TPS’ boundaries.

good proxy for the TPS. In more complex situation, like metropolitan areas, it is difficult to hypothesise that we can ascribe the flows to a specific TPS.

Moreover, functional approaches are obsessed with spatial continuity that is, building an exhaustive patchwork of territories, including each squared foot of land into a locality and at the same time avoiding overlapping among systems. This put some constraints on the adopted algorithm which are meaningless in our systemic perspective. The point of view is in fact internal to the system and therefore we are not really interested in the fact that when a TPS ends, immediately another one begins. More important, some of the systems localised in the territory also belong to other TPS and therefore boundaries are overlapping⁴⁶.

The third issue is that TPS are characterised by continuous structural change also the boundaries of its Structure change without ending. Therefore, even if we accepted that commuting flows are a good proxy, we should be able to calculate the boundaries of the systemic Structure in the precise moment when we are going to observe the TPS and not once out ten years when the census data become available. As far as Organisation is concerned, it is true that some *longue durée* guarantees continuity over time of the TPS, but it becomes hard to sustain the idea that physical commuting alone is a good proxy for territorialised learning processes.

Hence we can say that the inadequacy of any standard definition depends on two simultaneous rescaling processes of the networks of relationships that make the TPS:

- (i) on the one side, some learning networks are longer than any given territory's boundaries, in that they involve other systems localised elsewhere;
- (ii) on the other side, some learning networks are somehow "shorter", in the sense that they involve only certain elementary systems present in a given territory.

The first issue is well known in learning region literature and we might say that over the last years it came to the forefront. Most of NIG literature agrees on the fact that interactive learning is not an exclusive property of regionalised clusters but that it entails as well an important supra-local dimension. For instance, Boschma points out that there are many kinds of proximity playing a role in learning dynamics and that spatial proximity is "neither a necessary nor a sufficient condition for learning to take place" (Boschma 2005, p. 62). Gertler (2003) has sketched three problems influencing the effectiveness of tacit knowledge (how to produce it, how to find and appropriate it, how to reproduce or share it), claiming that some of these processes take place partially independently from territorial

⁴⁶ This is of course a quite naïf deviation from biological systems theory, where boundaries are seen as certain and unique.

assets and geographical proximity. Analogously, in Amin and Cohendet (2004) territorialised learning is just one out of several forms of building knowledge architectures. Also Asheim pointed out the challenge that temporary organisations can move to the embeddedness of territorialised learning processes (Asheim, 2002). Recently, Malmberg and Maskell themselves, together with Bathelt (Bathelt *et al.*, 2004), have been focusing on the learning processes which take place through long distance in absence of geographical proximity, using the metaphor of the global pipeline.

All these warnings have been extremely important in avoiding the hyperlocalism trap: it is clear that the boundaries of whatever territory cannot contain the whole of the learning process. Nevertheless, they have been shifting the attention from what happen between different scale, underestimating the variety of the process that are taking place within given scales (the shortness of territorialised learning). If it is common sense to admit that any cluster's boundaries are always fuzzy toward the outside in that a territory cannot exhaustively contain all the relationships going on, our point is more striking. We claim, in fact, that the boundaries are blurred not only at the external borders of the TPS, but also internally. Around a more or less clearly identifiable bulk of territorialised learning there is a broad grey zone where other processes happen and which are not taken into account by most of the NEG and NIG literature. This is a fundamental issue that we shall try to address in next section, when dealing with the specific added value that our systemic account of TPS-territory link can offer to the ongoing debate in Economic Geography.

4.3 When (and if) TPS makes a difference.

In the previous sections we have outlined the main features of an ideal typical TPS, saying that it simultaneously relies on both structural and organisative territorialisation. We have also claimed that some of the more sophisticated conceptualisation of clusters, such as industrial district, milieux innovateurs and learning regions, can be considered as very closed to this abstract idealtpe (see section 4.1.2). Following, we have identified as the main feature of organisative territorialisation the process of territorialised learning, which allows the TPS evolution while maintaining some form of continuity with a set of basic knowledge inherited by the past (see section 4.1.3). This standpoint have also somehow enhanced the familiarity of TPS with the three fundamental strands in NIG mentioned above: actually, all these approaches (industrial district, milieux innovateurs and learning regions) are to a different degree claiming some sort of synthetic cognitive dimension of the territory:

- (i) Italian industrial district literature is mainly about how a centuries old set of knowledge and competencies have been reworked through local traded and

- untraded interdependencies in order to maintain a competitive advantage on globalised markets;
- (ii) *milieux innovateurs* scholars explicitly assume the presence of industrial tradition and of cognitive interaction as cornerstones of the definition itself of *milieu*;
 - (iii) learning regions approach is self-evidently centred on the process of interactive learning within regional boundaries as main engine for enhancing local development processes.

Finally, in section 4.2.1 we have highlighted how the NIG debate, and signally learning regions approach, can offer a fruitful insight to distinguish between structural embeddedness and organisative embeddedness.

What is still to be considered is the specific added-value that systemic conceptualisation can offer to the debate in Economic Geography⁴⁷. Does the TPS have some emergent property or it is simply ordering and bringing together different approaches in NIG? While developing the subsequent arguments, several passages have suggested that actually there are deep divergences from some of the main assumptions of the new orthodoxy of NIG. In the following pages we will try to address this question with reference to two fundamental questions:

- (i) the relationship between homogeneity and plurality, that is the variety of the territory;
- (ii) the relationship between continuity and change that is the dynamicity of the territory.

4.3.1 *The unbearable variety of territory.*

One of the main points which run across all our analysis is what we might call the unbearable variety of territory. Most of the literature in contemporary Economic Geography, both on NEG and on NIG side, has been concerned with the categorisation of different kinds of interaction between economic activities and territory, trying to systematise the relationships between territorial endowment and firms' performances. This

⁴⁷ Some explicit reference to system theories within learning regions related literature have been made over the last years, in particular with reference to Cooke's work on localities and learning processes (Cooke and Morgan, 1998; Cook and Schienstock, 2000 and Cooke, 2001) and to French school of GREMI – *Group the Recherche Economique sur les Milieux Innovateurs* (Maillat *et al.*, 1991; Maillat et Perrin, 1992; Maillat *et al.*, 1993 and Maillat, 1995). Despite these efforts, the consequences of a systemic approach in terms of methodology have never been consistently developed.

classification is managed to a high simplification of territorial complexity, which can be articulated in four steps:

- (i) the first step is the identification of standard categories for the description of the territorial organisation of production. The massive use of the term "cluster" with all its ambiguities is a good example of this process. Cluster became a sort of shortcut toward regional development: clustering firms seemed to be the fastest way to improve both firms' and regions' competitiveness. Of course this misuse arose numerous criticisms, addressing the cluster issue as a chaos (Martin and Sunley, 2003). This turned into some classification effort (Markusen, 1996; Gordon and McCann, 2000) which tried to distinguish between different kinds of cluster;
- (ii) subsequently, such categories can be easily converted into a classification of different territories according to the type of cluster that they were hosting. The case of Italian industrial district is somehow emblematic of this process: the rediscovery of Marshallian industrial districts by Becattini and his fellow scholars passed quickly from its original neo-braudelian narrative interpretation to more systematic attempts to statistically standardise their features (e.g. through the concept of local labour system), ending in a legal normative definition of which territories are industrial districts (the so called legge Bersani, from the name of the minister who enforced the new law)⁴⁸. In this process, what was a feature of the cluster become a character of the territory;
- (iii) in order to work, this schematisation of the territory ends by assuming some degree of homogeneity in the territory. If this homogenisation process is clear in NEG approach, where it expresses through the typical neoclassical statement about hypotheses that applies within a bounded space, it is nevertheless at work in NIG studies, although in a more subtle and implicit, but deeper, version. Most of NIG theorisation, also those closer to our TPS approach, share some belief that territories possess relational and cultural features according to a binary distribution: either they have them, or they do not. This leads to consider important territorial assets, such as social capital, trust, routines as if they were equally distributed within a given territory. Very often, the emphasis put on "sharing" simply hides a desire for describing the territory in terms of cohesion, uniformity, homogeneity and finally some sort of collective agency;

⁴⁸ This made some bad luck for some of the historical Italian districts: a simple increase in some of their structural feature (like the ratio of SMEs) withdrew them from the list of legally recognised industrial districts, preventing them from the benefits that have been thought expressly for them.

- (iv) the fourth simplification, probably the most important, is that most of both and NEG and NIG literature operates a dramatic simplification of the territory, establishing a series of dichotomic images which try to fix the territory's unceasing flow. As far as NEG is concerned, its dichotomic approach is quite clear in Krugman and Venable's famous models of cumulative development, where the question is whether monopolistic competition and increasing returns lead to a centre-periphery polarisation between two or more regions. When it comes to NIG, we find an even richer set of dual oppositions and divides: between virtuous learning regions and those trapped in obsolete lock in, between institutionally thick places and almost empty ones, between Fordist hierarchies and flexibly specialised networks.

To this regard, both NEG and NIG frameworks turned to be powerful tools for territorial analysis, namely inter-territorial analysis, highlighting the variety of territories, although it might be questionable the extreme manicheisation of territorial differences: on the one side, virtuous territories, if possible flexibly specialised, SME thick, trustful and cohesive; on the other side, Fordist, heterodirected, TNC dominated and exploited territories. More radically, within NIG schemes it is not easy at all distinguish between organisative and structural institutions. Is the presence itself of trust enough to pass from structural to organisative embeddedness? Which intensity of untraded interdependencies is required to produce an industrial district or a *milieu innovateur*, rather than a mere agglomeration?

Of course, many criticisms have arisen against the excessive emphasis on local homogeneity and the possibility that this uniformity turns into some competitive advantage (Amin and Tomaney, 1995; Hudson, 2003). Nevertheless, this scepticism is usually produced by the consciousness that ongoing supra-local processes will somehow disrupt territorial cohesion and/or interrupting the virtuous linkage between territorial assets and firms' performances⁴⁹. This argument is somehow similar to the one we have considered about TPS' boundaries: uncertainty and menaces come from the outside and are not generated by processes internal to the territory.

As a consequence, what stayed largely unexplored was the variety within a given territory. Hence, this is the main point where our systemic account of firms-territory relationship diverges from the other NIG interpretations. Since the very beginning we have questioned the possibility of considering the territory as something monolithic⁵⁰, with a limited set of nuances within its boundaries, strictly dependent on its cluster structuration,

⁴⁹ For an interesting account of supra-local relationships can be managed through multiple embeddedness, with specific reference to the evolution of Italian industrial districts, see Zucchella, 2006.

⁵⁰ This is what, in chapter 2 and 3, we called the issue of juridical personality of territories.

packed in some clear category. As we have highlighted before (section 4.1.2), in our systemic approach the preservation of variety within a territory is guaranteed by a two main points.

The first is that the belonging of a system to a category is not exclusive. For instance, the presence of a TPS does not exclude that in that territory there are ongoing processes of mere agglomeration or even simpler footloose localisation: a TNC might be interested in localising in an industrial district just to try to take advantages of some resources locally embedded. It is also possible that a TPS is part of a Global Commodity Chain or buy raw materials rather than specialised services on the market without entangling in an organisative interaction with those other systems. Also we can imagine that some elementary systems manage simultaneously systemic interactions in many realms. Let us think to a global player like Motorola: they can buy intermediate goods directly on the market – like silicon, microchips and software – or locate manufacturing plants in a developing country to take advantage of cheap labour, enhancing some territorialised learning into Silicon Valley TPS without losing its corporate identity.

Even more important, here, is the relationship between TPS and territory. The TPS is not of course the territory, as in the territory there are other systems which are not involved into the TPS. At the same time, TPS' Organisation can be assumed as a good proxy of the territory as it is characterised by emerging properties which are territorial, which is defined in terms of both geographical and institutional proximity. We have to notice that *there is not a two way identity* between a given territory and a TPS: every TPS identifies a territory, but a territory can host more TPS, either coexisting or in competition among them. Therefore, in our inquiry of territorial competitiveness, we have shifted radically our focus: we are not questioning if a territory as whole can be assumed to possess its own competitiveness, but how specific TPS do. As we have argued in the previous sections, there is not feasible way to theorise rigorously such a thing like a territory as an autopoietic system, because it is actually too complex. Take for instance Prato and London. As the former is small enough and relatively less complex, we might assume that just considering one TPS (the industrial district) may be a good proxy for the whole territory, that is, we might accept the simplification that comprehending Prato's industrial district we also grasp the wholeness of Prato itself. In the case of London, it is evident that its complexity is so high that we cannot *reduce* its "identity" to particular processes ongoing for instance in the City or, conversely, in Brixton. Better put, the City – i.e. one single London's TPS – is not a good proxy for the whole city.

Hence, what really connotes a TPS is not its eventual internal homogeneity, but rather of being more complex than the elementary systems that live in the territory, but less complex than the whole territory. In other terms our aim is to build up an analytical object which is a not-exhaustive representation of the territory, but possessing some of the

features that refer to the territory and that cannot be found in the elementary systems which are located into the territory. The possibility to have, within the same territory, many configurations of firms' relationships – many kinds of "cluster" – shifts our attention to internal processes rather than to external oppositions – the territorialised cluster versus the globalised markets, local tacit competencies versus global codified knowledge, homogeneous community versus rootless disaggregating capitalistic values, etc. As we shall see in next section, this attention paid to internal variety also allows to address in a different way one of the more problematic issue in contemporary Economic Geography, that of transformation and change.

4.3.2 Path dependence and change: the limits to specialisation.

As a second main point we have to address the character of path dependence, which is traditionally associated with agglomeration and competitiveness, considering how it interacts with the ideas of emergence and novelty which are central in complexity and systemic epistemologies. We will argue that the shortcut to explain the coexistence of both continuity (that is, path dependence) and emergence (that is, invention of new paths) is given, once more, by the distinction Varela and Maturana introduced between Organisation and Structure. More precisely the application of autopoiesis to social systems and territories allows us to distinguish two kinds of path dependence, a structural one and an organisative one:

- (i) *structural path dependence* refers to the concept of structurally determined change, that is, the fact that the changes in a system are change in the Structure which depends on the previous states of the Structure itself.
- (ii) *organisative path dependence*, that is, the fact that the TPS maintain continuity in the basic set of relationships which define its identity. In other terms, organisative path dependence can be assumed as a synonym of organisative closure

At the same time, both Structure and Organisation can change over time, but in different ways. More precisely, the Structure has a broader range of possible variation, as long as the Organisation stays relatively still and maintains its internal consistency. In a theoretical perspective, we might admit that also the Organisation changes over time without substantial alterations. Nevertheless, in practical terms, it is very difficult to set a boundary after which the TPS has changed so much its Organisation that it becomes something different. Therefore, we can hypothesize that the Organisation either changes dramatically and catastrophically – and therefore the TPS becomes something completely different – or it stays mainly unchanged over time.

This systemic account of emergence and path dependence, allows us to address some of the open questions we inherited from the literature. We can shortly consider here, two of them: Krugman's account of history and path dependence and the problems of lock-in, inertia and creative destruction.

Krugman's interpretation of path agglomeration and path dependence mainly refers to the Structure of a TPS, in that he focuses his explanation on the two concepts of *increasing returns* and *monopolistic competition*, which are actually features of the contingent Structure, rather than the immanent Organisation. Even more explicitly, Krugman has repeatedly claimed that softer and fuzzier elements like spillovers and knowledge flows, essential to our comprehension of territorialised learning cannot be modelled within the NEG epistemological framework. As a consequence, NEG seems to fail in addressing long term continuity, which is (un)explained as QWERTY effect (David, 1985) or pure chance. In a systemic perspective, what is seen by Krugman as chance is instead a specific learning process with a relatively clear beginning and development. Of course at the very beginning, we agree that a random fortuitous event might be the spark which led to TPS' birth, but focusing on the learning organisative core rather than just on structural mechanisms might help us in shifting the boundaries of our interpretation and comprehension.

The main important point, where NEG converges with NIG, nevertheless is the worry about the lock-in trap. Krugman insisted on the fact that path dependence and continuity, as well as the role of tacit forms of knowledge, imply, in fact, a certain degree of inertia which might prevent the adaptation of the economic system to changing times⁵¹. A similar analysis applies to the issue of specialisation – probably the main form of path-dependency we can find in regional economies – and how it is treated by learning region literature. Evolutionary economics has broadly reflected on path-dependence, highlighting how knowledge production is a largely cumulative process, where different stages in knowledge clearly rely on the previous ones (Nelson and Winter, 1977 and 1982; Arthur, 1994). In the learning regions approach, path dependence assumes both a positive and a negative meaning. On the one side, it is the very base of any learning process as it takes the form of continuity with past knowledges and it is embodied in routines, habits, formal and informal norms. On the other side, like Krugman, also Maskell and Malmberg underline the risk for regional lock-in:

Normally, a region gradually develops its physical, social, institutional and cultural structure *in correspondence to needs of existing industries*. Even if we assume that each round of building new institutions or improving the old is based on , and

⁵¹ Hence, the revival of the Schumpeterian emphasis on "creative destruction" as part of the innovation process which keeps capitalism alive.

perfectly adjusted to, the most advanced technological, organisational or market knowledge available at the time, there is always a risk that the resulting institutional endowment in the long run will become an obstacle to future development and perhaps even develop into a regional lock-in. [...] Thus, not only do firms experience difficulties when they face the need to un-learn successful routines, but in regions the process of un-learning will often necessitate the disintegration and removal of formerly important institutions which now hinder new development. (Maskell and Malmberg 1999, p. 178-179, emphasis added)

In our systemic perspective, the impossibility of solving the issue of regional lock-in descends from the emphasis that both NEG and NIG scholars put on specialisation. In most of the related accounts, first come specialisation (the needs of existing industries) and the organisation of territorialised learning follows. Without doubt, this must be the case if we are just considering structural embeddedness, as specialisation is actually part of the TPS' Structure and, in particular, it expresses the way the TPS couples with local and supra-local markets. If we shift our attention to the organisative synthesis, the situation significantly changes: in this case, Organisation (should) come first and Structure – and hence also specialisation – follows. If it is true that a TPS cannot rely simply on the reproduction of its Organisation, without some effective structural coupling with other systems and with the environment, it is also true that organisative consistency precedes adaptation. In other terms, the external environment somehow offers a range of possibilities in terms of variety and diversification, it imposes some constraints with reference for instance to market evolution and to technological trajectories, but in a TPS it is the Organisation that dictates the development path of the system.

We cannot anyway exclude *a priori* that a TPS can face such a deep crisis that even its Organisation is at risk of becoming obsolete. This might be the case that, in systemic terms, there is no possible structural coupling with the fast changing environment, so that this particular Organisation will implode. Nevertheless, this represents the extreme case and it would imply the implosion of the TPS itself. Actually, not only the TPS approach does not exclude catastrophes, but its emphasis on variety implies a greater sensitivity to changes and challenges, even in smaller localities like Prato. Consider, as an example, the consequences of huge immigration flows from China into all major Italian industrial districts. At first, this immigration has been somehow integrated in the basement of TPS' Structure, being functional to the price-competitiveness of the district without altering substantially the systemic Organisation of the industrial district. Later, these expatriate communities seemed to constitute autonomous TPS, with their own Organisation and Structure, representing now a challenge from the within of the industrial district. It can happen that a bag and leather wholesaler in East London is going to buy low-quality-low-cost bags and wallets from Chinese communities which are settled

near Florence, without any connection being made with the original TPS hosting these enclaves. Therefore, it is likely that in Prato or Valenza⁵² there are now at least two TPS, each of those with its specific Organisation and structural coupling with that particular territory. If we go on considering the identification between the TPS and the territory in industrial districts, we will never understand what is going on. For instance we could not grasp why, after many claims that the tacit dimension of districtual knowledge was the founding of their competitiveness, now the focus is shifted towards forms of codification – for instance establishing brands and trademarks which secure the originality, the recognisability and the uniqueness of local production. The fact is that the challenge is not just from overseas imitating competitors, but it is internal, by embedded vanguards.

4.4 Introducing the empirical case study.

In the previous sections we have argued that the way we built the concept of TPS – and in particular the distinction before Structure and Organisation – allows us to address some of the open question unanswered by both NEG and NIG. In particular we have claimed that the variety within a given territory cannot be oversimplified by postulating some degree of homogeneity and a substantial correspondence between the territory and a particular form of productive setting.

4.4.1 Why Turin?

The second part of the thesis will attempt to empirically operationalise the TPS concept with reference to a specific case study. To this purpose our attention has been focusing on Turin manufacturing fabric, not only for biographical reason⁵³.

In many ways, Turin is the ideal example on which to check the hypotheses put forward in the course of this work. In the 20th century, the presence of Fiat and its capacity to organise and profoundly structure the local territory gave Turin its most well known image. Over time, the identity of Turin was condensed into that of a car-producing city, the city of Fiat (Volpato 2004). The name Turin evokes Dickensian scenes and arouses comparisons with the grey centres of early industrialisation, such as Manchester, Liverpool or Lyon.

⁵² Valenza, in Piedmont, is probably the most important industrial district worldwide for jewellery making. Recently, many producers and association have reported about a growing Chinese community progressively becoming autonomous from the original district and competing on design imitation jointed to cheap prices.

⁵³ Actually researcher's biography has some important methodological implications. In fact, a methodology based on a mixture of historical analysis and more synchronic qualitative and quantitative view needs some sort of embeddedness to mobilise different sources of information and turn them into a consistent tale about local production fates.

Despite the mythology built upon Agnelli's travelling to Detroit in the 20s and the 30s, the influence of Ford was rather an inspiration than an applied model. At least during the first half of XIX century, the car production in Fiat and Turin was still much close to the pre-Fordist era, with a central role played by handicraft production and by the presence of important competitors.

The years immediately following the Second World War were crucial for the future development of Fiat. Working in a rapidly expanding market like the Italian one, without any significant import penetration and with few local competitors, Fiat focused its market strategy on small and medium-sized models. It also organised production in a way which paid little attention to R&D, planning or scientific activity. Fiat's entire strategy was directed towards quantitative expansion, both in terms of employment and productive capacity, paying little attention to its internal organisation. These technological and product decisions were accompanied by a spatial strategy which deliberately enhanced the relative advantages of concentration and mass production. This had two main features: the concentration in the north-west of the country and in the city of Turin in particular; and concentration of production in a few large, vertically integrated, factories. In the Turin area, Fiat has in fact found, produced or has seen others produce (the public administration) a large part of those "territorial conditions" which marked the establishment of the system of mass production (Castronovo, 1971; Gabetti, 1977). As a consequence, Fiat's industrial investment was identified with the boundaries of the Turin agglomeration: this area not only contained the entire car production cycle (in 1968, about 1,300,000 out of 1,550,000 cars came from the Turin area), but Fiat also participated in the whole range of production based on the internal combustion engine, involving a close-knit network of small and very small supply companies, often completely dependent upon Fiat.

It is important to notice that, despite the presence of vertically integrated plants, a broad and capillary supply-chain also spread over Turin metropolitan area: while at the end of the 1960s there were over 125,000 employees working in Fiat's Turin factories, at least an equal number worked in production units which directly or indirectly were part of its network of subcontractors. In reality, it has never been possible to delimit exactly the boundaries of this network because its composition was in a state of constant flux, especially as regards the smaller suppliers. Fiat drew on around 1,200 direct contractors, about a third of the 3,500 units (often small and very small) linked in some way to the automobile industry. Under these conditions, despite the high internal integration, during the 1960s Fiat acquired on average over 50% of its total turnover from external companies, of which about half were located in the Turin agglomeration.

As a result of the automobile industry's strategy towards indefinite output expansion and a consequent, and sometimes uncontrolled, enlargement of production capacity, the Turin area became one of the most sectorally specialised regions in Europe,

comparable to just a few other international examples such as Detroit and the West Midlands. It is in this context that Turin has been rightly seen as representing the model of the factory town, albeit with its own specific features and connotations. It is no surprise that even in international literature Turin has been a favoured area of study for the relationship between industry and the city in the era of the second industrial revolution (Gabert, 1964; Jalabert and Gregoris, 1987).

Starting in the eighties, Fiat's strategies have led to a gradual bifurcation between the corporation and the changes in Turin's manufacturing system. In that period, Fiat's strategy radically changed, due to several contingent reasons: the opening of Italian car market, the increasing pressure of international competitors, mainly from Japan, and the consequent worldwide reorganisation of the whole automotive sector. This deep transformation in both the location – with the opening of new plants in Southern Italy, Eastern Europe and Latin America – and organisation – with the dramatic restructuring of the local supply-chain and the entry strategy of global components producers – has indeed produced a deep crisis in Turin's manufacturing fabric.

Massive unemployment, unceasing firms' failures, negative demographic trends, the agreement with General Motors and, last but not least, the death of the two leading figures of the ownership, Giovanni and Umberto Agnelli, with the consequent rise of a new management spread over the area the fear that an era was finishing, that Turin's fate was divorcing from the fortune of its more representative firm. Turin was not any more Fiat's town, Turin was not any more a one-company-town, Turin was something else but it was not clear at all what it was. It is easy to imagine that such an identity crisis has produced an intense debate about the productive restructuring process that was going on. Basically two strong positions have been sustained in the public and academic debate: the first one affirmed that the automotive specialisation was becoming a sort of lock-in, that some forgetting was necessary and that a new post-industrial identity had to be found: on the contrary, the second one has been keeping Fiat's presence – at least with the headquarters and its more strategic functions – as central for the destiny of the area and that the question was just facilitating the passage to new organisation of the production, namely a kind of "automotive industrial district".

This short tale might help in highlighting some of the interest reasons that Turin case raises with reference to the TPS model and clarifying the research hypothesis we are going to address in the second part of the dissertation. Our main task is to verify if the application of the TPS framework to a specific case study would confirm our hypothesis about systemic added value, with reference to our capability to understand territories without excessive simplification of the diversity that a place entails and to keep the balance between continuity and change.

In this perspective, the main issue is that the Turin area is characterised by a set of knowledge clearly identifiable with an engineering and electrotechnical tradition which maintained strong relationships with the pre-Fiat age. As we shall see in chapter 5, Fiat rose at the end of XIX century from a pre-existing set of core competencies, deriving on the one side from the royal arsenal and the coach manufacturing, and, on the other side, from the Savoia kingdom policy of developing a strong research basis in the field of applied technologies. This specificity will turn out to be fundamental when it comes to recognizing the emergence, permanence and evolution of place-specific learning processes. More precisely, we shall claim that automotive specialisation was simply the contingent structural evidence of a more underground territorial learning process.

Hence, we shall try to challenge the consolidated image of Turin as a one-company-town, arguing that not even during the climax of its Fordist age Turin could be reduced to such oversimplified image. In our perspective, this a good example about how a territory can be roughly identified non even with a sector or a cluster, like in the case of industrial districts, but just and simply with a single firm, although the biggest Italian firm. Hence our first task will be deconstructing this monolithic image of univocal identification between territory and firm, considering whether it would have been more correct to talk about a Fiat-centred TPS. In order to do so we will be focusing not only on Fiat but also on its supply chain, highlighting how a number of different actors was actually playing a co-primary role in Fiat's big tale.

Third, we will try to argue that, even in the case that a homogenisation of some of the main features of a territory effectively happened and it led to the emergence of an encompassing representation of that territory – like in the case of the one-company-town – we can still assume that a degree of variety is still at work in that space. For this purpose, the enduring presence of an highly hierarchical organization such Fiat has probably contributed to the imposition of certain territorial endowments over others, not only with reference to vertical customer/suppliers relationships, but also to more cultural attitude toward social capital and community shaped factors, such as trust, spillovers and cooperative attitude. Hence, in our perspective, this feature might be helpful in keeping our categorization of TPS largely independent of a communitarian standpoint. In other terms, if social capital is more or less ubiquitous in the territory, we can better test our hypothesis that TPS might be distinguished only in terms of territorialised learning processes, without needing a strong reference to the social production of shared meaning and values.

Finally we will be dealing with the issue of change and continuity. The 80s and 90s restructuring has set free a dramatic amount of resources: many workers and, more importantly many firms, have been ousted from Fiat's environment, hence searching for a new market position and a new productive identity; local public and private institutions have been called to invent a new development path, as well as a new image for the city-

region and the surrounding Province; universities and research centres have been expected to foster a deeper involvement in local industrial fate; TNCs, once attracted by the possibility to serve Fiat supply-chain, have been forced to consider new (de)location dilemmas, hence rethinking the deeper reasons for their staying. This framework represents a good playground to consider how the Fiat centred monolith has been either preserved or split off in diverse systems, with significantly different patterns of both structural and organisative territorialisation.

4.4.2 Methodological implications.

The main issue, when it comes to methodology, is the *longue durée* character of the TPS Organisation which is difficult to assess through normally available diachronic datasets, even in the case of the most important Italian firm in the XX century where archives and data go back to the turn of the past century. Most if not all of the historical series we can find is, in fact, referred to variables such as specialisation, firms' size and ownership, performance indexes (such as ROI, employment and productivity), labour market size and characters, etc. Also we can easily get information – sometimes even data – about the modification of input-output regional framework, allowing us to analyse the change in the vertical customers-suppliers asset, which is a fundamental component of territorial embeddedness. The issue is that such variables can express, at best, Structure dynamics, but they have little to say about territorialised learning. Despite existing information can highlight some aspects of structural embeddedness, mainly those related to pecuniary externalities, the more relational dimension of structural coupling (such as untraded interdependences or institutional endowment) and, above all, organisative synthesis (that is to say territorialised learning) lay down in the shadow. On the contrary, more qualitative methods, such as focus groups, meeting with key-observers and structured questionnaires, can give a peculiar synchronic insight into the embeddedness process, allowing investigating both structural coupling and organisative synthesis through direct observation of the elementary systems composing the TPS. At the same time, it is very difficult to get from qualitative methods a clear perception of the *longue durée* processes underlying TPS organisative dynamics.

As a consequence we must adopt a twofold approach, an historical one and an analytical one. Historical analysis, based mainly on existing literature and previous analysis can offer some perspectives on the diachronic evolution of the TPS, making at least intuitive the main features of structural and organisative embeddedness across time. Subsequently, an analytical approach, base on structured interviews to firms localised into the TPS, will give more precise and updated information about the way the system's behaviours and its relationships, on the one hand, with firms' competitiveness and, on the other hand, with the territory where the TPS is localised.

Chapter 5 will address the main historical questions, in particular in identifying the main bulk of knowledge which can be assumed as the object of Turin territorialised learning and challenging the monolithic idea of Fiat-centred clustering, advancing the hypothesis that it might be more fruitfully interpreted as a TPS. In chapter 6 we shall be focusing on the effect of Fiat's crisis on the SME fabric, highlighting some processes of diversification and change within the primary TPS: the chapter will end with the hypothesis that more than one TPS came into existence in the second half of the 90s. Finally, in chapter 7 we will move our stance to the present situation and, on the basis of original empirical observations, we shall evaluate how different processes of structural and organisative territorialisation are at work in Turin at the turn of the millennium.

Chapter 5: Interpreting Fiat-Turin relationship in the prism of Territorial Productive Systems.

In this first chapter devoted to the case-study, we will attempt to assess to what extent and in what terms Fiat-Turin relationship really tells us the story of a one-company town, or it can be more meaningfully interpreted through the concept of Productive Territorial System. Contextualizing Turin's economic history in systemic terms, in fact, is the first step towards understanding the manufacturing dynamics and current stance of the area's economy, ensuring a reliable basis of comparison between the past and the present and, consequently, enabling us to evaluate the images and analyses that scholars and public players have put forward in recent years.

5.1 Methodological questions.

For this purpose, certain necessary simplifications regarding the TPS's morphology and operation will be made both in this chapter and those that follow. Specifically, the first set of assumptions concerns the definition and nature of the subsystems considered as components of the TPS. To limit the number of interrelationships which come into play, and in accordance with the examples given in the first section, we will restrict ourselves to four *elementary systems*⁵⁴ which are essential in defining the Productive Territorial System:

- (i) transnational corporations;
- (ii) local enterprises;
- (iii) labour market;
- (iv) formal institutions.

This is an admittedly partial and subjective attempt at outlining the taxonomy of a TPS, and, as such, presents a number of significant gaps and simplifications. The two

⁵⁴ In order to simplify reader's task, in this chapter, we shall call "subsystems" the elementary systems, while with the word "system" we shall refer to the TPS itself.

most important of these omissions are the educational and training system, and the research and innovation system. Both of these systems have a central role in the process of producing and reproducing knowledge that stands at the very core of the TPS's organization. On the one hand, in fact, the educational system expresses how and when a system (re)produces the human resources it needs in order to function: thus, the transformations and reforms in professional education can be seen as a true litmus test of the production system's changing needs. On the other hand, the research system furnishes the TPS with the scientific and technological skills that are required to take the knowledge inherited from the past and adapt it to the needs of today's markets. Nevertheless, as including these two elements as independent subsystems of our TPS would have entailed a number of insoluble problems, we decided to take a different approach. Accordingly, the educational system is organized, at least in its broad outlines, on a scale other than the local, as it is normally one of the spheres for which central governments claim responsibility. If it is true that professional training is to a certain extent more flexible and better attuned to the changing and changeable demands of the productive fabric, it is no less true that the educational system is almost completely untouched by the trends at work on the urban or regional scale. For this reason, the educational system's participation in the more general TPS will be interpreted restrictively as a single component of the relationships that link the labour market to the other subsystems taken into consideration. In other words, the educational system as seen as being instrumental to the processes whereby the workforce is reproduced inasmuch as it plays an important role in the dynamics of the Productive Territorial System. For the research and innovation system, the problems that arise are greater. The rationale for excluding this important subsystem lies in the fact that it is only since the 80s that outsourcing of R&D work has shown significant growth, and the scientific literature has become aware of the importance of the ties that bind industry and the academic world. In this sense, and as seen from the perspective of a medium-long term diachronic analysis – spanning, in our case, around one hundred years – this system is difficult to consider as an independent subsystem which participates explicitly and with a role of its own in the process of forming a TPS. The problem of how to incorporate it in our model remains: the approach that was preferred in the context of this analysis was to equate R&D work with other corporate services, i.e., to regard it as an economic activity like the others, whose task is to provide the market with skills that have their own economic value. Case by case, the players engaged in research and innovation will be considered as part of the subsystem of transnational corporations or that of local enterprises, depending on their prevalent character. This approach poses certain problems in dealing with public

universities and research centers⁵⁵, which can be regarded as economic entities only in part. Though an alternative would be to regard this system as part of the “formal institutions” system, this option was rejected for reasons that can be grouped under the following two headings:

- (i) Identifying formal institutions, such as the public administration, as a separate and independent subsystem would mean homing in on the purely political dimension of the process whereby a TPS comes into being. Here, the presence of agencies or consortia who promote innovation is entirely consonant with the PA subsystem’s operation, whereas universities and research centers are not sufficiently “political” in character.
- (ii) Historically, the relationships between public research and the private sector have intensified as an Anglo-Saxon, and largely American, model of university governance has gained ground. In this model, research institutions habitually do work for economic and manufacturing interests: work from which they derive a sizeable proportion of the resources they need for their activities. The fiscal crisis of the Western state and the dearth of public funds have encouraged the spread of similar practices in continental Europe. As a result, putting a public research center on a par with a capitalist enterprise is no longer such an unbreakable taboo.

A further methodological clarification must be made regarding the composition of the elementary systems we have identified. Clearly, the complexity of the real world is such that they cannot be taken as uniform, homogeneous systems without unacceptable oversimplifications: the labour market offers a staggering array of job types, skills, compensation levels and ideological attitudes, just as two transnational corporations are very unlikely to be organized in the same way. Similarly, local enterprises can have a multitude of different relationships, both structural and organizational, with transnational corporations and with each other: supply and purchasing agreements, strategic alliances and competition are only a few of the ways that contribute to making each enterprise in the subsystem different from the others. Likewise, it is probable that the subsystem of local enterprises associated with a given TPS – the automotive TPS, for instance – will in turn belong to different sectors and value chains that, to varying extents, will influence their dynamics and behaviour. The same is true for the public administration which, on a different scale, will exhibit strategies that are not always, and not necessarily, centered on the TPS in question: different levels of local government may be working towards restoring

⁵⁵ If we consider that private research institutions often work intensively for the public sector, to the extent that they are largely dependent on the latter’s decisions, the picture that emerges is even more complex and difficult to assimilate.

the Turin's automotive industry to competitiveness and, at the same time, be implementing policies designed to broaden the region's production base, orienting it towards other areas of specialization such as ICT or cultural tourism. In a setting like this, it will thus be necessary to make appropriate distinctions within the four elementary systems which reflect the diversities within the TPS, and which could well prove to be the forces behind the system's evolution – or even its dissolution.

Our approach to classifying the subsystems involved also has an appreciable impact on the types of learning process that we can assume as expressions of the TPS's organization. Earlier, in conceptualizing the TPS, we defined its organization as consisting of cognitive learning processes which preside over the (re)production and evolution of the knowledge and skill sets that distinguish this system from its surroundings and from other systems that are similar to it, either in territorial location or in the sector they specialize in. Given their complexity, these cognitive processes are not readily modeled or quantified in an empirical analysis. Hence, it must be freely admitted that our point of view is necessarily somewhat parochial or place-oriented, as it were, and can make no claims to objectivity. Out of the host of cognitive processes that can take place in a territory (with its production of cultural identities of various kinds, be they based on ethnic origin, class, gender or religion), our chosen purview is restricted to the processes of production and reproduction of those types of technical and organizational knowledge that can be said to be most directly linked to industrial and economic competitiveness. In this sense, we are more closely concerned with the many issues surrounding the knowledge-based economy and learning regions, than with what we referred to in the first section as the "cultural turn" in economic geography.

One last clarification is in order: as our investigation focuses on the relationship between enterprise competitiveness and territorial competitiveness, the TPS must necessarily be observed from a specific vantage point which will provide us with a basis for interpreting the organizational and structural relationships. This vantage point will be that of the production activities on which the TPS under analysis hinges. In analyzing the TPS that hinges on Fiat, this means that the relationships that make up the system will be construed in the light of the behaviour of this strategic player, not because it is in fact central, but rather because it can be viewed as a kind of "vanishing point" around which we can arrange our interpretation of the behaviours and dynamics at work inside the system.

In line with the foregoing considerations, this chapter will attempt to conceptualize the past existence of a TPS centering on the presence of Fiat in the Turin area, analyzing the operation of this system from four standpoints:

- (i) the strategies of the major player
- (ii) the relationships between Fiat and the subsystem of local enterprises

- (iii) the relationships with the labour market
- (iv) the relationships with the formal institutions

In analyzing these four themes, our goal will be to shed light on the learning relationships that can have constituted a fully fledged Productive Territorial System in the course of the twentieth century. In order to describe all of the transformations that this TPS has undergone over the years, we will divide our discussion into two main periods, where the first will span the time from the system's foundation to the Seventies, and the second goes from the Seventies and Eighties to the present day. The chronological organization of this representation of the automotive TPS is centered on two hypotheses, which stem, if you will, from two metaphors, one which likens it to a set of photographs, and one that sees it as cinema:

- (i) the first hypothesis is that the TPS's Fordist territorialisation reached its zenith and its nadir in two specific decades, viz., the Fifties and the Nineties respectively: our construction of the idealtpe of the TPS – the photographs of our metaphor – centers essentially on the form the system took in this two moments;
- (ii) the second hypothesis, which is closely linked to the first, is that in both periods there was a pronounced cognitive delay between the time organizational innovations were introduced and the time they became fully manifest. In particular, we will attempt to demonstrate that though the scientific organization of work was introduced in theoretical form early in the twentieth century, it was fully deployed only from the Fifties onwards. Similarly, many of the processes which were to lead to the TPS's de-territorialisation that became clear in the Nineties actually began in the Seventies.

In other words, our method will be based on a two-pronged approach: a comparison between two moments, frozen in time, in the rise of Turin's automotive TPS, and an analysis of the processes that seem to proceed in slow motion, or to be in some way out of synch:

- (i) the very fact that the Fordist system was built up implies that a substantial portion of Turin's epic as a one-company town unfolds against an essentially pre-Fordist organizational backdrop;
- (ii) by contrast, the Fordist system's de-territorialisation began shortly after all of the pieces finally fell into place.

We could go so far as to say that the Fordist TPS existed, really and truly, for the merest handful of years – no more than a couple of decades out of a history that was over a century long – and that in order to establish itself, it had to build on the very elements – such as the development of an extended supply chain or the marginalization of highly skilled labour – which would later prove to be the seeds of its undoing.

5.2 From rootedness to rootlessness.

Before plunging into an analysis of the relationships between Fiat and the other subsystems that gave Turin's automotive TPS its shape, some attention should be focused on the strategic behaviour and choices of location that Fiat has exhibited in its hundred years of history, in an attempt to highlight the signs of rootedness and rootlessness that surface in the two historical periods we mentioned earlier. Thus, this section will examine Fiat's locational decisions in relation to its strategies and how they evolved. In other words, we will proceed with a diachronic analysis of the structural coupling between Fiat and the Turin area in pre-systemic terms: rather than taking other subsystems and relationships that lead to organizational synthesis into consideration, we will take a look at how Fiat's creation of its own structure was superimposed on the Turin area through a series of locational choices.

5.2.1 The Age of Rootedness.

Briefly stated, the history of the early decades of Fiat (founded in Turin on July 11, 1899) was played out entirely in the Turin area: from the first factory employing a few hundred skilled workers, up to the construction of Fiat's two major plants at Lingotto (1916-1926) and Mirafiori (1939) and the later expansion throughout the Turin metropolitan area, the company's strategic decisions centered in its home area. Suffice it to say that the number of Fiat employees in the Province of Turin went from slightly more than 3,000 in 1911 to over 100,000 sixty years later.

The dynamics whereby Fiat struck root in the Turin area cannot be separated from the history of its expansion, i.e., of Fiat's policy of diversification and differentiation. This policy can be divided into two stages.

During its first cycle of acquisitions, Fiat policy concentrated on differentiating the main product along with a moderate diversification, though always remaining in sectors with links to motor vehicle production. Starting in the Twenties, Fiat grew rapidly, taking over all of the car makers of any size then operating in Italy, one after the other: SLPA – Società Ligure Piemontese Automobili in 1926, SCAT – Società Ceirano Automobili Turin in 1932, Autobianchi in 1960, Lancia (which specialized in GT cars) in 1969, and Alfa

Romeo, Italy's legendary sports car maker, in 1986, followed by Ferrari (1988) and Maserati (1993) in the supercar segment⁵⁶.

The first cycle of diversification also brought Fiat a striking measure of success: in the second decade of the twentieth century, less than twenty years after it opened its first car factory, Fiat started mass production of trucks, buses, and streetcars. The company entered aircraft production – setting up Fiat Aviazione – in 1908, and built its first trains in 1917, followed by its first tractors in 1919. If this diversification proved so positive, it was largely because of two fundamental factors: it had a strong manufacturing bias, and, though Fiat entered many operating sectors, car-making retained its decisive role. This twofold process of diversification and differentiation, then, strengthened Fiat's roots in the local productive fabric: almost all of the acquisitions and diversifications, in fact, were concentrated in the Province of Turin or, to a lesser degree, in the remainder of Piedmont. At most, we can say that this stage expanded the group's local territorial base, pushing it to extend its manufacturing activities beyond the confines of the city. And not only: some of the areas that were ventured into as part of this diversification are now the fulcrum of Fiat's competitiveness and of what remains of its manufacturing roots in Piedmont: Iveco, one of Fiat's few motor vehicle divisions to come through the recent crisis unscathed, still has much of its production and research work in Turin⁵⁷, while the Avio aeronautical division – which recently moved its headquarters to the former car plants in Rivalta on the outskirts of Turin – maintains its core manufacturing and research in the Turin area⁵⁸.

5.2.2 Fiat's decisions and delocalization.

There can be no doubt that first unmistakable sign that the automotive TPS was severing its roots came from the strategies that Fiat started fielding in the Eighties in order to pull itself out of the social and manufacturing crisis that engulfed it in the Seventies. Here, the events that are of particular importance to our analysis include:

- (i) the new wave of product diversification that took place, as contrasted with
- (ii) Fiat's attempt to increase production capacity in its core automotive sector.

This time, diversification chiefly involved moves into new non-manufacturing sectors, both by the Fiat Group and by IFIL, the holding company controlled by the Agnelli

⁵⁶ Ferrari bought the Maserati brand from Fiat in 1997, and in 2002 Fiat sold around 34% of its shareholdings to Mediobanca.

⁵⁷ Alongside its major production and research centers in Brescia and Ulm (Germany).

⁵⁸ In addition, the birth of a small but technologically significant nucleus of highly specialized suppliers gravitating around Fiat Avio and Alenia – Italy's state-run aerospace industry – is one of the major factors in the regeneration of the learning processes associated with the metalwork manufacturing and electronics sectors in the Turin area.

family via the latter's IFI. A number of businesses were thus acquired which not only had nothing whatsoever to do with motor vehicles, but were also completely extraneous to the manufacturing industry in general. These new ventures included forays into publishing, paper products, wholesale distribution, tourism and the hotel industry.

To reorganize and strengthen its production capacity, Fiat embarked on two concurrent strategies that involved:

- (i) relocating production operations, first to Southern Italy and later to developing countries, a trend that was to pick up speed with the passage of time; and
- (ii) combining forces with other major OEMs, both by buying out competitors and by entering into joint ventures and strategic alliances.

5.2.2.1 The move away from Turin

The relocation of major production operations to Southern Italy that started in the Seventies was the first aspect of Fiat's growth strategies that had a negative impact on the group's presence in the Turin area: in quick succession, manufacturing facilities were opened for automobiles (Termini Imerese in Sicily in 1970, Cassino in Lazio in 1972, Pomigliano d'Arco in Campania in 1987, Melfi in Basilicata in 1994), trucks (Atessa Val di Sangro in Abruzzo in 1981) and engines (Termoli in Molise in 1973). In addition, other Fiat group companies made investments in component manufacture, research, aeronautics, etc.

Table 5.1 – OEM employment in Piedmont and Italy

	1971 workforce	1981 workforce	1991 workforce	2001 workforce
Piedmont	102,283	97,396	65,536	25,368
	100	95	64	25
Southern Italy	9,391	35,134	30,318	25,012
	100	374	323	266
- Lazio	124	9,760	8,171	5,184
- Abruzzo	0	2,232	3,549	4,663
- Molise	0	3,203	3,003	0
- Campania	8,417	16,421	12,452	7,816
- Basilicata	0	0	35	5,227
- Sicily	850	3,518	3,108	2,122

Source: Istat, 1971, 1981, 1991, 2001

As can be seen from Table 5.1, Fiat's shift southward was particularly pronounced in the Seventies, when the total number of jobs in the Italian automotive industry increased. Starting in the Eighties, employment in Southern Italian plants dropped in absolute numbers but grew in relative terms, i.e., by comparison with employment in Piedmont: in 2001, date of the last manufacturing census, jobs stemming directly from motor vehicle production in Italy were distributed more or less evenly between Piedmont

and the South. In other words, the Piedmont/South ratio went from 1 to 10 to one to one in forty years.

This replacement of Turin by Southern Italy is even clearer if we look at data that are more strictly qualitative than employment figures alone. If we take production volumes, for instance, we will see that in the Nineties Turin's Mirafiori and Rivalta⁵⁹ plants saw their share of total production cut in half, dropping from over half a million to around 250,000 vehicles. By contrast, production in the rest of Italy rose by 31%.

Table 5.2 - Auto production and manufacturing employment in the Province of Turin

	1993	1997	2001	2002	2003	1993-2005
Auto Production, Turin	571,472	568,368	374,379	306,000	250,000	-56.25%
Auto Production, Italy	593,128	1,059,232	897,384	819,769	776,454	30.91%
Piedmont/Italy (%)	49.07%	34.92%	29.44%	27.18%	24.35%	-50.38%
Workers at Mirafiori, Rivalta	40,061	31,399	25,285	21,909	15,695	-60.82%
All workers in Turin (province)	880	879	916	912	924	5.0%
Mfg workers in Turin (province)	309	306	292	297	288	-6.8%

Source: Whitford and Enrietti, 2005, p. 778

Additionally, we can look at the breakdown of total investments in fixed assets made in the periods 1982-1989 and 1990-1997 (table 5.3): the figures leave no doubt that investments were chiefly channeled into Southern Italian plants, rather than to the group's long-established facilities – which were mostly in the province of Turin and, in the case of Alfa Romeo, in Lombardy).

Table 5.3 – Breakdown of investments in fixed assets

	1982-1989	1990-1997
South	33%	48%
Rest of Italy	59%	34%
Outside Italy	8%	18%

Source: Mariotti and Treves, 1999, p. 309

This process of shifting production to Southern Italy took place in two fairly distinct periods:

- (i) in the Seventies, we see an increase that was above all quantitative, with the number of employees rising from slightly over 10,000 to more than 35,000. At the same time, manufacturing locations spread over virtually the entire South (in 1971, 90% of all workers in the Southern regions were concentrated in Campania, whereas by 1981 sizeable numbers are also to be found in Lazio, Abruzzo and in Molise).

⁵⁹ Production was discontinued at the latter facility in 2005.

- (ii) from the Eighties onwards, the replacement effect makes itself felt in relative terms; above all, the Turin area's marginalization as regards investments in process innovations becomes clear. This process will culminate in 1994 with the opening of the "Toyotist" plant in Melfi, which we will discuss in greater detail later.

Again starting in the Seventies, Fiat took this shift to Southern Italy one step further and began moving manufacturing operations offshore:

- (i) in 1973, Fiat Automoveis was set up in the Brazilian state of Minas Gerais. In 1993, this plant employed some 8,000 people and production had reached 270,000 units.
- (ii) in Argentina, Fiat began to establish a manufacturing presence during the Fifties. After a series of ups and downs, the situation stabilized with the establishment of a component production and assembly plant in Cordoba which in 1993 turned out 150,000 vehicles and 187,00 engines, providing jobs for almost 9,000 employees.
- (iii) with Tofas, a joint venture set up in 1968 between Fiat and the local Koc Group, Fiat established a presence in Turkey, where the numbers are similar to those for Brazil and Argentina (9,000 employees and 200,000 vehicles produced in 1993).
- (iv) and finally, Poland, site of Fiat's major move offshore: dealings with Poland date back to the Twenties, and intensified in the Sixties when several popular models like the "126" were produced under license. Fiat's presence in Poland reached its peak with the 1992 agreements that called for initial investments of approximately 900 million dollars, to be followed by an additional 960 million over the next seven years, with an output of over 250,000 vehicles per year.

The milestone event in this process of internationalization, however, was "Project 178" for worldwide production of a series of models based on a world-car platform. In its original form, the project called for investments in no fewer than ten developing countries: Brazil, Argentina, Turkey and Poland would be joined by Morocco, India, Russia, Egypt, South Africa and China, with an overall capacity of more than one million vehicles per year and total expenditures in excess of 1.4 billion dollars. Project 178 was Fiat's most important strategic challenge in the last twenty years, and its failure, largely as a result of sluggish market conditions in many of the countries involved, is unanimously acknowledged to be one of the causes of the recent crisis. As a consequence, the project fell far short of expectations: though it got off to a good start with the 157,000 cars produced in Brazil in 1996, and the annual output of cars based on the 178 platform had shot up to nearly 450,000 only one year later, the numbers soon began to decline. By 2001, production stood at only 350,000-odd units, as against the million called for in the original plans. Geographically, moreover, the hoped-for expansion was not achieved, and

Fiat's worldwide range remained substantially unchanged: in 2001, 77% of production took place in Brazil, as against the 40% contemplated in the plans, the plant in Venezuela was shut down in 1999, those in China and Russia were never built, and manufacturing operations in Argentina were suspended in 2002 as a result of that country's financial crisis⁶⁰.

As can be seen, the internationalization of Fiat's manufacturing operations had already begun in the days when the Fordist TPS was in full flower, but – and this is what is most important for our purposes – its effects in terms of deterritorialisation became plain only starting in the Nineties. The question, obviously, is not one of straightforward substitution in terms of production volumes: as producing vehicles in Turin for export to Latin America or Eastern Europe would simply not be feasible, the jobs gained in the developing countries are not jobs lost in the Turin TPS⁶¹. As highlighted by Table X, the point, rather, is that we are dealing here with a strategy that sees the Turin TPS's role in production as residual, and cuts investments in process innovation accordingly. We will return to this “technological-geographic replacement effect” in the section devoted to human resources.

5.2.2.2 Intensifying the relationships with other OEMs

Alongside its process of relocating and internationalizing through greenfield investments in Southern Italy and the developing world, Fiat has since the Fifties made efforts to increase its critical mass by means of acquisitions and strategic alliances. There were three key moments in this endeavor⁶²:

- (i) The 1968 agreement with Citroën
- (ii) The 1985 agreement with Ford
- (iii) The 2000 agreement with General Motors

In 1967, Fiat disposed of its holdings in Simca in order to free up the energy and resources needed to take up a significant equity interest in Citroën, where Fiat's holdings reached 26.9% in February 1970. However, the boost that Fiat planned to give to this

⁶⁰ Though there were a number of important market factors over which Fiat management had no control in the latter case, it should be noted that Volkswagen and Citroën have already resumed production, gaining a “first-strike advantage” and carving off ever-larger slices of the Argentine market.

⁶¹ In this sense, and from a purely territorial standpoint, the Turin TPS's real competitor is to be found in Fiat's plants in Southern Italy. This is clear from the events of the last two years, with the two areas fighting a sort of “turf war” over their respective allotments of domestic production.

⁶² In addition to these three main agreements, we should for the sake of completeness mention the acquisition of Spain's Seat (from which Fiat withdrew in 1981, and was replaced by Volkswagen as majority shareholder) and the 1998 bid for Volvo, where Fiat lost out to Ford.

partnership, pooling research and manufacturing efforts and integrating the two brands' product lineups, met with stiff resistance from the French side: a resistance that was motivated by economic and strategic considerations (viz., the desire to maintain the Citroën brand's identity, and the specter of increased competition on their home markets raised by both Peugeot and Renault), as well as by national pride (De Gaulle saw the French maker's takeover by a foreign company as little short of a slap in the face). As a result, convergence between the two OEMs deadlocked, and in 1973 the agreement was terminated⁶³.

The next development was the start of negotiations for a merger between Fiat Auto and Ford Europe. Initially, the agreement on the table called for rationalizing the two major European automakers' supplier portfolios and, at most, making a few cars in common. As soon as the parties realized that the savings thus achieved would not justify the operation, the stakes were upped to a full-scale merger between the two car divisions. Here as with Citroën, the talks fell through because of a total inability to agree on who would control the merged company: Ford proposed that Fiat would take charge for seven years, after which management would pass permanently to Ford. The Italians, however, refused.

Finally, March 2000 saw the important agreement between Fiat Auto and GM. This accord, which was widely touted as decisive for the future of the Italian automotive industry, merits discussion in some depth. In exchange for 20% of Fiat Auto, the latter acquired a 5.7% stake in GM, becoming the largest single stockholder in the world's biggest automaker with holdings worth 2.5 billion dollars. The agreement also provided for a put option giving Fiat the right to sell the remainder of its automotive division to GM in January 2004. Despite this agreement, which was intended to achieve major cost savings and rationalize the design and production processes, Fiat saw its sales plummet in the first years of the new millennium, with disastrous repercussions on the group's finances. Debt continued to mount, with the ever-present risk that the lending banks would convert the amounts owed by Fiat into equity in the company, resulting in a change in its ownership structure. In these conditions, while Fiat's right to exercise the put option was practically a bankable asset, GM was struggling under the weight of the crippling cash problems and poor credit ratings triggered by its disappointing market performance in both Europe and the United States, and was also faced with an uncertain future should it be dragged against its will into restructuring Fiat. The Detroit group thus found itself penalized by falling share prices at the same time that the rating agencies had downgraded GM's credit in expectation of just such a denouement, making it all the more costly to raise new money. In March 2005, Fiat's own problems pushed the group to turn its holdings in the

⁶³ In 1973, Michelin was to sell its Citroën holdings to Peugeot, respecting that "national preference" so dear to the hearts of French politicians.

US maker into ready money: desperate to scrape together the cash needed to pull itself out of debt, Fiat sold its stake in GM for 1.16 billion dollars⁶⁴. This was less than the amount it had invested only two years before, but enough to get out from under the sword of Damocles represented by the bank's three billion euro convertible loan facility, at least for the time being.

From the strategic and manufacturing standpoint, the Fiat-GM alliance could have had major repercussions on Fiat's local ties and those of its supplier pool, particularly as a result of setting up the two joint ventures contemplated by the agreement:

- (i) GM-Fiat Worldwide Purchasing BV, headquartered at the Opel facilities in Germany and run by an American CEO, and
- (ii) Fiat-GM Powertrain, with headquarters in Turin and an Italian CEO.

While the reforms in procurement and supply policy will be discussed in the next section, it should be noted here that the convergence in engine and transmission types brought about by the second joint venture would have entailed a reorganization of powertrain manufacturing operations whose impact on production in the Turin area was never estimated in any detail⁶⁵. Nevertheless, the total number of powertrain systems would have dropped from 32 (16 made by Fiat and 16 by GM) to 19 once the partnership was up and running at full steam, saving the two makers 2 billion euros in 2005. Clearly, then, certain Fiat engines would have seen an increase in their production while others would have been abandoned, but the question of which geographical areas would have ended up as winners and which would have lost out was never openly addressed.

5.2.2.3 Conclusions

The separation into two distinct periods that we have taken as the basis for our interpretation is clear from an analysis of Fiat's strategies: a first period of strong structural coupling between Fiat and the Turin area was followed by a second stage of delocalization. This process is perfectly recognizable from the group's corporate tactics as a whole. As a result, in fact, the policy of diversification, differentiation and expansion embarked on in the mid-Seventies and stepped up in the Eighties and Nineties inevitably loosened Fiat's ties to the local productive fabric, though without solving the automaker's productivity problems or helping it become more competitive:

⁶⁴ The full scope of this "divorce" between Fiat and GM, and its connotations as a "new departure" for the Turin-based auto maker, has been effectively summed up as "the major event of the new year" (Bernacchi, 2005,a).

⁶⁵ Now that the agreement has fallen through, the question of impact is irrelevant as well as unverifiable.

- (i) diversification extended into sectors that were far removed from Fiat's core business and the Turin area, sapping their learning processes of their strength and draining away resources that could have been used to reorganize the automotive value chain;
- (ii) the Turin plants' share of production has dropped steadily, and not even the launch of new models between 2004 and 2005 halted the move away from the area. As can be seen from Table X, the aftershocks of Italy's shrinking motor vehicle production were largely felt in the Province of Turin, while in the rest of Italy – thanks in part to the special tax concessions for manufacturing facilities in Southern Italy – output remained substantially unchanged;
- (iii) as we will see in the following section, the rationalization of production platforms and purchasing arrangements that resulted from the General Motors agreement weakened the links – shaky enough to begin with – between Fiat and its Turin-area component supply chain.

5.3 The creation of the automotive TPS.

In this section, we will attempt to identify the relational dimensions that led to the emergence and consolidation of an automotive TPS between Fiat's foundation and the end of the Seventies. As part of this effort, we will discuss the points of contact – and of friction – between this system and the Fordist production organization that for so many years was the dominant image that Fiat projected onto the Turin area. In this connection, our attention will center chiefly on Fiat's relationships with its suppliers, a focus motivated by two sets of reasons:

- (i) the first is that the literature on learning regions is unanimous in viewing the close customer-supplier relationship as one of the main mechanisms whereby territorially embedded learning processes come into being and tacit knowledge is fed into the network;
- (ii) the second is that, faced with the complex array of variables that a systemic approach would have to take into consideration, our analysis must be "placed" by using a standpoint which – given the predominant role that the relationships between enterprise competitiveness and territory have in our investigation – is necessarily that of the enterprises belong to the TPS.

At this stage, we will make no distinction between the subsystem of multinational corporations and that of the local enterprises, as the trends that involve both can never be entirely unraveled from the overall trends in which outsourcing as such is caught up.

5.3.1 Relationships with suppliers.

If we hope to understand how Turin's automotive system can be regarded as a TPS, going beyond the overworked image of the one-company town, we cannot ignore the relationships that Fiat has maintained with an assemblage of small and medium enterprises which continued to hold together even in Fiat's Fordist heyday. In particular, we postulate that:

- (i) the localized learning process distinguishing the automotive TPS would not be conceivable only in terms of Fiat's own management of cognitive and innovative processes, but must be contextualized in a productive fabric consisting of a multitude of players who interact in a complex web of relationships: suppliers, competitors, competitor-suppliers, enterprises doing business in similar sectors, and so forth;
- (ii) even in the years when the "Fordist orthodoxy" was at its peak, the fact that there continued to be a plurality of enterprises, however much they may have differed in competitiveness, entrepreneurship and independence from Fiat, made it possible to reassemble and reorganize localized knowledge into structures that – and this will be a hypothesis we will address in the subsequent chapters – that were different in nature.

Here, we would like to direct attention to how the web of local SMEs played a fundamental role in making the Turin area an automotive TPS, and not simply a one-company town.

In this connection, it can be instructive to return to the analysis that Cristiano Antonelli (1999) conducted of the relationship between technological innovation and an undertaking's growth. From a perspective that is purely – and programmatically – microeconomic, Antonelli attempts to offer an explanation of why there is a positive link between factor productivity and output growth that goes beyond the traditional macroeconomic and microeconomic explanations formulated by Kantor and Penrose respectively. Antonelli's theoretical stance hinges on two basic concepts, that of replacement costs and that of localized knowledge. As Antonelli puts it:

Replacement costs can be defined as the costs of changing the firms' existing production process and organization with a given technology because of the indivisibility, interdependence and incompatibility of different inputs generated by dimensional combinations other than those that were originally planned (Antonelli, 1999, p. 344).

Antonelli's thesis is that, when replacement costs are particularly high, firms may find that it is advantageous to maintain the same set of inputs while striving to increase their efficiency through technological innovations centering on localized knowledge:

In this context, particular relevance attaches to the process of accumulating tacit knowledge based on learning from experience, and more in particular on learning by doing, learning by using, learning by interacting with customers, and learning by purchasing. Here, learning is understood as a product which is closely associated with the production process, and takes on all of the features of joint production. It is, in other words, a highly focused activity based on the specific skills gained by each individual player acting in his own market setting and technological environment (Antonelli, 1999, p. 345).

This approach, which at first glance might appear to be consistent with our assumptions concerning TPSs, in reality restricts its attention to the localized knowledge held by the dominant firm – Fiat in this case – and does not, in the light of fact, consider learning by purchasing, i.e., the role that suppliers and component makers have had in influencing Fiat's competitiveness and that of the Turin area's manufacturing system.

The question that remains open here concerns why we are unable to explain certain moments of discontinuity in the history of Fiat's relationships with the surrounding territory. In particular, it is not clear why, just when it was severing most of its relationships with its small-to-medium sized suppliers in the Turin area, Fiat decided to embrace new forms of organization based on lean production by opening a new plant in Melfi, far from Turin. In other words, the question is: why did Fiat accept huge replacement costs (construction of a whole new factory), rather than introducing innovation by using the localized knowledge it already had at its Turin plants? As we will see in the second part of this chapter, this decision can be better explained as part of a conscious, deliberate process of moving away from Turin, a process which relied heavily on systematic cuts in Fiat's supply arrangements with SMEs in the Turin area.

Another limitation of centering an interpretation on the microeconomic scale of the enterprise consists of the fact that regarding only the localized tacit knowledge found within the boundaries of the single major firm as important does not explain the continued existence and survival of the many fundamental firms – all "independent" of Fiat – that have had a crucial role in the history of the automotive TPS. I refer here to the bodybuilder-designers who made Turin one of the world's capitals of automotive styling. If it is true that Antonelli is right to say that Fiat is the only automaker in Turin or in all of Italy to survive independently for more than a century – and thus to assign major importance to the cognitive processes at work within the company – it is equally true that bodybuilder-

designers like Pininfarina, Bertone, Giugiaro, Stola and others have always maintained a certain independence from Fiat as styling centers in their own right and, what is even more important, as bodywork producers and assemblers for other car makers who compete with Fiat. In this sense, even though these firms do not produce or market cars of their own, a number of factors⁶⁶ make them Fiat's quasi-competitors. As a result, the microeconomic explanation centering on Fiat alone is not entirely adequate.

If we look at the data for the Province of Turin between 1971 and 1981 (Table 5.4), we will see that all of the sectors that are in any way connected to the automotive industry saw a sharp rise in the number of local units

Table 5.4 – Number of local units in the Province of Turin, 1971-1981

	Sector	1971	1981
Components	34 - MOTOR VEHICLES, TRAILERS AND SEMITRAILERS	471	601
	25 - RUBBER AND PLASTIC ARTICLES	618	1039
	26 - NONMETAL MINERAL PRODUCTS	596	646
	28 – METAL PRODUCTS; EXCLUDING MACHINERY AND EQUIPMENT	4253	6457
	29 – MECHANICAL EQUIPMENT AND MACHINERY	1202	1712
Capital goods	30 - IT SYSTEMS AND OFFICE MACHINERY	10	42
	31 - OTHER ELECTRICAL EQUIPMENT AND MACHINERY	702	1114
	33 – MEDICAL AND PRECISION EQUIPMENT	271	948
			350*

* 1971=100

Source: Istat 1971, 1981

The data show that between 1971 and 1981 there was a significant increase in the number of enterprises making up the local manufacturing system. With a distinction as made in Porter's diamond model of competitive advantage, we can divide the firms that are linked in various ways to the automotive TPS into two groups: component manufacturers and capital goods producers.

For component manufacturers, or in other words that part of the local production fabric that is directly involved in the vehicle value chain, growth in the motor vehicle, trailer and semitrailer sector amounted to 32% in this one decade alone. Growth was even

⁶⁶ For example, all of these bodybuilder-designers present prototypes that they have developed and patented under their own names, rather than simply as suppliers to major auto makers, at motor shows around the world. Nor is it a coincidence that these firms work in the coachbuilding sector, i.e., the setting where Turin's shift from pre-automotive products to its long-standing emphasis on motor vehicles first took place.

stronger in the areas of rubber and plastic articles (68%) and metal products (52%), two sectors that, while not working exclusively for automakers, nevertheless represent a sizeable portion of the firms that depend on them in some way, and particularly of the second and third tier suppliers that are not statistically classified as part of the auto sector.

The important thing that should be recognized here is that this growth in the areas depending directly or indirectly on the auto industry did not take place in a period when Fiat was increasing its competitiveness and output, but against the backdrop of market stagnation that followed the worldwide oil crisis and labour unrest that culminated in the strikes staged during the so-called “hot autumn” of 1968. The decision to outsource part of production as the first step in the deverticalization of the Fordist-Taylorist setup thus stemmed from a deliberate effort on the part of management to make the group’s organization more flexible along two fronts, viz., those of:

- (i) *labour relations*, as most of the newborn firms had very low levels of union membership, and
- (ii) *production*, by shifting the burden of technologies, costs and scheduling – and hence the enterprise risk – onto medium-small suppliers.

Seen in this light, we can say that this wave of outsourcing took place in a context of high structural coupling – imposing a hybrid relational field between hierarchy and market that will have important consequences on the fortunes of the entire TPS – between Fiat and those who could be considered to all intents and purposes as “outside units” or mere job shops. From the standpoint of organizational synthesis, by contrast, the links were extremely frail: the fledgling suppliers took no part in territorially embedded learning processes of any kind, were not involved in Fiat’s engineering decisions and could not – both because of their own organizational and cultural limits, and because such were the dictates of their sole customer – do business on the open market, diversifying their customer portfolio. This does not mean that cognitive learning processes did not take place within this web of small and medium enterprises, but only that these forms of learning were unlikely to result in the systematic production of new codified knowledge, and tended to stress innovations in processes (necessary in order to survive each new turn of the screw by Fiat), rather than in the product. In other words, the knowledge generated in this subsystem did not come into contact, or did so only sporadically, with the TPS’s broader cognitive processes, which centered on Fiat as the dominant player. Despite this ingrained flaw, and as we shall see in the following sections, once these enterprises had weathered the Eighties, they were able to play an important role in converting learning processes in new sectors and new areas of specialization.

Two types of supplier warrant specific attention: the major component manufacturers controlled by the Fiat group, and Turin's bodybuilders and body designers. Though co-design as such did not burst on the scene until the Eighties, the contribution of these two categories of supplier to the cognitive processes operating in the Turin area has always been crucial to the TPS's competitive dynamics. As we mentioned earlier, most of the area's bodybuilders and designers sprang directly from the same primordial ooze that gave life to Turin's motor vehicle industry, in the same state of near-perfect competition between hundreds of carmakers that preceded Fiat's rise to dominance. Pininfarina started business in 1930, Bertone as long ago as 1912, producing horse-drawn carriages, Stola in 1919. And even if they are less venerable, Turin's other big names in automotive styling were founded well before the first major wave of outsourcing in the Seventies⁶⁷: Itca in 1951, Coggiola in 1966, Giugiaro's Italdesign in 1968. Above all, they are all firms that originated in the pre-Fordist (or artisanal) days of the automotive industry, when European producers normally offered their more expensive models in chassis-only versions, letting customers go to the custom coachbuilder of their choice⁶⁸. These companies played an essential role in reproducing the engineering knowledge underlying the automotive TPS, and continue to do so today. They conceived, and even more importantly, built the most important models in Italian automotive history, from the first Isotta Fraschinis to the latest Ferraris, as well as designing and styling the majority of the cars turned out by the Fiat group. As for the major component manufacturers, it should be noted that most of Fiat's suppliers in the period preceding the upheavals of the Eighties were small and medium enterprises. The most significant exceptions were firms with two fundamental characteristics:

- (i) a long history in the Turin area: Riv was founded in 1906, Magneti Marelli in 1919, Teksid, though a latecomer who arrived on the scene in 1978, was a spinoff from Fiat's foundry operations which date back to 1917 with the acquisition of Ferriere Piemontese and Industrie Metallurgiche Torinesi, while the Gilardini group (part of Magneti Marelli since 1995) was formed in the Fifties from a merger with a flexible tubing manufacturer founded in 1921, the Compagnia Italiana Tubi Metallici Flessibili;
- (ii) a deep-seated organizational contiguity with Fiat: Magneti Marelli was set up with a direct investment by Fiat, Teksid was an offshoot of Fiat's metallurgical business, the Gilardini group was sold to Fiat in 1976, and Riv came into being at the direct initiative of Fiat's founder, the elder Giovanni Agnelli.

⁶⁷ I.D.E.A, established in 1978, is the only exception.

⁶⁸ Coachbuilders like Coggiola still have skilled craftsmen who make the bodywork for the Rolls Royces of emirs and princes "by hand", with drop hammers and wooden forms.

As regards the second major subsystem, i.e., that of capital goods producers, all of the sectors considered saw skyrocketing growth in the decade between 1971 and 1981 (mechanical equipment and machinery rose by 42%, electrical equipment and machinery by 59%, and measurement and control equipment by an astounding 250%). Here, there can be no doubt that the most direct link with the automotive system is Comau (the Italian acronym for Machine Tool Consortium), an association formed in 1973 to manage the commercial activities of the Turin area producers who were involved in setting up Fiat's Togliattigrad Vaz plant in Russia, and which morphed into a true corporation in 1978, through the merger of such historic names in machine tool production as MST, Morando, IMP and Colubra Lamsat, who had in their own time snapped up any number of firms operating in Turin and Piedmont since the Thirties. The most important point that should be noted is that Comau belonged to the Fiat group from the outset, and its position in the local production system is a somewhat ambiguous one. On the one hand, Comau is integrated to all effects in the Fiat Group and is thus part of the Turin-based multinational's hierarchical organization, following it on the road to globalization by opening plants near Fiat's new facilities around the world. On the other hand, Comau has gradually transformed itself from a machine tool manufacturer into an automotive production system designer and integrator for all of the major car makers. This transformation provided a major impetus to the growth of Turin's capital goods industry by multiplying the supply opportunities open to local SMEs, who thus became very much a part of the processes for learning, reproducing and extending technical knowledge in the area. In this sense, it could be claimed that this network of capital goods producers gained entry to Turin's motor vehicle TPS not just through a process of structural coupling (supply arrangements, external economies, and so forth), but also through a process of organizational synthesis whereby they were able to access cognitive pathways that, as we will see, will prove to be so decisive after 1980.

In conclusion, it seems fair to say that the local firms specializing in mechanical components and, to a certain extent, those specializing in electronics, have played a fundamental part in the creation of an automotive TPS in the Turin area, extending the reach of those cognitive processes that make up a Productive Territorial System well beyond the confines of the corporation that expresses the system most forcefully.

5.3.2 Relationships with the labour market.

Relationships with the labour market are fundamental to an understanding of the Productive Territorial System, first because we must not forget that whenever a TPS is

formed, it is always founded on positive externalities⁶⁹, and that the quantity and the quality of the labour market has traditionally ranked alongside the presence of the kind of specialized suppliers discussed in the preceding section as one of the chief foci of any attempt to come to grips with external economies. And not only: labour market pooling is one of the major points of contact between the interpretations of externalities proposed by the NEG and NIG models. The point, in the economy we are dealing with here, is one of understanding the specific contributions that relationships with the labour market have made in the formation of an automotive TPS and, consequently, in bringing about certain learning processes – i.e., in terms of Organization and not simply of Structure. In this connection, it should be noted that the role of the labour market in the TPS goes far beyond the stereotypes of the one-company town, which oversimplify the Ford-Taylorist (Amin, 1994) relationships between capital and labour in the scheme in a number of respects:

- (i) the deep divide between unskilled workers, skilled workers, engineers and other technical specialists, and white-collar employees;
- (ii) the differences in levels of union membership and in employers' attitudes towards labour organizations;
- (iii) the decisive influence that production outsourcing has on trade union organizations as well as on technical learning processes.

In this context, two aspects are especially relevant to us here:

- (i) the relationship between production organization and learning processes, and
- (ii) the relationship between learning processes and how industrial relations are managed.

Though these two aspects can in theory be separated, the links between the two dynamics are in reality strong and indivisible, given that Fiat has traditionally pursued its corporate growth goals through combined strategies that blended production organization with management of industrial relations in an apparently seamless whole.

Any analysis that hopes to clarify the role of the labour market subsystem in training and development must start from the context – and the skills – where Turin's automotive industry arose and took its first steps. Already by the end of the nineteenth

⁶⁹ Clearly, a TPS differs from simple agglomerations or qualitatively more sophisticated types of grouping like clusters of industrial districts in that the presence of external economies is a necessary condition, but is not in itself sufficient. These externalities, in fact, must have consequences in terms of Organization and not just in terms of Structure.

century, the electrical and mechanical industries had largely replaced textiles – i.e., silk and cotton processing – as the drivers of economic growth in Piedmont, gradually attracting more and more local capital in the latter's search for new and more profitable investments. On the one hand, the Turin area had a class of highly skilled metalworkers drawn from the tradition of the House of Savoy's royal arsenals and from bicycle and carriage making. And from the mid-nineteenth onwards, Turin could boast a number of institutions providing the highly specialized technical education⁷⁰ needed to produce engineering-literate middle managers for the new sectors spearheading the second industrial revolution. As Rugafiori writes:

[...] the decisive factor for the new Fabbrica Italiana di Automobili (*author's note: Fiat*) was precisely that the local system offered *exactly those* resources – financial and entrepreneurial, as well as technical, manual and cultural – in *exactly that* critical moment, when the firm could still get under way without being too far behind its competitors in Italy and, especially, those outside the country, or at least not so far behind that it would be unable to catch up. (Rugafiori 1999, p. 179)

This was a core of knowledge that reproduced itself over the approximately 150 years of industrial history in Turin and Piedmont through a territorially embedded learning process, and through a continual cross-fertilization of codified knowledge – represented by the area's engineering schools and the like – and tacit knowledge – as embodied in a class of skilled workers whose descendants can still be found today in the workshops of the great car designers and prototype makers. In other words, this is something very close to what we identified in the previous chapters as the primary feature of the TPS's organization. The very fact that this knowledge has been translated over the years into so many different, specialized, forms of production – weaponry, carriages, bicycles, motor vehicles, capital goods and machine tools, robots and measuring instruments, office machinery, electronics, telecommunications and so forth – is a confirmation of the systemic hypothesis that sees a TPS as characterized by an organizational continuity (a cognitive process) that only later finds an opportunity to translate itself into a given specialization and a given structural setup. We will return to the centrality of the learning processes in the mechanical and electrical industries – skills that later spilled over into electronics – in the next chapter, when we will attempt a reformulation of the Turin

⁷⁰ The area's first engineering school, the Scuola di Applicazione per Ingegneri – which became the Regio Politecnico di Turin in 1906 – started operating in 1860, first with a degree program in civil engineering, followed in 1879 with a degree program in industrial engineering. The first institution devoted to electrotechnical education, the Scuola Superiore di Elettrotecnica directed by Galileo Ferraris, was founded in 1888, becoming the Istituto Elettrotecnico Nazionale Galileo Ferraris in 1934.

Productive Territorial System – or systems – in the light of exactly these cognitive processes.

At this point, however, our analysis will concentrate on the relationship between the TPS revolving around Fiat and the knowledge base that supports Turin's manufacturing tradition and is incarnated, as it were, in its workforce. In particular, what we want to emphasize is the ambiguity of the relationship – one of dependence, but also of antagonism – that has linked the area's automotive TPS and its human resources.

Though Fiat will be forever associated with the introduction of Ford-Taylorism, its embrace of scientific management principles was in reality far less direct and by no means all-pervasive: while the dominant view of history⁷¹ emphasizes the trips that the elder Giovanni Agnelli made to Detroit in 1906 and 1911, his admiration for the Model T – an admiration that inspired the launch of the Fiat Zero, a car that cost 7,000 lire as opposed to the sixteen or seventeen thousand lire sticker price of the other Italian mid-size autos of the day – there is no lack of contrary evidence. Volpato argues convincingly that we cannot speak of mass production before the Thirties: thus, the first car that Fiat aimed at a wider market – the 508 Balilla – did not come out until 1932, and it was only in 1936 that the first true economy car⁷² bearing the Fiat brand made its appearance – the 500, nicknamed "Topolino" because of its fancied resemblance to Mickey Mouse (Volpato, 2004).

At the Lingotto plant, for example, "Topolino" production was organized into departments, with assembly proceeding on three parallel lines, one for the engine, one for the chassis, and one for the body. Among its other features, the vehicle had a true chassis frame, on which the driveline components, engine and bodywork were installed in sequence by work "crews". These crews are a typical feature of an organization that still relies on craftsmanship, as opposed to the individual work stations we see in fully fledged moving assembly line mass production. Each crew was made up of workers with a whole range of qualifications: the foreman in charge, followed by skilled workers, semiskilled workers, unskilled laborers and apprentices. These categories were subject to the typical rules of the craft trades: to move from one rung to the next, for example, an aspirant had to produce proof of his skill (the "masterpiece"), a demonstration of ability that Fiat still required in the Seventies (Volpato 2004, p. 41)

This thesis is borne out by the figures for productivity, measured as the number of vehicles produced per worker per year, which stayed at around 2 for approximately forty years, right up to the mid-Fifties. At that point, it began to grow exponentially, reaching and

⁷¹ See, for example, the comprehensive history of Fiat produced by Castronovo (2005).

⁷² The Balilla, in fact, cost more or less as much as a small city apartment.

then exceeding seven vehicles per worker in 1960. In other words, it would not be going too far to say that throughout the first half of Fiat's manufacturing history, production was still anchored in its craft origins, and the skills and values ("doing the job right") that were traditionally rooted in Turin's workforce have had a substantial role in the evolution of the area's automotive TPS⁷³. The first major break with this tradition came in the Sixties, when increasing standardization in production – once limited to assembly procedures – began to affect machining operations as well. Machine tools were redesigned to process a single type of workpiece, carrying out a single operation, with a single cutting tool. In other words, the skills required of a machinist – once capable of performing several processing operations with different tools – were drastically scaled back, reducing his chances for professional advancement and social mobility *within the factory*. Where the "crew" was once a many-faceted organism bringing different skills and job qualifications, it is now a harshly polarized dichotomy: on the one hand, we have the generic, one-size-fits-all workman, often hailing from Southern Italy and equipped with very little in the way of technical training, engaged in numbingly repetitive routines. And on the other hand we have the foreman, no longer bringing his own specific skills to the job, but mostly just keeping tabs on the amount of work his team is able to put out. This was a recipe for the tension between capital and labour that was to have such negative effects from the Seventies onwards:

- (i) sharp contrasts between generic workers and foremen;
- (ii) steady erosion of the know-how available at the factory;
- (iii) growing dissatisfaction with the quality of their jobs among workmen, and even among the aristocracy of skilled workers.

The most striking result of this process was the rise in absenteeism, which by the early Seventies led to a loss of 18.88% of all working hours: in absolute terms, this means that in the first seven months of 1973, an average of 19,500 people out of a total of 200,570 failed to show up for work on any given day.

For the purposes of our analysis, it is important to recognize two specific aspects of this widening gulf between management and the workforce. The first concerns how industrial relations were systematically used since the first decade of the twentieth century to bring the aspirations of the better-qualified workers back down to earth. Until the Seventies, when work crews were finally abandoned, labour relations had much more at stake than higher wages or better working conditions: to a very real extent, disputes

⁷³ Note that the importance of craftsmanship and the kinds of production organization based on it was even higher in the truck industry and in the aeronautical and marine sectors.

centered on who was to wield authority at the plant. Fiat workers, most of whom came from small-scale sectors such as carriage and bicycle production with high levels of craftsmanship, put up a spirited resistance to the introduction of scientific management principles: emblematic of this resistance was the defence of piecework contracts – characteristic of production organizations that allowed workers to work at their own speed and paid them according to the quantity produced – that marked the majority of the labour disputes in the first forty years of the twentieth century. The attempt to reduce reliance on piecework, and tie it in with the worker's acceptance of Taylor-inspired reforms in work organization, that took place midway through the Twenties with the introduction of the Bedaux system⁷⁴ gave rise to numerous conflicts that concluded with the latter system's abolition in 1934. As a result, piecework earnings in 1936 came to 90-95% of traditional wages. Essentially, what lay at the heart of the matter were not the usual wage claims and so on, but a combination of class consciousness and the workers' awareness of their own technical skills – a combination aided by the fact that, with production booming, mechanization still in its nonage, and methods of organization that continued in the main to be those of the artisan's workshop, the labour supply found that it had a relative advantage over capital. This process pushed the more highly skilled portions of the workforce to the forefront of the labour movement, leading to a period of turmoil and strikes that culminated in the occupation of Fiat's plants in 1920. Fiat took many steps in the course of its history to weaken the more militant arm of the workforce, so many that we are unable to discuss them all here. We will thus limit ourselves to two sets of seemingly contradictory measures that are of particular relevance to our analysis. Through these measures, Fiat:

- (i) introduced new training methods, and;
- (ii) filled its plants with massive influxes of unskilled workers.

In the first area, Fiat founded its first training center, the Scuola Allievi Fiat, in 1921, with enrolment largely restricted to employees' children and close relatives. In its second line of action, Fiat hired enormous numbers of poorly educated workers, first from the Piedmontese countryside and later from eastern and southern Italy: a effort it capped with the mass hiring of 15,000 workers in 1928⁷⁵. Though these two types of measure would

⁷⁴ "The Bedaux system was presented, not as a simple piecework pay scale, but as a scientific method for measuring the amount of physical energy expended by the worker, and expressed this effort in terms of a unit that represented the standard amount of work to be performed in one minute" (Musso 1999, p. 185).

⁷⁵ As Bonazzi (1999) notes, Fiat scraped the bottom of the labour barrel on this occasion, when most of the new hires were women and young people who were entirely innocent of even the most elementary technical credentials. The effect was in many ways devastating: the new employees had none of the class consciousness of the previous generations, but were nonetheless prone to claim a full complement of their

appear to be at odds with each other, they had the combined effect of reducing the importance of skilled labour. The Scuola Allievi Fiat, in fact, set out to produce technical specialists and supervisors cast in the Ford-Taylorist mould who could replace the foremen drawn from the ranks of Turin's metalworking elite, while the flood of unskilled labour watered down the workforce, leaving its fervently unionized, anarcho-syndicalist elements high and dry. These hirings, in any case, took place in periods of market growth, and were regularly followed by wholesale layoffs, particularly of the more politically active skilled workers. By ensuring turnover, they thus became a way of reshaping the workforce into more amenable form. As we mentioned earlier, this process was to take over thirty years to reach completion, as the work crews still retained pre-Fordist organizational structures at the beginning of the Fifties, and piecework had not yet disappeared.

The second aspect of the deepening rift between capital and skilled labour that is important to our analysis concerns the fate of those skills that, as could be expected, did not vanish into thin air. From the end of the war onwards, there was a complete turnaround in the relations between Fiat and that section of the labour market that embodied the knowledge we have identified as central to the learning processes that are the hallmark of Turin's productive system. From the time Fiat was founded until the Fifties, skilled workers saw being taken on by Fiat as the crowning moment of a process of empowerment that often began in smaller metalworking factories or with other carmakers. This sense of privilege did not stem only from the fact that wages were higher at Fiat and the company offered better opportunities and a plumper benefits package: above all, it was because being hired by Fiat was an acknowledgement of the worker's excellence – as witnessed by the proofs of skill that we have seen governed advancement in the hierarchy of the factory floor. Steadily and inexorably, the spread of scientific management – cutting into the leeway workers had to organize their own time and social contacts at the plant – the isolation or firing of the more politically-minded workers, the ill-feeling towards the new unskilled hires from the South⁷⁶, and the foreman's transformation into little more than a clipboard-toting stopwatch operator, if not indeed into a species of policeman and stool pigeon rolled into one, all caused workers to view their jobs at Fiat with deepening dissatisfaction. This change in attitude sparked an exodus of the more highly skilled workers towards other parts of the metalworking sector, and in particular towards the small and medium enterprises that were then springing up in response to the first wave of outsourcing, as well as towards machine tool and capital goods manufacturers and companies specializing in design and prototyping. In a certain sense, we can say that

social rights and free time at the workplace. The de-skilling of the craftsman and his supervisors was thus brought to completion, but at the cost of a substantial loss of control over the shop floor.

⁷⁶ On the significance of the migratory flows that affected the TPS and the city as a whole from the Fifties onwards, see Fofi (1964) and Negri (1982).

these skills fell into slumber after the Fifties: though they were to play an important part in guaranteeing the flexibility of the SMEs that depended on Fiat for a livelihood and could survive its monopsonistic demands only through the know-how of generations of able workmen, but their direct involvement in the Fiat automotive TPS would necessarily be limited. They were to reawaken after the Eighties, when a growing awareness that the Fiat TPS was cutting its moorings to the Turin area prompted observers and policy makers to raise questions about the other structures - or in other words, the other areas of specialization – that were also repositories of the mechanical and electric knowledge underlying the system.

In the picture we are attempting to outline – one depicting the Turin's automotive industry at its Fordist pinnacle as a TPS – we can thus conclude that the relationship between Fiat and the labour market evolved from the Fifties onwards largely in terms of structural coupling, applying the eminently Taylorist tenets of hiring poorly qualified labour and marginalizing the more highly skilled portions of the workforce. Throughout this evolution, two processes rode in tandem: the “scientific” reorganization of production, and the strategic manipulation of labour relations. Above all, the demands of this structural coupling between capital and labour – on the same baldly contractual basis as any other exchange of goods – were to have a profound effect on the structure of the city, inundated by thousands of unabsorbed workers housed in immense bedroom communities on the outskirts of town. The tradition of “doing the job right” expressed by the learning processes that were the foundation of the organizational synthesis between capital and labour in the first years of Fiat's life was pushed further and further aside. This is by no means the same as saying that Fiat was nothing more than an empty shell, all its technical skills drained away. Nevertheless, though the more dedicated sections of management and a class of technicians and engineers worked steadfastly on, swinging between triumph and crisis, it is also true that, from the Fifties to the Eighties, they did so in a rigidly organized work hierarchy which permitted a bare minimum of strictly codified interaction and involvement in learning processes that was a far cry from the German and Japanese approach to worker participation in decision-making.

5.3.3 Relationships with the public administration.

As for the last aspect that we must analyze, viz., the contribution that the “public administration” subsystem made to the creation and evolution of the Turin area's automotive TPS, we can start by simplifying the complexity of the relationships between Fiat and political power. Here, then, it is not unreasonable to say that it was in Fiat's dealings with the public administration that the traditional canons of Fordism were applied most directly and explicitly to the Turin area. The public administration's attitude towards Fiat, in fact, was essentially one of submission, as it limited itself to the “Keynesian”

function of supporting the growth of the area's – and the country's – largest enterprise. Translating this into systemic terms, we can say that the relationship between the public administration and the automotive TPS bore the unmistakable stamp of structural coupling, in the sense that the PA did no more than guarantee that the system was provided with the functional structure that was indispensable to the rise of a Ford-Taylorist model (industrial areas and housing sites, regional infrastructures, transportation, professional training, etc.), without ever making significant forays into the learning processes that gave the TPS its identity. The fact that one of the major bedroom communities built in the Seventies to house the torrents of immigrants arriving from the South⁷⁷ was named "Le Vallette" after Vittorio Valletta, Fiat's celebrated chairman and the man who did more than anyone else to whip the company into Fordist form, is perhaps the most telling expression of the workaday usefulness that linked local politics to the automotive system. By the same token, an elementary morphological reading of the infrastructural system in Piedmont and Turin could reveal the geography of the functional relationships between Fiat's plants and the metropolitan area with exceptional precision. Not even the election of the communist Diego Novelli as mayor of Turin, an office he held from 1975 to 1985, during the so-called "leaden years" which were perhaps the most difficult period in the city's political life, was able to bring about substantial changes in the relationships between the PA and Fiat⁷⁸.

5.4 The transformations of the automotive TPS.

The crisis of the Seventies wrought deep-seated changes in both the structure and the organization of the Productive Territorial System, in a process that then picked up unprecedented speed in the Eighties and Nineties. Our aim in this section is to demonstrate how the relational foundations under the TPS we outlined in the previous pages began to crumble, shifting irretrievably towards a gradual but inescapable de-territorialisation of all relationships, be they tangible (structural coupling) or intangible (organizational synthesis).

5.4.1 Relationships with suppliers: the shakedown.

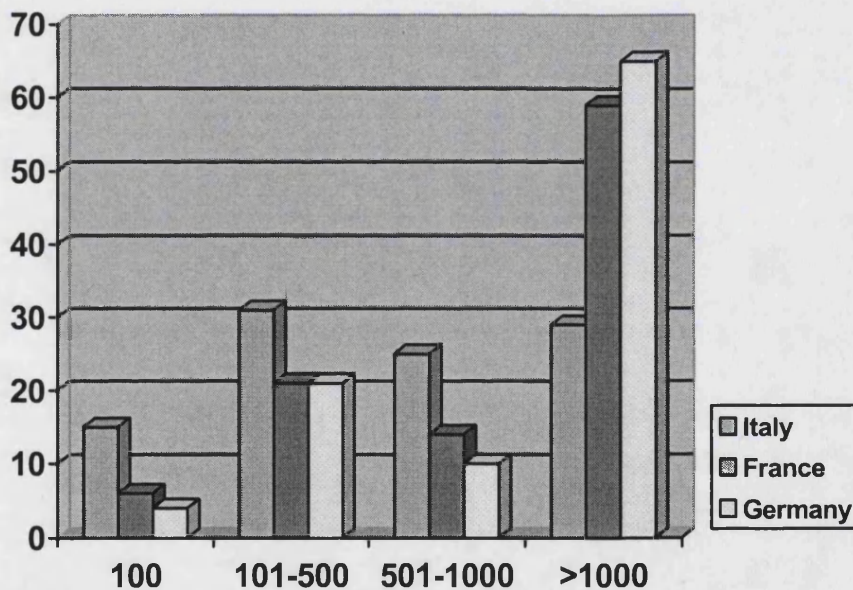
Without doubt, the decisive event that struck to the heart of Fiat's relationships with the local production system was the decision, which took shape in October 1989, to adopt Total Quality Management. To this end, Fiat fielded a number of specific projects whose goals involved a reassessment of the very principles underlying the company's structure in order to restore its competitiveness. With the worldwide motor vehicle industry dogged by

⁷⁷ Turin doubled its population in this period, going from around 600,000 inhabitants to over a million.

⁷⁸ To understand how little local politics counted in Fiat's strategic decisions, we need only note that of the 15 mayors who ran the city after World War II, Novelli is the only one to figure in the index of names appended to the major monograph on Fiat's history (Castronovo, 2004).

financial woes and balky markets, Fiat Auto's priorities lay in cutting costs, renewing its product lineup, stepping up its globalization strategies, boosting quality and reestablishing Italy's preeminence in design as a means of setting Fiat's products apart from the crowd and sharpening their competitive edge. Projects were thus drafted for shortening time-to-market, rationalizing and reducing management costs, forging better relationships between the automaker and its network of suppliers, improving quality in product distribution and after-sales service, and implementing a new approach to organizing work at manufacturing facilities. One of the first things to be borne in mind in this connection is a trait that has long been typical of the Italian component industry: its fragmentation. Thus, though Italy has twice as many automotive suppliers as Germany or France, their average size is far smaller. In 1990, at the beginning of the "new route" inaugurated by Fiat, Italy's automotive industry was served by around one thousand suppliers, as against 600 in Germany and 400 in France (Figure 5.1).

Figure 5.1 – Size classes of European car component makers.



Source: AMMA data

In terms of average number of employees, however, these suppliers were only one third as large as their French counterparts, and a quarter the size of those in Germany. Considering the increasing percentage that components represent out of the total value of a car, and the need to devote ever-heftier chunks of the R&D budget to them, this figure testifies to the true extent of Italy's handicap in this area, and the pressing need to do something about it.

Another point to be borne in mind regards Fiat's ability to develop a significant level of vertical integration, which for decades hinged on two factors: first, Fiat's position as Italy's only large automaker until the end of the Second World War, and second, the

technological backwardness that marked the Italian mechanical industry for much of the early part of the twentieth century. This development model changed radically in the area of interest to us here after Fiat Auto's strategic decision to outsource many components and systems from suppliers who would be able to close this technological gap and bring costs down to the levels enjoyed by competitors on the one hand, and to streamline the production process and improve product quality on the other⁷⁹.

But Fiat's dealings with independent suppliers were also scrutinized in an effort to reduce the level of vertical integration and clear the way for a new type of partnership. In a few short years, Fiat Auto sharply increased its component purchases and, even more importantly, had more and more of its component development and design work performed by outsourcers. The goal behind this decision – making sure that everything that is bought-out is also designed-out – has now been reached, as more than 70% of the parts in Fiat's cars are both designed and produced outside the company⁸⁰. Accordingly,

The changes in the nature and structure of that group of enterprises that makes up the automotive value chain have been such that where we once had a loose assortment of suppliers and subsuppliers to the auto industry – or rather, to Fiat – we now have a system. In other words, we have gone from a situation where suppliers depended on Fiat not only as a market outlet, but from the technological standpoint as well, given that design was largely concentrated at Fiat, to a situation where the end producer's performance is heavily dependent on the behaviour of all the firms in the chain. This, then, marks a change from a relationship of domination/subordination to one of cooperation between automaker and suppliers (Enrietti and Lanzetti, 2002, a: 18).

As a result, Fiat passed from being a vertically integrated manufacturer, to increasing reliance on outsourced production, services, and even design (Table 5.5).

Table 5.5 – Fiat Auto's vertical disintegration (percentage of outsourced production and design)

	1982	1987	1992	1996	1998	1999	2000
Production	50%	52%	65%	70%	70%	73%	72%
Design	30%	30%	45%	59%	70%	73%	72%

Source: Whitford and Enrietti 2005, p.783

⁷⁹ In this context, mention should be made of the *Guidelines for Cooperation between ANFIA Vehicle Manufacturers and Component Suppliers* issued by ANFIA, the Italian National Association of Automotive Industries, in 1990. Founded in the idea that customer satisfaction is the basic goal pursued by vehicle manufacturers and component suppliers alike, the Guidelines established the fundamental principles on which cooperation between the two groups is based, aiming at continuous improvement through Total Quality Management.

⁸⁰ While 30% of the components used in Fiat's 1983 Uno were designed by outsourcers, the percentage rose to 45% for the 1993 Punto and 60% for the new Thema in 1995.

This process, which is by no means over, has involved a series of mutual adaptations which have not only called for an ability to innovate, but have also entailed risks – in the form of new investments – and sacrifices, as costs have continued to come down. At the end, however, they have provided a small group of elite suppliers – chosen for their demonstrated “loyalty” to the carmaker, as well as for their growth capacity – with an opportunity to prosper, increasing their know-how, size and economies of scale. And this, by making them less dependent on Fiat, has enabled them to increase their sales to other areas⁸¹.

5.4.1.1 Reduction in the number of direct suppliers

If we look at the same process from the supplier’s viewpoint, the first thing we see is pronounced trend towards concentration. Some of these firms – those to whom Fiat channels more and more of its purchases – have become Tier 1 component suppliers, charged with coordinating their second-tier competitors. Through this process, Fiat has made an all-out effort to cut the number of its direct suppliers, which dropped by over 40% in only a few years (Table 5.6).

Table 5.6 – Direct Fiat Auto suppliers

Year	1984	1985	1986	1987	1988	1989	1990	1991
Number	1200	998	865	1200	1050	990	723	670
%	100	83.2	72.1	100	87.5	82.5	60.3	55.8
Year	1992	1993	1994	1995	1996	1997	1998	2001
Number	560	520	410	380	370	350	367	330
%	46.7	43.3	34.2	31.7	30.8	29.2	30.6	27.5

Source: reworked from Volpato 2004, p. 283

Obviously, the figures shown in Table 5.6 do not imply that 70% of Fiat’s suppliers have been expelled from the TPS, but simply that:

- (i) The outsourcing hierarchy has been reorganized, reducing the relational complexity immediately upstream of Fiat by cutting the number of direct suppliers.
- (ii) Subsuppliers are grouped around the Tier 1 supplier, who is responsible for designing systems and modules, managing input from second and third tier suppliers, assembling integrated systems and performing final inspection.

⁸¹ Surveys by the Turin Employers’ Association and API, the area’s small and medium enterprises association, have shown that Fiat Auto’s partners in that period depended on the carmaker for an average of around 45% of their revenues.

This process of rationalizing procurement is even clearer if we look at the number of suppliers per product line: in 1989, each product line was served by an average of 8.5 suppliers⁸², a number that had been halved only two years later, and then dropped to slightly over 2 in 1996 (Volpato, 2004, p. 282-284). The reasons for having so many suppliers in the first place lie in Fiat's desire to retain the upper hand and increase its bargaining power by setting up a competitive mechanism among potential suppliers, maintaining control over technologies, scheduling, quantities and prices. In this sense, we can say that though buying out was always an option, the corporate hierarchy was – at least until the end of the Eighties – the predominant institution, and turning to the market was seen as the merest formality. In addition, having a large number of suppliers for each product line was a sort of insurance policy that protected Fiat if suppliers were caught up in labour unrest, as

- (i) Work stoppages at any one component supplier could be readily compensated; and
- (ii) Multiplying the number of suppliers effectively limited their growth, putting them less under the sway of the labour unions.

At least on paper, these quantitative changes were necessarily accompanied by improved relations along the entire value chain, establishing a true spirit of partnership with suppliers. This, as we have said, was the result of an extensive assessment of suppliers' current and prospective capabilities as regards the goals to be achieved, and not simply in terms of value for money as in the past. Above all, it resulted from a program of "Guided Growth" that was intended to spark processes that would improve quality across the board (from design to flexibility in responding to orders) and keep costs down. This Guided Growth process was organized by setting up "roundtables" with Fiat Auto personnel, specialists from Isvor⁸³ and supplier management. The operational stage began as soon as a diagnostic method had been developed for identifying sources of waste and inefficiency, opening "test sites" at a number of suppliers for trying out ways of increasing productivity and the quality of intermediate products.

At the end of this process, a significant number of suppliers (around 50% of the pool) had qualified as partners and were awarded multi-year supply contracts. The next

⁸² As we will see in the conclusions to this chapter, when we will attempt to reconstruct an image that reflects the changes that took place in Turin's automotive TPS, the reduction in the number of direct suppliers per product line is one of the basic features of the transition from a Fordist approach to dealing with suppliers to an approach influenced by Japan's Keiretsu networks, though we are not yet dealing with a complete Toyotization.

⁸³ Isvor is the Fiat Group training center.

important measure was to authorize suppliers to self-certify their own output: an essential step in being able to implement just-in-time deliveries, as self-certification eliminates the need for acceptance inspection, and parts delivered by suppliers can be sent directly to the assembly lines. The progress that was made in this area is documented by the fact that all supplies to Fiat are now self-certified, with the result that by 2002 the number of parts that failed to comply with agreed standards stood at an eminently commendable 5 per million.

While it is true that this process of reorganization was largely successful in meeting its twofold goal of simplifying dealings with suppliers and improving component quality, the aspect that is of greatest interest for our analysis is the radical rearrangement of the TPS's internal hierarchy that it produced:

- (i) As regards Tier 1 suppliers, it should be borne in mind that a significant proportion are branches of multinational corporations, while many of the remaining nationally-based independent suppliers belong to corporate groups that often have an international dimension of their own.
- (ii) The second- and third-tier suppliers, who have closer links to their home region, have seen an increase in their products' importance in recent years. These are the suppliers who have borne the brunt of Fiat's rationalization programs and cost-cutting measures.
- (iii) The largest group is found at the lowest level: small enterprises with extensive experience in some specialized area and an approach to running their businesses that is more that of the engineer than the manager. To be competitive, they rely heavily on factors such as low product cost, flexibility and responsiveness to changes in plan and the demands of just-in-time delivery, and quality that the customer sees as acceptable, though not outstanding. The fact, however, that they depend on the technical and manufacturing skills of a single entrepreneur can make these firms vulnerable when they are called upon to shoulder design responsibilities and guarantee quality through product and process controls (Enrietti and Lanzetti, 2002, a: 19).

Finally, it should be noted that the procurement rationalization process also extended to the so-called captive component supplies, i.e., those by firms owned by the automaker. In this area, Fiat's position is something of an anomaly on the OEM scene, and has been ever since it was founded, when its chosen strategy was to make virtually all components in-house. Table 4 shows how the Fiat Group was in a certain sense one of its

own biggest component suppliers, at least in terms of production variety⁸⁴ (Table 5.7). At the end of the Seventies, captive production accounted for around 46 component families out of the 60 then in existence: a number far above the 27 families produced by the second-largest supplier, Lucas. In addition, Fiat's component output also included a sizeable share (61%) of the families featuring low-to-medium technological content.

Table 5.7 – Component families and suppliers

Producer	Number of component families produced	Percentage of output featuring low-to-medium technological content
Component families	60	50.0%
Fiat	46	60.9%
Lucas	27	44.4%
Ferodo	24	41.7%
Bosch	22	36.4%
Bendix	20	35.0%
ITT	19	52.6%
AC Delco	18	50.0%
GKN	13	0.0%
TRW	10	50.0%

Source: Volpato 2004, p. 190

In this period – the late Seventies – captive component production was a flourishing scene, with around 60 plants nearly all of which were located in Italy, 37,200 employees, and total revenues of 1,460 billion Lire (approximately 730 million euros). Some ten years later, in 1987, component production was in the hands of three large groups: Magneti Marelli (electromechanical equipment), Gilardini (mostly rubber and mechanical components) and Teksid (metallurgical products)⁸⁵.

5.4.1.2 The creation of codesign platforms

In the reform of component supplies, one of the greatest breakaways came with the gradual involvement of suppliers in creating innovation and developing new products and processes. The Fiat-supplier relationship of the Sixties and Seventies was largely limited to contract processing, especially in the case of SMEs. At the beginning of the Eighties, however, Fiat's need to improve the quality of its cars was transmitted all the way down the component manufacturing value chain, where efforts were made – or at least planned

⁸⁴ In terms of volume, the Fiat Group's importance is less striking, despite the efforts that the Group has made since the Eighties to encourage its captive suppliers to increase the proportion of their sales revenues from other OEMs.

⁸⁵ As mentioned earlier, this is not in fact a three-way split, as the group of suppliers also includes Comau, the capital goods and production systems manufacturer established in 1978.

– to help suppliers deal effectively with quality issues. In this process of extending quality control back down the line, development assignments played a fundamental role.

As can be seen from Table 5.8, a conspicuous amount of New Product Development (NPD) work was already being delegated to suppliers in the early Eighties. This trend continued throughout the decade, which ended with nearly 400 development assignments awarded in 1989 alone. In reality, though, if we look at the value of these NPD assignments, we see that they averaged around 250 million lire each (approximately 130,000 dollars): pitifully little set against what it takes to run a serious R&D program in a sector like the automotive industry. It should be noted, moreover, that the average value rose only in the first five years of the decade (peaking at 345 million lire per assignment in 1985), and had already started to drop back down to initial levels in 1986.

Table 5.8 – Relationships with component manufacturers

	Development assignments			Long-term contracts
	Number	Billions (lire)	Average value (million lire)	Billions (lire)
1980	29	6	207	NA
1981	34	8	235	NA
1982	38	9	237	300
1983	41	12	293	353
1984	48	15	313	420
1985	58	20	345	470
1986	80	27	338	730
1987	155	45	290	970
1988	261	75	287	1600
1989	377	101	268	1750

Source: reworked from Volpato, 2004, p. 194

Nevertheless, the growing number of outside development assignments takes on an entirely different meaning if we interpret it in the light of the process of vertical disintegration that got under way towards the end of the Eighties, and which we discussed in the previous sections. Until the mid-Nineties, as Table 5.9 demonstrates, there was a yawning gap between the percentage of components that Fiat Auto bought from outsourcers and the percentage of these parts that were also designed outside the company.

As can be seen, the principle that production and design should be bundled together reached fulfillment in the second half of the Nineties, when the semi-jobshop status that had branded the majority of component suppliers finally became a thing of the past.

Table 5.9 – Vertical integration and component design

	1987	1992	1997	2000
Make	38%	35%	30%	28%
Buy	62%	65%	70%	72%
- buy captive	14%	18%	17%	17%
- buy non captive	48%	47%	53%	55%
Outsourced design	24% ¹	30%	70%	72%

Source: reworked from Volpato 2004, pp. 280-281

5.4.1.3 In-house outsourcing

The third factor in the radical transformation in customer-supplier relationships was in-house outsourcing (IHO), or in other words, the near-deverticalization of certain production activities, which are assigned to specialized suppliers but carried out at the OEM's plant, under the same roof.

Under-the-same-roof outsourcing is emerging as an important novelty in the governance of transactions. Specialized suppliers are called on to contribute to the production process of the focal company within the physical boundaries of the focal plant. Specialized suppliers undertake their own specialized activities in the same plant alongside the activities still carried on by the focal company – or by other specialized companies – within a broader production process that is designed, monitored, implemented and eventually changed by the focal company. Spatial proximity becomes a basic ingredient to coordinate the activities of the specialized supplier and to make them transparent and open to scrutiny and control by the focal company. (Bonazzi and Antonelli 2003. p. 578-579)

In this sense, in-house outsourcing can be a way of going beyond the standard make or buy tradeoff, since it has certain features that bring this form of organization closer to the network, viz.:

- (i) The incomplete contract approach, and
- (ii) The need for coordination activities.

As Bonazzi and Antonelli maintain:

According to the incomplete contract approach, transactions can be performed in the market place also when sequential redefinition of the terms of trade and the mutual obligations of the parties involved is possible within dedicated contractual specifications. Incomplete contracts are stipulated between parties that agree upon the conditions and the procedures by which future obligations are assigned. [...] Second, for IHO to be implemented substantial coordination activities need to be performed. The outsourcing firm closely monitors the actual performance of the

tasks assigned to the external specialized supplier. As a rule, when outsourcing is sequential, monitoring in the focal company follows bureaucratic criteria. When outsourcing is interdependent, both partners are expected to rely on mutual understanding and cooperation based on "good will". (Bonazzi and Antonelli 2003, p. 579)

At Fiat, IHO has chiefly been applied to four processes: managing presses and wheel assembly units on the production side, and managing logistics and plant maintenance on the services side. Here, the findings of an empirical analysis conducted by Bonazzi and Antonelli are of interest, as they suggest that IHO operations can be classified into four categories (Table 5.10).

As the table shows, market rules are sufficient for operations whose complexity is low. As complexity increases, as it does for logistics and maintenance, hierarchical forms of agreement will come into play alongside these rules.

Table 5.10 – Cross-referenced operations at Fiat Auto

	Sequential	Interdependent
Low Complexity	Presses (market)	Wheel Unit (market and approved reciprocity)
High Complexity	Logistics (market and hierarchical agreements)	Maintenance (market, hierarchical agreements and disapproved reciprocity)

Source: Bonazzi and Antonelli, 2003, p. 590

An even more interesting point is that reciprocity – i.e., the give-and-take typical of networked organizations, with their interdependence and mutual reliance – is applied to two specialized suppliers (Magneti Marelli for wheel assembly and Comau for plant maintenance) who are both part of the Fiat Group. In other words, informal arrangements such as exchanges of favors and micro-negotiations between UTEs (the so-called Elementary Technological Units responsible for each self-contained segment of production), arise only where there is a close formal link – the fact of belonging to the same group – upstream of any incomplete or open contract. Obviously, it is not possible to determine whether reciprocity depends on this latter factor, but the suspicion remains that common ownership facilitates communication and fellow-feeling between customer and supplier, since any losses that might occur in either partner's market will be canceled out once they move up to the Group scale.

From the standpoint of our analysis, IHO is interesting for several reasons. Ostensibly, it is a way of managing outsourcing that is based on close physical proximity (with operations "under the same roof") and thus puts territorial constraints on the process of deverticalizing production. In addition, IHO would appear to encourage the replacement of the hierarchical organization marking Fiat's dealings with its suppliers in the Fordist TPS

with a hybrid cross between the market and the network. Looked at more closely, however, this process is largely incomplete, given that:

- (i) two of the four suppliers involved belong to Fiat, and are thus bound by the same strategies as the OEM: in other words, the process of under-the-same-roof decentralization would not appear to be capable of creating interdependencies that can stand in the way of delocalization;
- (ii) as we have shown, informal reciprocity appears to apply only where there are formal relationships that are far firmer and more “reassuring” than incomplete contracts can offer. In this sense, the same thing that we have seen happen with co-design seems to take place with IHO: though relationships of mutual dependence and shared decision-making processes appear to emerge, they in reality mask tremendous staying-power on the part of the Fordist TPS’s traditional hierarchical organization.

5.4.1.4 Penetration by foreign groups and processes of concentration

Another far from unimportant point concerns the relationships between Italian and non-Italian suppliers. When change first began to sweep through the system in the early Nineties, most Italian suppliers were located in the Turin area and, a few exceptions aside, were somewhat underdeveloped technologically (as we have seen, this was due to the lack of other carmakers and the high level of vertical integration in Fiat Auto’s design work). As an inevitable consequence, Fiat turned to foreign suppliers at the same time that it introduced Guided Growth programs for local vendors:

Opening the doors to foreign suppliers was a means of compensating for the weaknesses of the Italian firms, though there can be no doubt that the latter were more flexible. Unlike Italian suppliers, the foreigners could rely on more sources of knowledge because they had more customers. And they had more highly developed R&D structures, because even if their customers – our [German] competitors – did less co-design than we do, they demanded higher levels of technology. And so we decided to bring foreign suppliers into Italy (interview with a Fiat Auto manager in Caputo and Zipoli, 2001).

Many of the big European component makers benefited from this reorganization (including, for example, Plastic Omnium, GKN and Valeo). But a large slice of the market went to US suppliers, who took advantage of the opportunity extended by Fiat to break into the European market or expand their presence on it. This had far-reaching repercussions on the sector and on the destinies of many Italian firms, who thus had to choose between diversifying their customer portfolio and selling to carmakers other than Fiat, becoming

subsuppliers, or specializing in the service parts market. The result, as we have said, was a pyramidal procurement structure, where Fiat Auto and every Tier 1 supplier all had more than one supplier and more than one customer.

Finally, we must not forget the agreement that Fiat and GM signed in March 2002 (and terminated in 2005)⁸⁶ to set up two joint ventures to handle the two groups' purchasing and powertrain design and production operations in Europe and Latin America. In essence, this agreement merged all procurement activities for Fiat and GM, who undertook to use a single channel for all their component purchases. This was a move that further disturbed supply equilibria in Italy. Though Fiat suppliers' potential sales multiplied, so did the number of their competitors, which almost doubled when GM's suppliers – and GM itself, with its own component design and manufacturing divisions – erupted onto the scene. Even though the agreement has since been terminated, it had an abiding influence on how outsourcing is organized, since Fiat introduced the APQP (*Advanced Product Quality Planning*) system required for certification to the US's QS9000 quality standard as part of its preparations for setting up the GM-Fiat Worldwide Purchasing joint venture. As this system obliges suppliers to comply with rigidly codified parameters for engineering performance, quality, cost and service, it is likely that the reduction in the number of suppliers and the expulsion - whether total or partial – of local firms from the TPS centering on Fiat will continue in the years to come.

5.4.1.5 Conclusions

In conclusion, we can say that Fiat's reorganization of its outsourcing operations has brought major changes to local firms in the Turin area, who have emerged both strengthened and weakened:

- (i) *Strengthened*, as the deverticalization of NPD processes and the spread of co-design practices has involved an increasing number of firms in the TPS's characteristic learning processes.
- (ii) *Weakened*, since the reduction in the number of Tier 1 suppliers and fact that many of them are now supralocal firms specializing in worldwide component production is marginalizing a growing number of SMEs who were direct suppliers in the Eighties.

Restating this in a systemic formulation, we can say, roughly, that:

⁸⁶ See pages 12-13.

- (i) In terms of *structural coupling*, links have weakened: a fair number of components still come from the Turin area, but are made by multinational groups, who have located in the region essentially because of the need to supply the Mirafiori plant.
- (ii) In terms of *organizational synthesis*, the links have been selectively strengthened, as the greatest increases in involvement in learning processes are being made by those firms that have specific skills in component design and engineering.

Looking more closely, however, the process of organizational synthesis also gives cause for concern. First, the massive influx of multinational component suppliers has appreciably narrowed the range of R&D activities carried out in the area: generally speaking, this kind of work tends to be redirected to the parent company's research centers, which are usually outside Italy, leaving the more mundane tasks of product engineering and adaptation to the needs of the end customer – Fiat, in other words – to Turin. Two further aspects, one negative and one positive, of outsourcing's reorganization will be dealt with more explicitly in the following sections. The first is the close link between the (re)organization of the relationships outside Fiat and the (re)organization of production inside Fiat's plants: deverticalizing procurement is part of a process of radical change in the manufacturing process carried out under the banner of lean production and new forms of integration at the factory. Now, as we will see in the next section, these dynamics are at work only marginally in Fiat's plants in the Turin area, and are concentrated in the plants in Southern Italy. And on the other side of the coin, as we will see in section 5.4 – over and above the changed status of local firms, and SMEs in particular, in the automotive TPS – the spread of co-design, the strengthening of managerial expertise and capacity for innovation, and the dwindling number of job contracts from Fiat have all played a fundamental part in reducing local SMEs' dependence on the Turin area's monarchical OEM, opening up new prospects for growth which we examine later in our analysis.

5.4.2 Relationships with the labour market.

Like the other systemic relationships discussed above, relationships with the labour market have changed drastically from the Eighties onward, both as regards how work is organized and in terms of industrial relations. In the latter area, one date stands out as the true turning point: October 14, 1980 (Castronovo 2005, pp. 693-698). On that day, Fiat supervisors organized a demonstration in favor of the "right to work", hoping to put an end to the picketing and strikes that had brought production to a near-standstill for 35 days⁸⁷. The demonstration went well beyond expectations – the organizers had thought that only around 3,000 people would show up – and ended with an impressive number of

⁸⁷ The strikes had been called to induce Fiat to reconsider its planned job cuts, which would have resulted in almost 15,000 layoffs, mostly in the Turin area.

supervisors, middle managers, office workers and ordinary citizens marching through the streets. Over and above the unlooked-for number of participants⁸⁸ and the effect it had on negotiations⁸⁹, the protest's real significance was political, as it expressed the discontent and dissatisfaction, not so much of the white-collar workers, but of the supervisors, or in other words, that section of the highly skilled working class whose status had suffered most over the years, caught as they were between the rock of scientific management and the hard place of the labour unrest spearheaded by the masses of poorly qualified immigrant workers. As Castronovo writes, the supervisors:

... had in the last few years been saddled with the most thankless tasks, as well as the heaviest responsibilities, involved in dealing with both management and the shop stewards. They had do everything from keeping the lines running, to making an unruly workforce somehow do what the company had planned. In addition, they had become one of terrorism's prime targets, and the union had done nothing, either to protect them or to systematically isolate whoever had threatened or attacked them, or even to try to maintain certain standards of professionalism. Indeed, the supervisors had been penalized by an over-egalitarian collective bargaining approach that sought to iron out wage differences and reduce mechanisms for taking merit and experience into account (Castronovo 2005, p. 694)

Paradoxically, we can say that in many ways the real intent of the march of the forty-thousand was more to affect organizational practices at Fiat than to reform industrial relations. Though it did not fail to have profound effects on both of these aspects, they did not take the direction the march's organizers had mapped out. True, the dynamics of work organization versus labour relations did in fact change, reducing conflict at Fiat's plants and easing Ford-Taylorism's strictures. But it is also true that the skilled workers in the Turin area were not the chief beneficiaries. As we will see in this section, the real factors in reducing disgruntlement about working conditions were technological innovation and automation, not some heralded return to the craftsman's practices and his respect for "doing the job right".

With automation as with so many other changes, the transformations began when motor vehicle production was still in full Fordist swing. At the beginning of the Seventies, eighteen Unimate welding robots were introduced at the Mirafiori plant, followed by the Digitron system in 1974 and the Robogate system at the Rivalta and Cassino factories in

⁸⁸ Estimates ranged from 20,000, according to the police, to 40,000: hence the name "march of the forty-thousand" popularly assigned to the protest.

⁸⁹ Immediately after the march, the unions signed an agreement whereby Fiat would forego its planned layoffs, and 22,000 workers would draw state-funded unemployment benefits for a period of two years.

1978. Though these first experiments in automation were made in the Turin area, this must not distract our attention from the fact that almost all of the subsequent changes in work organization took place alongside Turin's marginalization and were instrumental in bringing it about, helping de-territorialize the area's automotive TPS. Fiat's conversion to automation culminated with the idea of the Highly Automated Factory or HAF, an idea that became reality, not close to home at Mirafiori or Rivalta, but at Termoli in 1983 and at Cassino in 1987.

Undeniably, these innovations reduced the stress and fatigue associated with many factory jobs, introducing ergonomic improvements and moving a high proportion of the workforce away from tiring manual tasks and into indirect control and maintenance functions. On balance, however, their real upshot was not to untangle, but to add to the technocentric contradictions of scientific management. The interpretation advanced by Volpato is of interest here:

Turn-of-the-century Taylorism was riddled with problems from the standpoint of the relationships between the technological setup and the organizational setup: many more problems than it has today, since it could only make headway by breaking up the old structure of craftsmens' qualifications. Nevertheless, it gained ascendancy because its power to create efficiency was enormously higher than that of craft production (seen as a sort of socio-technical "golden age"), and this higher efficiency largely offset the organizational conflict it engendered. [...] Conversely, it seems clear to me that if the technocentric paradigm is pushed to the limits of its current potential, critical problems will inevitably emerge that creative, proactive socio-organizational approaches would be able to solve much more simply and economically than any system that is totally reliant on purely technical solutions. (Volpato 2004, p. 263)

The need to overcome the contradictions inherent in technocentric production organization by restoring the balance between its technical and social components spurred Fiat's top management to develop the concept of the Integrated Factory (IF), touted as the end of the Ford-Taylorist era and the dawning of a new "Italian" approach to just-in-time and Toyotism. The aspect of the integrated factory which is of greatest interest to us here is the Elementary Technological Unit, or UTE in its Italian acronym, which Fiat documentation defined as:

The basic organizational unit governing a measurable elementary technological subsystem which carries out prevention, variance compensation, self-inspection and continuous improvement activities in order to meet the firm's goals for quality, productivity and service (quoted in Volpato 2004, p. 270)

The UTE introduced new professional roles to oversee shopfloor workers:

- (i) the UTE supervisor, who combines the duties formerly assigned to the shop foreman with additional responsibilities for costs, quality and service. Above all, the reform laid the emphasis on the proactive rather than the reactive or adaptive dimension, shifting the focus away from the mechanical application of rules established by the higher-ups, to cross-functional procedures that allow a good deal of individual discretion and independent decision-making;
- (ii) the "integrated process team leaders" (CPIs) and "integrated process operators" (OPIs) who are responsible for teaching shopfloor workers the "right way to do things", and thus ensure that quality goals are achieved. To a certain extent, they are allowed to use their own discretion in performing their duties.

Volpato's conclusions in this context would appear to be convincing:

The attention to detecting and interpreting the "weak signals" that can provide advance warning of operating problems, the emphasis on problem-solving, the right/duty to show creativity in exercising their own judgment, all make the role of the CPIs and OPIs very different from that of their predecessors, the deputy foremen and skilled workers. The CPI/OPI is not the UTE shopfloor workers' hierarchical superior, but a functional coordinator whose standing is legitimized by his effective ability to find positive-sum solutions. [...] In my view, Fiat's biggest conquest as a learning organization lies precisely in the relationship between the CPI/OPI and the shopfloor operative. When it comes down to it, both the role of the UTE supervisor and that of the team can perfectly well be seen as another way of implementing decentralization in the technocentric organization and driving a wedge between those who make the decisions and those who carry them out. [...] it is only with the CPI/OPI that we finally have a figure who is expected and paid both to "work" and to "think" and, above all, to "train". (Volpato 2004, pp. 272-273)

Aside from the question of whether introducing the UTE did in fact meet social and organizational expectations rather than simply satisfying the demands of production and efficiency, what we want to make clear here is that it can to a certain extent be interpreted as a return to that sense of responsibility for "doing the job right" that the skilled worker had at the dawning of Turin's automotive TPS, and which was deliberately undermined by the forced introduction of scientific management. In this sense, we can indeed speak of a learning organization. What remains to be determined is the effect that these transformation have had on the TPS *qua* learning region. The point to be underscored here, and which justifies the emphasis put on this reform, is that the introduction of the Integrated Factory was not preceded by trials or pilot projects of any kind at Turin's plants,

which thus lost some of their standing as test beds and “laboratories”. Above all, it should be noted that choosing where the IF would be introduced called for an elaborate and complex decision-making process that excluded the Turin area *a priori*. And though it is true that the radical nature of the innovation was better served by a greenfield plant, the choice of peripheral areas with no significant manufacturing tradition was indicative of the dim view that Fiat’s top management took of the Turin area. As the IF was very much an attempt to apply the principle of the learning organization to the production structure, the decision to rule out exactly that area that had Italy’s highest concentration of automotive knowledge was tantamount to admitting, more or less implicitly, that the thoroughgoing application of Ford-Taylorism had redrawn the entire cognitive scene surrounding the Turin TPS. Just how radical this decision was is confirmed by Bonazzi, who found that the UTEs at Turin’s Mirafiori plant spent more time in getting production back on track than on improving productivity. Bonazzi thus suggests that there is a bifurcation between the UTEs that are more successful in carrying out the imperatives of the Integrated Factory, and their poor relatives, the UTEs in and around Turin, who are still caught up in Fordist stopgaps and fire-fighting. Further proof can be found in the fact that the decision to build an IF in Melfi did not stop with the plant alone, but included a research center and a training school that would instill the principles behind the new factory in the employees who were hired to work there.

As a result, we can conclude that the reorganization of production at Fiat’s plants marks an increase in the organizational synthesis between the firm and the market, but that this reorganization:

- (i) produced effects that were little more than fallout at the plants in the Turin area, where worker participation in the cognitive processes that make a TPS competitive was held back by old Ford-Taylorist habits; and
- (ii) ended by weakening the structural coupling between Fiat and the local labour market, as opening new plants in Southern Italy reduced job opportunities at the factories in Piedmont.

5.4.3 Relationships with formal institutions.

The final aspect to be considered is that of the relationships with our last subsystem: the public administration and other formal institutions (agencies, trade associations, etc.) that act as enablers for the processes of structural coupling and organizational synthesis between the various subsystems in the TPS.

In this relational framework, the structural dimension retains its importance despite major changes in nature and intensity. In the first stage, as we have seen, the public administration and trade associations such as AMMA, the Italian metallurgy and

metalworking manufacturers' organization, work chiefly as structural enablers, or in other words provide the material conditions whereby structural coupling between Fiat and the Turin area was able to meet the dominant player's need to produce and be competitive. In the second stage, the stakes have changed: it is no longer a question of supporting Fiat at home by building infrastructures and providing social mediation; now, the problem is how to soften Fiat's exit strategy and take some of the sting out of abandonment and its more macroscopic manifestations. For Turin's municipal administration in particular, this new need has meant determining how to reuse the industrial spaces vacated by Fiat's discontinued manufacturing operations. The first wave of such initiatives took place in the Eighties, when the problem arose of finding a fitting use for one of the "crown jewels" of Turin's industrial inheritance from its days as a one-company town, Fiat's historic headquarters at Lingotto, now shorn of any role in production. Masterfully renovated by Renzo Piano, Lingotto thus became the lynchpin of an ambitious urban renewal program which, as might be expected, is almost a case-study in tertiarization: the hundreds of thousands of cubic meters that once symbolized Fordism in all its glory are now home to an exhibition center, a major shopping mall, cinemas, hotels, a branch of the Politecnico, and the management offices of a number of companies, Fiat among them. More recently, this functional rethinking has been extended from the individual "monument" – the factory – to the entire district that takes its name from the factory, expanding its railway station (slated to become Turin's major transport hub) and locating many of the venues for the recent Winter Olympics in the area. Since 2005, a second wave of functional conversion has been rising around Fiat's other major factory in Turin, Mirafiori, an area four times larger than the historic city center, where recent closures have already vacated large tracts. Here, however, the trend would seem to be towards converting these areas to new uses in manufacturing as part of a process of concentrating operations that are now spread across the region.

Together with this interest in giving a new lease on life to Fiat's former sites in Turin, the area's manufacturing identity is attracting close scrutiny from a number of newly-formed agencies and other players, most of which are public-private partnerships, that take a proactive role in supporting local development processes. Here, attention is directed both towards the TPS's structural dimension (e.g., by attracting new businesses or setting up sophisticated material and telematic infrastructures) and its organizational dimension, where efforts are being made to strengthen the territorially embedded learning processes that underlie the competitiveness of area's co-located firms. In the last two decades, the number of institutional players who are striving to establish a relationship of organizational synthesis with the Turin area's automotive TPS (or in other words, to address its territorially embedded learning processes directly, without limiting themselves to the structural dimension) has multiplied. These new players include groups involved in

analysis and investigation (the Observatory for the Italian Automotive Components Industry established by the Turin Chamber of Commerce, or the Labour Market Observatory set up by the Province of Turin) as well as groups who formulate and implement policies designed to make Turin area firms more competitive, like the *From Concept to Car* program organized by the Chamber of Commerce together with other institutional players⁹⁰.

At times, these initiatives are rooted in the automotive TPS and attempt to unite the structural and organizational dimensions. This, for example, is the case of the Automotive Engineering degree program set up jointly by Fiat and the Politecnico di Turin in 1999, and housed – emblematically – in Fiat's former paint shop at Lingotto. More often, however,

- (i) The new institutional players do not limit their sphere of action to the automotive industry: for example, ITP (*Invest in Turin and Piedmont*), the regional agency dedicated to attracting domestic and foreign investment, has five areas of interest in addition to motor vehicles (ICT, life sciences, nanotechnology, aerospace and logistics);
- (ii) Even when programs center on the automotive industry, as in the case of *From concept to car*, the links with the Fiat TPS are marginal, as these are initiatives that exist precisely because Fiat has slackened its ties to the Turin area.

6. A synthesis.

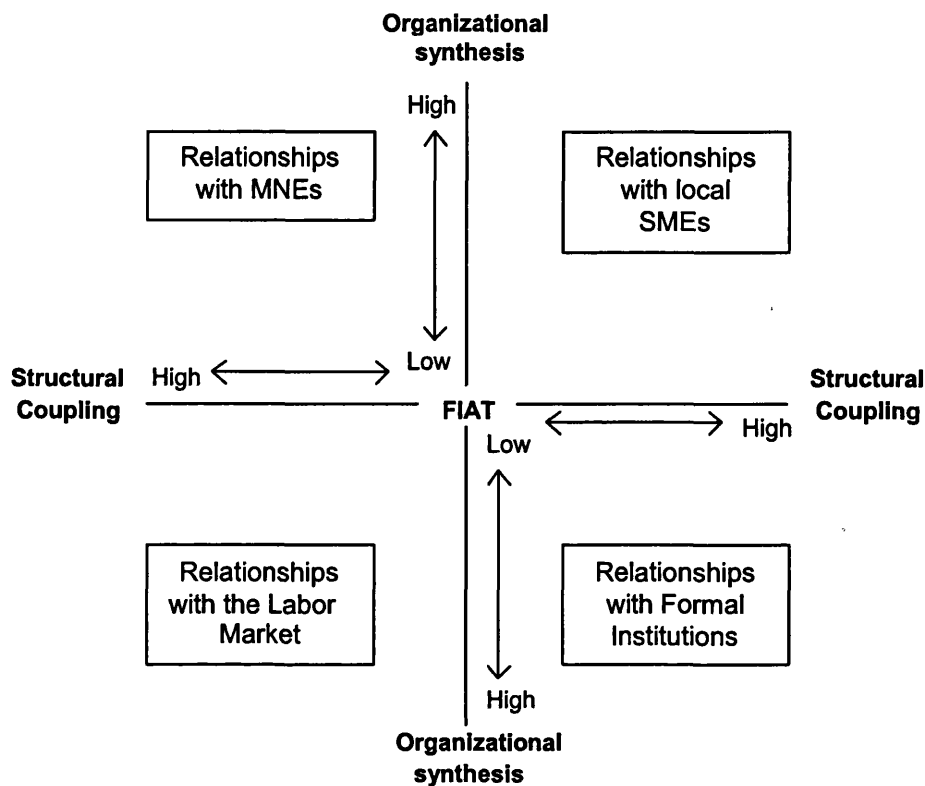
To conclude our attempt to describe the genesis, operation and transformations of the Turin area's automotive TPS, we will offer a synthesis that summarizes the system's major features, highlighting the relationships that Fiat has established over the years with the four subsystems that we have identified as the main components of a Productive Territorial System.

This synthesis can be represented graphically as a relational space (Figure 5.1) whose four parts are the relationships between Fiat and:

- (i) The subsystem of multinational automotive enterprises who have operations in the Turin area
- (ii) The subsystem of SMEs and, more generally, the local firms who do business in the automotive industry or adjoining sectors
- (iii) The subsystem of the local labour market
- (iv) The subsystem of institutional players

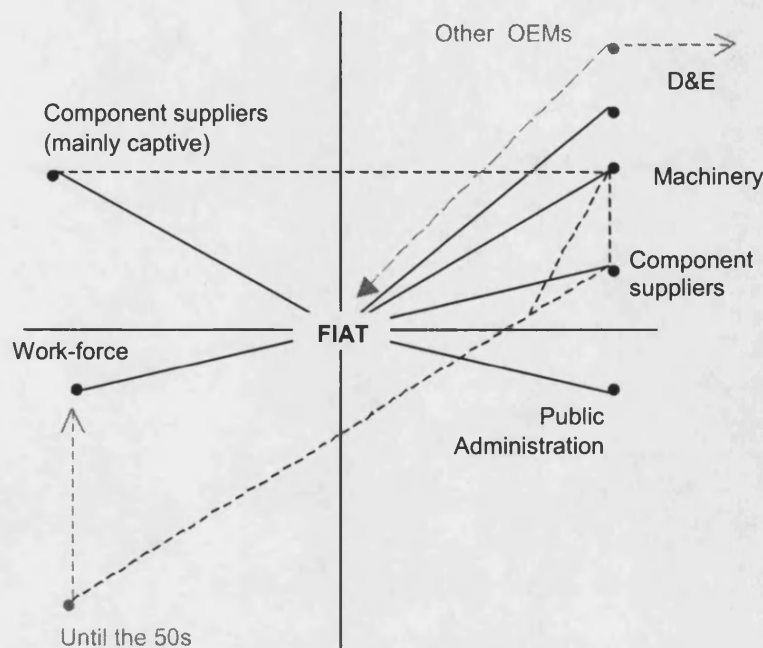
⁹⁰ The program will attempt to promote internationalization and contacts with OEMs and international buyers for around 200 component manufacturers in the Turin area selected on the basis of their design skills and capacity for technical innovation.

Figure 5.1 – The relational space of the Turin area automotive TPS



For each of these relational sub-areas, we can also identify the two processes that are fundamental to the systemic interpretation of the relationships between the territory and the economic activities that take place in it, viz., structural coupling and organizational synthesis. As will be recalled, structural coupling refers to all of those material and formal relationships that contribute to determining the system's territorial structure, while the term organizational synthesis is used to denote those processes that identify the TPS's organization. In other words, the first process is where we find the contractual market arrangements, the hierarchical relationships and, in general, all of the more or less territorialized functional relationships that support Fiat's competitiveness, whereas the second is chiefly of interest for its territorially embedded learning process that allow us to speak of a true TPS.

Figure 5.2 – The Turin area automotive TPS in the Fordist period



Thus, Turin's automotive TPS as it was at the height of its Fordist organization can be concisely represented as shown in Figure 5.2:

- (i) The relationships with other MNEs in the Turin area and doing business there chiefly take the shape of supply arrangements with captive component makers, i.e., companies belonging to the Fiat Group, or, to a lesser extent, with multinationals who have long been located in the Turin area and traditionally are on good terms with Fiat. These relationships show a high degree of structural coupling (given that most of the components are produced near Fiat's plants) and a medium level of organizational synthesis: though codesign had not yet reached the agenda in the TPS's Fordist days, the close organizational and geographical proximity of the MNEs who supply Fiat encouraged a certain measure of cooperation to be extended to the cognitive learning processes.
- (ii) The relationships with the local SMEs who supply components share a high degree of structural coupling with the first group, though it is accompanied by a rather low level of organizational synthesis: as we pointed out in section 5.2.2, most of the impact of the first major wave of outsourcing was felt by small firms who were

was to provide the system with low-cost flexibility rather than to interact with their major customer and the other SMEs in territorially embedded learning. The only relationships that do not fit into this picture are those with capital goods producers and bodybuilder-designers: firms that are bigger than the local component makers or have highly specific skills, and can accordingly show a higher level of interaction with Fiat, sharing in the production and synthesis of new knowledge.

- (iii) In the TPS's Fordist period, relationships with the workforce showed, obviously, an intense degree of structural coupling, given that the Turin area's labour market provided the overwhelming majority of all of Fiat's employees in Italy for over seventy years, consistently accounting for nearly 90% of the total. Even as this structural coupling intensified, however, workers' participation in the learning processes continued to drop. Though the TPS grew from the craftsmanship of a core of highly skilled employees, and the piecework payment systems that rewarded this craftsmanship were still widespread in the postwar period, once scientific management began to be systematically applied in the late Fifties, the whole idea of "doing the job right" that prevailed on Turin's shop floors – and the know-how it took to do it – were gradually but relentlessly swept aside.
- (iv) Finally, the relationships with the institutional subsystem can be said to have been purely functional, with the public administration limiting itself to guaranteeing the material underpinnings required for production (infrastructures, mostly) and for keeping class conflict from flaring up (by building low-income housing projects, for example), but never attempted to take an active part in organizational synthesis through policies designed to support learning processes.

To complete this picture, we must also consider the hierarchical character of the relationships: by its very nature, the Turin area's automotive TPS is necessarily centered on one major player, Fiat, whose strategic decisions have fueled all of the changes within the system. The system's top-heavy hierarchy means that the *vertical relationships* between Fiat and the various subsystems are incomparably more powerful than the *horizontal relationships* between the elements that make up the TPS. Indeed, the only horizontal relationships that exist are weak ones, and derive from the fact that many of the SMEs are also suppliers to the larger component manufacturers, and that some of the more highly skilled workers who left Fiat for jobs that were more congenial to their abilities ended up with the smaller component makers and capital goods producers, where they were in some cases given entrepreneurial responsibilities.

In conclusion, we can say that the early days of the motor vehicle industry in Turin produced a weak form of a Productive Territorial System, as:

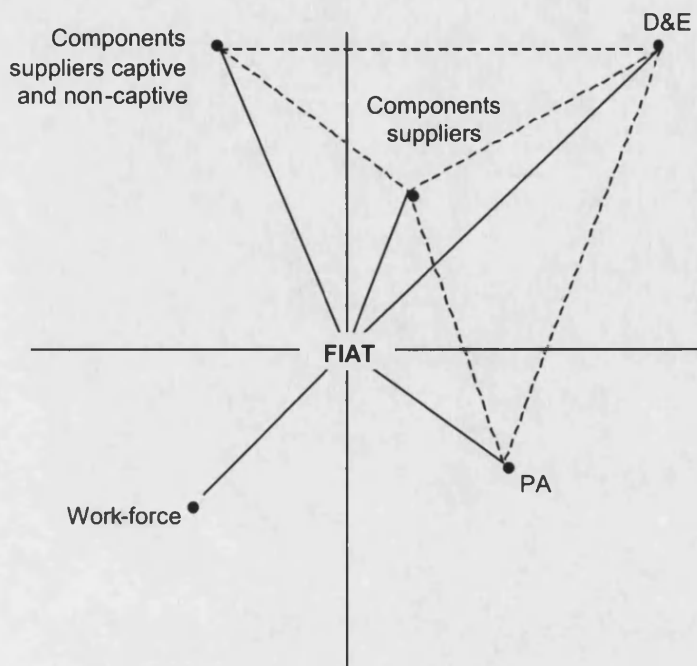
- (i) structural coupling prevails markedly over organizational synthesis. Consequently, the system that emerges from this process shows a weak systemic identity (given the weakness of its territorially embedded learning processes), and
- (ii) it would hardly seem appropriate to speak of an autopoietic system when the evolution of both structural coupling and organizational synthesis hinges on the will and the strategies of the dominant player, rather than on the dynamics between the subsystems.

The image we can draw of the changes that have occurred in the system since the Eighties and have marked a substantial retreat from Ford-Taylorism is quite different (Figure 5.3):

- (i) Relationships with multinational enterprises have intensified from the standpoint of collective learning processes, thanks to the new role assigned to them by Fiat's outsourcing policies and the spread of codesign practices. At the same time, however, Turin's participation in the structural coupling between Fiat and its global suppliers has lessened, since these multinational component makers relocated their own manufacturing operations to follow their main Italian customer's moves.
- (ii) In principle, the same is true for those local suppliers who survived Fiat's drastic cuts in procurement from the Turin area, though the two phenomena do not operate on the same scale as they do for the MNEs: on the one hand, in fact, the structural coupling between SMEs and Fiat has weakened as a result of the almost 75% reduction in the number of first-tier suppliers⁹¹, while on the other hand, the local firms' more modest technological capabilities have given them less access to the collective learning practices that Fiat encourages in its supplier partnership program. The other important change concerns the exit strategy – which we will discuss in detail in the next chapter – developed by the capital goods producers: the growth of Comau (the captive supplier of production systems and technologies) as a global buyer, whose operations are increasingly oriented towards integrating components, machine tools, robots and control and measurement systems purchased on the international marketplace, has significantly reduced the percentage contribution that capital goods manufacturers make to the automotive TPS's end product. By contrast, the role of design and styling is as well-rooted in the system as ever – if not indeed more so – in terms of both structural coupling and organizational synthesis.

⁹¹ As we will see in the next chapter, this weakening in the structural coupling between Fiat and Turin-area suppliers can also be seen from the increase in the latter's revenues from other OEMS and after-market sales as compared to those from Fiat.

Figure 5.3 – The Turin area automotive TPS in the Nineties



- (iii) As for relations with the labour force, the introduction of the Integrated Factory and, in particular, of the UTEs helped inject new life into the processes of organizational synthesis between the TPS and workers, even though – as we have seen – these practices were not implemented in full at the Turin-area plants. Conversely, the level of structural coupling has undeniably dropped, as witnessed by the approximately 75,000 jobs lost to Fiat’s plants in and around Turin between 1971 and 2001.
- (iv) The relationships with institutional players have also undergone profound changes. Structural relationships are still important, though their intensity and aim are no longer the same: the role of the public administration is no longer that of guaranteeing the prerequisites for production and social consensus, but rather, to help work out an exit strategy that can make the social impact of Fiat’s move away from Turin less devastating. This has meant a reduction in structural coupling (now limited to finding a new use for the “industrial voids” left vacant by Fiat’s erstwhile operations in the city) and a slight increase in organizational synthesis, as shown, for example, by new industrial and cultural policies for getting the Turin-area component and design industries back on their feet.

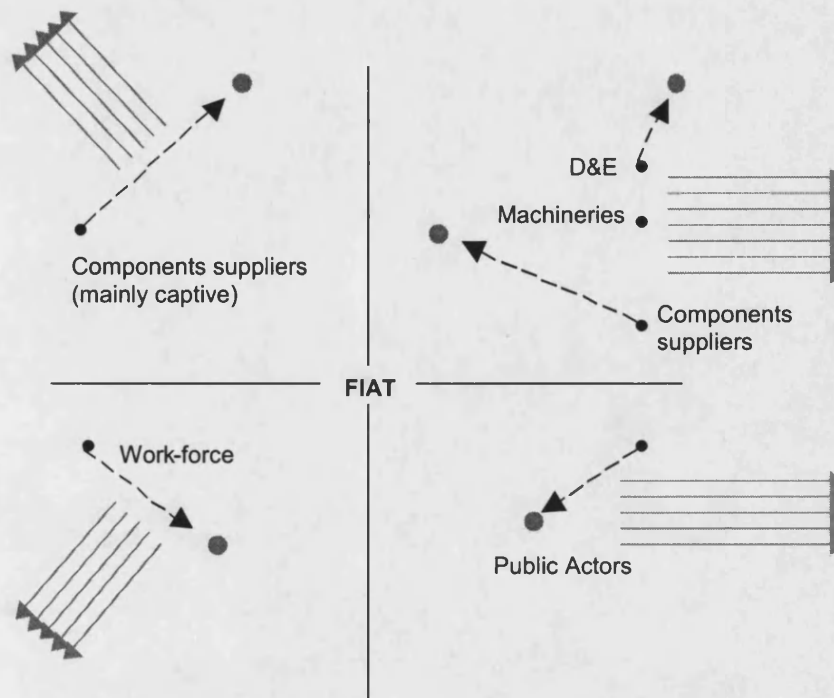
Alongside these wide-ranging transformations, there has been another fundamental driver of change: the fact that the traditional vertical relationships that continue to link Fiat to the TPS’s various subsystems have been joined by a wider

range of horizontal relationships within and between the subsystems, with less and less mediation by the Fiat hierarchy. Looking at the two stages in the history of the automotive TPS in their entirety points to yet another interpretation. Thus, as Figure 5.4 shows in broad outline, three processes have taken place simultaneously:

- (i) The organizational dimension has come to predominate over the structural dimension, as territorial learning processes have strengthened and structural coupling within the system has loosened.
- (ii) Delocalization in manufacturing activities has been intense, both on the part of Fiat (as shown by the layoffs at its plants in the Turin area) and of the major multinational suppliers (particularly those who supply modules, followed by systems suppliers), who have had to move their operations in order to adapt to Fiat's geo-economic strategies.
- (iii) Major diversification and differentiation has taken place both within the subsystem of local firms, who have had to find new markets and new settings, and in the institutional subsystem, which has made efforts to attract investments from a wider range of sectors and drafted local development policies that are less and less dependent on Fiat's presence in the area.

Just where these processes will lead is unpredictable: the existence of a TPS implies a balance between the structural and organizational components, and in the history of the Turin area's automotive TPS, this equilibrium has always been unsteady. In the first stage, the system expressed itself as a Fordist one-company town, with a strong structural coupling dictated by Fiat's production requirements, and thus with a hierarchical order that not only hindered the rise of organizational synthesis processes, but even went so far as to quash any form of collective learning by marginalizing the more highly skilled workers and either absorbing or expelling the other OEMs in the Turin area. In the second stage, by contrast, a revitalized, more challenging collective learning process arose, but the forfeit it inevitably paid was the expulsion of firms and workers from the TPS and the steady withdrawal of Fiat and supplier plants from the area. In a certain sense, we could describe this transformation as the transition from a "weak" TPS (one lacking in any intense organizational synthesis) to a "fragile" TPS: fragile because it risks a further loss of structural elements.

Figure 5.4 – The dynamics of the Turin area automotive TPS



Here, only one thing is certain, and that is that there is less uncertainty about Fiat's future presence in the area: the consensus in both political and business circles is that Fiat is likely to shift all of its manufacturing operations away from Turin in the coming decades, while the "quaternary" activities – management, research, styling and design – will remain. The automotive TPS thus stands at a crossroads: will it disband, leaving nothingness and dust, or will it reorganize into a multi-centered network in which Fiat, first among equals but monarch no more, will doff its outworn crown? Most interpretations – and most policies – are moving in precisely this direction. Nevertheless, if we are to address this question effectively, we must proceed with a closer analysis of what has happened to the Turin-area firms that are involved in any of the manifold aspects of motor vehicle manufacturing and, more specifically, of what position the various clusters have taken up in recent years with respect to the knowledge that is the foundation of Turin's manufacturing tradition. These are the twin topics we will tackle in the next two chapters.

Chapter 6: Beyond Fiat.

In the previous chapter we tried to reconstruct, through the integrated use of historical and statistical sources, the evolution of the automotive-based PTS and, more in particular, the Fiat universe, along its hundred-year history. One of the most significant dynamics that has emerged seems to be undoubtedly the restructuring of the system headed by Fiat and, above all, the recurring level of exit options in the course of this process. Whether these are partial exits (diversification and differentiation of the client and/or product portfolio) or total exits (bankruptcy or abandonment of the automotive industry), it is still of fundamental importance to reconstruct these centrifugal processes and, especially, to evaluate the consequences on both the automotive PTS and on Turin's production fabric founded on its engineering and electro-technical tradition. To this end, we will briefly examine the transformations in the manufacturing fabric that was once superficially identified as "Fiat suppliers". We will then go on to evaluate what synthetic images have been suggested to represent the changes underway and, thus, formulate hypotheses that will guide the last stage of empirical research.

6.1 The local manufacturing fabric re-acquires competitiveness.

In the previous chapter we saw how the relations between companies that characterised the PTS of the Turin automotive sector have profoundly changed since the eighties with the reorganisation, both qualitatively and quantitatively, of outsourcing. Before attempting a synthetic recomposition of the overall transformations undergone by the PTS in the course of its hundred-year history (with particular reference to the hypothetical formation of an automotive district), it appears necessary to consider how the transformation of the relations between Fiat and the local fabric of engineering and electro-technical companies has influenced the performance of the latter. To this end, our analysis will distinguish between the three main categories of firms "freed" by the reorganisation of Fiat:

- (i) components producers;
- (ii) producers of capital goods;
- (iii) designers, engineers and other specialists involved in the process of automotive design and engineering.

6.1.1 *The strategies of the components sector.*

If we look at the performance in terms of employment in the Italian components sector between 1971 and 2001, we can see that the geographical distribution of employees in this sector (Table 6.1) does not follow the same trend as automotive production (Table 5.1). While in the case of the final production of vehicles employment in Piedmont has been reduced to one quarter of the original figure and has essentially been reached by jobs in the southern regions, employment in components in Turin has remained at roughly the same levels⁹².

In addition, Piedmont has maintained its role as the leading region in components, with almost double the employment compared to the total figure for the regions of the Mezzogiorno.

Table 6.1 – Employment in the production of components in Piedmont and Italy

	Employees 1971	Employees 1981	Employees 1991	Employees 2001
Piedmont	30839	32231	31544	31360
	100	105	102	102
Mezzogiorno	1362	6201	7474	17414
	100	455	549	1279
- Lazio	809	1401	1334	3179
- Abruzzo	275	1580	2706	3435
- Molise	14	10	135	2767
- Campania	160	2639	2643	5239
- Basilicata	0	189	179	2334
- Sicily	104	382	477	460

Source: Istat, 1971, 1981, 1991, 2001

⁹² The data examined is obviously not indicative of all the automotive components supply chain, as only those employed in the Ateco sector directly linked to the production of components were taken into consideration. This classification therefore neglects the second and third tier supply that is normally classified in line with the type of production (engineering, rubber, plastics etc.) with reference to the destination of the output. This also explains why, as things stand, fully reliable and consistent estimates are not available on the real size of the automotive sector in Piedmont. One estimate made by the Osservatorio talks of 46,000 employees in Piedmont, against about 100,000 employees in the whole of Italy.

In this section, it could be useful to discuss briefly the roads taken by supplier companies to tackle the repercussions of the Fiat crisis on their competitiveness. On this question, the strategic choices of the PTS have been particularly diversified. Leaving aside the exit option, in other words the abandoning of the automotive sector, which is progressively being used less and less⁹³, the two main strategic options are undoubtedly the differentiation of the client portfolio – especially in terms of OEMs – and the so-called after-market, i.e. the market for non-original parts⁹⁴.

Table 6.2 – Production value of components in Italy, by destination (figures in million €)

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total OEM	10,591	12,110	13,156	14,217	15,879	15,866	14,362	14,516	15,118
- Italy	7,641	8,792	9,351	9,994	10,864	10,415	9,014	8,617	8,205
- foreign	2,950	3,318	3,805	4,223	5,015	5,451	5,348	5,899	6,913
Total After Market	6,887	7,490	7,922	7,186	8,089	7,542	7,802	7,758	8,715
- Italy	2,189	2,281	2,159	2,228	2,336	2,389	2,449	2,506	2,584
- foreign	4,698	5,209	5,763	4,958	5,753	5,153	5,353	5,252	6,131
Total components	17,478	19,600	21,078	21,403	23,968	23,408	22,164	22,274	23,833
(1996=100)	100	112	121	122	137	134	127	127	136
% OEM	61%	62%	62%	66%	66%	68%	65%	65%	63%
- Italy	72%	73%	71%	70%	68%	66%	63%	59%	54%
- foreign	28%	27%	29%	30%	32%	34%	37%	41%	46%
% After Market	39%	38%	38%	34%	34%	32%	35%	35%	37%
- Italy	32%	30%	27%	31%	29%	32%	31%	32%	30%
- foreign	68%	70%	73%	69%	71%	68%	69%	68%	70%

Source: author's calculation on OCVI figures, 2005

The figures published by the Osservatorio sulla Componentistica Veicolare Italiana in its annual report are fairly clear on this point (OCVI, 2005). Out of a sample of over 800 Italian companies interviewed, 80% stated that less than 25% of its turnover stemmed from sales to the Fiat Group or its suppliers and about 16% stated that its main outlet lay in the after-market. It should be noted, however, that if we consider the companies that have a turnover of more than €50 million, the percentage of companies dependent on Fiat (>50% of turnover) rises to about half of the sub-sample. It should also be noted that these OEMs, on which employment in the sector largely depends, have seen their operating margins drop significantly in recent years and they have been absorbed into rigid supra-

⁹³ The situation is different compared to the 1980-90s, in the first phase of the restructuring of the Fiat supply system when there were numerous bankruptcies (for first and second tier suppliers) or changes of sector/supply chain (for sub-suppliers or contractors offering generic processing).

⁹⁴ Original parts are obviously distributed by the OEMs or first tier suppliers.

national hierarchies, characterised by decision-making processes essentially external to the Turin area and, more in general, Italy. This is why it is not possible to rule out the fact that the gradual downscaling of Fiat production in Italy and Piedmont may have in the future further side effects on the components industry.

Beyond the risks linked to the deterritorialisation and globalisation of Fiat's strategies, it should in any case be noted how the Italian components industry, especially in Piedmont, shows a strong export trend. In 2004 the Italian components industry recorded exports for €12,800 million (+12.2%), against €6,800 million for imports, with a positive and constantly growing balance (+25% between 2000 and 2004 and +60% since the mid 1990s). Again in March 2005, an increase of 16.7% was recorded compared to the same period of the previous year, taking the share of components out of total national exports from 3.7% to 4.1%.

If we observe the composition, we see that the ratio between the OEM and after-market has stayed around 1.5:1, with the significant exception of the central period when, presumably, the presence of incentives for the purchase of cars shifted turnover to the OEM sector. The difference between the OEM and after-market is even more marked if we consider the geographical division of sales: while the after-market was characterised for the whole decade by the clear-cut prevalence of international markets over the domestic market (with a stable ratio of around 7:3), the OEM market looked abroad only gradually, passing from a share of 28% to a maximum of 46% in 2004.

If we focus attention on the sample of Piedmont companies in the study by the Osservatorio, we see how they maintain a share of around 30% of all Italian exports.

Table 6.3 – Share of Piedmont's exports out of total Italian exports

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Italian exports	7,648	8,527	9,568	9,181	10,768	10,604	10,701	11,151	13,044
Piedmont exports	2,274	2,553	2,806	2,748	3,149	3,190	3,275	3,517	3,873
% Piedmont	30%	30%	29%	30%	29%	30%	31%	32%	30%

Source: author's calculation on OCVI figures, 2005

This figure assumes even greater significance if we consider that the percentage of Piedmont companies dependent on the Fiat PTS is still considerably higher than the rest of Italy (15% against 6% in the rest of Italy). If we assume a more qualitative perspective and consider the results of a questionnaire that surveyed about 800 Italian components manufacturers, the figures from the Osservatorio show how the competitiveness of Piedmont's producers is significantly higher than the rest of Italy in terms of R&D expenditure (18.2% of Piedmont's companies dedicate more than 5% of their turnover to R&D, against 15.8% in the rest of Italy), export orientation (57.7% of exporting companies against 46%), the presence of innovative products (28.6% against 23.2%). In contrast,

Piedmont companies seem less confident about the competitiveness of Italian components, a feeling that is borne out by the worrying fact of the trend towards relocation: in 2004, of the 23 new sites created in Italy, less than half were due to the initiatives of companies rooted in Piedmont, while the percentage rises to 80% if we consider the opening of foreign plants (12 out of 15).

To understand better the differences between Piedmont's and Italy's components producers we can use the division into five categories proposed by the Osservatorio:

- (i) design and engineering (D&E): specialised in the design, engineering, prototyping and testing of new products, with reference to both the overall vehicle concept (mainly styling and engineering) and the design of components;
- (ii) systems manufacturers: these are first tier suppliers specialised in the design and production of systems (for example, air-conditioning, suspensions, safety etc.) with a high innovative and technological content;
- (iii) specialists: these are suppliers of complex parts, often with a high-tech and innovative content, but that often do not have a business structure capable of competing on international markets;
- (iv) sub-suppliers: these are second and more frequently third tier suppliers, often involved in generic engineering and electro-technical processing, with a low degree of innovation and complexity;
- (v) module producers: these are first tier suppliers, like the systems providers, but that produce "modules", i.e. they pre-assemble parts to be assembled on the production lines.

As emerges from Table 4, the structure of Piedmont's components industry differs significantly from the national picture: against an average concentration in Piedmont of 28% in terms of companies and of 42-44% in terms of turnover and employees, we see that for design and engineering the share of the region's industry rises to 47.5% and 60%. The same trend is true for module and systems producers (at least when referring to the number of companies). Piedmont's share of sub-suppliers and specialists is, instead, slightly below the national average.

The overall positioning of these categories varies enormously in terms of competitiveness, use of local knowledge and potential.

- (i) *design and engineering*: the Turin companies specialised in D&E occupy an oligopolistic position shared with few other specialised clusters (mainly the Californian one) and make intense use of long-standing local competencies,

starting from that of bodywork companies⁹⁵. This means that they are subject to a low risk of relocation;

Table 6.4 – Composition of components companies in Italy and Piedmont

	Firms			Turnover			Employment		
	Italy	Piedmont	%	Italy	Piedmont	%	Italy	Piedmont	%
Design and engineering	99	47	47.5%	1,373	828	60.3%	9,262	5,573	60.2%
Systems manufacturers	8	5	62.5%	2,240	1,050	46.9%	8,569	4,000	46.7%
Specialists	370	97	26.2%	7,340	2,696	36.7%	28,677	11,137	38.8%
Sub-suppliers	1,198	308	25.7%	9,668	3,687	38.1%	45,724	18,401	40.2%
Module producers	40	19	47.5%	3,179	1,751	55.1%	13,222	7,265	54.9%
Total	1,715	476	27.8%	23,800	10,012	42.1%	105,454	46,376	44.0%

Source: author's calculation on OCVI figures, 2005

- (ii) *systems manufacturers*: there is a small number of companies, extremely important in terms of turnover and employees (they represent less than 1% in terms of the number of companies but account for 9.4% of turnover and 8.3% of employees in the Italian components industry). These are almost always Italian branches of major multinational groups that occupy an oligopolistic if not monopolistic position, working with virtually all the OEMs. From the point of view of cognitive processes, they are characterised by a blend of codified knowledge (normally produced by the parent company) and tacit knowledge (embedded in Piedmont). Although their location in Italy and Piedmont derives from the presence of Fiat, the low cost of transport and the high degree of territorialised knowledge make them relatively insensitive to Fiat's location decisions;
- (iii) *specialists*: these are companies that work mainly for the domestic market and have a considerable capacity for innovation, above all in term of products (less in terms of processes), that they draw from intensive use of the knowledge rooted in the Turin area. For good or for bad, they are, together with D&E, the most direct heirs of the original engineering and electro-technical tradition, of which they maintain, on the one hand, the traditional organisation of production and the pursuit of a "job well-done", and on the other, a limited level of enterprise and poor access to codified forms of knowledge. As a result, this group is positioned in a higher range of relocation risk compared to D&E and systems producers⁹⁶;

⁹⁵ As was said earlier, the two identities still coincide even today, especially for larger companies.

⁹⁶ The outcome of the process will depend essentially on the strategies of these categories of company: if the strategy of focusing on labour costs and the proximity to the national client prevails then it is likely that in the next few years we will see an intense relocation process. If instead adequate policies are introduced

- (iv) *sub-suppliers*: these undoubtedly represent the weak link in the value chain of the Turin components industry. Given that they operate chiefly in production with low added value, they appear particularly vulnerable to both the competition of manufacturers in countries with low labour costs and to the location choices of module producers. Although they also show significant elements of continuity with the manufacturing tradition, their ability to draw on this skill pool is limited to adjusting their organisation and processes to ensure them the flexibility and respect of costs demanded by clients – normally the components makers of a higher level. It follows that this is a group with a high risk of failure or relocation. On the other hand, their generic specialisation could, compared to the other groups, facilitate their differentiation by easing the adoption of exit strategies from the automotive sector and re-orientation towards other industrial sectors;
- (v) *module producers*: the module producers share some features with the systems manufacturers (for example, the strong presence of multinational groups and the use of a blend of tacit and codified knowledge), but diverge considerably in that their work of pre-assembly makes them particularly sensitive to transport costs. This means that they are the players most subject to relocation, given that they are tied to operating close to the OEM plants, when not actually "under the same roof", as highlighted in section 5.3.2.3 on in-house outsourcing.

Table 6.5 – A taxonomy of the Turin components industry

	Competitiveness	Localised knowledge	Relocation
Design and engineering	Consolidated position of world oligopoly.	Intensive use of localised knowledge in the Turin area.	Almost zero risk.
Systems manufacturers	Consolidated position of world oligopoly.	Mix of codified knowledge (parent company) and localised knowledge.	Poor location adjustments. Possibility of attraction.
Specialists	Mainly on the national scale.	Intensive use of knowledge localised in the Turin area. Poor access to codified knowledge.	Average risk.
Sub-suppliers	Mainly on the local scale. High vulnerability to competition from developing countries.	Intensive use of knowledge localised in the Turin area exclusively to acquire flexibility. Poor product innovation.	High risk of failure or relocation.
Module producers	Mainly on the national scale. Strong impact of transport costs.	Mix of codified knowledge (parent company) and localised knowledge.	High risk of dependency on Fiat's location choices.

If we consider the composition of the Turin components industry with these five categories, we can see how Piedmont is characterised by a greater specialisation in

to encourage embedding (facilitating, for instance, access to relations with important local producers of codified knowledge, such as the Polytechnic of Turin and the Fiat Research Centre (CRF).

operations with a low risk of relocation (thanks above all to the presence of designers and engineers). As far as the highest risk activities are concerned, we note that Piedmont is more exposed for both for the module producers and the sub-suppliers: this probably means that the Turin area and Piedmont will have to face a further fall in employment following the repositioning of the main module producers in the proximity of Fiat plants, but research and development activities that depend on co-design with Fiat will in all likelihood continue to be located in Turin.

Table 6.6 – The composition of the components industry in Italy and Piedmont

	Italy	Piedmont	Italy	Piedmont	Italy	Pie
<i>Low Risk</i>	6.2%	10.9%	15.2%	18.8%	16.9%	
- design and engineering	5.8%	9.9%	5.8%	8.3%	8.8%	
- systems manufacturers	0.5%	1.1%	9.4%	10.5%	8.1%	
<i>Average Risk (specialists)</i>	21.6%	20.4%	30.8%	26.9%	27.2%	
<i>High Risk</i>	72.2%	68.7%	54.0%	54.3%	55.9%	
- sub-suppliers	69.9%	64.7%	40.6%	36.8%	43.4%	
- module producers	2.3%	4.0%	13.4%	17.5%	12.5%	

Source: author's calculation on OCVI figures, 2005

6.1.2 Capital goods and the mechatronic plain.

Activities linked to the production of capital goods emerged in studies into the Turin manufacturing sector in the course of the 1980s following a joint Ceris-Ires study that highlighted a strong concentration of companies (more than 200) in the Turin area (Ceris, 1990; Rolfo, 1993) that outlined what the Ceris researchers defined as the "mechatronic plain".

Far from being a recent feature, this set of companies dates back to the industrialisation of Turin and it appears to have re-conquered a role that the "automotive culture" dominant in the course of the century had effectively made marginal, or at least secondary. It is obvious that there has been a radical renewal in this group: while the leading companies with the longest tradition are those specialised in the production of machine tools, those operating in the fields of robotics and electronic components have a more recent origin.

As the role of Fiat as the client for products diminished bit by bit, the companies in the sector gradually established growing independence that, through reorganisation, led them to specialise and on these foundations conquer increasing shares on the international market. The customisation of products on the basis of customer needs is, in this light, a strong point of the Turin system, and is thus, in reality, more robust than might appear at first glance: from the organisational point of view, this is a goal that has been pursued through the decentralisation of production and the maintenance within the

company of core functions: design, production of fundamental components, software, assembly and technical assistance.

This change in relations with Fiat and the automotive system has demanded an adaptation of the system to the new situation: it responded essentially to three closely linked processes:

- (i) the first is deverticalisation: in contrast with competing industrial companies, characterised by a high level of vertical integration, the Italian machine tools sector, and especially the Turin sector, is marked by the presence of a broad and complex network of companies specialised in specific segments of the production cycle;
- (ii) the second process is represented by the internationalisation and specialisation of the chief local producers, which have increasingly oriented their operations towards product customisation on the basis of customer needs;
- (iii) finally, the third process involves the growing independence that some companies specialised in mechanical components have won, above all thanks to their penetration of international markets and the conquest of clients outside the Turin area.

Further confirmation of the importance of the production of capital goods emerges from the statistical analysis of sectors which, in different ways, can be viewed as belonging to Turin's mechatronic sector.

Table 6.7 shows an estimate of the number of employees in the production of capital goods⁹⁷, comparing the employment trend in the province of Turin with the other provinces of the "industrial triangle"⁹⁸ where these industries are traditionally located.

As can be seen, employment in the sector of the production of capital goods grew in the period of 1971-2001 in the province of Turin by about 4,000, equal to 16.6%, keeping the Turin area in second place amongst Italy's north-western provinces after Milan (where, however, jobs fell by 10% against macro-regional growth of 22%) with around 13-14% of total employment.

⁹⁷ For this purpose, the following ATECO codes were aggregated: Manufacturing of machines for general use; Manufacturing of machine tools and parts; Manufacturing of other machinery for special uses; Manufacturing of medical equipment, Manufacturing of measurement and control equipment, Manufacturing of equipment for the control of industrial processes.

⁹⁸ The term "industrial triangle" indicates the economic region within the three traditional points of industrial development in Italy since 1945 (Turin, Milan and Genoa). The need for a comparison over a mid to long-term period (30 years) made it preferable to not consider the so-called Third Italy.

Table 6.7 – Employment in the production of capital goods

	Employees 1971	Employees 1981	Employees 1991	Employees 2001
015 - Milan	72,823	69,094	70,439	65,415
	41%	37%	33%	30%
001 - Turin	24,507	26,937	28,371	28,577
	14%	14%	13%	13%
016 - Bergamo	8,175	11,047	16,071	19,687
	5%	6%	8%	9%
017 - Brescia	11,565	13,214	15,529	17,781
	7%	7%	7%	8%
012 - Varese	14,526	15,304	15,836	15,353
	8%	8%	8%	7%
018 - Pavia	11,866	7,022	8,587	8,244
	7%	4%	4%	4%
Total North-West	176,136	186,467	210,429	216,237

Source: Istat, 1971, 1981, 1991, 2001

A similar situation can be found for the production and delivery of energy – which can be assumed as a good indicator of activities rooted in electro-technical competencies (Table 6.8). In this case, faced with a notable reduction in employment in the North West (-12,000 employees, equivalent to 9%), we can observe that the province of Turin actually increases its share of employment in the sector, rising from 14% to 16% of employment in the sector in the industrial triangle. The importance of this performance is even more evident if we consider that the province of Milan, while keeping top position, sees its own share fall from 51% to 38%: in other terms, while in 1971 one worker in two in the electro-technical sector was employed in the Milan area, in 2001 this proportion had dropped to little more than one in three.

Table 6.8 – Employment in electro-technical manufacturing

	Employees 1971	Employees 1981	Employees 1991	Employees 2001
015 - Milan	73,696	83,575	65,738	50,022
	51%	46%	44%	38%
001 - Turin	19,478	30,715	24,082	20,329
	14%	17%	16%	16%
016 - Bergamo	5,994	8,758	9,661	10,294
	4%	5%	6%	8%
012 - Varese	6,126	9,827	8,199	8,273
	4%	5%	5%	6%
010 - Genoa	10,617	13,461	6,617	6,353
	7%	7%	4%	5%
Total North-West	143,951	181,536	150,052	131,020

Source: Istat, 1971, 1981, 1991, 2001

Research conducted again by Ceris in 2002 (Ceris, 2003) identified 257 companies operating in the production of capital goods in Piedmont on which an in-depth assessment was made of the competition dynamics, starting from data in their financial statements. Given that the 257 companies selected accounted for a total of about 18,000 jobs (against the approximately 28,000 in the "statistics" in Table 7) and given that the Ateco codes also contain activities not entailing direct production, such as installation and maintenance, we can consider that the Ceris sample gives a satisfactory reflection of the behaviour of the entire sector. Of particular interest is the comparison between the companies located in the province of Turin and those located in the rest of Piedmont: the analysis of the financial statements shows, in fact, how companies located outside the province of the regional capital have a decidedly higher performance compared to those in Turin.

Table 6.9 – Indicators of Piedmont's specialised engineering industry

			Net industrial ROI				Net technical capital investments ¹			
			2001	2000	1999	1998	2001	2000	1999	1998
<i>Turin</i>	<i>Engineering</i>	<i>C.</i>	7.9%	8.7%	4.5%	7.2%	1,677	1,595	1,491	1,482
		<i>A.</i>	8.4%	9.0%	4.5%	7.2%	1,591	1,514	1,491	1,482
	<i>Other sectors</i>	<i>C.</i>	10.0%	12.7%	15.7%	15.4%	3,689	3,567	3,029	2,906
		<i>A.</i>	11.9%	14.7%	15.7%	15.4%	3,386	3,201	3,029	2,906
<i>Other provinces</i>	<i>Engineering</i>	<i>C.</i>	15.6%	16.0%	14.2%	15.8%	2,142	1,991	1,709	1,626
		<i>A.</i>	16.8%	17.4%	14.2%	15.8%	1,992	1,811	1,709	1,626
	<i>Other sectors</i>	<i>C.</i>	10.2%	10.6%	12.8%	12.8%	3,346	3,307	2,760	2,681
		<i>A.</i>	12.4%	12.8%	12.8%	12.8%	2,996	2,898	2,760	2,681

Source: Ceris (2003)

Notes: ¹ Figures in thousand €

C = current; A = adjusted

Table 8.9 clearly shows how Turin's mechatronic sector has a ROI considerably lower than the rest of Piedmont (7.9% against 15.6% in 2001). The same is true for net technical capital investments. In 2001, these came to an average of €1,677,000 for Turin companies and €2,142,000 for companies located in the other provinces. In the comparison with a sample of about 1,200 companies belonging to other sectors, the Turin/rest of Piedmont dichotomy is even more obvious:

- (i) on the one hand, it is clear that the portfolio of Turin companies belonging to other sectors is perfectly in line with that of the rest of the region – even technical investments are clearly higher in the Turin area;
- (ii) on the other, there is an evident positive dynamic of mechatronics outside the Turin area, that out-performs the sample from other sectors (15.6% against 10.2%).

If we look at the dynamics of the main performance indicators (Table 10) we can note how the divergence between Turin and the rest of the region is clearly confirmed, to the evident disadvantage of the Turin production fabric, where:

- (i) the positive indicators (turnover, investments and employment) grow less strongly than in the rest of the region;
- (ii) the indicators that express a weakness in the business fabric (financial dependency and net working capital) grow more rapidly.

Table 6.10 – Trends in the main performance indicators in 1998-2001

	Turnover	Investments	Employment	Financial dependence	Net working capital
Piedmont	17.9%	15.3%	9.6%	-0.4%	7.2%
- Turin	11.9%	7.3%	3%	1.7%	16.5%
-Other provinces	24.3%	22.5%	16%	-2.7%	2.8%

Source: Ceris (2003)

A further indication comes from Economic Value Added analysis (EVA), which is based on the comparison between the ROI rate and the weighted average cost of capital⁹⁹ (WACC). On the basis of this comparison, companies can be split into value "creators" and "destroyers" (Table 6.11).

Table 6.11 – Creation and destruction of value in Turin's mechatronics industry

	2001		1998	
	Creation	Destruction	Creation	Destruction
Other sectors	43%	57%	46%	54%
Mechatronics	42%	58%	50%	50%
- Turin	34%	66%	45%	55%
- Other provinces	51%	49%	54%	46%

Source: Ceris (2003)

The figures show how mechatronics in Piedmont has moved from a positive condition compared to other sectors (in 1998, 50% of Piedmont's mechatronic companies created value against 46% of companies belonging to other sectors) to a substantial convergence around a figure of 43-42% of value-creating companies. At the same time, however, we should note how this result can essentially be attributed to Turin companies, amongst which only 34% create value (a full 11% lower than in 1998), while in the other

⁹⁹ In the case of the Ceris study, the WACC used was the one calculated by Mediobanca adding a spread of 3.5% to the return on mid to long-term state bonds and the result was: 7.1% in 1999, 7.9% in 2000 and 8% in 2001.

provinces substantial stability is found (with the percentage of value-creating companies falling from 54% to 51%, in any case above the threshold of 50%).

On the basis of these figures, we can conclude that the production of capital goods in the province of Turin, despite an improvement (although being lower than in the rest of the region, both the ROI and net investments increased in the four-year period considered by the analysis), remains clearly less competitive compared to companies located outside the province. For certain aspects this is not an unexpected result: the profound restructuring of the automotive PTS, especially linked to Fiat, has probably conditioned the performance of Turin's mechatronics industry compared to the rest of the region, where the ties with Fiat have always been weaker, if not actually non-existent.

6.1.3 Design and engineering.

The third group of activities traditionally linked to the automotive PTS for which focused examination is worthwhile is that of design and engineering, already partly analysed in section 5.4.1 with reference to transformations in the components industry. In addition to what has already been said, in this context we would like to develop some thoughts on the progressive configuration of design and engineering. In particular, D&E has gradually assumed a dual role:

- (i) firstly, D&E was the first sub-system of Turin's automotive industry and assumes an increasingly autonomous position with respect to Fiat and the related PTS, establishing right from the fifties regular collaboration with other OEMs;
- (ii) secondly, it has progressively detached itself from specialisation in just the automotive sector, increasing its own component of "industrial design" in the broadest sense: for example, Pininfarina Extra was founded in Turin in 1986, a spin-off of Pininfarina specialised, as the name suggests, in industrial design.

In this sense we can say that D&E is both a central element within the PTS of the Turin automotive industry and, potentially, a PTS itself, whose activities are not necessarily applied in the Turin area. In fact, while it is true that automotive-related design and engineering has traditionally been linked to manufacturing operations located chiefly in the province of Turin, it is equally true that the more strictly industrial design activities – which cover a vast range of products, from household goods to the production of furniture, textiles and clothing – are often performed in collaboration with companies located outside the province and region. In contrast, a whole series of Piedmontese product sectors, outside the province of Turin, which over time have adopted a district organisation (for instance, textiles around Biella, taps and household goods production in eastern Piedmont or goldworking in the Valenza district), have often set up links with designers and

engineers in the Milan area, rather than with Turin's extensive D&E fabric. In a certain sense, it appears fair to say that non-automotive industrial design found itself out of phase between design and production, precisely in the sense that:

- (i) Turin designers often work for companies located outside the province of Turin and often outside the regional scale;
- (ii) Manufacturing companies in Piedmont with a high intensity of design and engineering have often drawn on design skills from outside the territory of Piedmont.

In addition, three fundamental characteristics that make Turin's D&E particular should be borne in mind, in other words its special position within the learning processes of the Turin manufacturing sector. Firstly, it should be noted that the main companies operating in this sector have their roots in the Turin engineering tradition, in particular in the production of bodywork: it follows that, as already observed in the previous chapter, the great Turin design brands are still today bodywork producers. The second element is that D&E is not limited to the phase of product concept, but covers the complete range of technical processes that go from concept to modelling, from process development to prototyping, and from testing to the launch of short production runs. This entails the presence of a comprehensive spectrum of competencies that create an indissoluble bond from the concept stage to later phases of engineering and the start-up of production. Thirdly, in recent years Turin's D&E has seen a rapid process of composition and integration between traditional tacit knowledge – such as the "hand-made" production of models – and codified knowledge available on the global scale – such as Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM).

As a consequence, D&E is a sort of laboratory that concentrates the engineering and electro-technical traditions, traditional and tacit knowledge with technologically codified knowledge, from concept to production. For these reasons, given the systemic approach adopted, D&E assumes a dimension that we could define as meta-sectoral. As it probably represents the nucleus that has maintained the greatest continuity with the technical knowledge traditionally present in the Turin area and that has managed best to develop in a process of territorialised learning, the relations that different "pieces" of the Turin manufacturing fabric have with D&E represent, in a certain sense, a litmus test to evaluate the impact of different cognitive processes. In other words, if we identify the organisation of a PTS in terms of cognitive learning processes starting from traditional and locally-rooted knowledge, D&E, precisely because it is a direct and clear expression of this

knowledge, becomes a central element in the differentiation of the learning processes of the various PTSs present in the Turin area¹⁰⁰.

Its inclusion among the competitive systems of the Turin economy appears, therefore, as a fundamental passage in the understanding of the possible industrial scenarios that will characterise Turin in the coming years. Design and engineering, increasingly identified as advanced and prestigious functions, vital to the product production cycle, have their roots in the city's manufacturing tradition, in the extensive practical skills that can traditionally be traced back to the previous strategic clusters of the Turin system.

To understand the structural dynamics of the cluster we must distinguish between automotive design from industrial design in the strict sense. Automotive design is divided into two levels: on the one hand, the local Turin manufacturing system includes leading designers that work for the world's largest producers; on the other hand, a significant supply sector of small and medium-sized designers has developed that work for the major designers and first tier Fiat components suppliers. In the eighties and nineties we saw a considerable expansion of both levels, with the development and rooting of strong competencies. The growth of the system's automotive component is closely linked to the changes in the relations between the final vehicle producer and its suppliers: in fact, the involvement of suppliers in the design of components and the consequent increase in investments has meant that specific competencies, once developed within the final manufacturer, has spread and become rooted in the local territory, thus constituting the bases for the autonomous existence of a design and engineering cluster. As regards the relations between design and production, it is important to remember that this activity developed starting from the competencies of local bodywork companies, the historic "panel beaters" that represented the elite manual workers in Turin (Brosio, 1994). Most of these companies still continue to produce bodywork for the top segment of the market alongside design and engineering activities. This very close link between creativity and manufacturing is one of the special features of Turin's know-how and has undoubtedly facilitated the integration of first tier suppliers into co-design platforms.

As far as industrial design is concerned, this involves almost exclusively small craft firms, often without employees. It has a lower penetration of CAD and service activities and follow individual projects: prototyping is often conducted close to the client or at suppliers that are able to provide special types of processing, not always present in the Turin system. The industrial designers are also characterised by their strong specialisation and customer loyalty, in the sense that the relationship between designer and client aims

¹⁰⁰ This aspect will assume key importance in the next chapter, to which reference should be made for some in-depth considerations.

to give continuity and exclusiveness to the collaboration. As far as relations within the sector are concerned, this specialisation and customer loyalty mean that, in contrast to car design and engineering, there is neither strong competition nor frequent collaboration between the various studios.

Despite representing an area of unquestioned importance in Turin and Piedmont's economic fabric, D&E has been the subject of a limited number of studies and analyses. At the time of the Torino Design show (1995), one of the few studies available identified 146 studios operating in Piedmont, 104 of which engaged specifically in the field of industrial design (thus excluding visual communication, construction, clothing and textiles). First and foremost it emerges how the design and engineering studios are strongly concentrated in the province of Turin (80 out of a total of 104 and 60 out of 78) and are small (64 companies out of 78 employ 1 to 5 designers).

If instead we consider the entire D&E supply chain, limiting it to the automotive sector, the literature to refer to is probably the research conducted by the Gruppo Dirigenti Fiat association (2003) [the Fiat managers' group] on behalf of Torino Internazionale, the agency responsible for the internationalisation of Turin and its production system. The analysis in question identified a universe of about 200 companies (193 to be exact) that cover the eight phases of the Product and Process Development Plan (*Piano Sviluppo Prodotto e Processo*, PSPP): definition of objectives and general planning; concept and style; modelling; engineering of the electrical, electronic and telecommunications systems; development of the product and process plan; prototyping; testing; production start-up. The estimate for total employment in D&E linked to the Turin automotive industry is about 10,000, mainly concentrated in small and medium-sized companies (only 13 companies have more than 100 employees, but they provide 40% of jobs in the sector).

Table 6.12 – Share of contracts and turnover by type of client

		Share of contracts	Share of turnover
Type	Final manufacturer	28%	74%
	Main contractor	35%	12%
	Components producer	33%	9%
	Other	4%	5%
Origin	Turin	40.6%	47%
	Italy	17.4%	12%
	Europe	23%	22%
	Americas	8.9%	10%
	Far East	10.1%	9%

Source: Gruppo Dirigenti Fiat (2003), p. 47.

The in-depth study conducted on a sample of 57 companies confirms the central role and vitality of Turin's D&E: it should be enough to note that around 40% of the

companies interviewed was founded, through spin-off processes, between 1992 and 2002, in other words in a period characterised, as was seen in the previous chapter, by a drastic re-sizing of the Turin components industry. The analysis made by Torino Internazionale brings out at least two other pieces of information of great interest for this general picture of the dynamics within the Turin D&E sector.

The first interesting issue concerns the relationship with clients. The fact that emerges from Table 6.12 shows a situation of change and transformation not yet completed:

- (i) on the one hand, there is, in fact, an intensification and differentiation of contractual relations (highlighted by the fact that relations with final manufacturers account for less than one third of the client portfolio) which could lead one to think of a network and polycentric reorganisation of the supply relations with a variety of actors;
- (ii) on the other hand, the relations with the final producers sustain a fundamental role for the survival and competitiveness of D&E companies, if it is true that 3/4 of the sample's turnover depends on contracts with final producers, confirming, and partially contradicting the previous point, the maintenance of the organisational structure of hierarchical dependency that has traditionally characterised the Turin automotive PTS.

This last point is partly corrected by data that show how the geographical origin of clients sees a substantial alignment between the percentage regarding turnover: for example, the relations with Italian clients (including those in Turin) accounted for 58% in terms of number of contracts and 59% in terms of turnover. This means that the dependency on final producers does mean dependency on Fiat, but also rather more. It is significant to observe a sort of bifurcation in the scale of relations with clients, if we consider that over 40% of the sample's turnover comes from contracts with foreign clients and 47% from clients located in the Turin area. Relations with suppliers are much more deeply rooted in the local territory which see a minimum presence of relations with the rest of Italy and Europe, while supply contracts with companies located in Asia and the Americas are almost totally absent. In terms of location/relational dynamics, we can therefore conclude – and this is the second interesting element – that D&E has an almost optimal structure in terms of rooting, thanks to the simultaneous presence of three nuclei of well-established relations:

- (i) a solid portfolio of local clients, with which the economies of agglomeration can facilitate the triggering of learning and co-development processes;

- (ii) a broad supra-national network of clients, which represents both a substantial part of turnover and privileged access to sources of supra-local knowledge;
- (iii) an upstream fabric of supply relations essentially self-contained at the local scale, capable of favouring, at least in theory, the dissemination of spin-offs on the provincial and peri-urban scale.

6.2 Towards a Turin automotive district?

Starting in the 1990s, the "automotive district" has been one of the most successful images in the minds of the specialists. As can be imagined, the image suggests that a system is being formed of Turin SMEs specialised in various phases of the production cycle linked to the automotive industry, sharing at least some of the strong features of Marshallian district organisation as it has emerged in the experience of industrial districts. The basic idea is that the fabric of companies located in the Turin area – mainly in the metropolitan area but also in the rest of the province – has now made itself largely independent of supply to Fiat and/or that it can become so without suffering fatal effects, maintaining its own specialisation in the automotive industry. Although this progressive expansion of the client portfolio is now unanimously acknowledged in almost all studies of the sector, when, to describe this situation of *specialisation without dependency* on the main client, use is made of the metaphor of the "industrial district", in reality some not insignificant implications arise that concern the organisation of the system as such. In particular, the assumption of the Marshallian district as the key to interpretation goes beyond the structural fact – the maintenance of automotive specialisation in the Turin area – to assume organisational elements that cannot be assumed a priori, but must be verified in terms of the organisation of the system.

On this point, the hypothesis that the PTS of the Turin automotive sector has reorganised itself as an automotive district must be verified with respect to two possible falsifications:

- (i) the compatibility of the district model with the characteristics typical of the automotive industry;
- (ii) the compatibility of the district model with the contingent characteristics of the Turin automotive industry.

On this, we will focus our analysis of the district proposal on the relations between suppliers and assemblers, largely ignoring here the discussion of the role of the other two sub-systems considered, i.e. the labour market and competition facilitators (public administration, local development agencies, trade associations, universities, research centres etc.). An article recently published in the *International Journal of Operations and*

Production Management by Zirpoli and Caputo (2002) was dedicated to the nature of client-supplier relations and their role in co-design activities. Starting from the debate that contrasts *keiretsu*¹⁰¹, the Japanese method of organising the value chain in the automotive industry, with the traditional "Fordist" forms based on the prevalence of hierarchical models in the management of relations between the OEM and suppliers, the authors identify six characteristics that determine the possibilities of translating co-design processes into New Product Development (NPD) processes:

- (i) formation of the supply chain enhanced by the initiative of the OEM;
- (ii) preference for a long term "obligational contractual relation" (OCT) instead of an "arm's length contractual relation" (ACR);
- (iii) dismissal of OEM's monopolistic power and use of techniques such as target costing, target pricing, value engineering and profit sharing;
- (iv) a small number of suppliers providing each type of part (in order to reduce transaction costs);
- (v) potential competition between suppliers;
- (vi) cooperation institutions (in particular vertical and horizontal sharing of knowledge, transparency of the operative conditions, elimination of information asymmetries);
- (vii) reputation as discipline mechanisms.

Table 6.13 shows how these traits emerging in the automotive industry coincide or not with the organisational model of the industrial district and how they are expressed in the case of the Turin automotive PTS.

Table 6.13: Buyer-supplier relational features, industrial district, Fiat supply chain

Buyer-supplier relational features	Industrial District Model	Flat Supply Chain Model
OEM's initiative	Not relevant or even counter-productive	Fundamental
Preference for OCT rather than ACR	Preference for ACR	OCT substituting ACR
Dismissal of OEM's monopolistic power	Fundamental	Low
Small numbers of suppliers	Not relevant or even counter-productive	One supplier for each component
Potential competition between suppliers	Fundamental	Limited
Cooperation institutions	Fundamental	Partially applied
- vertical and horizontal sharing of knowledge		- just vertical sharing
- transparency		- low transparency
- low information asymmetries		- high information asymmetries
Reputation	Fundamental	Codified reputation

Source: reworked from Zirpoli and Caputo, 2002

¹⁰¹ Defined according to the case as *Japanization* or *Toyotatism* (Wood, 1991)

The table shows how the model of relations between clients and suppliers that is emerging in the automotive industry does in fact demonstrate some points of contact with the industrial district model, in particular with reference to the re-sizing of the client's monopolistic power, to the balance between competitive and co-operative mechanisms and the role of reputation. On the other hand, some elements typical of the automotive industry remain that cannot in any way be associated with a "district" form: the OEMs necessarily keep the initiative as they remain the key players in the sector, just as the level of investment demanded and the nature of the co-design process require a greater degree of formalisation in contracts, incompatible with the prevalence of ACR typical of the industrial district, and the presence of few suppliers for each component. The most important fact that emerges from the analysis by Zirpoli and Caputo is, however, another one: the fact that the interpretation given by Fiat of the model of relations between client and supplier underlines precisely the elements that diverge the most from the district model. The management of outsourcing by Fiat does not seem, in fact, to lead to a downsizing of its monopolistic power, with the limited participation of suppliers in sharing profits and limited transparency in the management of the supply relationship. The management of the flow of knowledge does not appear to respond to the district criteria, either, with a low impact of horizontal relations of knowledge sharing and a substantial maintenance of the information asymmetry in favour of the OEM. The same is true for reputation: paradoxically, reputation played a greater role in the phase preceding the reorganisation of relations with the components producers, when a significant segment of the suppliers was linked to Fiat by more informal and arm's length relations. On the other hand, the entry of the major components multinationals has helped to spread within the system a more codified notion of reputation, i.e. linked to the possession of formal requisites (for example the specific certifications demanded by the French company Valeo, one of the world leaders in components, with numerous plants in Piedmont). It is no chance that Zirpoli and Caputo conclude their analysis by hypothesising that the transformation of the supply chain introduced by Fiat in the 1990s can be identified in a different model that the authors call "new adversarial":

In this model, co-design practices (modes and times of supplier involvement in NPD) are associated with relational practices not consistent with ones reported in the dominant literature. They can be summed up as follows:

- absence of cross equity stakes;
- [...]
- absence of formal and informal agreement of long-term supply relationships (beyond the life of the model);
- low level of trust between actors;

- strong pressure on cost cutting not always motivated by technical discussions;
- absence of formal programmes of knowledge sharing between actors (Zirpoli and Caputo 2002, p. 1047).

It is easy to note how it is precisely the institutional characteristics that bring the keiretsu model closer to district organisation. This is what seems to be missing the most in the relations between OEM and suppliers in the case of Turin, making it difficult to talk explicitly of an "automotive district".

Finally, the full application of the district metaphor seems to be threatened by two further elements. The first is given by the presence in the territorial system of a substantial number of components multinationals which Fiat has turned to, not finding in its own portfolio of local suppliers the competencies necessary to implement its co-design and NPD programmes. Apart from the fact that the presence of multinational companies is a feature essentially extraneous to district organisation – or, to put it better, there is no unanimity in the literature on districts about the effects of the penetration of MNCs in the local fabric – it should be observed that the presence of these companies in the Turin area is linked mainly to the need to serve Fiat (thus making relocation possible) and that often their entry into the PTS has been followed by a concentration of R&D activities at the research centres of the parent company, further impoverishing the territorialised processes of the production of knowledge. Linked to this fact is the second element that comes into play: as noted by the Osservatorio sulla Componentistica Veicolare, the components industry can no longer be assumed as a single block of companies that exhibit the same competitive behaviour, but it is possible to distinguish between at least five types of supplier: module producers, systems manufacturers, designers, specialists and sub-suppliers. As things stand, all five of these actors are present in the Turin area, giving the PTS the features of completeness and integration of the various phases of the production cycle that are effectively an important characteristic of the district model. However – and this is the central point in the analysis made by the Osservatorio – module producers and sub-suppliers are two categories with a high risk of relocation:

- (i) the module producers because their exposure to high transport costs and the characteristics of their products mean that they must be close to the final assembler, giving an incentive to follow automotive producers in their location changes;
- (ii) the sub-suppliers because their weakness in innovation, specialisation in relatively simple components and normally limited size expose them, on the one hand, to the strong competition of developing countries and, on the other, to the temptation to

base their competitive advantage on lower labour costs that can be obtained through relocation.

In this way, the nascent automotive district would be exposed immediately to the risk of dissolution, given the likely disappearance in the coming years of the all-embracing territorial presence of the entire production cycle that represents one of the pillars of the Marshallian industrial district.

6.3 Towards a new interpretation of Turin TPS¹⁰²?

Before considering some empirical evidence that emerges from a sample of over 300 interviews with companies within the engineering and electronics tradition, it seems worth focusing our attention on previous research conducted by the author on the Turin manufacturing sector in the late 1990s. To examine the transformation of Turin's manufacturing structure, a questionnaire survey of engineering companies was undertaken. The survey covered 150 companies operating in five local production systems in the province of Turin – Turin itself, Avigliana, Pinerolo, Ivrea and Rivarolo. The engineering companies were producers of:

- (i) industrial goods (44 interviews), including makers of machine tools and measuring machines, but also companies engaged in related activities such as the design and manufacture of industrial plant, and the design of integrated production systems;
- (ii) vehicles (62 interviews), including specialist vehicle components producers and also producers of boats; and
- (iii) non-specialist engineering products (44 interviews), some of whom have historical and geographical ties to car production, but who work for numerous firms in other sectors including household appliance manufacturers, aerospace companies, and machinery producers and companies making finished goods such as locks and handles.

The questions focused on:

- (i) local/global relations and competitiveness- especially the internationalisation of the local manufacturing structure;
- (ii) inter-company relationships - the continuing existence of hierarchical forms of organisation (particularly among multinational groups) and the formation of networked clusters of companies; and

¹⁰² This section was published in part in Conti and Giaccaria, 2001.

- (iii) learning processes - and the increasing importance of Turin's designers and engineers and their relationships with engineering companies.

Table 6.14- The selected variables

Perspectives	Variables
Local/global relations and competitiveness	Export
	Presence of TNCs
	Role of internal and external sources of information
Inter-company relations	Role and intensity of informal communication
	Role of untraded relations
	Dependency on suppliers and customers
	Role of the local institutions and organisations
Learning process	Role of trust in supplier agreements
	Linkages with suppliers and customers
	Existence of innovation networks
	Relations with design and engineering
	Role of know-how and know-who

Table 6.14 shows the variables that have been used to analyse these three features of the local manufacturing system. The companies interviewed were asked their opinion on the role that traditional local factors play in determining competitive advantage: logistics and accessibility; the presence of other local agents; training; relations with the workforce; and institutional support. They were also asked their opinion on the local business environment and local "industrial atmosphere".

6.3.1 Competitiveness of the local in the global.

The analysis of Turin's engineering sector necessarily began by considering the competitiveness of the three groups into which it has been divided, taking three variables into account: the propensity to export, the type of competition (if based on the needs of one or few main customers) and the evaluation of whether there was any increase in competitiveness in the course of the 1990s.

The figures (Table 6.15) show fairly clearly how there is a clear-cut difference between the competitiveness of producers of industrial goods and that of companies belonging to the automotive sector. For example, 61.5% of companies that export more than 50% of their sales produce industrial goods. On the contrary, almost half (47.5%) of the companies that do not export belong to the automotive sector, demonstrating that most Turin companies linked to the car industry still maintain an exclusive bond with the Fiat supply chain. A confirmation of this indication is given by the type of competition: 60% of the automotive companies competes essentially by trying to satisfy the price standards of

the main customer, a percentage that drops to 16.7% for the manufacturers of industrial goods.

Table 6.15 - The competitiveness of Turin's manufacturing industry

	Propensity to export		Type of competition		Increase in competitiveness
	High	None	Price-based	Innovation-based	
Generic engineering	1 (3.9%)	19 (31.1%)	7 (23.3%)	14 (20.9%)	16 (24.3%)
Automotive	9 (34.6%)	29 (47.5%)	18 (60%)	28 (41.8%)	23 (34.8%)
Industrial goods	16 (61.5%)	13 (21.4%)	5 (16.7%)	25 (37.3%)	27 (40.9%)
Total (out of 150)	26	61	30	67	66

It can also be seen that 40.9% of companies showing an increase in competitiveness belongs to the cluster of industrial goods (27 out of 44 manufacturers of machine tools and similar have become more competitive in the last ten years).

Finally, the marginal position of generic engineering should be noted, both in terms of propensity to exports and in innovation capacity. This is explained by the fact that this category is made up of third or even fourth tier supplier companies, often small ones that play mainly a support function.

6.3.2 Networks and trust: the local organisation of production.

The organisation of the manufacturing structure was assessed principally by examining the nature of the communication between the various local actors, assuming that the prevalence of formal communication (manuals, technical specifications, contracts) indicates a prevalence of hierarchical relations. On the contrary, the use of more informal means of communication (for instance, personal visits and the exchange of technical staff) has been considered as a sign of the presence of a network organisation. Similarly, trust in the technicians of the customers and suppliers has been considered an important factor for the creation of trust-based relations in the local system.

Again in this case, the companies belonging to the automotive sector are clearly distinguished from manufacturers of industrial goods. Two main conclusions can thus be drawn:

- (i) the first concerns the producers of industrial goods and establishes a relation between the intensity of informal communications with customers, trust in suppliers' technicians and competitiveness. In this activity, the local knowledge relationship that is the basis of competitive advantage seems to be of a strictly technical type. In other terms, local learning occurs upstream (in the supply relationship) through trust in the suppliers' technicians, and downstream (in market

- relations) through the close collaboration between the producer's technicians and those of the user of the product;
- (ii) the second refers mainly to the automotive sector and underlines the intensity of supply relations (based on price) and its relations with competitiveness. In this sector, the learning process is still organised according to the hierarchy typical of Fordism, in that it connects the hegemonic company, its first tier suppliers and sub-contractors in a hierarchy: the leading company transmits orders to those below through forms of communication that become more and more informal as one descends the tiers in the hierarchy. As this is a sub-contracting chain, the asymmetry between relations up and down stream may be surprising: the individual company seems to perceive its own relationship with its suppliers as more intense than with its customers. However, when it has to express the perception of its own relations with its main customer, it describes it in terms of relative dependency. This is typically hierarchical behaviour, in that there is a clear perception that the information and decision-making flow is top-down, from the main customer to the supplier, and from there in turn to the sub-contractors.

Thus, as we move down to the lower levels of the hierarchy, the use of informal methods of communication reflects the need of sub-contractors to adapt flexibly – or, better, to bend over backwards – to the highly codified flows of orders and information that arrive from above³.

6.3.3 Design, engineering and learning.

One of the principal hypotheses formulated about the transformation of Turin's manufacturing structure is that D&E are fundamental to the definition of the identity of the local system. These are activities of great interest from the point of view of learning processes:

- (i) because of the high level of tacit knowledge: although the growing importance of computer-based design and engineering tools (CAD, CAM) has introduced a process of codification of the knowledge required, D&E activities still depend on forms of tacit knowledge, linked to experience and to the sharing of aesthetic and technical understanding, reproducible only through intense personal relations of collaboration and apprenticeship⁴;
- (ii) because of the close bonds with production: most of Turin's historical designers combine design and engineering work with the production of special, high quality bodywork. The tacit knowledge immanent in D&E activity is thus easily codified in products that are exported worldwide;

- (iii) because of the immaterial and symbolic nature of design, which makes it similar to the production of luxury consumer goods in the industrial districts. In both cases, in fact, tacit local knowledge is translated into style, taste and sophistication that confer a particular symbolic value on the products. In other terms, in the case of design, the transfer of knowledge between local and global, between the tacit and the explicit, occurs through the creation of sign-value.

It can be noted that it is the vehicle sector that uses design the most: 22.5% of companies in this sector regularly use more than three forms of design, against the 15.9% of producers of machine tools and equipment and just 6.8% of generic engineering (Table 16).

Nevertheless, this relationship has a contradictory aspect. In fact, almost half the companies that do no design work (48.1%) belong to the vehicle sector and only 14.8% to the industrial goods sector. We can thus say that the vehicle sector is the most design-intensive in Turin, but it is also the one with the greatest number of companies that do not undertake any design work first-hand and is, therefore, in a situation of total dependency on the customer. In contrast, the production of industrial goods sees the use of design as an activity needed by almost all the companies in the sector, even if less intensively than the vehicle sector⁵: 75% of industrial goods manufacturers regularly undertakes one or two forms of design.

Table 6.16 - Intensity of design and specialisation

Specialisation	Intensity of design (1)			Total
	None	Average	High	
Generic engineering	10 (22.7%)	31 (70.5%)	3 (6.8%)	44 (100%)
Vehicles	13 (21.0%)	35 (56.5%)	14 (22.5%)	62 (100%)
Industrial goods	4 (9.1%)	33 (75.0%)	7 (15.9%)	44 (100%)
Total	27 (18.0%)	99 (66.0%)	24 (16.0%)	150 (100%)

Note: (1) $\chi^2 = 0.081$

The difference between the vehicle and the industrial goods sector is clear even when considering the different ways in which the companies conduct their design work. It can be seen, firstly, that industrial goods producers usually maintain control of design, whether internally or delegated to external consultants (Table 6.17).

As far as autonomous and internal design is concerned, the difference is unequivocal: only 8 industrial goods producers out of 44 (18.2%) do not do design work internally, a percentage that rises to 43.5% for vehicles and 59.1% for generic engineering. Again in the case of design entrusted to external studios and professionals, the industrial

goods producers are the ones that use the tradition and skills of Turin designers most intensively (22.7% against 16.1% for vehicles and 6.8% for generic engineering).

Table 6.17 - Autonomous design and manufacturing specialisation

Specialisation	Autonomous and internal design (1)		Autonomous and external design (2)		Total
	No	Yes	No	Yes	
Gen. Engineering	26 (59.1%)	18 (40.9%)	41 (93.2%)	3 (6.8%)	44 (100%)
Vehicles	27 (43.5%)	35 (56.5%)	52 (83.9%)	10 (16.1%)	62 (100%)
Industrial goods	8 (18.2%)	36 (81.8%)	34 (77.3%)	10 (22.7%)	44 (100%)
Total	61 (40.7%)	89 (59.3%)	127 (84.7%)	23 (15.3%)	150 (100%)

Note: (1) $\chi^2 = 0.00041$

(2) $\chi^2 = 0.11$

If we consider the design done by the customer, the situation is reversed: only 6.8% of industrial goods producers works to customer designs, against the 21% of components manufacturers and 31.8% of companies operating in generic engineering⁶.

We can thus conclude that the production of industrial goods implies greater design autonomy and greater use of resources external to the company, but internal to the local system in which it is rooted. Naturally, the dependency of the vehicle sector on the main customer does not concern only the outlet market but also design.

6.3.4 When Fiat make the difference.

The empirical analysis has identified two different components of Turin's manufacturing industry, characterised by their own production and competitive behaviour, the vehicle and industrial goods sectors. Before recomposing the results of this analysis into a new image of Turin's manufacturing industry, it is however useful to look more closely at the vehicle sector.

The feeling of there being a radical transition in Turin's vehicle industry is backed up by some profound transformations in the local manufacturing structure. The location of numerous components multinationals, the growing importance assumed by the quality of sub-contractors, the progressive involvement of suppliers in research and design, and significant symptoms of entrepreneurship shown by small and medium sized companies raised to the rank of first tier suppliers are all evidence that suggest a radical transformation of the vehicle sector. In particular, they suggest that this transformation has assumed traits of innovativeness, participation and competitiveness that justify talk of a full-scale auto district, of a post-Fordist organisation of the sector no longer guided by the hierarchical principle that saw the absolute hegemony of Fiat. In this interpretation, new economic actors (first tier suppliers, transnational companies, research centres, designers) are acquiring new significance. These are connected to each other by relations of co-

operation and collective learning that confer new competitiveness on Turin's vehicle industry.

Above and beyond the specific traits that the auto district assumes in the various interpretations, it is important to observe that they bear out in any case the hypothesis that the vehicle sector still represents a strongly homogeneous set of activities which, despite the profound changes of recent decades, possess a common identity. However, this hypothesis makes it difficult to explain some phenomena, the most important of which is the polarisation of the behaviour of companies totally dependent on Fiat and of those which had become independent of the hegemonic company. Among the former, the formation has been seen, for example, of a nucleus of small first tier suppliers that depend totally on the relationship with Fiat and which show little territorial embeddedness. Among the latter, instead, the conquest of autonomy has often meant abandoning OE production, with an orientation towards the vehicle after-market, and abandonment of the auto sector, with the consequent specialisation in the production of components for motorcycles, boats and agricultural machinery (Città di Torino, 1998).

Table 6.18 - Non Fiat vehicle sector and Fiat suppliers

Characteristic	Non Fiat vehicle sector	Fiat suppliers
High propensity to export	10 (23.3%)	0 (0%)
Informal communication with suppliers	2 (4.7%)	7 (21.2%)
High intensity of design	5 (11.6%)	7 (21.2%)
Total absence of design	7 (16.3%)	11 (33.3%)
Customer's quality standards	28 (65.1%)	28 (84.8%)
Price competition for the customer	8 (18.6%)	12 (36.4%)
Membership of a group	6 (14%)	11 (33.3%)
Prevailing use of local information	11 (25.6%)	17 (51.5%)
Fundamental role of logistics	7 (16.3%)	3 (9.1%)
Negative role of logistics	8 (18.6%)	2 (6.1%)

Note: All relations are statistically significant ($\alpha \leq 0.1$).

The most interesting aspect is that both of these types of behaviour have been translated into an increase in competitiveness: in the period 1990-1997 the growth in exports was high above all among companies that were no longer first tier Fiat suppliers and which, in contrast, had moved more decidedly towards supplying Fiat (Enrietti, 1999).

At this point, the key question is to understand whether such a profound divergence of behaviour can be interpreted within a coherent framework, such as the one proposed by the image of the car district. Is there one car district or should we consider there to be a profound rift between the galaxy of companies that still orbits around Fiat and the vehicle nucleus that has tried different roads to independence from Fiat? Posing this question is the same as asking whether the vehicle companies dependent on Fiat and those that have become autonomous show different forms of behaviour that imply two distinct ways of organising production, embedding themselves locally and achieving competitiveness.

The absolute figure indicates how many companies possess a given characteristic, while the figure in brackets indicates the percentage of companies that possess the characteristic in question, taking 100 as the total companies belonging to the cluster.

To investigate these differences, the generic engineering companies were reclassified into two groups: companies integrated in the Fiat-centred PTS and companies extraneous to it. This division is obviously not intended as absolute: within this PTS there are companies which have tried to diversify their production, especially by increasing exports; vice versa, other companies extraneous to the Fiat supply chain may in the past have used relations with the Fiat-centred PTS to acquire knowledge and skills later used for their own purposes.

76 companies were identified in this way, 54⁷ of which belonging to the vehicle cluster and 22 classified previously in the generic engineering group (of these, 9 belong to the hot pressing system of the Rivarolo local system). Table 9.6 summarises the differences between the two groups, with reference to some of the main characteristics of the vehicle cluster.

The comparison clearly brings out how the characteristics of the vehicle sector are in fact those of the Fiat-centred PTS. The first significant fact is that, despite the government incentives to trade in old cars, companies in the Fiat supply chain have not seen a significantly higher increase in competitiveness than others. This is particularly interesting if we consider that many of the companies which have left the Fiat orbit work in the after-market, a sector damaged by the trade-in incentives, as the incentives encouraged motorists to buy new cars rather than repair old ones. As far as the role of groups is concerned, we can see that it has been above all Fiat suppliers that have been the targets of takeovers. This fact underlines once again that the main reason for the presence of multinational groups is still access as a supplier to Fiat.

The processes of value creation also differ profoundly:

- (i) the Fiat supply companies have an ambiguous relationship with design: on the one hand, they are the companies that do most design; on the other, numerous

companies depend entirely on Fiat for design (one third of companies has no design activity);

- (ii) the hierarchical production chain that binds each single firm closely to the main customer (on which it depends) and its supply chain is specific to the Fiat system, and not to the vehicle sector as a whole;
- (iii) it is above all the companies of the Fiat-centred PTS that depend very much on local information, and they also show less propensity to export: these are two symptoms of the Fiat-centred PTS's relative closure, but also of embeddedness.

The empirical analysis thus leads us to the fact that the Turin vehicle sector can no longer be seen as a cohesive set of activities and actors. Our hypothesis is, in contrast, that two different systems have formed within it, each of them characterised by its own behaviour. The Fiat supply chain, despite its important transformations, still appears as a hierarchically ordered system, within which positions of innovation and production excellence co-exist with situations of precariousness and dependency on the decisions of the hegemonic companies. The non-Fiat vehicle sector has instead gradually differentiated itself from the rest of the system, to the point of assuming an alternative identity: this, although not characterised by its own behaviour and perceptions as happens with the producers of industrial goods, can no longer, in our opinion, be traced back to the Fiat system. The next section will recompose these results in an attempt to offer a partially new image of Turin's manufacturing industry.

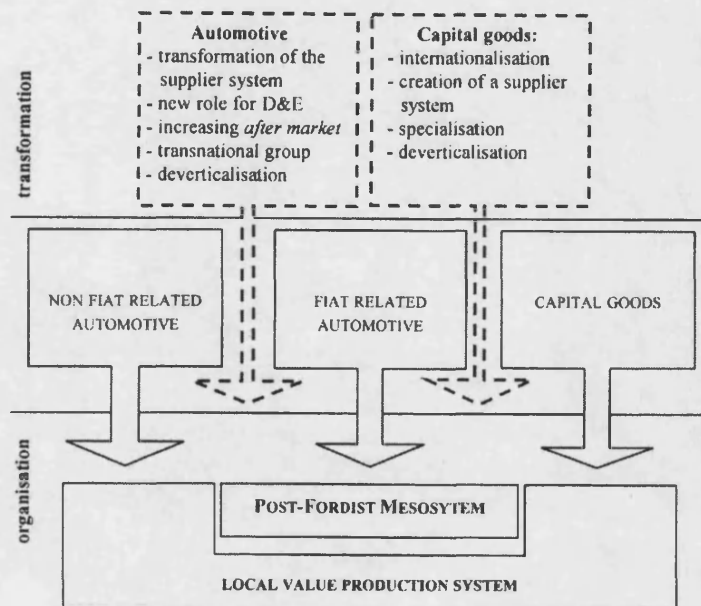
6.3.5 Fiat-centred PTS and emerging Mechatronic PTS.

The empirical analysis highlights that the former Automotive PTS went through a schismogenesis process¹⁰³ and now is split into three distinct sub-systems: an industrial goods system, a vehicle production system dependent on Fiat, and a vehicle system independent of Fiat (Figure 6.1).

Empirical evidence suggests that this schismogenesis process ended up with the reorganisation of these three systems into two separate Productive Territorial Systems, a post-Fordist Fiat-centred PTS – the son and the heir of the original unique Automotive PTS – and an emerging Mechatronic PTS, bringing together the capital goods and non Fiat-related automotive sectors.

¹⁰³ Schismogenesis is a term used by Gregory Bateson (1979) to indicate a process of progressive differentiation of norms of individual behaviour as the result of cumulative interaction between individuals.

Figure 6.1 – The transformation in Turin manufacturing



6.3.5.1 The post-Fordist Fiat-centred PTS

The empirical analysis shows that the relationships in the Fiat-centred PTS have declined, questioning the traditional assumption that Turin's manufacturing base pivots exclusively around automotive production in general and Fiat in particular. The hierarchical production system that remains is, however, typical of Fordist Turin.

The competitiveness of the Fiat-centred PTS still depends on companies having preferential relationships with major corporations, principally Fiat. It is true, nevertheless, that change has progressively empowered first tier suppliers. However, these relationships remain profoundly hierarchical, with decision-making and innovation flowing through various levels, from Fiat at the top to small and medium sized subcontracting companies at the bottom.

This continuity of Fordist organisation is particularly evident in four aspects of current relations. First, the relations between companies show the emergence of network characteristics in addition to the persistence of hierarchical features. On the one hand, this involves the transformation of the Fordist multinational, Fiat, into a networked transnational corporation (TNC). On the other hand, there are also signs that innovation is spreading to small enterprises as networks centred on Fiat develop to embrace design and engineering studios (D&E), first tier suppliers and Fiat Research Centre programmes. Nevertheless, dependency on Fiat remains. Second, hierarchical relationships still provide the frame to local and global interactions. Either Fiat or first tier suppliers mediate access for firms to international markets. But, the international groups that act as nodes in both local and supra-national networks are shown in survey responses not to be embedded at both

scales, but now progressively to be less locally embedded as their exports expand. Indeed, the rise of national and international groups appears to diminish territorial embeddedness without bringing the benefits of connections to global markets. Third, the learning relations linked to design and engineering work are still channelled primarily through the companies' main customer, Fiat. In this PTS, the use of D&E for product and process innovation is less frequent than in the system making industrial goods. Perversely, while components manufacturers linked to Fiat make greater use of D&E, many of them have no design and engineering activities and depend entirely on those of their customers. In this hierarchical decision-making chain, knowledge and information are in the hands of the dominant firms. Fourth, the final product of the PTS, the automobile, is sold on the customised mass market, which, as we have seen, has evolved from the Fordist mass market.

From this analysis of milieu relations, it is reasonable to conclude that the Fiat supplier system, despite continuing local bonds, is structured as an a-territorial economic PTS. The organisation of the Fiat-centred PTS appears to be in a process of transition from old Fordist arrangements to a post-Fordist identity that is still to be defined, but which is somewhere between the global and the local and between hierarchy and network.

The emerging post-Fordist Fiat-centred PTS is made up of various actors each following different trajectories of change and each of which will contribute differently to the system in the future. At the centre of the system is Fiat, which is becoming increasingly transnational, and assuming a global network form. Its territorial embeddedness in Turin is increasingly ambiguous and controversial. On the one hand, it is part of a network of local co-operation, especially for decision-making, innovation and engineering activities, because the designers and first tier suppliers it uses are strongly embedded locally in Turin. On the other hand, the locations of production plants are now seen in a global perspective, with little concern for Turin.

First tier suppliers appear increasingly to be on the borderline between hierarchy and network forms of organisation - between local embeddedness and a-territorial dependency. However, the inter-firm relationships of these enterprises are still evolving. Their progressive involvement in co-design networks with Fiat has increased their autonomy and facilitated the consolidation of network relations. But, their acquisition and take-over by multinational groups has meant that many first level suppliers have become part of a new hierarchy. Ambiguity can also be seen in their evolving relationships with the local area. While these networks embed companies in a close-knit fabric of untraded relations, it is still true that many of these companies are willing to relocate their manufacturing activities close to the new globally distributed plants of their main customer.

Subcontracting is the component of the system that most closely reproduces the characteristics of the old Fordist form of organisation. Subcontractors remain largely

excluded from the restructuring processes of the Fordist hierarchy and are unaware of the birth of new relational networks with either first tier suppliers or other subcontractors. From a territorial point of view, subcontracting acts within a mainly local context in contrast to the findings reported in Chapter 4. These small firms can gain access neither to global production and innovation networks nor to foreign markets.

Finally, there are two other important sets of actors that “network” with Fiat and its first level suppliers. These are the design and engineering companies and Comau, the group controlled by Fiat that makes industrial goods for the holding company (especially robots and integrated production systems). In both cases, these are actors whose competitiveness and excellence are based on local factors which cannot easily be found outside the Turin area (tradition, know-how, experience, skilled personnel, trusted suppliers).

The image that emerges from this analysis is that of a system shifting towards the globalisation of the relations of production and, therefore, towards potential uprooting from the Turin milieu. The rooting of the PTS in Turin depends, in fact, on the balancing of two opposing forces:

- (i) a centrifugal force, resulting from the strategic decisions of global actors – the buying up of local suppliers by outside interests, and Fiat’s global decentralisation that encourages its suppliers to follow; and
- (ii) a centripetal force, linked to specific localised knowledge-based processes, the most important of which is the close connection between D&E activities and production.

A balance between these forces has yet to emerge.

6.3.5.2 The Mechatronic PTS

The empirical analysis also underlines the emergence of another local system characterised by a stratification of local and global relationships which sets it apart from the system discussed previously. This is the PTS identifying those activities and sectors which, starting from the engineering tradition that is the heart of Turin’s know-how, have been able to activate the local factors (trust, personal acquaintance, sharing of values and skills etc) that play a fundamental role in supporting the competitiveness of local manufacturing systems.

The organisation of the Mechatronic PTS is a nucleus of relationships that link D&E, the manufacture of industrial goods and a close-knit network of companies specialised in micro-mechanics and information technology (IT). This is the first and principal element of the local value production system. The competitiveness of this system

arises from its propensity to export and the increased competitive capacity of the firms involved in recent years. They tend to have a multitude of customers, rather than one or two key ones. They are highly specialised and globally market oriented. At the same time, they see the role of the local economic environment of Turin in a positive light in terms of "industrial atmosphere", manufacturing tradition and so on.

The milieu of the industrial goods system derives from three aspects of the interactions between companies that define the identity of the local manufacturing system. First, companies are involved in networks of informal relationships, especially with their customers. Products are tailored to the highly specialised needs of customers who are mainly located abroad. As far as supplier relations are concerned, a distinction can be made between those with IT consultants (for software) and those with the micro-mechanics sector. Here, quality is a major issue, and more so than in the vehicle sector. Second, local/global connections are radically different to those of the Fiat-centred PTS. In the absence of major international groups, the link to the global network is through numerous small and medium sized companies that sell directly on international markets. Here, market access is not mediated through a few large actors. Most of the manufacturers and their suppliers of tools and components are export-oriented. The informal and co-operative nature of their commercial relationships facilitates the transfer of skills and knowledge and provides access to innovation. Third, inter-firm relationships involve learning through customer-focused transactions centred on co-design and co-engineering. With customers located abroad, these are not entirely local learning processes, though firms in the PTS make intensive use of the D&E skills in Turin. Thus, in part, territorially embedded learning processes persist.

In the design and engineering element of the local value production system, firms are therefore strongly embedded in the local Turin context (Brosio, 1994). They draw their competitiveness from the continuity of the Turin manufacturing tradition, of which they have been able to build advanced and innovative competencies in micro-mechanics (especially in aerospace production), mechatronics and IT (Ceris, 1990; Rolfo, 1993).

A second element of the Mechatronic PTS centres on vehicle production activities not linked to Fiat. In some cases, firms have shifted to producing components for motorbikes and agricultural machinery, others to producing for the automotive spare parts market. The drivers of this transformation are medium sized and large internationalised companies, some of whom were formerly first tier suppliers to Fiat which have adopted diversification strategies. They have drawn around themselves significant parts of the Fiat supplier system, nurturing the formation of Turin's third engineering system. From a territorial point of view, this engineering system has features half-way between those of the Fiat-centred PTS and the industrial goods system:

- (i) relationships between companies remain fundamentally hierarchical;
- (ii) however, they make greater use of information external to the local system, depend less on one main customer, are more market-oriented, export more, are more dependent on local logistics support and have fewer corporate groups in their ranks; and
- (iii) design and engineering activities are in a phase of incipient diffusion amongst the companies in the system.

These characteristics make this vehicle segment (not linked to Fiat) one of the critical kernels of local development in Turin. The manufacturers of the industrial goods system and the Fiat-centred PTS possess their own clear development trajectories; the former based on embeddedness and the latter on globalisation. The situation is more critical for the vehicle segment not linked to Fiat. It appears to be in a delicate phase of transition in which the supportive network of personal and entrepreneurial relationships has not yet been formed. At the same time, the globalisation of the automotive sector and the desire of local entrepreneurs not to belong to the Fiat supply system are weakening their ties with the Fiat-centred PTS.

The Mechatronic PTS thus has two components. One comprises companies that constitute the industrial goods system, and the other comprises the firms of the non-Fiat vehicle system. In the first, businesses have a very local production perspective and are linked into networks based on trust and the sharing of specialist skills. They appear to be strongly embedded in the territory from which they draw the resources needed to maintain their own competitiveness in international markets. In the second, only some businesses in the system are strongly embedded locally. Others are not. This is an unstable component of the PTS, that is going through profound transformation.

Overall, the markets for the output of the PTS discussed here are highly specialised and serve personalised international markets, where networks of relations between producers and users are created that are decisive for the competitiveness of both. These are predominantly global markets: the vehicle spare parts market, the non-Fiat vehicle sector, and niche markets for consumer goods and intermediate goods.

Nevertheless, it is still clear that local markets remain important. The Fiat group and its suppliers have played a dual role. While they have created a large pool of demand, they have also functioned as a "technological incubator" in the sense that many new entrepreneurs are technicians or workers who have left the Fiat-centred PTS.

Obviously, the mechatronic PTS and the Fiat-centred PTS are not reciprocally closed systems. In addition to the market relations already mentioned, there are various other points of contact between the two. First, in recent years, Comau has progressively reduced its exclusive bond with Fiat, establishing itself as one of the world leaders in the

design and manufacture of integrated production systems. Parallel to this, it has intensified its untraded relationships with local and global company networks. This transformation makes Comau a potentially important catalyst of knowledge creation and innovation in the Turin area, generating positive externalities for the local value production system. Second, the design and engineering studios, although based on skills profoundly rooted in the Fiat-centred PTS, are also important actors in the local value production system. Third, some first tier suppliers are gradually breaking free from Fiat and many small subcontractors who formerly worked exclusively for Fiat are now sometimes accepting contracts from these companies.

6.4 Conclusions.

As we have seen in the previous chapter, the Turin vehicle PTS has been exposed since the 1980s to centrifugal forces that have challenged its cohesion and, in a certain sense, its very existence. Looking at this in detail, it has been through two distinct phases, the first characterised by a strong structural coupling and weak organisational synthesis; the second, in contrast, was distinguished by an intensification of the organisational synthesis, challenged, however, by an evident process of destructuring. It has also been underlined how this destructuring was deliberately pursued by the hegemonic figure in the PTS, Fiat, through radical processes of relocation and reorganisation of the supply chain. In this chapter, our attention has been focused on the behaviour of those segments of the original PTS that have seen the gradual weakening of their relations, once privileged, with the centre of the system or even marginalised or expelled from the system. From this perspective we have noted how the three most significant segments of supply (components makers, capital goods manufacturers, designers and engineers), although characterised by rather heterogeneous competitive dynamics, are in a phase of transition:

- (i) the *components producers* have begun a process of diversification and differentiation of their production which has led them to a relative, even if limited, autonomy from Fiat's strategic choices. In particular, it is possible to observe a bifurcation between some segments stably rooted in the Turin area in terms of both research and production, and other sectors that are more subject to international competition and/or the temptation of relocation;
- (ii) the production of *capital goods* has in a similar way shown itself able to undertake a development path largely independent of belonging to the automotive PTS, even if with clear difficulties. In particular, it has been underlined how, in contrast to the components makers, on the regional and not only provincial scale there is a fabric of companies operating in the production of capital goods. At the same time, it also emerged how the competitive performance of Turin companies differs profoundly

from that of those located in the rest of Piedmont, making it unlikely that we will see the formation of a Piedmont system of capital goods producers in which the different local and provincial situations are integrated;

- (iii) finally, *design and engineering*, appears clearly as the most complex sector. On the one hand, D&E appears to be a fundamental element for the competitiveness of the Turin automotive industry while, on the other, it has begun processes of sectorial and geographical diversification and differentiation. Again in this case there is no shortage of elements of uncertainty and ambiguity: examples are the dependency in terms of turnover that still links automotive D&E to final vehicle producers, or the difficulties in creating links between design and production on the local and regional scale in non-automotive sectors.

Two alternative hypotheses of reorganisation and reterritorialisation were then considered. The first of these pivots on the transformation of the PTS centred on Fiat into an *automotive district*, in other words a different PTS characterised by:

- (i) relations no longer rigidly hierarchical but mainly networked, in which co-operative relations assume considerable weight and in which:
- (ii) the presence of Fiat is no longer the centre of gravity of relations but a sort of *primus inter pares*, meaning that:
- (iii) the possibility for the automotive PTS to reproduce its own organisation even in the event of catastrophic structural changes, such as the total or partial relocation of Fiat.

The thesis of the automotive district has been questioned here in that there are clear incongruities both at the industrial level (i.e. regarding the compatibility of the district organisation with the automotive industry) and at the Turin scale (in other words, concerning the specific resilience that stems directly from the history of the Fiat-centred automotive PTS). More radically, we have attempted to demonstrate, on the basis of the results of previous research by the author, how the various "pieces" of the original Turin automotive PTS are characterised by radically differing forms of organisational behaviour. This led us to draw up an alternative thesis to that of the automotive district, that of the schismogenesis of the Turin automotive PTS. In other terms, the transformations driven by Fiat starting in the 1980s were to progressively open the road to differentiated behaviour within the various sub-systems, in particular within that of small and medium-sized enterprises. In other words, the emerging hypothesis is that the formation is underway of a number of Productive Territorial Systems which, although they show some points of structural coupling, are characterised by radical differences in the processes of

organisational synthesis, i.e. in the processes of territorialised collective learning that define the organisation of one PTS compared to the others located in the same area.

Chapter 7: Toward the identification of Turin's TPS(s).

The previous two chapters have been respectively focusing on the historical reconstruction of the genesis and dynamics of the Fiat-centred automotive TPS and on the possibility that the radical transformations it passed through deeply changed not only the Structure but its Organisation as well. According to our conclusions about TPS approach's added value, and its following methodological consequences, we might say that chapter 5 and 6 have been concerned with both the issues of variety and change. In particular, starting from an assessment of the variety that characterised Turin manufacturing fabric even when it was alleged to be a pure Fordist town (chapter 5) our concluding remark suggested that some processes of divergence from the ideal typical Fiat TPS were at work at the end of the 90s (chapter 6). In particular, the hypothesis emerged that from within the original TPS two groups were now following different paths, with the conclusion that eventually two TPS were simultaneously at work, a mechatronic one and Fiat-centred one. Also the degree of differentiation between non-automotive firms (mainly specialised in machine tools production) and non-Fiat automotive firms was reducing. Finally a third demarcation was emerging within the Fiat-centred group, distinguishing direct suppliers from indirect ones. While the former were more and more merged into trans-national groups and hence involved both in global automotive supply-chain and in deep local co-design processes with Fiat, the latter were forced to fit a dramatic re-organisation of the supply-chain. In particular, automotive SMEs met a double selection: on the one side, Fiat decreased the number of direct suppliers, pushing many firm either to second and third layers or even outside the Fiat system; on the other side, the entry of TNC into the local supply-chain forced local SMEs to face international competition and to adapt to more demanding standard, in terms of both quality and just-in-time capabilities.

In this chapter, we will try to empirically test this image about variety and change through the lenses of the Territorial Productive System. In order to meet this task, we are going to focus our attention to two scales of analysis, single firm behaviours and territorialised collective behaviours. At the first level we will try to distinguish different behaviours among groups, with reference both to firms' structural characters (size,

performance, ownership) and their specific competitive behaviour. At the second level we will be focusing on the main hypothesis of our work, that is the possibility of distinguishing the territorialised behaviours that influence firms' competitiveness in terms of a twofold principle of embeddedness: on the one side, those generic endowments expressing a structural coupling among firms and between firms and the territory (*structural embeddedness*) and, on the other side, the place-specific learning processes which suggest the presence of organisative synthesis (*organisative embeddedness*).

This task will imply a change in the methodology we followed in chapter 5 to describe Fiat's environment as a TPS. We shall move, in fact, the focus from the interaction between a limited number of elementary systems to the attempt of building a microfoundation of the TPS. In other terms, we will try to make the TPS emerge from direct observation of the individual actors involved. In particular we shall focus the attention on the behaviours of individual firms belonging to the mechanical and electrotechnical tradition. This choice has been dictated by the need to assess the issue of indirect territorial competitiveness, that is the relationship between territorial processes and firms' competitiveness.

We will develop this line of argument in trying to address three research questions:

Question 1 – Did the divergence process highlighted in the previous chapters lead to a greater degree of variety in the Turin manufacturing fabric?

In order to answer this question, we shall introduce in the sample two principles for classification within these categories, firstly with respect to firms' proximity from Fiat and automotive (section 7.2) and secondly with reference to the sectorial belonging of the sampled enterprises (section 7.3). The point is that, theoretically speaking, any hypothetical TPS takes place to a scale which somewhere between the single firm and the territory (excluding of course the extremes) and this scale is not given once and for all. In fact, as we have seen in chapter 4, TPS' boundaries are fuzzy toward both the external otherness and the internal otherness. Hence cutting TPS' boundaries always takes place in a grey zone where topographical categories such as inside/outside are necessarily relative and ambiguous.

Question 2 – Is the emerging typology effective in showing a clear correlation between firms' competitiveness and territorialised behaviours?

The point here is to evaluate whether this narrative about change and variety can also offer a further added value with reference to the issue of firms' competitiveness (section 7.4). We are asking whether the distinction between structural and organisative embeddedness can highlight some more general features about the relationships between

economic activities and territories. In other terms, the issue is whether the concept of TPS can be displayed to analyse firms' behaviours and performances.

Question 3 – What kind of synthetic picture can we get from observing Turin manufacturing fabric through the lens of TPS?

The point is to consider how and why the TPS can offer a better overview of what has been going on in Turin during the last twenty years than traditionally oversimplified concepts, such as industrial district, cluster or one-company-town (section 7.5). In other term, we will be questioning if TPS offers a more satisfying image of Turin than other concurrent narrations. In particular, we will address the question of how the TPS can keep together the apparently diverging issues of variety and continuity

7.1 Methodological notes.

In order to get the information needed to cover the above issues, there was of course no chance of finding a ready-made dataset concerning a broad set of information about local firms' qualitative behaviour such as territorial embeddedness and territorialised learning. Hence the choice has been to collect directly the requested information through a questionnaire.

7.1.1 The sample and the questionnaire

A survey covering 400 enterprises have been made through face-to-face interviews. The sample has been generated random covering proportionally the main areas of specialisation which might considered the expression of traditional Turin mechanical and electrotechnical competencies. In particular we have identified five areas covering the main field of this tradition: machine tools; production services; electrotechnics; mechanics and metalwork; automotive. The sum of the ATECO codes into which such areas are split gives us a population of 9.773 plants, with an overall employment of 209.219 workers¹⁰⁴. We defined a sample of 400 firms, equal to about 4% of the overall population, proportionally split among the five categories (table 7.1).

The only correction made to the sample was in relation to the geographical distribution: about 80% of the plants in the population are located in Turin metropolitan area, while our sample was more equally distributed across the Province territory (about 55% in Turin metropolitan area and 45% in the rest of the Province), in order to grasp also dynamics and processes which were far from the geographical bulk of the FIAT-centred TPS.

¹⁰⁴ We have considered only full time long term employment. Despite the rise of flexible contracts, the data about temporary workers were not reliable.

Table 7.1 – The composition of the sample and of the population.

	Sample	Population	Composition	Employment
Machine tools	48	1.176	12,03%	34.576
Production services	128	3.121	31,93%	35.785
Electrotechnics	54	1.328	13,59%	27.710
Mechanics and metalwork	148	3.623	37,07%	41.368
Automotive	21	525	5,37%	69.780
	400	9.773	100,00%	209.219

Source: Istat census 2001.

The population which the sample was drawn from came from the merging of two different databases; the first one is called AIDA, produced and managed by Bureau Van Djck, while the second one is the database of the Chamber of Commerce, in order to integrate the AIDA database¹⁰⁵.

I have personally carried out about 40 interviews, while the others were conducted by a specialised marketing agency. The team was made up of about 20 graduate interviewers, whom I trained in a two day workshop about the main purposes of the research. In the end, out the 400 interviews made, 12 were excluded from the sample as the real activity of the firm was outside the set of competencies we identified as the main core.¹⁰⁶

Table 7.2 shows how the sample can be split according to a Pavel and Pavitt inspired typology (Pavitt, 1984; Pavel and Pavitt, 1987) and, subsequently, with reference to the sectorial specialisation¹⁰⁷. The most numerous group is represented by scale intensive producers (184 firms, about half of the sample) and, within it, by car components producers (53, equal to 13,66%) and mechanical work firms (55). Exactly one hundred is the number of specialised suppliers, mainly machine tools and equipment (e.g. mould) producers. Finally we have 33 hi-tech (electronics, ICT equipment, nanotechnologies, aeronautics) and about 71 firms which are related to production services, either in ICT (mainly software for automation and control of industrial processes) or in design and engineering (D&E).

About 1/3 of the sample belong to a group which, in most cases, is Italian rather than foreign (roughly 2/3 and 1/3). 32% of the sampled firms have been created after 1990 and only 5,7% before 1945. As far as the dimension is concerned, about 10% of the firms have less that 5 employees and another 10% has more than 250. Hence most of the

¹⁰⁵ The two databases cover about 93% of the Istat evaluation of the population.

¹⁰⁶ In particular, 7 firms were specialised retail and maintenance and 5 were architects workshops and interior designers.

¹⁰⁷ Table 7.1 and table 7.2 do not match exactly each with the other, given a gap between the ATECO description of the activity and the real production carried out by the firms. Hence, in the rest of our analysis, we shall be referring to the "real" composition of the sample as showed in table 7.2.

sample is concentrated in the between classes, with special reference to the "5 to 15" and to the "16 to 50" ones (25% of the sample each). The overall employment is a few less than 50.000, with a conspicuous growth between 1996 and 2004 (from 23.550 to 49.163 workers). Although almost half of the sample does not export at all (42,5%), there is a consistent group (20%) of export-led enterprises (exporting more than 20% of their turnover).

Table 7.2 – The composition of the sample.

Pavel and Pavitt	Specialisation	Sample	%
Hi tech	Hi tech	33	8,51%
Specialised suppliers	Machine tools	89	22,94%
	Electronic equipment	11	2,84%
	Plastic and rubber transformation	34	8,76%
	Metalwork	13	3,35%
Scale intensive	Mechanical work	55	14,18%
	Electronic components	29	7,47%
	Car components	53	13,66%
Production services	Information and communication	41	10,57%
	Design and engineering	30	7,73%

7.1.2 The questionnaire.

The questionnaires have been realised through face-to-face meeting of about one hour length and it has been articulated on four main parts:

- (i) structural characters;
- (ii) competitiveness and strategy;
- (iii) embeddedness in territorial assets;
- (iv) involvement in territorialised learning.

Structural characters regards all those factors which can return an overall picture of firm's main features, such as location, specialisation, products, turnover, employment, export, ownership. For the purpose of our work, the investigation of competitiveness is clearly more important. First of all, we adopted a subjective measure of competitiveness, in that it has been asked if the firm experienced an increase in competitiveness over the period considered by the enquiry (1996-2004). The choice for asking directly to firm's manager or entrepreneur if they judge being more competitive than in the past is mainly due to two reasons:

- (i) the rest of the questionnaire is based on subjective assessment of the importance of different competitive factors;
- (ii) it was extremely difficult to get precise information about quantitative facts, such as productivity or return on investments¹⁰⁸.

Nevertheless, if we compare firm's subjective evaluation with some more objective benchmark we can notice that there is a significant positive correlation between the perception and the trends in both occupation and turnover (table 7.3).

Also it has been asked, in case of positive answer, which are the main firm's strategies applied to get this result. For each of the following factors a score between 1 (minimum) and 10 (maximum) has been asked the interviewed: suppliers' selection to different scales (local, regional, national and international); cooperation strategies with other firms; hiring specialised workforce; acquisition of innovation from outside (licences, machineries, patents etc.); quality certification; product innovation and process innovation.

Table 7.3 – Relationship between perceived competitiveness increase and firm's performances¹⁰⁹.

	Occupation ¹			Turnover ²		
	Growing	Stable	Decreasing	Growing	Stable	Decreasing
Yes	49,1%	34,1%	16,8%	67,4%	15,0%	17,6%
No	27,8%	46,8%	25,4%	48,4%	26,9%	24,7%

Note: ¹ $\alpha = 0,001$
² $\alpha = 0,012$

Following, we have focused our attention on the territorial assets, that is those local endowments which, according to the literature, are likely to influence firms' competitiveness, driving mere agglomeration into clusters or industrial districts. It is also to be remarked here is that, in our perspective, firm's embeddedness into such territorial assets also expresses the structural coupling process of the system. To ease the analysis of these elements we have distinguished three categories of territorial assets:

- (i) *pecuniary territorial assets*, that can originate a direct and immediate advantage in terms of costs: infrastructure; availability of space; availability of specialised workforce; labour cost; access to credit; availability of venture capital; local taxation;

¹⁰⁸ This was both a matter of suspicion on the side of the firm and need to concentrate the attention onto more qualitative and strategic issues (such as territorial behaviours) on the side of the interviewer.

¹⁰⁹ In order to evaluate the significance of the relationships we used mainly a contingency coefficient based on χ^2 as most of the variables are nominal ones. We accepted as significant the relationships where $\alpha \leq 0,100$.

- (ii) *institutional territorial assets*, which refer to the existence of virtuous relationships with local institutional actors: labour relationships; intermediation structures with PA (such as local development agencies); local industrial and development policies; local political stability; category association (e.g. entrepreneurs' association, chambers of commerce, consortia):
- (iii) *relational territorial assets* comprise both transaction costs related factors which are now more considered for their untraded relational dimensions (presence of long-term customers and of specialised suppliers, presence of universities and other public and private research centres, specialised fairs and expos) and more strictly "cultural" assets (manufacturing tradition, trust and cooperation among firms, environmental and social quality).

Finally we have to consider the territorialised learning behaviour of the firms. To this purpose we will adopt the three-parted classification introduced in chapter 4: buzz, formal and informal cooperation and cognitive synthesis. As these three steps into the territorialised learning implies a growing importance as well as a growing complexity, they present different degree of difficulties into translating these behaviours into variables that can be first asked and than systematically analysed.

As far as buzz is concerned we decided to move in two different directions, considering:

- (i) *the management of the supply-chain*: we have considered the stability of the supply-chain (in terms of suppliers turnover) and the importance of informal routines in selecting new suppliers: personal acquaintances either with other entrepreneurs or with technicians and employees; suggestion of other trusted firms; spin-off; existence of previous friendship relationships;
- (ii) *the organisation of the information collection system*: attention has been focusing on the collection of information through tacit knowledge oriented (workers from other firms, informal acquaintances with other entrepreneurs, formal and informal association among entrepreneurs, input-output relationships with other firms) as well as codified knowledge oriented (fairs and expos, specialised journal). Also it has been considered if such links are local or supralocal;

When it comes to formal and informal cooperation we assessed two main strands of enquiries:

- (i) *the management of the inter-firm communication flows* (focusing mainly on tacit forms of communication, such as the exchange of technicians and frequent

- reciprocal visits, but only on explicit ones, like manuals and written instructions), with different kind of actors (customers, suppliers and competitors);
- (ii) the presence of *established cooperation networking* (informal cooperation, participation to EU programmes, belonging to association and joint-venture), aimed to different purposes (joint purchase orders, research and development, training, export, stock exchange), and taking place to different scales (local, regional, national and international).

Finally we have to consider those behaviours which might express a *cognitive synthesis* process taking place between the firms of a given group. In particular, design and engineering activities have been considered with specific attention, assuming that, if it is true that these activities represent the most important element in terms of continuity – and at the same time of innovation – with the manufacturing tradition of Turin, hence the presence of co-design and co-engineering relations can be considered as privileged means to transmit and reproduce knowledge. More specifically, there are three peculiarities which make it reasonable focus on design processes:

- (i) design and engineering activities count a number of economic agents which at the same time possess a clearly recognised authority in global markets and at the same time are fundamental interlocutors for local firms;
- (ii) co-design make the product and process innovation to arise from recursive cognitive interaction, till be extreme point that intellectual paternity – although not the intellectual property – does not belong to a specific firm;
- (iii) co-design and co-engineering, more than other hi-tech and scientific research and development activities, are practices where technical codified knowledge interacts with technical tacit competencies into a problem-solving approach.

Furthermore, while loose forms of territorialised learning such as buzz and cooperation might be present in different territories with similar routines and institutions, the those expressing a cognitive synthesis should be more place-specific, as they are the closest to the deeper systemic Organisation of the TPS. Better put, we are not claiming that design and engineering activities are always and everywhere the best proxy to identify TPS Organisation, but that in Turin production fabric they do.

To this purpose, we have investigated two set of behaviours in order to get some information about cognitive synthesis:

- (i) *design and engineering management*: as a first step we have been monitoring how firms manage the D&E process, whether they do it internally and/or externally, with customers and/or suppliers or if they just get instructions from the customers;
- (ii) *participation to co-design and co-engineering networks*: more importantly, we have considered the involvement in co-design and co-engineering long-term networks as the main evidence of the involvement into a territorialised learning process. To this regard we are also considering who are the partner participating to and the scale to which such networks take place.

7.2 Putting the variety to work: first empirical evidence.

In the previous chapters we have seen that the restructuring of Fiat's supply-chain has implied a dramatic reduction in the number of direct suppliers: about 80% of formerly direct suppliers, in fact, have lost their direct involvement with Fiat. This restructuring turned into at least three different options:

- (i) *failure*, above all for the smaller firms, entirely dependent on Fiat orders and without a strong individual entrepreneurship;
- (ii) *shift to lower layers of supplying*, forced by the changed nature of the production itself;
- (iii) *diversification and differentiation* of the portfolio of customer, sometimes within the automotive sector, sometimes outside.

Nevertheless, the fact that some firms have been more or less voluntarily¹¹⁰ involved in centrifugal processes is not by itself an evidence that different TPS came into existence. In fact, TPS are not defined according either to mere vertical relationships or to the "proximity" to Fiat decisional process, but exclusively with reference to territorialised learning. To express it in systemic terms, the exit of some actors from the previous TPS surely means that some severe alteration is structural coupling (i.e. structural embeddedness) is taking place, but it does not automatically means that this change is echoed by a change in territorialised learning in the primary TPS or that a new one is now operating within the same territory.

In the end of chapter 6, we have seen that some previous researches show that actually there was a demarcation process, highlighting significant organisative differences between several distinguished clusters of firms. The point here is to verify if about 10 years later this process continued and led to a consolidated different framework. To this regard, the first step is introducing into the analysis the four typologies identified at the end of

¹¹⁰ Not all the time the exit option was completely in the hands of Fiat: many cases occurred in which it was a contractor's choice to disembed itself from Fiat's supply chain or, more rarely, from automotive sector.

chapter 6: direct Fiat suppliers, indirect Fiat suppliers, non-Fiat automotive suppliers and non automotive firms. The first two categories share, as we saw, some higher proximity to Fiat's environment, while the latter two are characterised by some sort of distance from Fiat's decisional power.

7.2.1 Single firm behaviours.

If we consider the general features of the four groups, a clear correlation emerges between organisational proximity to Fiat and spatial proximity to Turin: direct suppliers are the most concentrated in Turin metropolitan area (70%), while non-automotive firms are the most dispersed (55% are located in the rest of the province area). Also the belonging to a group varies according to the typology we identified earlier: groups are mainly concentrated in direct suppliers (50% of direct supplier belong to a group) and non automotive (35%). Indirect suppliers are, on the contrary, the category where traditional Italian family-based ownership resists more (only 12,5% of the sub-sample belongs to a group). Also the presence of foreign groups seems to be a strong character only among direct suppliers, where half of the group are not Italian. Dimension seems to affect Fiat-centred TPS more than the mechatronic one: 50% of direct supplier have a turnover higher than 10 million Euro a year, while 50% of indirect suppliers sell products for less than 1 million. Analogously 40% of direct suppliers have more than 100 employees, against 11% of indirect suppliers. Export is confirmed to be more important among mechatronic firms, above all among Fiat-independent enterprises, where about 1/3 of the sample exports more than 40% of their turnover.

Table 7.4 – Turnover dynamics over the 1996-2004 period

	Decrease	Stability	Increase	Total
Fiat direct suppliers	12	9	33	54
	22,22%	16,67%	61,11%	
Fiat indirect suppliers	18	12	25	55
	32,73%	21,82%	45,45%	
Non-Fiat automotive	5	12	40	57
	8,77%	21,05%	70,18%	
Non automotive	14	14	46	74
	18,92%	18,92%	62,16%	
Total	49	47	144	240
	20,42%	19,58%	60,00%	

Although there are not significant differences in the perceived competitiveness increase, we can notice that indirect suppliers underperformed the results of the other three groups in terms of turnover dynamics (table 7.4). Quite surprisingly the best

performance is obtained by non-Fiat automotive cluster, where 70% increased their turnover and just 10% decreased them.

Also, when considering single firms' behaviour, the differentiation within the manufacturing fabric becomes more intelligible than from simply opposing firm-centred and mechatronic clusters. If we just consider statistically significant Anova in evaluating the importance of specific behaviours, we immediately notice that there is a clear distinction in terms of innovation strategies between direct suppliers and non-automotive firms, as the former emphasise the role of process innovation (7,52) while the latter consider more important product innovation (7,52). Also we can notice that direct suppliers estimate more than the other clusters the management of international supply-chain, a feature which can be easily understood considering the higher presence of international groups within this category.

Albeit the other differences are not significant, we can draw some interesting suggestion by a general view of the judgement expressed about firm related factors (table 7.5):

Table 7.5 – Evaluation of firm related competitiveness factors (mean)

	Fiat direct suppliers	Fiat indirect suppliers	Non-Fiat automotive	Non automotive	Total
Process innovation ¹	7,52	6,10	6,49	5,73	6,42
Trained workforce	6,24	5,32	4,63	5,56	5,44
Quality certification	6,05	5,08	5,43	4,41	5,20
Innovation from outside	5,09	4,09	5,07	3,81	4,48
Cooperation with other firms	4,52	3,60	3,37	4,23	3,93
International suppliers quality ²	4,30	2,74	3,38	3,09	3,35
National suppliers quality	4,25	4,09	3,13	3,91	3,85
Services utilisation	3,09	2,74	2,49	2,91	2,81
Local suppliers quality	3,77	4,43	3,07	3,38	3,66
Regional suppliers quality	3,25	4,04	3,31	3,34	3,49
Internationalisation	4,44	3,29	4,56	4,40	4,17
Product innovation ³	6,75	5,94	6,27	7,52	6,65

Note: ¹ $\alpha = 0,065$

² $\alpha = 0,071$

³ $\alpha = 0,097$

- (i) the presence of TNC and groups among Fiat direct suppliers can explain the fact that most of the firm-related factors show an average score superior to the sample mean: management of national supply chain, trained workforce, innovation acquisition from outside, quality certification, cooperation with other firms, service utilisation and, of course process innovation. This might be interpreted as a proactive behaviour spread among this category of firms;

- (ii) the only factors that indirect Fiat suppliers estimate higher than other groups do are those related to the management of local, regional and national supply-chain, while they show a more adaptive behaviour with reference to other more active strategies. This fact can be likely explained with reference to their smaller dimension and to their double dependency, on direct suppliers and ultimately on Fiat itself;
- (iii) Fiat-independent firms show scores superior, albeit not significant, than the sample average with reference to some factors which indicate some sort of dependence, or at least of attention, to processes taking place outside the local scale, such as acquisition of external standard knowledge, certification quality, and internationalisation. This framework is also coherent with the fact they seem to evaluate less important the management of the local and regional supply chain and to their higher ratio of export. This behaviours can be easily understood considering that automotive firms which are not strictly linked to Fiat have only two main strategic option: serve the national and international aftermarket and/or enter the supply-chain of foreign car producers;
- (iv) non-automotive firms express average value very closed to the sample mean, except for product innovation. This fact might be interpreted as an indication that the group is still too broad and that differences would emerge when splitting the cluster into sub-systems;

7.2.2 Territorialised collective behaviours.

When it comes to structural embeddedness we have a confirmation of the importance of Marshallian externalities: specialised workforce and suppliers, long-term customers, manufacturing tradition and trust are still the most important territorial endowments, cutting across all the four categories we are considering. There are some slight differences between the groups but they are not significant at all.

Some significant differentiation is instead more evident and statistically relevant with reference to minor factors, such as the local industrial and development policies and the presence of University and public research centres which are more important for direct suppliers (their mean is respectively and 4,55 and 4,48 against 4,12¹¹¹ and 3,89¹¹²). This result can be interpreted in the light of what we have been saying in chapter 5 about the relationships between Fiat TPS and local institutional actors, such as Universities and local development agencies. Let us just think to the establishment of a BA degree in Automotive Engineering at the Polytechnic of Turin or the public-private agency "From concept to car", in charge of the promotion of a selected portfolio of the most prominent component

¹¹¹ $\alpha = 0,036$.

¹¹² $\alpha = 0,081$.

suppliers working in Turin area. Also this result might mirror the effort of local Public Administration in the management of Fiat crisis, reaching its peak in 2006 spring by Fiat's decision to keep "Grande Punto" production lines in Mirafiori.

When it comes to buzz, there are few significant differences among the four clusters. For instance, indirect Fiat suppliers seem to pay less attention in the selection of suppliers to the suggestions from other enterprises (only in 8% of the indirect suppliers it takes place on a regular basis, while the percentage is about 20% in the rest of the sample¹¹³). In another case, it the informal networking among firms that appears to be a minor source of information for non-automotive firms (only 17% of positive answers, versus 30% in the other clusters¹¹⁴).

Table 7.6 – Cooperation behaviours and inter-group similarities.

	Technicians exchange with customers ¹	Technicians exchange with competitors ²	Cooperation relationships ³	Participation to association ⁴
Fiat direct suppliers	29 34,94%	6 7,23%	29 34,94%	53 63,86%
Fiat indirect suppliers	12 12,24%	3 3,06%	28 28,57%	47 47,96%
Non-Fiat automotive	35 34,65%	9 8,91%	38 38,00%	66 65,35%
Non automotive	31 29,25%	5 4,72%	26 25,24%	57 53,77%
Total	107 27,58%	23 5,93%	121 31,51%	223 57,47%

Note: ¹ $\alpha = 0,001$
² $\alpha = 0,310$
³ $\alpha = 0,198$
⁴ $\alpha = 0,043$

More interesting outcomes emerge when considering the cooperation among firms (table 7.6). Albeit not all the differences are significant, we clearly get the impression of a sort of correspondence between Fiat direct suppliers and Fiat-independent firms, both showing a more intensive exploitation of different forms of cooperation among firms¹¹⁵. Nevertheless, this similitude is more apparent that substantial, in that it refers more to the intensity of the cooperation than to its qualitative features:

¹¹³ $\alpha = 0,044$

¹¹⁴ $\alpha = 0,047$.

¹¹⁵ Of course this does not mean that the same similarities apply between indirect suppliers and non-automotive firms.

- (i) direct suppliers practise the first kind of cooperation on many scales, local, national and international (86% of the cooperation among direct suppliers is precisely aimed to this purpose¹¹⁶);
- (ii) Fiat-independent firms seem more keen to cooperate in order to have access to foreign markets (21% versus 7%¹¹⁷);

Also, direct suppliers have better access to international research facilities, as 24% of the cooperation network they establish involve international R&D centres.

Also the local density of the respective cooperation network differs significantly: about 65% of direct suppliers' network is locally based (against only 29% among Fiat-independent firms¹¹⁸); more importantly 41% of direct suppliers' networks are multidimensional, that is they are aimed to successfully fulfil a multiple set of tasks.

As far as the two other groups are concerned, we can notice that:

- (i) *indirect suppliers* are less involved into established cooperation network and, when they are, it is almost exclusively into local ones: for instance, regional and international cooperation are together just at about 20% of the whole networks. Also it is remarkable that 80% of their networks are aimed at getting joint purchase orders, mainly within the boundaries of the province;
- (ii) in the case of non-automotive firms the situation is similar to the evaluation of territorial endowments: like grey cats in the night, they show a behaviour quite closed to the average of the sample, usually slightly below, without any strong characterisation.

Finally we have to consider the core of territorial learning processes, that is the design and engineering practices spread within the groups. Considering first the D&E management we notice again an analogy between direct suppliers and Fiat-independent producers (table 7.7). As we can see Fiat-independent firms manage the D&E process through a series of links with different actors: specialised design and engineering suppliers (both private and public), customers and suppliers.

¹¹⁶ $\alpha = 0,005$.

¹¹⁷ $\alpha = 0,094$.

¹¹⁸ $\alpha = 0,020$

Table 7.7 – Territorialised learning and inter-groups similarities.

	Together with D&E suppliers ¹	Together with customers ²	Together with suppliers ³
Fiat direct suppliers	28 33,73%	61 73,49%	27 32,53%
Fiat indirect suppliers	13 13,27%	52 53,06%	19 19,39%
Non-Fiat automotive	29 28,71%	62 61,39%	37 36,63%
Non automotive	18 16,98%	58 54,72%	32 30,19%
Total	88 22,68%	233 60,05%	115 29,64%

Note: ¹ $\alpha = 0,002$
² $\alpha = 0,022$
³ $\alpha = 0,054$

Nonetheless, when we consider more structured forms of co-design and co-engineering, we can notice that the resemblance is not any more at work: 18% of non-Fiat automotive firms participate to such networks – exactly the same share than non-automotive and indirect Fiat suppliers – while direct suppliers participation arises to almost 45%¹¹⁹.

If we analyse which the partners are involved in this networks and their spatial distribution, we also find some interesting results, albeit not statistically significant¹²⁰. The first evidence is that while in the sample co-design network are based on a firm-to-firm agreement within the same sector, a consistent number of direct suppliers' co-design network involve the whole range of possible partners: firms from different sectors (24,3%), D&E specialised firms (35%¹²¹), public research centres (21,6%), private research centres (16,2%¹²²). As spatial distribution is concerned, we can observe a positive correlation between organisational proximity to Fiat and spatial concentration of co-design networks into Turin province, passing from the maximum among direct suppliers (81%) to the minimum among non-automotive firms (53%).

Despite the disaggregated data are not statistically significant, we can identify some roughly defined tendencies within our sample:

¹¹⁹ $\alpha = 0,000$

¹²⁰ For all these correlations $0,10 < \alpha < 0,60$. The fall in statistical significance is mainly due to the dramatic decrease in the sample size (only 91 firms out of 388 are involved into co-design networks) and its concentration into only one category (more than 1/3 are centred on direct suppliers). Nevertheless, we can draw some intuitive evidence from the analysis.

¹²¹ The same ratio also applies to indirect suppliers.

¹²² The same ratio also applies to Fiat-independent producers.

- (i) Fiat-independent networks are more concentrated in the rest of Piedmont and EU-15 (38% each) and secondarily in Eastern Europe;
- (ii) non-automotive networks seem to gravitate more intensively on Milan metropolitan area (32%) and the whole Lombardy (26%), but also toward EU-15 (32%), North America (26%) and developing countries (26%);
- (iii) direct suppliers' networking moves on the twofold axe Turin-EU (respectively 82% and 32%) and only secondarily on Lombardy (21%);
- (iv) indirect suppliers appear to be strictly dependent on local co-design networks (for instance only 6% of the sampled firm within this category participate to network to the Eu-15 scale, against a participation which is comprised between 32% and 39%.

7.2.3 Conclusions.

Applying the quadruple classification to our sample, we have highlighted some interesting emerging features of Turin manufacturing fabric (table 7.8):

- (i) a formal similitude between direct suppliers and Fiat-independent automotive firms became clear, concerning territorialised learning processes. It can be labelled as "formal" as it is based on quantitatively similar behaviours (management and intensity of cooperation with both suppliers and customers, management of design and engineering routines), hiding deeper qualitative differences (in terms of aims prosecuted through cooperation, partner involved in interactive learning, scales of territorialised learning);
- (ii) the direct suppliers fit outstanding performances with reference to all the realms taken into account in our analysis, with reference to firms' strategy, structural embeddedness and territorialised learning;
- (iii) as a consequence, indirect suppliers' eminence has been drastically reduced within Fiat-centred TPS: in particular, it is becoming more and more clear that their access to territorialised learning is limited and dependent on direct suppliers choices and behaviours;
- (iv) non-automotive group can be considered, up to now, the "black box" of Turin manufacturing fabric: while Fiat-independent group has been getting a more definitive and sharp physiognomy along this section, non automotive cluster is still too much defined as a negative residual category ("all which is not related to automotive"). Hence the only clear elements that characterise this group are the highest vocation to product innovation, an average structural embeddedness and a strong capability to enter supralocal learning networks;

Table 7.8 – A synoptic view.

	Firm's strategy	Structural embeddedness	Territorialised learning		
			Buzz	Cooperation	Cognitive synthesis
Direct suppliers.	Pro-active behaviour. Prevalence of process innovation. Management of international supply chain. Presence of trans-national groups.	Marshallian externalities. Good relationships with the university and the PA.	In the average.	Highly localised and multipurpose. Access to international R&D facilities.	Participative design and engineering management. High intensity of co-design networking. Local-EU15 axe. Broad range of actors involved.
Indirect suppliers.	Management of local, regional and national supply chain. Adaptive behaviour. Domestic market. Prevalence of local ownership.	Marshallian externalities.	In the average.	Locally focused, highly specialised (joint purchase orders collection) cooperation.	Exclusively local networking. Co-design with D&E specialised firms.
Fiat-independent firms.	Export-oriented. Highest growth in turnover. Importance of codification processes (knowledge acquisition, quality certification).	Marshallian externalities.	In the average.	Intensive but highly specialised (access to foreign markets).	Participative design and engineering management. Mainly firm-to-firm intra-sector networking. Region-EU15 axe.
Non-automotive producers.	Export-oriented. Prevalence of product innovation. Presence of Italian groups.	Marshallian externalities.	In the average.	In the average.	Mainly firm-to-firm intra-sector networking. Multiscalarity.

With reference to our starting issue we can answer affirmatively: the classification suggested at the end of chapter 6 is still valid ten years later, but with some meaningful alteration in its qualitative aspects. For instance, we can notice that, to some extent, direct suppliers are more structurally and organisatively embedded than we would have been expecting, given the results of the previous survey. At the same time, non-automotive group is till now the "great delusion", in that it did not confirm the great expectations it arose in the mid of the 90s with the image of the "mechatronic plain" (see sections 6.1.2 and 6.3.5).

7.3 Sectorial behaviour.

The question we are addressing in this section is whether the articulation in four clusters/TPSs can be enriched by proceeding in the highlighting of different behaviours

within the identified category. In particular, we have seen that deconstructing non-automotive black box would require some further distinction within the cluster. Nevertheless, table 7.9 shows how actually all four the groups we used in the previous chapter are quite heterogeneous in terms of internal sectorial composition:

- (i) direct suppliers mainly comprise scale intensive firms (59%) and production services (20,5%);
- (ii) indirect suppliers and Fiat-independent automotive are principally composed by scale intensive producers (respectively 43,9% and 54,5%) and specialised suppliers (27,55% and 25,8%);
- (iii) non-automotive group seems to be the more balanced one, with a prevalence of specialised suppliers (32%) and scale intensive manufacturers (35%), but also with many production services firms (23,5%).

Table 7.9 – Sectorial composition within the four clusters.

	Hi-tech	Specialised suppliers	Scale Intensive	Production services	Total
Fiat direct suppliers	4	13	49	17	83
	4,82%	15,66%	59,04%	20,48%	
Fiat indirect suppliers	11	27	43	17	98
	11,22%	27,55%	43,88%	17,35%	
Non-Fiat automotive	8	26	55	12	101
	7,92%	25,74%	54,46%	11,88%	
Non automotive	10	34	37	25	106
	9,43%	32,08%	34,91%	23,58%	
Total	33	100	184	71	388
	8,51%	25,77%	47,42%	18,30%	

Note: $\alpha = 0,028$

As we can notice hi-tech manufacturers are spread along all the categories, making the sub-sets' size too small to give significant results. Hence we will first consider how our fourfold typology interacts with the three more numerous sectors, and then we shall develop a separate discourse about hi-tech.

7.3.1 The importance of sectorial belonging.

Within each of the four potential TPS we have analysed how the sectorial belonging – according to a rough *à la* Pavel and Pavitt sectorial classification – influences firms' behaviour, with reference to the usual set of key factors: firms' strategies; territorial assets and territorialised learning.

Table 7.10 – Sectorial differentiated behaviours: a synoptic view.

	Specialised suppliers	Scale intensive	Production services
Direct suppliers.	Higher attention to pecuniary territorial assets. High involvement in multiscale cooperation and in R&D cooperation. Strong participation to co-design network, mainly inter-sectors.	Lower level of structural embeddedness. Lower importance of buzz and local information collection. Lower importance of cooperation networks, mainly local. Strong participation to co-design network, mainly intra-sector.	Higher importance of trained workforce and of codified knowledge acquisition. Higher attention paid to relational territorial assets. Highest involvement in cooperation networks, mainly to the local scale and aimed to collect joint purchase orders.
Indirect suppliers.	Higher attention to pecuniary territorial assets.	Higher impact of spin-off.	Higher attention paid to the presence of long-term customers. Slight more intensive use of local tacit communication. Slightly higher participation into cooperation networks, mainly to the local scale and for lobbying purpose. Lower impact of design practices with suppliers. Higher impact of spin-off.
Fiat-independent firms.	Higher importance of external sources of information. Slightly lower participation to co-design networks, not to the local scale.	Average participation to co-design network, mainly to the supra-local scale.	Higher impact of spin-off. Average participation to co-design network, mainly to the local scale.
Non-automotive producers.	Highest importance of product innovation (8,05).		Higher importance of trained workforce and of codified knowledge acquisition. Also higher emphasis on trust and cooperation. Strong participation to multiscale co-design networks. High involvement in multiscale cooperation, mainly aimed to R&D and joint purchase orders collection.

Crossing the categories emerged in section 7.3 with Pavel and Pavitt's classification some further evidences emerge¹²³ (table 7.10):

- (i) the direct suppliers group showed a clear internal divide in cognitive behaviour among the different sectors: in particular, scale intensive suppliers showed a lower degree of structural embeddedness as well a minor importance of "soft" territorialised learning, like buzz and cooperation. On the other side they proved to be the group the most embedded in local co-design networks.

¹²³ In order to ease the reader's understanding we shall limit to present in table 7.11 the outcomes of the cross-section analysis between the four categories we got from section 7.3 and the Pavel and Pavitt's typology. All the detailed tables are nevertheless available in annexe 2.

- (ii) within direct suppliers, some nuances emerged between specialised suppliers and production services, with the former more connected to supra-local networks and to inter-sectors networking and the latter more engaged in local multipurpose cooperation. Nevertheless, such differences seem to be less deep than those opposing scale intensive producers to specialised suppliers and production services;
- (iii) production services showed strong similarities among the different cluster they were split in, in particular with reference to the use of tacit form of communication, buzz and cooperative behaviours, mainly to the local scale. Also the presence of multipurpose cooperation suggests that these firms attained an higher degree of joint action to the local scale;
- (iv) finally, we registered a substantial analogy between specialised suppliers and scale intensive producers within each of the three lasting categories (indirect suppliers, non Fiat-dependent automotive suppliers and non-automotive firms). More precisely, time-by-time, there are some emerging difference – for instance, specialised suppliers are paying more consideration to firm level strategies, such as process innovation, and to pecuniary territorial assets, while, among scale intensive firms, spin-off and some sort of territorialised learning are more spread – but they do not seem to be enough strong to suggest further distinction among our categories.

If we briefly consider the behaviour of hi-tech firms we immediately notice that they differ significantly from the average behaviour of the rest of the sample. While structural data are quite similar, in terms of performance, ownership and dimension, there are important difference concerning both territorial Structure and Organisation.

Table 7.11 – Hi-tech firms in front of relational externalities.

	Hi-tech	Rest of the sample	Total
Specialised workforce	3,97	4,69	4,63
Manufacturing tradition	4,41	5,10	5,04
Trust and cooperation with other firms ¹	4,18	5,51	5,39
Specialised suppliers ²	4,61	5,83	5,72
Long-term customers ³	5,06	6,17	6,08
Universities and other public research centres	3,72	4,16	4,12

Note: ¹ $\alpha = 0,012$
² $\alpha = 0,021$
³ $\alpha = 0,054$

For instance, considering the traditional set of Marshallian relational externalities, we can see that the average judgement expressed by hi-tech firm are systematically lower

that the rest of the sample, and in many case these differences are statistically significant. For instance hi-tech manufacturers are less embedded in vertical input-output relationships and underestimate the role of local trust and cooperation (table 7.11). These differences are even more evident when considering territorialised learning to all three the level we have been considering in our analysis. If we consider the impact of spin-off on the creation of a new supply-relationship, we can notice for instance that this practice is frequent in only 3% of hi-tech firms (against 12% of the rest of the sample¹²⁴).

The difference is even more striking when considering more structured forms of territorialised learning: the ratio of hi-tech firm cooperating with other firms is dramatically lower than among the rest of the sample (15% versus 33%¹²⁵) and the same applies to co-design (9% versus 25%¹²⁶). This differentiation refers to a specific lower attitude toward cooperation and networking and not to a fault in the data structure caused by the small size of the hi-tech sample: in fact, for other forms of inter-firm linking, such as joint venture, consortia, and EU programmes the percentages are very similar for both hi-tech and the rest of the sample. Also it is worth noticing that the situation within the hi-tech cluster does not significantly change if we consider how the hi-tech firms intersect our classification in four groups, to confirm the impression that we are actually facing another cross-cutting category (like production service) which is not particularly significant to our previous categorisation.

7.3.2 *Toward the status quo?*

From our analysis we can reasonably claim that within mechanical and electrotechnical Turin's manufacturing tradition at least six clusters, or hypothetical TPS, can be identified:

- (i) competencies core;
- (ii) scale intensive direct suppliers;
- (iii) hi-tech;
- (iv) indirect suppliers;
- (v) non-Fiat automotive suppliers;
- (vi) non-automotive firms.

Table 7.12 shows in synoptic view the main features of each of them, whose genesis can be traced back to the different differentiation step we made.

¹²⁴ $\alpha = 0,090$.

¹²⁵ $\alpha = 0,036$.

¹²⁶ $\alpha = 0,034$.

Table 7.12 – A synoptic view.

	Firm's strategy	Structural embeddedness	Territorialised learning		
			Buzz	Cooperation	Cognitive synthesis
Scale intensive direct suppliers	Emphasis on both product and process innovation. Emphasis on internationalisation. Emphasis on multiscalar supply chain.	Traditional set of Marshallian externalities. Emphasis on accessibility.	Mainly related to the personal acquaintances of the entrepreneurs and of the technicians.	Average level of participation.	Highly relying on informal cooperation (>50%).
Competencies core	Emphasis on the quality of the labour force and on the acquisition of knowledge from the outside.	Emphasis on trust, university. Customers more important than suppliers. Higher importance of manufacturing tradition and associations among machine tools producers.	Highest presence of spin-off.	Highly relying on informal cooperation (>50%).	More than average participation (>30%).
Hi-tech firms	More emphasis on product rather than process innovation.	Lowest importance of Territorial assets.		Lowest share of participation.	Lowest share of participation.
Indirect suppliers	Emphasis on the local and regional supply chain.	Traditional set of Marshallian externalities. Emphasis on the availability of space.	Mainly related to the personal acquaintances of the entrepreneurs and of the technicians.	Average level of participation.	Average level of participation.
Non-Fiat automotive suppliers	Emphasis on internationalisation.	Traditional set of Marshallian externalities.	Mainly related to the personal acquaintances of the entrepreneurs and of the technicians.	Above the average level of participation.	Average level of participation.
Non-automotive firms.	Emphasis on product innovation. Emphasis on internationalisation.	Traditional set of Marshallian externalities.	Mainly related to the personal acquaintances of the entrepreneurs and of the technicians.	Significantly lower share of participation.	Significantly lower share of participation.

The *competencies core* is made by specialised suppliers which are also direct Fiat suppliers and by production service firms, regardless they belong or not to Fiat environment or to automotive environment. Taken together, these two groups represent quite well the two souls of Turin engineering tradition:

- (i) *specialised suppliers* are mainly machine tools producers. To this respect we can quite certainly affirm that they fully represent one of the most competitive heirs of Turin engineering tradition. This is witnessed, between other things, by the fact that this is the group assigning the highest average value to manufacturing tradition.

When it comes to their participation to Fiat supply chain as direct suppliers, this implies that they are mostly robotics and automation related firms, a specialisation where Turin enterprises reached some important leadership positions – e.g. Comau, Brown Boveri (formerly known as Dea);

- (ii) as *productive services firms* are concerned, although they are not manufacturers they can be nevertheless considered part of the heritage of Turin traditional knowledge. In particular they represent the outcome of some merging between traditional learning-by-producing (e.g. the cult for the well-done work) and more hi-tech knowledge, with reference to both mechanical (design, engineering) and electrotechnical (ICT, automation and control) know-how. In particular they have expressed the highest judgement about the importance of trust and cooperation and give importance to the presence of Universities and, in a lower measure, private research centres.

Table 7.13 – Informal cooperation and co-design networking.

	Informal cooperation	Co-design networking
Direct suppliers scale intensive	12 24,49%	25 51,02%
Competencies core	42 51,85%	28 34,57%
Hi tech	5 15,15%	3 9,09%
Indirect Fiat suppliers	18 25,71%	13 19,40%
Fiat-independent automotive firms	30 37,50%	14 17,50%
Non-automotive firms	14 19,72%	8 11,43%
Total sample	121 31,51%	91 23,95%

Note: in both case $\alpha = 0,000$

When it comes to territorialisation, we can notice that this group is strongly characterised by both structural and organisative embeddedness. As far as the former is concerned, it does not concern only the traditional externalities¹²⁷ but also more sophisticated factors, such as manufacturing tradition (above all among specialised

¹²⁷ Competencies core firms express the highest evaluation about the presence of long-term customers (7,14 versus average 6,08, $\alpha = 0,012$).

suppliers¹²⁸) or the presence of universities and trust and cooperation (respectively 4,87 and 6,29 versus 4,12 and 5,39 in the whole sample¹²⁹). This strong structural embeddedness is mirrored by an intensive territorialised learning. 52% of the group entails cooperation with other firms, against a sample average equal to 31,5% and a minimum of 15% among hi-tech firms. Also this group is second, after scale intensive direct suppliers, in terms of intensive participation to co-design network (34,6% versus 51%¹³⁰).

Also, it can be noticed that the firms belonging to the competencies core, when searching for new suppliers, rely more intensively on spin-off (21% does it on regular basis, against 11% of the overall sample and only 3% of the hi-tech firms¹³¹). This feature will be even more important in next section when considering the relationship between embeddedness and competitiveness. On the contrary, hi-tech firms and scale intensive direct suppliers rely more on codified forms of selection of the suppliers, like catalogues and fairs (respectively 28% and 24,5% do it on a regular basis, versus 18% in the sample¹³²)

It is interesting to observe the difference between core competencies and scale intensive direct suppliers with reference to the territorialised learning processes (table 7.13). As we noticed above, the latter are doubtless deeply involved into localised learning, but this takes almost exclusively the form of local co-design networking, strictly dependent on Fiat supply chain re-organisation in the 90s. On the contrary they show a more ambiguous relationship with territorial assets: if, on the one side, they evaluate very positively the presence of manufacturing tradition (5,38), on the other side they express more diffidence toward the role of trust and cooperation (5,04). This can be noticed also when looking to the lower role played by buzz and, more importantly, by cooperation networks: only 24,5% of them habitually entails informal cooperation with other firms, less than non-Fiat automotive suppliers (37,5%) and even than indirect Fiat suppliers (25,7%). Hence we might conclude that scale intensive direct suppliers define a borderline situation in which it is possible to have strong organisative embeddedness without – or with a lower degree – of structural one. It seems that their competitiveness relies on a mix of structural assets (mainly colocalisation with customers and suppliers), supralocal resources and firms' strategy, outlining a lower degree of embeddedness into territorial assets. This is the category where there is the highest incidence of groups and foreign ownership and the stronger linkages with Eastern Europe and Southern Italy. Despite this minor structural

¹²⁸ This group evaluate manufacturing tradition as more important (6,77) than the presence of customers (6,46) or suppliers (5,54) and even than the quality of labour force (5,62).

¹²⁹ $\alpha = 0,011$ and $\alpha = 0,044$.

¹³⁰ In both cases $\alpha = 0,000$.

¹³¹ $\alpha = 0,025$.

¹³² $\alpha = 0,043$.

embeddedness, they are deeply embedded in organisative learning, with the higher participation in local firm-to-firm co-design networks, strongly involving their local suppliers in learning process.

On the opposite side, we can probably collocate hi-tech firms, where all the indicators we have considered in the previous section suggest that we are facing a deterritorialised agglomeration, that is a group where firms do not rely strongly on territorial assets and territorialised learning in order to build up their competitive advantage.

Finally we have to consider the last three groups: indirect suppliers, non-Fiat automotive suppliers and non-automotive manufacturers. As we have seen in table 7.12 the differences between these three groups are less outstanding. They only show a very partial differentiation with reference to some characters but this does not turn into a fully satisfactory account of the variety between these three clusters. If we group the firms involved in production services together with the core competencies cluster, the lack of differences among these three groups becomes even more significant. It is also worth noticing that, as a consequence, the difference between these clusters can be better interpreted in terms of firm related features and strategies. For instance we can see that product innovation gets the highest score among non-automotive firms. Analogously, non-Fiat automotive firms have stressed the importance of internationalisation in order to get a competitive advantage. As we shall see in the final section, this relative homogeneity in terms of territorial behaviours, together with variety in firms' strategies, is highlighted by the fact that these clusters sum together the firms which, more or less freely, have chosen some sort of exit strategy with reference to Fiat TPS since the 80s.

7.3.3 Conclusions.

With reference to our starting question, this represents our feasible state of the art of the representation of variety and change within the territory of the Province of Turin. What it is important to consider here is that we are not claiming to offer the ultimate identification of Turin TPS. This awareness relates to the inescapable fuzziness of TPS boundaries. More and different distinctions are certainly possible. Many grey zones get different tones, but are still difficult to interpret and classify: this is quite clear considering the non-automotive cluster which escapes a clear understanding of the embeddedness processes ongoing there. For instance, the fact that the non-automotive cluster has not a clear identity can be related to the way we described and built it *a priori*, as residual with reference to other categories which were better defined – i.e. the Fiat and automotive firms. There are *n* more unidentified TPS to discover indeed: the only limit, hence, has been researcher's patience and data significance, dramatically reducing each time a new categorisation was introduced

7.4 Firms' competitiveness and territorial embeddedness.

If we consider the last step, that is how this typologisation may highlight the relationships between firms' competitiveness and territorial embeddedness, we can draw a first conclusion.

While the fourfold classification has not showed a correlation between the classification and the increase in competitiveness, we can see that the current division in six groups exhibits some interesting emerging evidence (table 7.14):

- (i) the three more directly automotive-related groups show a competitive dynamics very similar among them;
- (ii) non-automotive firms perform slightly under the average, although probably not significantly;
- (iii) core competencies TPS and hi-tech deterritorialised agglomeration have opposite performances, the former getting the highest ratio of positive answers (66,67%) and the former the lowest (42,42%).

Table 7.14 – Taxonomy and competitiveness

	No	Yes
Direct suppliers scale intensive	23 47,92%	25 52,08%
Competencies core	28 33,33%	56 66,67%
Hi tech	19 57,58%	14 42,42%
Indirect Fiat suppliers	33 47,14%	37 52,86%
Fiat-independent automotive firms	37 45,68%	44 54,32%
Non-automotive firms	37 52,11%	34 47,89%
Total sample	177 45,74%	210 54,26%

Note: $\alpha = 0,163$.

This result seem to suggest that structural and organisative embeddedness makes, at least partially, the difference, at least for the extreme cases, the competencies core and the hi-tech cluster. In order to get some clearer images of the relationship between structural and organisative embeddedness and firms' competitiveness we are going to introduce some further analysis, based on logistic regression. The main methodological issue, here, is to get concise variables appropriate to synthesise the different territorial behaviours we have highlighted in the previous sections. To solve this problem we decided

to reduce the number of independent variables through a factorial analysis, grouping more variables into a few primary components¹³³. In particular, we run several factorial analysis in order to identify at the same time general behaviours – such as a synthetic measure of territorial embeddedness – and/or more detailed and nuanced behaviours. This produced several new variables – precisely sixteen – not all of which were fitting our task to explain the relationship between firms' competitiveness and embeddedness. For instance, when we tried to get a single factor expressing organisative embeddedness we realised that it was not correlated in a significant way to firm's competitiveness, while the factors summarising specific aspects of the territorialised learning were more meaningful. Finally we built five new variables expressing structural territorialisation and seven referred to organisative territorialisation. As far as the former are concerned, we have:

- (i) *overall territorial embeddedness*, expressing a synthetic measure of the role played by territorial assets, without any reference to their classification;
- (ii) three specific variables dedicated to the single groups of territorial assets: *pecuniary*, *institutional*, and *relational*;
- (iii) a fifth variable is referred to a subgroup of relational assets, signally *Marshallian externalities*.

With reference to the organisative learning we have built the following variable:

- (i) three variables to express different forms of buzz, with reference respectively to the role of buzz in establishing and managing the supply chain (*personal acquaintances* and *supplying spin-off*) and to get useful information from local sources (*local information*);
- (ii) two variables referred to cooperation behaviours, one centred on *informal cooperation* and one on *formal cooperation*;
- (iii) two variables expressing interactive learning: one synthetic measure of *design attitude* and one referred to the role played by designing in cooperation with customers (*design with customers*).

Drawing upon these 14 factors we have run binary logistic regression, using the perceived increase in competitiveness as dependent variable and assessing how performance can be assessed with reference to the different independent variable. Tables 15 and 16 contain the main outcomes of this exercise.

¹³³ All the tables showing how these new variables have been built are in annexe 2.

Table 7.15 – Firm's competitiveness and structural territorialisation.

	Overall TA	Pecuniary TA	Institutional TA	Relational TA	Marshallian TA
Overall sample	0,259 (0,017)	0,326 (0,003)	0,136 (0,194)	0,206 (0,050)	
Scale intensive direct suppliers.	1,096 (0,006)	1,299 (0,003)	0,897 (0,018)	0,813 (0,027)	
Competencies core.					
Hi-tech	-0,774 (0,086)			-0,704 (0,084)	
Indirect suppliers	0,481 (0,079)	0,506 (0,073)		0,475 (0,075)	0,467 (0,104)
Non-Fiat automotive suppliers					-0,518 (0,042)
Non-automotive firms.					

Starting from the relationship between structural territorialisation and firm's competitiveness we can notice that the positive correlation that emerges in the sample is mainly due to the two clusters more directly connected to Fiat, that is scale intensive direct suppliers and indirect suppliers. This outcome is consistent with our ongoing narrative about continuity and change: as the direct heir of the Fiat's TPS is some how normal that these clusters maintain a positive path-dependence through structural embeddedness. Apart this general trend, we can also draw some more detailed and nuanced consequences from the results in table 7.15:

- (i) pecuniary territorial assets seem to play a more important role than institutional and relational ones, leading to a confirmation of NEG emphasis on pecuniary externalities over NIG focus on soft relational factors;
- (ii) moreover, only direct suppliers seem to take advantage of institutional territorial endowment: this is largely confirmed by what we know from historical analysis and empirical evidence in previous sections. This behaviour can be explained by the fact that most of local industrial policies have been aimed to face the crisis impact on the first layer suppliers, addressing ad hoc policies and governmental support . The idea is that maintaining the localisation of direct suppliers impacts positively on the lower levels and it enhances the creation of knowledge spillovers;
- (iii) hi-tech shows a significant negative correlation with territorial embeddedness, in particular within the context of relational territorial assets. This confirms our previous judgement about this group: not only is it less embedded in Turin tradition, but it also seems to be trapped in a structural lock-in effect. The firms that are more embedded in territorial assets are also those that perform worst. This somehow throw a positive light on disembedding: it is somehow clear that local continuity is

low and it probably should be even lower in order to allow these firms to follow successfully their technological trajectory;

- (iv) limited to Marshallian externalities also non-Fiat automotive suppliers show some sort of lock in, negatively correlating embeddedness and competitiveness. This is even more meaningful if we consider that in previous sections we highlighted some behavioural similitude between this group and Fiat direct suppliers. Actually we might conclude that the same behaviour can lead to very different outputs, stressing that while structural embeddedness is fundamental for Fiat direct suppliers, it might be dangerous for those firms that are not dependent on Fiat any more. In a way, the exit from Fiat's environment implied an exit from the virtuous circle of embeddedness, even if these firms still belong to both the sector and the territory.

If we move our attention to organisative embeddedness we can draw a more accurate picture of the ongoing processes (table 7.16). Starting from buzz we have first of all some evidence that contradict some of the NIG postulates. In fact we can notice that buzz is somehow counterproductive when it comes to managing the supply chain. For instance we can see that relying on personal acquaintances of either the entrepreneurs or the technicians is negatively correlated in the case of Fiat direct suppliers. This can be explained considering the direct suppliers have to compete in the globalised automotive supply-chain where quality standard are internationally defined. In such a context, personal acquaintances of suppliers does not offer enough guarantee to meet such standards. In this context it is interesting to note that firms belonging to the competences core are the only ones to show a positive correlation with personal acquaintances. Albeit the relationship is not statistically significant, this fact sounds meaningful, suggesting that some forms of buzz positively influence competitiveness when they take place in a broader and deeper context of organisative learning.

This inverse correlation between the use of buzz in managing the supply-chain and firm's competitiveness is even more evident if we consider the effect of supplying spin-off, that is the choosing as suppliers firms belonging to formerly employees or firms suggested by other entrepreneurs. In this case, the negative correlation with competitiveness spread also to other categories, such as non-Fiat automotive suppliers and non automotive firms.

Table 7.16 – Firm's competitiveness and organisative territorialisation.

	Buzz		Cooperation		Interactive learning		
	Personal acquaintances	Supplying spin-off	Local Information	Informal cooperation	Formal cooperation	Design attitude	Design with customers
Overall sample	-0,030 (0,778)	-0,362 (0,001)	0,182 (0,095)	0,206 (0,082)	0,173 (0,131)	0,512 (0,000)	0,395 (0,000)
SI direct suppliers.	-0,863 (0,015)	-1,116 (0,024)	0,789 (0,073)			0,475 (0,062)	
Competencies core.	0,309 (0,340)			0,283 (0,162)		0,416 (0,089)	
Hi-tech							
Indirect suppliers						0,994 (0,013)	0,882 (0,020)
Non-Fiat automotive		-1,095 (0,000)			0,864 (0,014)		0,565 (0,018)
Non-automotive		-0,658 (0,021)				0,720 (0,092)	0,570 (0,046)

Quite meaningfully, this form of organisative lock-in in buzz takes together the three clusters that are more exposed to international competition and to codified quality standards. Once again we might observe that sectorial change together with Fiat's restructuring did not cut off the links with the territory, but rather transformed some of them into traps. At the same time, other kinds of less pretending buzz, like collecting information from local sources, is confirmed to have a positive correlation with firms' competitiveness, as claimed by the NIG literature.

When it comes to cooperation, we can just add some nuances to our previous analysis. In general, informal cooperation is significantly correlated with competitiveness but it does not emerge as a peculiar feature of one cluster rather than another. We just would like to stress that it seems to be more important in the competencies core: albeit the correlation is not significant, it is anyway consistent the fact that this cluster is characterised by an higher degree of cooperation as foundation of its Organisation. More importantly, we can notice that formal cooperation (such as consortia, joint venture and EU programmes) are strongly and positively correlated only in the case of non-Fiat automotive suppliers: this result somehow confirms once again the impression that these clusters had somehow to compensate the loss of relationships with Fiat with something else and therefore that formal rather than informal links fit the case. It also might be interpreted as a loss of access to tacit informal network which are somehow substituted by more codified, probably supralocal, relationships.

Finally, we have to consider what we assumed to be the core of Turin territorialised learning, that is the interactive learning processes centred on the management of design and engineering activities and, particularly, co-design networking. The regressions largely

confirmed that design-oriented firms get some sort of competitive advantage by being embedded in territorialised learning. If we consider the generic variable expressing the intensity of design and co-design (*design attitude*) we can notice that it is positively correlated with competitiveness in almost all the six clusters, with the exception of non-Fiat automotive suppliers and hi-tech manufacturers¹³⁴. When we consider a more specific form of interactive learning like that facilitated by customer-suppliers relationships (*design with customers*) we find a last interesting outcome: managing the design and engineering process together with customers is positively correlated with an increase in competitiveness for three out of six categories of firms: indirect suppliers, non-Fiat automotive suppliers and non-automotive firms. What is striking is that these are the clusters where, in the previous sections, we have found a minor degree of involvement in design and codesign. This evidence leads us the meaningful conclusion that it is not that interactive learning is unimportant for those firms, but simply that it is becoming a "rare good". It is not by chance that all these groups are the ones that have lost, willingly or not, their direct access to Fiat co-design platforms. In other words, those who found a way to access co-design networks – either with Fiat or more likely with other local subjects, such as other local customers, but also universities and research centres – increased their competitiveness more than those which did not.

7.5 A synthetic image of contemporary Turin manufacturing tradition.

Throughout this chapter we have jointly considered the two main issues of continuity (i.e. long *durée* or path-dependence) and differentiation (i.e. variety), showing that these two processes are not in conflict with each other: TPS' continuity does not imply homogeneity and a variety of clusters/TPSs can take place in the same territory while sharing some common features. We also claimed and, to a certain extent, showed that territorial embeddedness alone – that is a relationship with a territory mediated by territorial assets – is not enough to distinguish different evolutionary patterns. We also need organisative embeddedness – that is territorialised learning – to fully explain how continuity and differentiation proceed hand in hand. This process leads us to distinguish six clusters, or potential TPS, coexisting at the turn of the millennium in Turin's province. All of them are characterised by some sort of continuity with the mechanical and electrotechnical manufacturing tradition, while being at the same time differentiated by a different blend of firms' strategies, territorial embeddedness and organisative one.

Drawing these conclusions, we would like to build an attempt to connect these different group into a synthetic picture, somehow summarising the main outcomes of this empirical assessment of how the TPS concept can be operationalised. This will lead us to

¹³⁴ In both case the correlation is weakly positive, but statistically not significant.

address the issue which is implicit since the first sections of this chapter: how many TPS are coevolving at present time in Turin area? Before answering this question, nevertheless, we have to set up an interpretation scheme apt to represent simultaneously all six the identified clusters. To this purpose, we adopt a graphic visualisation, distinguishing territorial from organisative embeddedness (figure 7.1).

In order to put our six groups into this typology, we cannot but consider the *core competencies* group as the closest to the ideal type of a TPS. In fact:

- (i) it is characterised by deep roots in the territorial assets but also, more importantly, by an intense activity of territorialised learning;
- (ii) it maintains important relationships with Fiat and other local long-term, but at the same time it is not strictly dependent on Fiat orders.

We might say that the core competencies TPS might be rather defined as post-Fiat than anti-Fiat: it somehow represent the outcome of a convergence process between the local champions independently from their proximity to Fiat. The firms belonging to this TPS can enter in relationships with Fiat's environment but their survival does not seem to be dependent on the presence of Fiat in Turin, as they have diversified not only their customers portfolio but also their territorialised learning processes. We might affirm that the competences core should guarantee the reproduction of Turin manufacturing tradition of the "well-done work" over future times.

It is also quite evident that scale intensive direct suppliers can be collocated on the bottom right of our scheme. Most of them are big, many belonging to international groups; they have a direct relationship with Fiat, without depending on Fiat's orders. They also show a lower degree of structural embeddedness which sometimes turns out into structural crisis – plants closure, massive firing, social conflicts – but such structural crisis does not seem enough strong or deep to cause a rupture in their organisative embeddedness and to make them footloose. To present time, in fact, they are deeply involved in co-design platforms which guarantee their embeddedness in localised learning processes. Despite the fact that they cannot be defined as footloose corporation, the risk that direct suppliers decide to move elsewhere is always possible. For sure, as long as Fiat keeps its design and engineering premises in Turin, direct suppliers organisative embeddedness is preserved. Nevertheless, production might follow definitively further Fiat's delocalisation, further weakening structural embeddedness and the virtuous links between territorialised learning and production process.

The third recognisable group is made by hi-tech firms which clearly seem to belong to a sort of pure agglomeration. All the analysis has shown that this is the group where both structural and organisative territorialisation are weaker. Finally we have a weakly

differentiated space type where we can sum together indirect suppliers, non-Fiat automotive suppliers and non-automotive firms, with little possibility of differentiation. To this stage we might simply keep these three clusters together in what we might call the mechatronic galaxy, that is a relatively undifferentiated space where converged the firms which became extraneous to the FIAT system. It is interesting to note that, apart a conspicuous group of machine tool producers among non-automotive firms (approximately 40% of the cluster), the mechatronic galaxy is mainly made by scale intensive firms specialised in generic metalwork and moulding activities (85% of this kind of firms belongs to the mechatronic galaxy). More importantly, as we noted above, this mechatronic galaxy is largely the consequence of the exit strategy applied by Fiat to the different levels of its supply chain. Their position in our scheme is some how intermediate between the core competencies cluster and the hi-tech firms. Also, this large group differs from scale intensive direct suppliers in that it seems to be more embedded in structural territorial assets than in territorialised learning processes. Finally we have to notice that, in figure 7.1, the coordinates of the three clusters within the mechatronic galaxy are largely arbitrary in that, as we have seen, they do significantly differ from each other neither in terms of structural embeddedness nor in relation to organisative embeddedness.

At this point, trying to answer the question how many TPSs are now in Turin, we might say that only the competencies core has all the characters of a TPS. We might add that probably there is also a pseudo-TPS or a semi-TPS, that is the group of scale intensive direct suppliers, given its strong organisative embeddedness in co-design networks. We would have then have some groups following the path of a Porterian cluster, dwelling at the boundaries of the main TPS and of the pseudo-TPS, entering in some kind of structural coupling with them without being significantly integrated in the territorialised learning processes.

The point hence is to evaluate more exactly what is happening at the boundaries. To this purpose the evidences emerging from our assessment of the relationship between embeddedness and competitiveness can help us in highlighting what is moving in the fringe. The main outcome is that outside the competencies core there are three ongoing processes:

- (i) some sort of competitive advantage seems to be enhanced by those firms (belonging to scale intensive direct suppliers, also indirect suppliers, non-Fiat automotive suppliers and non-automotive firms) which are closer to the competencies core – i.e. they are able to balance organisative embeddedness with structural embeddedness can improve their competitive advantage;
- (ii) another subset of firms, belonging to all the groups except competencies core, are involved in some kind of lock-in trap, in terms of either structural embeddedness or

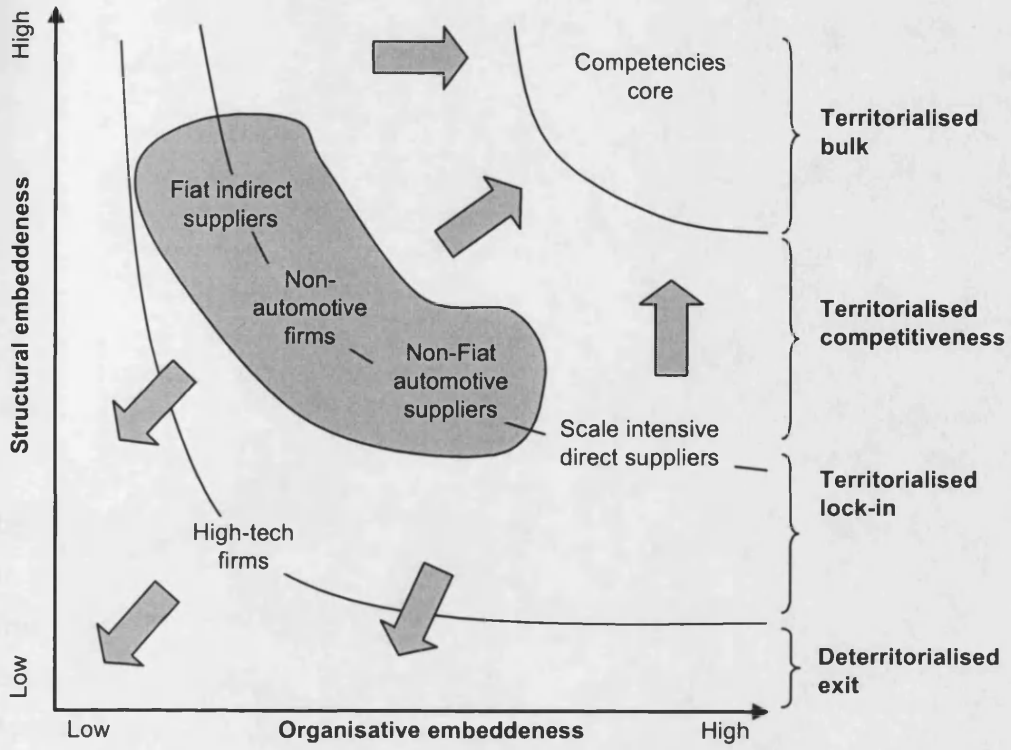
organisative one. In particular, hi-tech firms are not only the less embedded, but the ones that still are do not seem to get any advantage from embeddedness: in this case, territorialisation is rather a (lock-in) threat than an (learning) opportunity;

Hence, our inclination is to consider that there is a TPS' bulk, where a consistent number of firms are involved into a cumulative loop between structural and organisative embeddedness, leading to positive effects on their competitiveness. The point is that, rather than simply questioning whether there are other TPS or simple clusters around this, it seems to be more fruitful to analyse the ongoing process without any obsession with cutting clear boundaries between groups. In other terms, instead of asking how many TPS there are in Turin, we should be questioning what is happening at the margins of the clearly identifiable one. To this purpose, it might be useful to distinguish at least two fringe spaces around the main highly territorialised paradise, which we might call the *territorialised competitiveness purgatory* and the *territorialised lock-in limbo*. The former denotes a relational space where we can collocate territorialised behaviours that are not as intense as those taking place in the competences core, but that nevertheless create some sort of proximity between the competences core and the other groups. The latter indicates the fact that some firms seem to be locked in the "wrong embeddedness", overestimating for instance the importance of Marshallian externalities or excessively relying on buzz as a manner of managing economic relationships.

It is important to notice that such a framework keeps together the issue of variety within a territory and that of continuity. In our case, variety means that there are different groups characterised by some common behaviours, but it also means that variety also exists within each of these groups with reference to some sort of proximity to the territorialised bulk. Also variety is taken into account with reference to the effects of embeddedness, showing that virtuous path-dependence and abysmal lock-in can co-exist in the same moment, in the same territory, among firms sharing some sort of common background. At the same time, this multifaceted explanation of variety needs an equally multifaceted account of continuity. Continuity is not related to homogeneity, but rather to different degree of proximity to a central bulk of knowledge which is reproduced over time and which makes sense of being embedded¹³⁵.

¹³⁵ In this meaning, we can probably think that, compared to the late 90s survey, some convergence-with-difference occurred between different parts of Turin manufacturing fabric. We shall address this issue in the concluding chapter.

Figure 7.1 – A synthetic image of XXI Turin manufacturing tradition.



8. Conclusions.

The main purpose of this dissertation has been the rethinking of the relationships between territories and economic activities, with special reference to industrial production. In the introductory chapter, we addressed this issue starting somehow from the end, that is from the theme that assumes the deepest and most radical identification between the territorial dimension and the economic one, signally "territorial competitiveness". Any speech about territorial competitiveness cannot but assume an overwhelming narration of the territory itself in economic terms, as a sort of big, complex, multifaceted yet unique economic agent. Whatever is the geographical scale (national, regional, urban), claiming that a territory possesses a feature which is competitiveness against other territories forces us to grasp something extremely slippery. It is not just saying that there is a link between territorial and economic processes, but it is rather affirming that they share some common purpose: being competitive.

Hence talking about territorial competitiveness is not an innocent metaphor: to its extreme consequences, it implies that the whole territory is (or should be) organised in order to be competitive. There is also another implication, that is the possibility that the territory is something with clear boundaries and a monolithic identity within them, just like other economic actors, like a consumer or a firm. A successful economic actor must be consistent in its purposes and consistently organised in order to achieve them. This is what we called the "juridical personality" paradox, that is the extreme possibility of attributing to a territory some form of "collective agency". These features can explain why there is a large convergence about the importance of territorial competitiveness between heterogeneous groups, such a neo-liberal policy makers and local development advocates. The former find the competitiveness issue coherent with their overwhelming interpretation of economic interest as the engine moving and structuring human relationships, while the latter seem to be more attracted by the emphasis that territorial competitiveness puts on community, homogeneity and communality of purposes. Nevertheless, the idea that territories compete against each other shows to be a poor metaphor, in the eyes of both serious economists (sceptical about the fact that territorial

competitiveness can be something more than a zero sum game) and aware geographers (concerned about the fact that a territory is not a monolithic consensus building machine and that territorial competitiveness actually favours particular groups of stakeholders). As a consequence, we preferred to put more emphasis on the concept of indirect territorial competitiveness, that is the idea that specific features of a territory can positively influence firms' competitiveness.

8.1 Assessing the limits of the current debate in Economic Geography.

This shift of perspective drove us to move back to consider more general issues about the firm-territory linkages, contextualising the issue of territorial competitiveness in the broader debate ongoing in Economic Geography, but also in other disciplines. In particular, over the last twenty years, the consciousness that economic activity involves a number of intermediate scales – such as the city or the region – between the single firm (micro) and the whole economic systems (macro) spread beyond the tiny boundaries of Economic Geography to invest mainstream neoclassical Economics. Within this broad process, the issue of territory, or at least of space, has come to the forefront to the extent that a new branch of spatial and/or regional Economics arose, signally New Economic Geography (NEG). In parallel, also a New Industrial Geography (NIG) met a renewed interest in its traditional themes, especially related to the location process and to regional development. In particular the rediscovery of small and medium enterprises got a deeper set of meanings being contextualised in encompassing broad narratives, such as the post-Fordist transition and the emergence of a flexible specialisation model.

Although almost coeval, NEG and NIG intellectual trajectories diverged since their very foundation. On the one side, NEG has always been focusing on themes that most of geographers perceived as the archaeology of the discipline, from the early classic location models to the search for spatial regularities. On the other side, NIG was dealing with the idea of a paradigmatic change in the conceptualisation of the economic realm and of its relationships with space, place and territory, drawing on narratives of dramatic change, such as "the second industrial divide", the regulationist school and the transaction cost model. On the one side, NEG was firmly rooted in the neoclassical mainstream tradition, explicitly claiming for the foundation of a new stream in Economics rather than a (counter)reform in Economic Geography. On the other side, NIG increasingly started to look to a broad set of "alternative" Political Economics, from neo-Keynesian to post-Marxist, from Veblen's Old Institutional Economics till the latter development of Hayek's thought, the so called "second Hayek". Also NEG was emphasising the possibility of applying to the study of the spatial economy the set of robust and universal categories which made the good fortune of mainstream Economics, while NIG was, on the contrary, more keen to accept some cultural, post-structuralist, turn in its theoretical and

methodological assumptions. Albeit it has an explicit empathy with the more geographical of the two streams, our TPS approach attempted some sort of bridging between NEG and NIG.

In the second chapter, we addressed the issue of how these two approaches offer two radical different, yet imitatively related, views of the interaction between economic activities and territories. We articulated this confrontation across four different standpoints. First we considered how NEG situates in its "natural environment", that is mainstream Economics, rather than Economic Geography. Second, we tried to match the different explanatory power of NEG and NIG, focusing on the lessons that industrial geographers can draw from NEG experience. In the third part of the chapter, we considered the failure of NEG in addressing fundamental issues in Geography, i.e. the idea of place and the concept of scale, claiming that the current cultural turn in NIG has its roots in a different meta-theoretical framework, which is not Neoclassical Economics, like in the case of NEG, but rather Old Institutional Economics. Finally, stressing the limits to the cultural and institutional turns in NIG, we have concluded claiming for something more than a meta-theoretical shift, precisely for a paradigmatic change. In particular, we have been forced into this step by the awareness that NIG was operating some radical simplification in its account of territory that was not less dramatic than the hypotheses-setting process typical of mainstream Economics and NEG. In other terms, our point was that in order to fully grasp the complexity of territories and consequently of their relationship with economic activities a new paradigm was to be developed and it was to be searched in biology rather than physics, which has traditionally been the main source of metaphors for mainstream Economics. The idea was to trace back the metaphor of territorial competitiveness to its very primary source, life sciences.

8.2 The systemic gaze: introducing Territorial Productive System.

Consequently, in chapter 3 we have addressed the issue of defining a "new" paradigm for Economic Geography, which would allow a conceptualisation of the territory-firm nexus avoiding the excess of simplification implicit in both NEG and NIG. This research has been orientated toward the co-called complexity theories, signally system theory, with particular reference to Varela and Maturana's account of autopoietic systems, formerly developed in the field of neurobiology. This peculiar standpoint has brought to the forefront some themes that would connote the reasoning across the whole dissertation. First complexity framework helped in contextualising the NEG versus NIG juxtaposition within the broader debate in Geography concerning the conceptualisation of fundamental concepts like space, time, place, territory. Second, it contributed to focusing our attention on how variety and continuity relate to each other. System theory puts a great emphasis on some continuity – and hence on some form of identity – within the bulk of the system,

without denying the importance of change and variety, in the twofold meaning of evolution and emergence of new properties. Introducing Varela and Maturana's model, rather than on autopoiesis we have been focusing on their distinction between Organisation and Structure, where the former connotes the set of fundamental relationships that define system's identity and continuity, while the latter denotes simply the contingent set of components and relationships through which a system becomes contextualised in time and space. As we shall see the divide between Organisation and Structure represents the cornerstone of our systemic understanding of the firms-territory complex set of relationships.

The following chapter, number four, represents the core of the whole dissertation as it translates the notion of autopoietic system into the concept of Territorial Productive System, which is the central focus of the present work. The problem here is how to conceptualise the territory from a systemic perspective. Given the impossibility of formulating a holistic account of a whole territory as a system, we have followed an alternative path. Assuming that a given set of elementary systems happens to be colocated in the same territory, we have been questioning which kind of systemic interaction might occur between them. The first possibility is that they enter in some sort of structural coupling, which is the standard systemic interaction postulated by Varela and Maturana. In this case, the elementary systems coevolve through adaptation, simply sharing some features of their Structures while maintaining their organisative closure each against the other. In this case the elementary systems stay perfectly distinguishable between them and with reference to the territory, which is simply the material and immaterial outcome of this cumulative structural coupling. The second possibility is that these elementary systems, or at least part of them, enter into a process more complex than mere structural coupling, what we called organisative synthesis. In the latter case, the coevolution refers not only to the Structures but also to the Organisations. In other term interaction occurs at the level of the Organisation of the elementary systems, leading to the emergence of a more complex system, the Territorial Productive System (TPS). It is fundamental to remember that the TPS is not the territory, but it is rather a proxy of the territory. It might happen that, in less complex territories, the TPS can be considered "as if" it were the territory, but in most of the cases they are two different entities. The main implication is that in a territory more TPSs can coexist and coevolve.

Of course this is not a place where the complexity of the model can be entirely described. Nevertheless, it seems important to consider the main theoretical implication of the TPS. The fundamental point is that the distinction between Structure and Organisation allowed us to identify two different kinds of territorialisation of economic activities, leading to two separate accounts for embeddedness, respectively structural and organisative. On

the one side, structural embeddedness is solely produced by a structural coupling between the TPS and a broad range of territorial assets, varying from pecuniary externalities to Marshallian ones, till embracing more cultural and institutional territorial endowment, like trust and cooperation. On the other side, organisative embeddedness implied a deeper degree of integration between the economic activities and the territory, related to some cognitive process taking place in the territory. More precisely, we identified the presence of territorial learning processes as the main evidence of organisative embeddedness, supposing that the reproduction and hybridisation of a set of traditional knowledge and competencies is the mechanism that make possible the reproduction of the Organisation itself. As we shall see when discussing the contribution that the TPS model can offer to geographical analysis, this distinction helps us in addressing two fundamental issues which are consistently addressed neither by NEG nor by NIG, that is the account of how variety is produced within the territory, even in presence of some share features and behaviours, and how continuity can produce a more diversified set of outcomes than the mere opposition between virtuous path-dependence and lock-in.

8.3 Putting TPS at work: empirical evidences from Turin manufacturing tradition.

The second part of the thesis has been dealing with the attempt of applying the TPS framework to a concrete case study, that is the transformation that occurred in the Turin manufacturing fabric. As we have seen in the end of chapter 4, the Turin area offers some features that make it an appropriate case to assess the validity and the originality of the theoretical framework we developed in the first four chapters. The main issue is probably the long lasting identification between Fiat and the whole territory, summarised in the metaphor of the one-company-town. To this regard our interest was dismantling this monolithic image that, after Fiat's crisis and delocation, was turning out to be meaningless, without, at the same time, falling in another all-encompassing oversimplified tale, such as the post-Fordist or another post-labelled narration. Another good point was that Turin is characterised by a quite recognisable bulk of knowledge which has been reproduced over about a century and half, that is an overwhelming diffusion of tacit competencies in the area of mechanical and electrotechnical production. These two issues put on the forefront how this cognitive path-dependence evolved over time, embodying in different specialisation and producing simultaneously continuity and variety.

In order to address these issues, we have displayed a quite heterogeneous set of methodologies. In particular, in chapter 5 a historical assessment of how Fiat's environment has been working from its very foundation at the turn of XX century. Signally, we have tried to show that even the well-known Fordist narration about Turin and Fiat can be better interpreted as the product of interaction between different systems collocated in

the same territory and coevolving, rather than a mere imposition of Fiat's strategies and organisation on a passive territory. The following chapter has been focusing on the transition following Fiat's disengagement from Turin. Drawing on both historical account and previous empirical investigation we showed how the 80s and 90s restructuring set free a conspicuous volume of "energies" that were previously channelled into Fiat's system, in particular forcing many enterprises, mainly SMEs but not only, to search for a different setting of relationships, both productive and cognitive ones. Finally, in chapter 7, we came to present times, questioning how different clusters coevolved in the turn of the millennium. This passage pointed also a methodological shift, as more attention has been paid to the microfoundation of our model, trying to sketch the TPS dynamics drawing directly on the observation of a sample of about 400 firms which have been investigate through an extensive face-to-face questionnaire.

In this conclusion, rather than simply summarising the findings of our empirical work, we would like to sketch out a more complex and overwhelming narration of the Turin manufacturing history, cutting across all the three empirical chapters. Our position is that we had two shifts, the first one in the beginning of the 90s and the second in the turn of the millennium. The first shift, analysed in chapter 6, implied a process of divergence within Turin manufacturing tradition producing two quite distinctive bulks. Two TPSs seemed to coexist, a Fiat-centred TPS and a mechatronic one, each significantly distinguished from the other in terms of territorialised cognitive behaviours. Our point is that, in the decade between the two surveys we made, some further processes took place, at the same time differentiating and unifying the development path of mechanical and electrotechnical firms. On the one side, it seems to us that a convergence happened between some parts of the Fiat-centred and of the mechatronic TPSs, involving on the one side direct suppliers of machine tools and on the other side production services firms, the latter independently from their proximity to Fiat's environment. This lead to the emergence of what we called the "competencies core", a set of firms characterised by a high degree of both structural and organisative embeddedness and by a higher level of competitiveness than the rest of the sample. On the other side, at the fringe of this bulk expressing the core of the TPS we witnessed two different processes. First, further convergence happened between non-Fiat automotive producers and non-automotive firms, involving also Fiat indirect suppliers, within what we labelled the broader "mechatronic galaxy". Second, with respect to the mid 90s situation a divide seemed to arise cutting across the mechatronic galaxy, distinguishing those firms who could gain or maintain a position of proximity to the competencies core, and hence experience an increase in competitiveness, from other firms which showed a negative correlation between competitiveness and embeddedness, suggesting the existence of some lock-in.

8.4 Concluding remarks on our case study.

Before passing to draw some general conclusions about the added value of the TPS approach in the theoretical debate in Economic Geography, we would like to consider three further issues related to our empirical assessment. The first question to be addressed here is the role played by Fiat in this change. Although Turin has never been a proper one-company-town, there is no doubt that in the period between the end of the Second World War and the big organisational restructuring in the 80s Fiat played an hegemonic role in the destiny of Turin's territorial economy, justifying the claim that a Fiat TPS was to a certain extent the main evident expression of the local manufacturing tradition. The 80s crisis started a process of transformation which reached its peak, according to our interpretation, in the first years of XXI century, drawing an image of Turin productive fabric which is dramatically different from the previous one. The TPS that we sketched in chapter 7 is not any more a Fiat-centred one, but it is rather focused on a set of behaviours (mainly informal cooperation with a blend of co-design networking) in charge of the reproduction of the knowledge inherited by previous times. Some of the firms belonging to it have relationships with Fiat, other do not. At the same time, the image of the TPS is neither anti-Fiat nor Fiat-independent: as we have seen in chapter 5, co-design and co-engineering platform, which play an important role for the knowledge reproduction, have been established top-down by Fiat as a widespread practice in the 90s. The presence of Fiat is still important to maintain some degree of organisative embeddedness of some parts of the new TPS: we have seen, for instance, that scale intensive direct suppliers are embedded in Turin mainly thanks to co-design with Fiat, and that Fiat-centred codesign platform are probably the only chance for indirect suppliers to participate to some territorialised learning process.

The second point we would like to address is the fact that this final image was, in a sense, unexpected: given the image that emerged from the previous survey, we would have expected the confirmation of a dichotomy neat cut between Fiat's environment and a mechatronic TPS, each of them with its own destiny and development trajectory. The representation we get is, instead, more complex: the differences between the group are nuanced and, rather than an opposition between different clusters of TPSs, they can be better interpreted in terms of institutional proximity – but also of geographical proximity, given the concentration of the competitive core in Turin metropolitan area – to a bulk of knowledge and learning. This has some important consequences for our account of variety and continuity. Continuity is actually stronger than we expected and hence it makes the possibility of cutting clear boundaries, within a territory, between different TPSs sharing some common features such as a shared knowledge. At the same time, continuity did not mean homogeneity, but it simply addressed the issue of variety in a different manner: we have to focus our attention on thresholds and frontiers rather than sharp boundaries, on

nuances and tones of gray rather than contrasted black and white dramatic pictures. More importantly, even when some homogeneity is given – like in the importance of Marshallian externalities or of buzz – this does not necessarily imply that such features have the same impact on firms' competitiveness, as the risk of a lock-in is always present.

The third important issue is somehow an open question and it refers the possibility that the TPS model entails some predictive power. The impression is that our final TPS is more stable than the one we sketched in chapter 6, but it is doubtless less stable than the Fiat-centred one draft in chapter 5. Hence the question is about how the TPS is going to evolve in next years. Given the fact that Fiat reorganisation seems to be arrived to an end point and that the added value activities, like design and engineering, will not be delocalised; given the efforts from various agencies to sustain suppliers internationalisation; and given the evidence that in the last year we have even witnessed a re-embedding of Fiat production in Mirafiori, the main Turin plant, we can imagine that both the competencies core and scale intensive direct suppliers will remain relatively stable. The real playground is hence within the "mechatronic galaxy". It is likely that a deeper divergence will take place within this group of firms, with some of them closer and closer to the competencies core and others definitively trapped into the territorialised lock-in and eventually disembedding, moving closer to hi-tech firms in the deterritorialisation space. The problem is given by the fact that, apart a good number of machine tools producers and some components makers, most of the mechatronic galaxy is made of firms specialised in very generic production, without a clearly recognisable product, with weak entrepreneurship and limited access to learning processes. In other terms it is the typical case for dependent SMEs, which work at the lower levels of a supply-chain depending on customers not in terms of orders but also with reference to innovation transfer. The question, hence, is twofold: is the demand coming from the competencies core and scale intensive direct suppliers enough to absorb the supply? Are there other TPSs in the area with which these groups of firms can coevolve more successfully? Of course these questions cannot be addressed here, in that they need to take into account more complex territorial dynamics, included the role played by Public Administration.

8.5 Added value for the debate in Economic Geography.

We have now to consider how our TPS model can be collocated in the broader debate in Economic Geography, highlighting the added value that the systemic perspective add in addressing the issue of the relationships between economic activities and territories. The most important issue where the TPS approach challenged both NEG and NIG is the playground of simplification. For instance the way we have been conceptualising structural embeddedness was encompassing both NEG emphasis on pecuniary endowment and NIG preference for more institutional and relational assets.

Traded and untraded relationships are not simply played one against the other, but rather positioned on a continuous line where the presence of the latter does not contradict the importance of the former. At the same time, considering territorial assets as part of the structural territorialisation rather than of the organisative one reduced the emphasis that both NEG and NIG put on quite contingent elements, such as specialisation or labour market segmentation. The same process of deconstruction applied to the territorialised learning issue: while recognising it as the main bulk of TPS, we have at the same time tried to distinguish between a variety of learning processes, from mere buzz to more explicit cooperation till the highest form of interactive learning. The first outcome of this process has been introducing a higher degree of variety within our account of embeddedness, which is not any more a one-dimension process but rather a multifaceted dynamic, where there is room for a broad range of territorialisation processes which can coexist in the same territory and in the same time. This leads us to consider the second and most important advancement offered by the TPS approach, that is the possibility of assume and to a certain extent explain the complexity of the territory, that is, in our productive perspective, the possibility that different systems coevolve in the same territory, still maintaining certain continuity with a common past.

We believe that the empirical assessment of TPS confirmed both these advances. For instance, we have seen that traded and untraded relationships are equally important in fostering firms' competitiveness, above all in the case of firms that are more exposed to the "risk" – or the temptation – of disembedding (in our case study this was the case of globalised scale intensive direct suppliers). Also we have seen that buzz is to some extent overestimated: on the one side, we have seen that when buzz is present it is some how ubiquitous and it is not very helpful in addressing the issue of variety within a given territory; on the other side, buzz utility is limited to the acquisition of information: when it is displayed to manage more strategic activities (like the establishment or control of the supply chain), it can be even counterproductive, producing some sort of lock-in. As far as the issue of variety and continuity is concerned, we found that interpreting a territory through the prism of TPS withdraw the possibility of simply adapting an *a priori* category, such as industrial district or one-company-town, Fordist or post-Fordist.

8.6 The three paradoxes of TPS conceptualisation.

Nevertheless, both our theoretical and empirical analysis showed some limitations that need to be addressed here. In particular, we can identify three paradoxes implicit in the TPS approach. The first one might be labelled "generalisation without comparison". The TPS might be virtually used as a prism to describe and analyse an infinitive range of territory-production interaction. More generally the distinction between Organisation and Structure can be applied to the relationship between the territory and the economic

activities that take place in it even without a specific reference to industrial production. We might likely be able to describe Territorial Services Systems, or Territorial Tourist Systems. Also, Varela and Maturana's model of autopoietic system is not strictly bounded with economic categories, as it can be applied to the relationship between the territory and other social process, like class or ethnic conflicts. Finally, we can apply the same basic model to very different size of territories, that is to a range of geographical scales which stretches from the neighbourhood to the globe. At the same time, this generality implies that the way we applied systemic theorisation can be of little help in comparing what is going in different territories at a given time. This is because TPS model is very general in its basic assumptions, but it is far from universal in its operationalisation: which are the elementary systems producing the more complex territorial system and how they interact structurally and organisatively can be defined only with reference to a specific territory and to a specific set of questions we are asking that territory. Moreover, when we pass from theoretical operationalisation to empirical one we must recognise that our methodology massively relies on historical analysis in setting the hypothesis to be tested by the proper empirical assessment. To this respect we might conclude that the TPS and generally speaking the systemic approach to territorial studies is somehow closer to the humanistic and phenomenological streams in the geographical tradition than to the economic and industrial one. There is at work a strong notion of the uniqueness of each territory which makes it closer to the notion of place than to the concept of space.

This leads to the second paradox, that we might call "complexity with simplification". Despite the attempt at building a holistic comprehension of the territory, without reducing it to its economic dimension as in much of the territorial competitiveness literature, and despite the intention to take into account the complex uniqueness of each territory, some strong simplification is at work in our TPS model. Rejecting reductionism does not mean that our models pretend to be as complex as reality. More precisely, we built our TPS exactly to reduce the complexity of the territory as a whole and to make some sense of it. This is what we meant by saying that the TPS is not the territory, but a sort of interface between the elementary systems and the territory. Also it should be clear that this position is essential to our account of territorial variety. At the same time, we are nevertheless conscious that any operationalisation of a concept like TPS involves a situatedness of the observer. It is the researcher who decides which are the relevant questions to ask the territory and in doing so he/she unavoidably simplifies the richness of the territory, selecting some features and treating the other as something residual, as a black box which cannot be opened in the context of that contingent research. Under this perspective, the TPS approach still shares some of criticisms we have moved against the NEG approach: there is still a bin, a Pandora's Box or a QWERTY-like effect where

fundamental pieces of the territory are put. This limitation is at work as well when we try to pass to some empirical assessment of our systemic model. As we have seen in the Turin case study, when dealing with history and stories, we can grasp to a certain extent the complexity of the territory, considering other elementary systems (such as the Public Administration or the labour market), and not simply the productive clusters locally interacting. This simplification became even more evident when we passed to the empirical analysis, where the chosen methodology – the questionnaire – implied that the TPS has been built just considering firms' perception of the territory where they operate. It is partially true that this problem might be addressed through a change in methodology, for instance interviewing key observers belonging also to other elementary systems, but there will be always and anyway a subjective simplification in defining the main characters of a territorial system.

The third paradox emerges when dealing with the definition of boundaries, which is, as we have seen, a recurrent issue across our work, probably the most problematic one: we might baptise it "proximity without boundaries". It is quite clear, in fact, that the setting of boundaries is sensitive to how proximity works in a given context. Usually boundaries can be reasonably fixed when proximity becomes too loose to contain and explain the processes taking place in a territory. This leads to the important issue concerning the spatial boundaries of the territory, that is its geographical scale, and the relationship that the TPS, as territorially defined entity, entails with other scale. This is something which is largely addressed in the geographical literature, mainly under the label of local-global relationships. The main point is, nevertheless, another: our emphasis on variety within a territory implies that there are also internal boundaries. The possibility of distinguishing different TPSs and/or other kind of cluster acting within a territory is based on the fact that we described territorial proximity as made up of two elements, geographical (that is spatial) and institutional proximity. This means that, even if we could approximately fix the geographical boundaries of the territory and as a consequence of the TPS, we still should deal with a more subtle notion of boundaries which relates to institutional proximity. In fact, while geographical proximity is to some extent a condition necessary and sufficient to produce structural embeddedness, the same does not apply to organisative embeddedness which is far more selective and needs a full account of territorial proximity. Even when we can identify the bulk of a TPS, like in the case of what we called in our case study the "competencies core", what happens in its fringe is something extremely fluid which escapes fixed boundaries. The relationship between different groups of actors within a territory can hence take a broad range of nuanced shapes: being different does not imply necessarily otherness. Also what appears to be a disembedded behaviour can be

expression of embeddedness into another unknown TPS or into a non-territorial productive system.

The main problem when dealing with these three paradoxes is that there is a sort of trade-off between them: when trying to solve one, we are likely to worsen at least one of the others. If we increase the complexity of our model we are going to make empirical analyses which are less and less fitting an eventual comparison with other territories. To fix clear boundaries will help in comparing different territories, but at the same time it implies an oversimplification of territorial complexity. As an example, during the theoretical operationalisation of the TPS and early stages of our empirical analysis (mainly in chapter 6 and the beginning of chapter 7) we were actually oversimplifying the complexity of the territory, assuming that a question like "how many TPSs there are in Turin" was making sense. When it came to build up a synthetic image of Turin manufacturing fabric we had to shift to a fuzzier blurred notion of margins, talking about frontiers rather than boundaries. Vice versa, constructing a more complex account of TPS would increase the number and the quality of boundaries/frontiers to be taken into account. In this perspective our task has been piloting our theoretical and empirical research through the Scylla and Charybdis of the paradox. When we had to choose, we sacrificed comparability to variety and boundaries to (institutional) proximity. Doing so, we are conscious that we reduced the possibility of a fully satisfying validation of the model, floating between some sort of post-structuralist story-telling and a search for some kind of weak structuration of the reality. More difficult is to assess to what extent we have been successful in balancing complexity and simplification. For instance, our choice to focus almost exclusively on firms' behaviour in order to draw the diversification process within a given set of knowledge and competencies, can be criticised on two sides: from a complexity perspective, it is doubtless oversimplifying the complexity of the territory, but also that of the TPS as we have conceptualised it in chapter 4; from a reductionist standpoint, it is clear that we have not clearly settled the microeconomic foundation of our model, avoiding any statement about which are the purposes and the interests that motivate the individual actors.

8.7 An agenda for forthcoming research.

As a consequence there is room for further analysis on both theoretical and empirical sides. As far as conceptualisation is concerned, the main point is to more deeply consider the internal structure of elementary systems, which at present are more or less taken for granted as black boxes. This micro-foundation of the model might be addressed by taking into account some agent-structure model of explanation. Something has been done in the empirical analysis, when, starting from individual firms' behaviours, we have been identifying six elementary systems interacting and producing a TPS. Nevertheless

this passage must be reconsidered in its theoretical assumptions and consequences. At the same time, an analogous work has to be carried out with reference to different kind of elementary systems. In chapter 5 we have tried to do this through an historical approach to the definition of Fiat-centred TPS. Nevertheless, we had to abandon them in chapter 7, where their access to the explanation was exclusively mediated by the assessment and the perception of the firms belonging to the sample. Also, treating the internal structure of non-purely-economic elementary systems implies a complexification of the theory which will easily run out of control. More importantly, opening the black boxes of Public Administration dynamics or of the labour market implies bringing into our TPS model a broad range of disciplines and competences going far beyond the NEG versus NIG divide. Then, if we are going to consider non-economic Territorial Systems the complexity would increase and we should need a Braudelian or Vidalian capability to keep together so many lines of a broader and broader narration.

The second point which might highlight some dark sides of our systemic conceptualisation is a deeper reflection on the concept of boundaries and how they can be seen more profitably as frontier. Reconsidering the primary systemic foundation of our interpretation would add little, as in biology the boundaries of an organism have to be set down in a quite clearly cut way. More interesting might be referring to previous application of system theory in the realm of social sciences. Another source of inspiration might come on the concept of threshold developed within Cultural Anthropology to identify the set of both symbolic and spatial temporary boundaries where some ritual transformation takes place. What we need is hence to operationalise the concept of blurred boundaries and to put it at work.

When it comes to empirical research, we think that the most urgent issue is the boundaries one, i.e. to analyse what happening at the fringe of the TPS we identified in chapter 7, with special reference to non-automotive and hi-tech systems. In the building of the questionnaire itself there was a strong bias toward assessing Fiat-dependence and the role that automotive specialisation is still playing in defining Turin manufacturing identity. The picture has to be completed by paying more attention to the groups and specialisation that we treated, in practice, as a residual category: this black box needs urgently to be deconstructed. More generally some work is left in clarifying the nature of the relationships linking the territorialised bulk to the other(ness) spaces that surround it, mainly the territorialised competitiveness and the territorialised lock-in, understanding which kind of centripetal and/or centrifugal processes are at work.

The following step would be increasing the complexity of our picture, by introducing other elementary systems participating in our TPS. In chapter 5 we have seen that class conflict and migration processes within the labour market played a fundamental role in

influencing the transformation of Fiat TPS, somehow pushing Fiat management toward deverticalisation first and then delocalisation. In chapter 7, on the contrary, labour simply became a component of territorial endowment and it has severely filtered by the perception of the firms, leaving unaddressed important questions like the effects of flexibilisation of the labour market or the massive international immigration which replaced national immigration from the South. Even more importantly, introducing and detailing different elementary systems would help in increasing the complexity of our picture by introducing different Territorial Systems – either productive or non-economic ones – which might be co-localised in the same territory. Let us consider the role of the institutional actors, such as public administration, development agencies but also trade unions, chambers of commerce, and other private association. While being certainly interested in the destiny of mechanical tradition and hence being probably part of our TPS – let us think to the positive correlation between institutional territorial assets and competitiveness emerged among direct Fiat suppliers – it is also true that they have been playing on different tables. The efforts spent in getting Winter Olympic Games in 2006 and in upgrading the leisure facilities all around the Region witness the explicit attempt to build a Territorial Leisure System, centred on a mix of food, wine and culture that proved to be successful in other Italian and French regions.

Finally, some parallel work should be devoted to the issue of comparison between different territories. Of course, the more we proceed in our complexification of the image of the territory we want to forge, the more we will be moving toward an existentialist account of the uniqueness of a territory, the less we shall be able to make comparisons between territories. Nevertheless some attempts can be made, focusing on how similar knowledge traditions in different territories have led to different specialisation because of unpredictable divergences in the learning process. Consider, for example, Turin's and Swiss Jura's engineering specialisation: both of them have their roots in pre-industrial techniques and know-how, but, while Turin's TPS evolved through specialising mainly – but not exclusively as we have seen – in mass production and developed a certain kind of TPS, the Jura is historically specialised in micro-engineering workmanship carried on in small workshops, which likely resulted in one or more radically different kind of TPS. With a simplification, it is possible that these divergent structures are the outcomes of deep differences in the process of institutional learning. For instance, we might test the hypothesis that while Turin witnessed the emergence of just one large car producer adopting Fordist division of labour (out of more than one hundred independent competitors existing at the end of XIX century) and therefore a strong class conflictuality hegemonised by the Communist Party, the Swiss Jura's institutional learning has been substantially influenced by the presence of an outstanding anarchist self-reflexivity, embodied in the Proudhonian watchmakers.

Annex 1: The questionnaire

1. GENERAL INFORMATION

Name: _____

Address _____

Year of foundation _____

Belonging to a group YES NO

* since when _____

* nationality of the group: Italian Foreign

Turnover: 2004 _____ 1999 _____ 1996 _____

Export (% on turnover): 2004 _____ 1999 _____ 1996 _____

Employment: 2004 _____ 1999 _____ 1996 _____

2. COMPETITIVENESS AND FIRM'S STRATEGIES

Over the last eight years, did your firm increase its competitiveness

YES NO

If YES, which have been the strategies which eased the competitiveness increase (score from 1 to 10)?

- | | |
|------------------------------------|------------------------------|
| Local supply-chain | Quality certification |
| Regional supply-chain | Internationalisation |
| National supply-chain | Product innovation |
| International supply-chain | Process innovation |
| Workforce selection | Cooperation with other firms |
| Acquisition of external innovation | |

3. TERRITORIAL ASSETS AND STRUCTURAL EMBEDDEDNESS

Which role have the following territorial endowments played in enhancing firm's competitiveness?

- | | |
|---|---------------------------------|
| Infrastructure | Environmental quality |
| Availability of spaces | Social quality |
| Availability of specialised workforce | Entrepreneurs associations |
| Labour cost | Access to credit |
| Relationships with trade unions | Availability of venture capital |
| Local taxation | |
| Intermediation structure with PA | |
| Industrial and local development policies | |
| Local political stability | |
| Manufacturing tradition | |
| Trust and cooperation | |
- Specialised suppliers
- Long-term customers
- University and other public research centres
- Private research centres
- Specialised fairs and expos

4. BUZZ 1 - SUPPLY CHAIN ORGANISATION

Over the last ten years, the turnover of suppliers has been:

- more than 50% between 50% and 30%
between 30% and 10% less than 10%

How important are acquaintances in establishing and managing a relationship with a supplier
(nothing, few, quite important, fundamental)

- Acquaintances of the entrepreneurs
Acquaintances of the technicians

How is trust created within the supply chain?
(regularly, sometimes, seldom, never)

- Previous employment relationships
Counsel from other firms
Previous personal acquaintances
Catalogues, fair, expos

5. BUZZ 2 – GETTING INFORMATION

The exchange of information takes place through (multiple answers admitted):

- Formal associations between entrepreneurs
Informal associations between entrepreneurs
Contractual relationships with other firms
Fairs and expos
Employees from other firms of the same sector
Journal

6. LOCAL COOPERATION NETWORKS

Have you established cooperation relationships with other firms over the last eight years?

- YES NO

If YES, to what scale and to what purpose did the cooperation take place?

- | | Province | Region | Nation | Foreign |
|--------------------------|----------|--------|--------|---------|
| Shared orders | | | | |
| Research and development | | | | |
| Training | | | | |
| Export | | | | |
| Lobbying | | | | |

Have you established joint venture with local firms?

- YES NO

Do you participate in association and consortia?

- YES NO

Do you participate to EU programmes?

- YES NO

Which are the main communication forms you use with other local firms?

Customers Suppliers Competitors

Fax, phone
Manuals
Visits
Technicians exchange
E-mail

7. COGNITIVE SYNTHESIS

Design and engineering activities are managed:

Autonomously and internally
Autonomously and externally
Together with customers
Together with suppliers
By clients

Do you participate to co-design and co-engineering networks?

YES NO

If YES, with who:

Manufacturing firms belonging to the same sector
Manufacturing firms belonging to another sector
Design and engineering specialists
ICT firms
University and public research centres
Private research centres

8. EFFETTO DELLA CRISI FIAT SUL SISTEMA MANIFATTURIERO TORINESE

Did automotive and Fiat's crisis impact negatively on your competitiveness?

YES NO

If NO, because (mark one):

"We do not have any kind of relationship with automotive"
"Despite we work in the automotive sector we have not relationship with Fiat's supply chain"
"My specialisation makes our work fundamental"
"We do not depend entirely on Fiat's orders"

If YES, because:

"We are direct suppliers"
"We are indirect suppliers"
"We operate in a collateral sector"

Annex 2: Statistical appendices to chapter 7.

7.3 ANOVA analysis: firms' strategies and territorial structural assets.

DIRECT SUPPLIERS	Specialised suppliers	Scale Intensive	Production services	Total
Local supply-chain	2,43	4,38	3,45	3,81
Regional supply-chain	1,43	4,00	2,82	3,26
National supply-chain	2,86	5,17	3,36	4,31
International supply-chain	3,00	4,83	4,18	4,36
Workforce selection	6,63	5,46	8,27	6,40
Acquisition of external innovation	5,57	3,92	7,45	5,12
Quality certification	4,57	6,38	6,36	6,07
Internationalisation	3,50	5,17	3,36	4,40
Product innovation	4,71	7,17	7,36	6,81
Process innovation	6,50	8,00	7,55	7,61
Cooperation with other firms	3,86	4,21	5,45	4,48

INDIRECT SUPPLIERS	Specialised suppliers	Scale Intensive	Production services	Total
Local supply-chain	3,50	5,00	4,22	4,35
Regional supply-chain	3,79	4,20	3,67	3,95
National supply-chain	4,57	3,75	3,56	3,98
International supply-chain	3,43	2,30	3,00	2,81
Workforce selection	5,36	4,75	6,33	5,28
Acquisition of external innovation	3,14	3,95	5,44	4,00
Quality certification	4,00	5,38	4,70	4,80
Internationalisation	4,33	2,40	3,89	3,36
Product innovation	6,00	5,40	6,70	5,89
Process innovation	5,07	6,60	6,30	6,02
Cooperation with other firms	3,27	2,85	4,89	3,41

FIAT-INDEPENDENT AUTOMOTIVE FIRMS	Specialised suppliers	Scale Intensive	Production services	Total
Local supply-chain	3,07	2,88	4,40	3,11
Regional supply-chain	3,71	2,96	4,40	3,36
National supply-chain	2,71	3,36	3,60	3,18
International supply-chain	2,43	3,96	3,60	3,43
Workforce selection	4,73	4,52	5,60	4,71
Acquisition of external innovation	5,13	5,32	4,40	5,16
Quality certification	5,87	5,24	6,00	5,53
Internationalisation	4,07	5,40	2,40	4,64
Product innovation	6,93	6,12	5,50	6,30
Process innovation	6,80	6,74	5,50	6,60
Cooperation with other firms	4,27	2,72	4,40	3,42

NON-AUTOMOTIVE FIRMS	Specialised suppliers	Scale Intensive	Production services	Total
Local supply-chain	2,94	3,15	4,12	3,43
Regional supply-chain	2,94	3,15	3,94	3,36
National supply-chain	3,00	4,54	3,94	3,77
International supply-chain	2,94	3,23	2,76	2,96
Workforce selection	4,71	3,31	7,61	5,42
Acquisition of external innovation	3,29	2,38	5,44	3,85
Quality certification	4,35	4,15	4,39	4,31
Internationalisation	5,35	4,23	3,71	4,45
Product innovation	8,05	7,29	7,00	7,48
Process innovation	5,94	5,79	5,39	5,69
Cooperation with other firms	3,88	2,69	6,11	4,40

DIRECT SUPPLIERS	Specialised suppliers	Scale Intensive	Production services	Total
Infrastructure	4,23	5,43	4,47	5,01
Availability of spaces	4,31	4,60	4,76	4,59
Availability of specialised workforce	5,62	4,51	6,18	5,06
Labour cost	5,77	3,89	2,88	3,99
Relationships with trade unions	3,92	4,04	3,65	3,94
Local taxation	4,54	4,06	3,29	3,97
Intermediation structure with Public Administration	3,15	3,74	3,76	3,64
Industrial and local development policies	4,31	4,22	5,24	4,47
Local political stability	2,92	3,85	3,47	3,61
Manufacturing tradition	6,77	5,38	4,59	5,44
Trust and cooperation	6,54	5,04	7,41	5,82
Specialised suppliers	5,54	5,83	5,53	5,71
Long-term customers	6,46	5,83	8,41	6,51
University and other public research centres	5,00	4,07	6,00	4,66
Private research centres	3,31	3,63	5,06	3,89
Specialised fairs and expos	4,54	3,45	4,53	3,87
Environmental quality	5,08	4,06	4,65	4,36
Social quality	4,69	4,00	3,29	3,96
Entrepreneurs associations	5,69	4,60	4,59	4,78
Access to credit	5,23	4,43	3,94	4,45
Availability of venture capital	3,77	4,11	4,35	4,10

INDIRECT SUPPLIERS	Specialised suppliers	Scale Intensive	Production services	Total
Infrastructure	4,41	4,95	4,88	4,77
Availability of spaces	3,23	4,38	4,31	4,01
Availability of specialised workforce	4,11	4,33	3,88	4,17
Labour cost	4,41	4,71	3,38	4,36
Relationships with trade unions	3,73	3,95	3,69	3,83
Local taxation	4,42	3,86	2,69	3,81
Intermediation structure with Public Administration	3,81	3,55	3,50	3,62
Industrial and local development policies	3,54	3,40	3,25	3,42
Local political stability	3,85	4,19	3,19	3,89
Manufacturing tradition	4,76	5,07	4,00	4,77
Trust and cooperation	5,36	5,02	6,35	5,39
Specialised suppliers	5,73	6,16	5,50	5,91
Long-term customers	5,69	5,72	7,71	6,10
University and other public research centres	3,92	3,57	3,81	3,72
Private research centres	3,19	3,50	3,88	3,48
Specialised fairs and expos	3,62	3,64	3,69	3,64
Environmental quality	4,24	4,10	3,53	4,02
Social quality	3,92	4,14	3,06	3,86
Entrepreneurs associations	4,37	4,31	3,81	4,24
Access to credit	5,15	3,74	3,56	4,14
Availability of venture capital	4,08	3,95	3,93	3,99

FIAT-INDEPENDENT AUTOMOTIVE FIRMS	Specialised suppliers	Scale Intensive	Production services	Total
Infrastructure	5,00	3,76	4,33	4,17
Availability of spaces	5,54	5,29	5,25	5,35
Availability of specialised workforce	4,54	4,64	5,50	4,72
Labour cost	5,12	3,69	4,08	4,14
Relationships with trade unions	4,08	3,35	3,25	3,54
Local taxation	4,96	3,55	3,58	3,92
Intermediation structure with Public Administration	3,96	3,96	3,83	3,95
Industrial and local development policies	4,00	3,85	4,08	3,92
Local political stability	3,63	4,15	3,50	3,92
Manufacturing tradition	5,85	5,25	3,75	5,23
Trust and cooperation	5,31	5,49	4,67	5,33
Specialised suppliers	5,28	6,20	5,50	5,86
Long-term customers	6,15	5,84	6,67	6,03
University and other public research centres	3,58	3,87	4,33	3,85
Private research centres	3,40	3,65	4,17	3,65
Specialised fairs and expos	4,28	4,02	3,67	4,04
Environmental quality	4,33	4,02	3,50	4,03
Social quality	3,96	3,95	3,50	3,89
Entrepreneurs associations	4,15	3,91	4,08	4,00
Access to credit	4,04	4,20	4,42	4,19
Availability of venture capital	3,39	3,85	4,08	3,76

NON-AUTOMOTIVE FIRMS	Specialised suppliers	Scale Intensive	Production services	Total
Infrastructure	4,39	4,53	4,04	4,35
Availability of spaces	4,39	4,89	4,60	4,64
Availability of specialised workforce	5,09	4,51	4,88	4,81
Labour cost	4,15	4,64	4,16	4,34
Relationships with trade unions	3,27	4,39	3,60	3,79
Local taxation	3,64	4,31	3,79	3,94
Intermediation structure with Public Administration	3,06	3,42	3,25	3,25
Industrial and local development policies	4,67	3,42	4,08	4,03
Local political stability	3,97	4,00	4,38	4,09
Manufacturing tradition	5,32	5,19	4,20	4,98
Trust and cooperation	5,24	5,42	6,13	5,54
Specialised suppliers	5,65	5,95	5,88	5,82
Long-term customers	6,26	5,68	6,48	6,09
University and other public research centres	4,48	4,06	4,96	4,44
Private research centres	3,82	3,86	3,63	3,78
Specialised fairs and expos	3,61	3,69	3,83	3,70
Environmental quality	4,47	4,03	4,54	4,32
Social quality	4,44	4,50	4,46	4,47
Entrepreneurs associations	4,24	4,31	4,08	4,22
Access to credit	3,70	3,92	4,76	4,06
Availability of venture capital	3,91	3,58	4,19	3,84

7.4 Factorial analysis

1 = Overall territorial embeddedness	Component				
	1	2	3	4	5
Manufacturing tradition	,682	,154	-,158	-,028	,254
Trust and cooperation	,610	,488	,017	-,116	,167
Specialised suppliers	,537	,473	,246	-,239	,148
Long-term customers	,513	,631	,064	-,256	,192
University and other public research centres	,791	-,094	-,098	-,066	-,004
Private research centres	,783	-,060	-,223	,005	-,104
Specialised fairs and expos	,630	,022	-,239	-,021	-,235
Environmental quality	,799	-,144	-,035	,016	-,321
Social quality	,746	-,222	,036	,007	-,308
Infrastructure	,538	,152	,032	,495	-,145
Availability of spaces	,552	,335	,006	,462	-,059
Availability of specialised workforce	,437	,373	,450	,125	-,299
Labour cost	,304	-,153	,791	,014	-,062
Relationships with trade unions	,672	-,060	,023	,294	,192
Local taxation	,292	-,515	,519	,051	,364
Intermediation structure with Public Administration	,725	-,194	-,181	,171	,269
Industrial and local development policies	,638	-,199	-,050	,016	,297
Local political stability	,742	-,205	-,133	,078	,162
Entrepreneurs associations	,806	-,164	-,073	-,068	-,048
Access to credit	,639	-,246	,134	-,391	-,168
Availability of venture capital	,670	-,113	-,078	-,428	-,101

1 = Pecunary territorial assets	Component				
	1	2	3	4	5
Infrastructure	,577	-,547	,290	-,059	-,530
Availability of spaces	,506	-,607	,348	,159	,478
Labour cost	,551	,476	,423	-,522	,113
Local taxation	,488	,600	,332	,531	-,091
Access to credit	,786	,123	-,425	-,043	,024
Availability of venture capital	,732	-,040	-,551	,022	,037

1 = Institutional territorial assets	Component	
	1	2
Intermediation structure with Public Administration	,855	,026
Relationships with trade unions	,721	-,556
Industrial and local development policies	,719	,578
Local political stability	,809	,194
Entrepreneurs associations	,807	-,240

1 = Relational territorial assets 2 = Marshallian externalities	Component					
	1	2	3	4	5	6
Availability of specialised workforce	,513	,278	,518	,567	,021	,260
Manufacturing tradition	,709	,076	-,217	-,330	,086	,532
Trust and cooperation	,685	,409	-,224	,053	-,029	-,088
Specialised suppliers	,618	,506	,213	-,194	-,055	-,343
Long-term customers	,627	,591	-,109	-,120	,065	,000
University and other public research centres	,782	-,256	-,176	,113	-,423	-,034
Private research centres	,783	-,283	-,250	,192	-,299	-,036
Specialised fairs and expos	,615	-,218	-,367	,297	,552	-,154
Environmental quality	,806	-,380	,297	-,172	,122	-,070
Social quality	,741	-,402	,402	-,242	,093	-,043

1 = Informal cooperation 3 = Formal cooperation	Component				
	1	2	3	4	5
Local cooperation intensity	,473	,536	-,248	,053	,127
Provincial cooperation intensity	,396	,609	-,360	-,128	-,297
Regional cooperation intensity	,426	,603	-,269	-,085	-,238
Tacit communication intensity	,816	-,515	-,129	,073	-,079
Regular visits to customers	,517	-,322	,244	,275	-,468
Regular visits to suppliers	,539	-,428	,098	,043	-,517
Exchange of technicians with customers	,554	-,358	-,368	,030	,446
Exchange of technicians with suppliers	,537	-,456	-,359	-,091	,374
Participation to informal cooperation networks	,435	,561	-,070	,261	,057
Joint ventures (existing)	,537	,187	,548	-,438	,199
Joint ventures (in future)	,563	,172	,565	-,398	,145
Participation to consortia and associations	,270	,174	,312	,549	,228
Participation to EU programmes	,110	,203	,285	,606	,195

1 = Personal acquaintances 2 = Spin-off	Component	
	1	2
Acquaintances with the entrepreneurs	,854	-,398
Acquaintances with the other firms' technicians	,842	-,425
Previous employment relationship	,498	,697
Suggestion from other firms	,511	,686

1 = Territorial learning intensity 3 = Design with customers	Component					
	1	2	3	4	5	6
Design intensity	,948	-,072	-,166	,115	,003	,015
Autonomously and internally	,413	-,716	,018	,134	,382	,379
Autonomously and externally	,425	,378	-,691	-,327	-,108	,268
Together with customers	,575	,016	,492	,052	-,607	,227
Together with suppliers	,760	,192	-,039	,332	,139	-,486
By clients	-,052	,754	,220	,396	,303	,363
Participation to co-design network	,433	,204	,467	-,660	,335	-,062

7.5 ANOVA analysis: firms' strategies and territorial structural assets.

	Direct suppliers scale intensive	Competencies core	Hi tech	Indirect Fiat suppliers	Fiat-independent automotive firms	Non-automotive firms	Total
Local supply-chain	4,38	3,78	3,54	4,38	2,95	3,03	3,66
Regional supply-chain	4,00	3,33	3,54	4,03	3,23	3,03	3,49
National supply-chain	5,17	3,55	4,46	4,09	3,13	3,67	3,85
International supply-chain	4,83	3,24	3,08	2,76	3,41	3,07	3,35
Workforce selection	5,46	7,18	5,38	5,00	4,60	4,10	5,44
Acquisition of external innovation	3,92	5,80	3,92	3,62	5,25	2,90	4,48
Quality certification	6,38	5,06	5,85	4,83	5,48	4,27	5,20
Internationalisation	5,17	3,50	3,54	3,23	4,92	4,87	4,17
Product innovation	7,17	6,54	6,79	5,67	6,41	7,74	6,65
Process innovation	8,00	6,19	5,85	5,94	6,76	5,87	6,42
Cooperation with other firms	4,21	5,26	4,00	3,03	3,30	3,37	3,93

	Direct suppliers scale intensive	Compet. core	Hi tech	Indirect Fiat suppliers	Fiat-independent automotive firms	Non-automotive firms	Total
Infrastructure	5,43	4,37	4,48	4,74	4,15	4,46	4,55
Availability of spaces	4,60	4,63	4,24	3,94	5,37	4,66	4,63
Availability of specialised workforce	4,51	5,16	3,97	4,24	4,60	4,79	4,63
Labour cost	3,89	3,99	3,55	4,59	4,15	4,41	4,16
Manufacturing tradition	5,38	4,58	4,41	4,96	5,44	5,25	5,04
Trust and cooperation	5,04	6,29	4,18	5,15	5,43	5,33	5,39
Specialised suppliers	5,83	5,63	4,61	6,00	5,91	5,80	5,72
Long-term customers	5,83	7,14	5,06	5,71	5,94	5,96	6,08
University and other public research centres	4,07	4,87	3,72	3,70	3,78	4,26	4,12
Private research centres	3,63	4,00	3,39	3,38	3,57	3,84	3,67
Specialised fairs and expos	3,45	4,04	3,09	3,63	4,10	3,65	3,75
Environmental quality	4,06	4,29	3,81	4,15	4,11	4,24	4,15
Social quality	4,00	3,83	3,72	4,06	3,95	4,47	4,03
Entrepreneurs associations	4,60	4,39	3,72	4,33	3,99	4,28	4,24
Access to credit	4,43	4,39	4,15	4,28	4,15	3,81	4,20
Availability of venture capital	4,11	4,09	3,48	4,00	3,71	3,74	3,88

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