NETWORKS, DISTRICTS, CITIES, REGIONS:

EVIDENCE FROM THE THIRD ITALY

Dissertation submitted
for the
Doctor of Philosophy degree

by

Pamela M.M. Blais

Department of Geography
London School of Economics and Political Science

May, 1995

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ABSTRACT

For over three hundred years, including its most recent, “Fordist” phase, industrial capitalism has been shaping the organisation of territory, fostering urbanisation and the emergence of the great cities and industrial regions. Recently, many observers have suggested that Fordism is in crisis and a period of transition is underway to a "post-Fordist" economy, the characteristics of which are antithetical to those of Fordism.

Though territorial aspects are in many ways at the core of the post-Fordist school, particularly the so-called “rise” of the industrial district, regional and especially urban factors are not systematically dealt with in the literature. There is scant empirical evidence of the territorial organisation of the post-Fordist productive systems, nor a clear delineation of the logic behind this particular structure of territorial organisation.

Drawing on evidence of three case studies of industrial districts in the Third Italy, the central thesis put forward is that the pattern of cities and regions that has been evolving relatively smoothly since the beginning of the industrial era is currently undergoing a dramatic reorganisation, as a result of a new logic of post-Fordist capital accumulation. New patterns of uneven development are being forged, that are in many ways a reversal of previous and long-standing urban and regional evolutionary trends. The role of spatial and territorial factors in the evolution of certain forms of post-Fordist organisation of production are also explored.

In basic outline, the thesis:

- argues that we are entering a post-Fordist era and industrial districts can be marshalled as evidence of this;
- offers explanations as to why these *particular* territorial systems of production emerged in the Third Italy, and how they relate to the logic of

post-Fordist accumulation; and

- concludes that post-Fordism is associated with a reorganisation of urban and regional territory at all geographical scales: regions, urban systems and the urban hierarchy, intra-urban and intra-district space.

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INTRODUCTION

In the 19th and 20th centuries we have witnessed a continual process of concentration of population and employment in cities and towns. Within a relatively brisk period, the countries of Europe, America and elsewhere have been transformed from overwhelmingly rural cultures to predominantly urban societies within in relatively short period. The primary force driving this transformation is industrial capitalism, which has not only reconfigured rural nations into city-dwellers, but also produced the metropolis, the Turins, Detroits, and Manchesters; the great cities; industrial regions, and a complete reorganisation of the internal space of cities.

For most of the current century, patterns of uneven development (of which cities are the most extreme example) have been framed by a particular phase of industrial capitalism generally referred to as "Fordism", after the father of mass production, Henry Ford. By and large, the Fordist period has continued trajectories in industrial organisation, urbanisation and uneven development that pre-dated it, but on a more massive scale, creating yet larger cities and higher levels of urbanisation.

In recent years, many observers have suggested that Fordism is in crisis and a period of transition is underway to a "post-Fordist" economy, the characteristics of which are antithetical to those of Fordism. If true, we could expect changes in patterns of uneven development - especially in patterns of evolution of cities, city-systems and regions.

Though territorial aspects are in many ways at the core of the post-Fordist school (the industrial district, the re-emergence of regions, agglomeration economies, etc.) regional and especially urban factors are not systematically dealt with in the literature. There is scant empirical evidence of the territorial organisation of the allegedly post-Fordist productive systems, nor a clear delineation of the logic behind this particular structure of territorial organisation.

This thesis addresses this under explored aspect of the debate, aiming to address implications of post-Fordist production for the evolution of cities, city-systems and regions. At the same time, it explores the role of spatial and territorial factors in the evolution of certain forms of post-Fordist organisation of production.

Industrial districts are at centre of the current debate, and are often cited as prime examples of flexible production complexes and "evidence" of the new post-Fordist regime. This thesis presents original research on three productive systems in Emilia-Romagna, the post-Fordist region *par excellence*. An essential idea behind the empirical research is that it is important first to understand the territorial productive systems in detail, their organisation and logic within the wider economic context, in order to better understand their relationship with cities and regions. The territorial organisation of three production systems from the "Third Italy " (as the north-east central part of Italy in which Emilia-Romagna is located is called) is examined in detail: the knitwear district of Carpi, the oleodynamic components district of Modena, and the automatic packaging machinery industry of Bologna.

The research addresses questions such as: Are we indeed entering a "post-Fordist" era? What are the characteristics of post-Fordism? What are industrial districts? How can their territorial organisation of production be explained? Are they evidence of post-Fordism? What are the implications for the evolution of cities and regions?

The central thesis put forward is that the pattern of cities and regions that has been evolving relatively smoothly since the beginning of the industrial era is currently undergoing a dramatic reorganisation, as a result of a new logic of post-Fordist capital accumulation. New patterns of uneven development are being forged, that are in many ways a reversal of previous and long-standing urban and regional evolutionary trends. In basic outline, the thesis:

- argues that we are entering a post-Fordist era and industrial districts can be marshalled as evidence of this;
- offers explanations as to why these *particular* territorial systems of production emerged in the Third Italy, and how they relate to the logic of post-Fordist accumulation; and
- concludes that post-Fordism is associated with a reorganisation of urban and regional territory at all geographical scales: regions, urban systems and the urban hierarchy, intra-urban and intra-district space.

The thesis is organised in three parts. Part I sets the research in the broader context of the current debate. Chapter One presents a summation of the existing literature on the subject, while Chapter Two draws out the relevant themes and issues.

Part II presents the case study evidence, beginning with a description of the evolution and characteristics of industry, cities and territorial patterns in Emilia Romagna. Each of the three case studies is presented in turn: Chapter Four presents the Carpi knitwear district, Chapter Five the Modena oleodynamic components district, and Chapter Six the automatic packaging machinery district of Bologna. Each chapter examines the industry setting, the territorial organisation of production, and presents a synthesis which addresses why each of these particular territorial organisational structures evolved in the manner they did.

Part III draws the literature and case study evidence together to return to the broader issues of post-Fordism and uneven development. Chapter Seven addresses the existence and characteristics of post-Fordism, and suggests a generalised explanation of the emergence of the industrial districts within the broader context of the logic of post-Fordism. The thesis concludes by drawing specific implications of post-Fordism for cities and regions.

PART I

THE POST-FORDIST DEBATE

CHAPTER ONE

PRODUCTION, FLEXIBILITY, LOCALISATION

I. PHASES OF INDUSTRIAL CAPITALISM AND THE EVOLUTION OF TERRITORY

Industrial capitalism is the driving force which has shaped the evolution of territorial patterns of uneven development for the last four centuries. The most extreme example of uneven development is the city - and indeed the evolution of cities, the urban system, and regions is clearly and inextricably tied to the evolution of industrial capitalism. In 1899, Adna Weber noted that while the U.S. in 1790 had the same total population as Australia in 1891, the former's population was 3 percent urbanised and the latter's 33 percent urbanised. Industrial capitalism also created the modern metropolis, as is evident in the 19th century growth in population of Liverpool from 82,000 to 518,000; of Manchester from 90,000 to 703,000; of Chicago from 0 to over one million (Weber, 1899). As Weber remarked, "That the most remarkable social phenomenon of the present century is the concentration of population in cities is a common observation..." and "..the tendency towards concentration or agglomeration is all but universal in the Western world" (1899: 1).

Industrial capitalism has indeed brought about massive transformation in the economy, social life, and the built environment. But the evolution of industry and with it, cities and regions, has not been a smooth, linear process. Distinct phases of industrial capitalism have been identified, each with its own attendant pattern of urbanisation and regionalisation. The most recent of these is the "Fordist" period, said to have begun around 1900.

Since about 1970 however, the advanced industrial economies have universally found themselves in a period of economic and social upheaval. Many phenomena are cited as indications of this transition, but of particular interest here is the re-emergence in many advanced industrial nations of the industrial district: a localised, specialised, flexible production complex.

Many observers have interpreted events of the last two decades as a period of transition to a "post-Fordist" phase of capitalism. Based on the history of the last four centuries, if it is indeed true that we are entering a new phase of industrial capitalist accumulation, we can expect transformations in the evolution of cities, regions, and patterns of uneven development in general. This thesis attempts to determine the broad outlines of a post-Fordist regime of accumulation, and extract its major implications for cities and regions, defining the mechanisms through which such territorial transformations might occur.

This chapter provides a necessarily brief review of the main literature surrounding the emergence of localised, flexible production complexes. Section 2 looks at the historical relationship between industrialisation and urbanisation, up to and including the Fordist period. This will allow us to determine the main characteristics of the urban/regional system and its linkages with industrial capitalism to 1970. Section 3 examines the current literature dealing with the alleged transition to a post-Fordist economy, with a view to determining the major characteristics of the new regime and the degree to which there is consensus on this issue. Section 4 examines how the literature deals with the relationships between post-Fordism on the one hand, and cities, regions and uneven development on the other.

2. INDUSTRIAL CAPITALISM AND URBANISATION

It is almost a truism to say that the last 400 or so years of urbanism have been shaped by the emergence and evolution of capitalism, first in its mercantile forms, and later, by industrial capitalism (see for example Mumford, 1961; Weber, 1899; Gordon, 1978; Pred, 1977). Mercantile capitalism is associated with the expansion of large cities such as London, Paris or Amsterdam, as well as a wave of new city foundings that launched the "urban revolution" (Storper and Walker, 1989).

Industrial capitalism is primarily associated with a transformation in the modes of production, and a shift from agriculture to manufacturing industries. While of course the functioning of capitalism also requires distribution of goods to markets and transport of inputs to factories, and the railroad undoubtedly played a major role in the industrial revolution, it is the process of production that primarily underpins the economy. However, other approaches to the evolution of the urban system have taken distribution and retail market areas as a basis for explaining patterns of urbanisation. Probably the most influential of these is central place theory.

As defined by Christaller (1935) and subsequently refined by Losch (1944), central place theory aims to explain a hierarchical urban system based on the minimum market size thresholds needed to supply certain goods or services. Basic goods and services require lower market thresholds, and can therefore be supplied in smaller urban centres, and there will be many such centres. More specialised goods, however, require larger markets in order to make them economically viable, and these are therefore supplied only in larger urban areas, of which there are relatively few. As Pred (1977) points out, the Christallerian urban system is one of hierarchy and dominance: the largest urban unit must be completely self-reliant, there can be no large-city interdependence, and there can be no larger city acquisition of goods or services from smaller cities. The central place system exhibits a pattern of even distribution of urban centres over space (albeit centres of different sizes) - in a regular pattern. Such an approach can only apply in places where industrial production does not figure into the economy. Indeed many of the examples provided are in flat, agricultural areas, such as Wisconsin (Brush, 1953), Iowa (Berry et. al., 1962) or Snohomish County, Washington, U.S.A. (Berry and Garrison, 1958).

Within the period of industrial capitalism, which, depending on definitions, is identified as covering various portions of the period beginning in the mid 16th century, various phases have been identified. Each phase is associated with particular organisational structures and geographical patterns. Perrons (1981), for example, identifies four major periods of capitalist production, differentiated on the basis of the labour process: manufacture, machinofacture, scientific management and Fordism, and neo-Fordism. Each phase is seen as representing an increasing division of labour, both functionally and spatially, and a particular spatial pattern.

Rural Manufacture

In the period of manufacture, from the mid 16th century to the early 18th century, workers were collected into workshops where they could be supervised, the work day controlled, and the work process fragmented into specific tasks, although craft skills were still required. In Britain, manufacturing operations were widely dispersed throughout the countryside, largely to avoid guild restrictions and high labour costs which prevailed in the cities, and to have ready access to water power. Much work continued to be done in the home (Perrons, 1981).

Machinofacture: the urban wave

The key element of the period of machinofacture, from the early 18th century until the early 20th century, was the introduction of machinery and alternative sources of power into the production process. The division of labour proceeds, eliminating the need for craft skills and allowing the use of women and children as labourers. Surplus value was raised by increasing the amount of the working day devoted to productive activity (i.e. decreasing the "porosity" of the work day), increasing the length of the working day, and increasing productivity through changes in the labour process and applications of machinery (Perrons, 1981). Productivity gains were also dependent upon access to a wider market and raw materials through infrastructure improvements, such as the railway.

Machinofacture was therefore associated with the demise of rural areas as the primary locations for industry, and the concentration of manufacturing in urban locations, where alternative forms of cheap labour were to be found. In short, this was the period of factory mass production and rapid urbanisation, in which urbanisation proceeded at rates much higher than population growth, in Britain, America, and elsewhere. In Britain, pre-machinofacture forms of production, generally in rural areas were rendered obsolete (Perrons, 1981).

In the United States, industrialization proceeded concurrently with initial settlement and immigration. The northeast was the industrial heartland, where industrialization was fully underway by 1850, but the wave of industrialization continued westward during the second half of the 19th century (Storper and Walker, 1989). In the US, this period saw the evolution of the Manufacturing Belt and the rise of large urban centres such as Baltimore, Boston, Buffalo, Cincinnati, Cleveland, Indianapolis, etc. (Scott, 1988a).

During the period 1850 to 1870, some argue that while industrialisation decisively led to urbanisation, that both smaller and larger urban centres grew as a result, that "there was no significant correlation between rate of employment increase and initial population rank-size", and larger cities were not growing at faster rates (Gordon, 1978, p.39). The "rank-size rule" suggests that the population of any city multiplied by its rank in terms of size, will yield the population of the urban system's largest city. The tenth biggest city will therefore be one-tenth the size of the largest city, the second biggest city one-half the largest city's population, and so on. In these two decades, while New York, Chicago and Cleveland grew rapidly, so too did Jersey City, Worcester or Dayton.

A turning point seems to have occurred around 1870, when manufacturing began to concentrate in the largest urban centres: New York, Chicago and Philadelphia, where the rate of manufacturing employment increase was substantially higher than that of smaller urban centres (Gordon, 1978). This is what Weber (1899) called the period of growth of the "great cities". He attributes the centralization of industry to transportation improvements, which had the effect of cheapening raw materials relative to other inputs (labour, etc.), and increasing the importance of "non-natural" advantages for production (e.g. labour). For "finer manufactures", nearness to consumers becomes the dominant factor, which suggests locations in the largest cities.

This centralization in the largest urban centres is confirmed by Pred (1977), who notes than in 1860, 10 major cities accounted for 24.1% of U.S. manufacturing, while in 1890, they accounted for 38.1%. Like Weber, he attributes large city growth during the latter half of the 19th century and early 20th century to the "spatial lengthening" of industrial production through improved transportation, but suggests that this was synonymous with increased minimum optimal scales of operation, or the raising of thresholds of production beyond the reach of smaller cities.

The centralization of industry in large urban centres had commensurate impacts on the smaller towns and villages, which had previously been the locus of a significant amount of manufacturing activity. As the scale of production increased with the size of the market, small manufacturing establishments were replaced by the larger, urban factories. By the end of the 19th century, this development was hailed as the "doom of the small town" (Weber, 1899). The factory system was seen as destroying family industry in the farm houses, diminishing the number of "agriculturalists", destroying industries in the handicraft stages (such as milling or shoemaking) and removing population from the villages (Weber, 1899).

Even by the turn of the century, however, Weber was predicting that centralization had reached its limit. In the last decade of the 19th century, he observed "A reaction toward decentralization began when manufactures located their mills in the suburbs of large cities in order to escape the high city rents and still avail themselves of the city's superior shipping facilities" (1899, 1961 ed., p. 202). And indeed, in the large urban centres, a trend toward suburbanisation from the central cities was subsequently confirmed to have begun around the turn of the century (Gordon, 1978).

Fordist Cities

Though correct in his assertion of the suburbanisation of industry, Weber had, in 1899, failed to anticipate Frederick Taylor and Henry Ford. Taylor's approach to industrial production focused on the control and supervision of work, with the objective of transferring all decision-making to management. Taylorism therefore aimed to ensure a rigid distinction and spatial separation between control and execution (Perrons, 1981). Meanwhile, Henry Ford had conceived of the assembly line as a means of recombining the fragmented production process. Surplus value was therefore raised both by decreasing the porosity of the working day, and by changes to the labour process. These approaches allowed larger firms to increase their competitive superiority and market position, and furthered the tendency toward industrial concentration (Perrons, 1981).

In the U.S., the continued trend towards industrial concentration and the rapid development of a market for consumer durables fostered the multi-divisional company, with a separation between control and execution functions, as early as the 1920s. The spatial separation of control from execution functions, as well as the new importance of marketing activities to ensure mass markets, gave rise to the growth of office-based activities, which replaced industry in the central city locations, with industry continuing to suburbanise (Perrons, 1981).

The Fordist period, extending from about 1900 to 1970, was the period that saw the emergence of urban centres in which large-scale industry founded on Fordist principles was located, the most obvious example being Detroit, but also Los Angeles, Dallas or Seattle in the U.S.. In the early part of the period, the industrial core centred around the automobile complex of Detroit and the machine tool centre of Chicago, though the intervening region also included steel mills along the Great Lakes and household appliance assembly throughout the area (Storper and Walker, 1989). Other industrial centres included New York City, Niagara, New York and Philadelphia (chemicals); Boston, the Hudson Valley, and Pittsburgh (electrical equipment); and oil, movies and aircraft industries in Southern California. In the period of "high Fordism" (1940-1975), the Chicago-Detroit region continued to dominate, but new centres emerged in the oil industry (Houston); the aircraft industry (Pacific Northwest; and defence, aerospace and television took root in Southern California (Storper and Walker, 1989).

The New International Division of Labour

The 1960s also mark a key turning point for adherents of the "new international division of labour" theory. According to this view, beginning around 1960, the division of labour and separation of conception and execution functions that were characteristic of Fordism were extended to a trans-national scale. The term refers to the manner in which "continuing industrial concentration is associated with an increasing extension of the division of labour within the firm over international boundaries" Perrons (1981: 85). The increasing fragmentation of work and the simultaneous deskilling and "hyper qualification" of the labour force are seen as giving rise to a spatial process in which the elite and organizational functions are concentrated in the new office complexes of world cities such as New York, London, Paris or Tokyo, and the decentralization of basic manufacturing, operational functions and manual tasks are located in peripheral regions (e.g. Ireland) (Perrons, 1981). Divisional offices, mid-level engineering, advertising and other similar services are located in secondary cities (Storper and Walker, 1989).

Within the region, spatial patterns of the multi-national enterprise are seen to differ from traditional industry, as Perrons shows in the case of Ireland. Traditionally, industrial location was characterised by the formation of large industrial conurbations, because of a need for proximity to functionally related activities and access to infrastructure, services and labour. For the multinational, however, these needs are fulfilled within the corporation and thus "corporate integration supersedes geographical integration", while infrastructure supply has been generalised throughout most territory and skilled labour is less a concern with routinized production (Perrons, 1981). There is therefore a bias for such industry to locate outside of traditional urban locations.

In Italy, the internationalisation of production is seen as heralding the end of an era in which urban areas and production systems coincided with one another. For example, in the 1960s, the automobile industry was largely contained within Turin. Capital accumulation was seen to depend upon agglomeration and urbanisation economies, and production systems "grew with the large cities" (Dematteis, 1988). The 1970s, however, ushered in a period of non-metropolitan growth and counter-urbanisation, following two decades of intensive largest-city expansion in Italy. These urban trends are linked to the reorganisation of large companies and the decentralisation of production (Dematteis, 1988).

Urbanization since 1970

All of the advanced industrial economies have recently undergone radical changes in patterns of urban growth, development, and decline. Change is still underway and there is considerable ongoing debate about the nature of the industrial transformation and its urban implications. For example, de-industrialisation has hit particularly hard in the older industries generally situated in inner city locations, resulting in the "de-industrialisation of the city" (Fothergill et al, 1988). Where industry has relocated or new industries have emerged, they have tended to be drawn to suburban locations. This trend has been felt across industrialised cities, from Buffalo to Liverpool, leading to severe inner city blight and social problems.

In the U.S., while many of the large manufacturing belt cities continued to flourish until the 1960s as centres of heavy industry, most recent growth has taken place outside this area altogether, in the "Sunbelt" (Scott, 1988b). The new centres of industrial production include Dallas-Fort Worth, Houston, Orange County, Phoenix, San Diego, Santa Clara County, etc. At the scale of the city-system, an inverse relationship has been noted between growth rates and urban size. In a reversal of 19th and early 20th century patterns, smaller centres began to grow more rapidly than larger cities.

Hall and Hay (1980) have summarized the post-war patterns of evolution in the American urban system as consisting of the following movements:

- downwards, i.e. through the urban hierarchy from larger to smaller urban systems;
- outwards, i.e. within metropolitan areas from cores to rings, and from metropolitan to non-metropolitan areas (from urban to rural);
- across, i.e. from older industrialized and urbanised regions to newly industrializing and urbanising regions.

Along with others, they suggest that these patterns, which emerged around 1970, represent a "clean break" with patterns of urbanisation established and underway since the Industrial Revolution. In particular, they note a reversal of rural to urban migration and a new pattern of "counter-urbanisation" (Hall and Hay, 1980; Dematteis, 1988; Scott, 1988a).

In Europe, post-war urban patterns do not lend themselves so easily to a simple characterization. At least until 1970, there was no evidence of a tendency to deconcentration, as in the U.S. case. Non-metropolitan areas were static in terms of population, while concentration continued in metropolitan centres in the 1950s, and then in the metropolitan rings in the 1960s (Hall and Hay, 1980). In the early 1970s, the urban cores accounted for less growth, while the metropolitan rings accounted for an increasing share, but overall, the trend still consisted of a movement from non-metropolitan areas to metropolitan centres

(Hall and Hay, 1980).

However, Hall and Hay (1980) report distinct variations within Europe. In Southern Europe, including Spain, Portugal and Italy, there was a strong trend toward concentration in major metropolitan centres, which accounted for over 80% of growth in the 1950s and 1960s. In the 1970s, however, the rate of core growth slowed while that of the metropolitan rings accelerated.

In the U.S., post-war urban growth patterns can be interpreted as conforming to the "rule" that as industrialisation proceeds, urban hierarchies evolve from a primate distribution, in which a single large centre dominates, to a rank-size distribution, through the acceleration of growth in smaller centres (Hall and Hay, 1980). Though it is difficult to see a rationale for the supremacy of a rank-size distribution relationship, an urban system which adheres to the rank size rule has been viewed as an indication of a mature, developed urban system. In Europe, however, in countries which had a primate structure, the tendency was actually to reinforce primacy rather than evolve away from it, with vigorous growth exhibited at the top of the urban hierarchy. This was especially the case in Italy.

Despite considerable empirical evidence to the contrary, it has also been suggested that the rank order relationships of an urban system are stable over time, that is, that "rank stability" prevails (Pred, 1977). Pred maintains that the dynamics of urban growth and development are such that it is very difficult to overcome initial advantage and growth feedback mechanisms: "One of the most striking features of the historical growth and development of city-systems in those countries which can currently be classified as economically advanced is the long-term stability in the national or regional population rank of their leading metropolitan complexes" (1977: 33).

Hall and Hay (1980) attempt to explain the European patterns by postulating that as industrialisation and urbanisation proceed, there are predictable, sequential phases: centralisation during loss; absolute centralisation, relative centralisation, relative decentralisation, absolute decentralisation, and decentralisation during loss. Variations within Europe are explained by the fact that each country is at a different stage in the process of industrialisation-urbanisation. This is seen to explain why Great Britain, for example, which industrialised and urbanised early, was by the 1960s decentralising in a way similar to patterns observed in the U.S., compared to a relatively late-industrialising country like Italy, in which concentration was still observed.

Others see a flattening of the urban hierarchy associated with increasing internationalisation and the local productive specialisation that that brings about, and an erosion of an urban centre's control over its hinterland (Dematteis, 1988). According to this view, the new urban hierarchy consists fundamentally of only two levels: a metropolitan one and a regional one. "The former is directly inserted within the network of international exchanges (capital, goods, information, etc.) and by means of this function it controls and orientates the second level and with it also the rest of the territory" (Dematteis, 1988). Geographical urban hierarchies such as Christaller's are replaced with the interconnected network of nodes, each with its particular specialisation.

Clearly the evolution of urban and regional systems is strongly tied with the history of industrial capitalism. Up until the end of the Fordist period, industrialization engendered a process of ongoing urbanization. Around 1970, urban patterns began to shift in ways not previously seen during industrial capitalism. Perhaps not coincidentally, for many observers 1970 marks the beginning of a transition to a new regime of accumulation and a new economic order. The nature of that order and its implications for the evolution of urban and regional systems, as outlined in the literature, are the subject of the remaining sections of this chapter.

3. POST-FORDIST INDUSTRIALISATION: ALTERNATIVE MODELS AND APPROACHES

The current body of literature on post-Fordist industrialisation began (at least in the Italian case) with the emergence of several competing concepts aimed at describing some unique productive-territorial changes being observed in parts of that country. These were primarily "stand-alone" concepts, not generally situated within the context of any broader theory of productive organisation or economic development.

"Rural industrialization" consisted of a close-knit network of small, specialised enterprises, whose inter-relations are characterised by cooperation (Fuà, 1985). Garofoli (1983) proposes a three-part typology, including: areas of productive specialisation (small firms in the same sector, horizontally organised, and in competition); local productive systems (the same, only more extensive inter-relations amongst firms); and system-areas. The typology essentially represents a continuum from low to high levels of self-sufficiency, with the system-area representing the most advanced case, in which industries produce their own technology and production equipment. A "constellation" also consists of small-firm networks, but here the approach emphasises the process by which individual firms within such formations grow, based on inter-firm linkages, or investment decisions (Lorenzoni, 1987).

A main point of contention amongst these various viewpoints was whether the observed organisation of production was the result of endogenous factors (a territory characterised by small and medium-sized towns, a local entrepreneurial tradition) or exogenous factors, particularly productive decentralisation of large firms in the northwestern Italian industrial triangle.

With generally only slight differences in emphasis amongst them (e.g. rural industrialisation obviously emphasising the distribution of industry in rural locations), these concepts generally all share common core characteristics, including: specialised small firms within the same sector, many inter-firm linkages, and geographical concentration. As we will see below, there is considerable overlap with the industrial district idea. Based on Alfred Marshall's work of 100 or so years ago, the industrial district began to gain a growing following among current observers (including Bellandi, Becattini, Brusco, Sforzi, Piore, Sabel, Scott, and others), and was subsequently drawn into a broader theory, which now interpreted the industrial district as primary evidence that a transition to a new, post-Fordist regime of accumulation was underway. In this section, the evolution of the literature will be traced in a necessarily brief way.

Industrial Districts

In the late 19th and early 20th centuries, Alfred Marshall sought to explain the existence of several specialised areas of production based on firms of moderate size, such as the Lancashire cotton industry and the production of cutlery in Sheffield. The existence of these apparently successful areas contravened then-orthodox economic thinking, which tied competitiveness to efficiency to increasing internal scale economies and rising firm size.

These industrial districts were characterized by the production of a single product, and a division of labour amongst many specialised, small, and localised firms. Marshall draws on the concept of economies of scale to explain the possibility that small firms could be as efficient as large factories, by differentiating between "internal economies" (regarding internal organisation of factories, management, etc.) and "external economies", which relate to factors outside the firm and the "general development of the industry", "...those very important external economies which can often be secured by the concentration of many small businesses of a similar character in particular localities: or, as is commonly said, by the localisation of industry" (Marshall, 1890)[1].

1 Principles of Economics, 8th Edition (first edition, 1890); London: Macmillan, 1986, quoted in Bellandi, 1989.

The specialisation of each firm in a particular phase of production, and use of specialised machinery and labour which is associated with this, is linked to the attainment of efficiency and economies of scale, and is seen as a source of external economies - each firm and the industry as a whole benefit from the individual firm's specialisation. Such external economies are not however, linked at this point specifically to geographical concentration, that is, they are not seen as "agglomeration" economies.

This latter force does come into effect, however, with respect to transaction, skill, and innovation (Bellandi, 1989). The costs of transactions, for example, for non-standardized or customised inputs are reduced by agglomeration because personal contact is required, and the market relationships are infused with 'personal knowledge and trust'. Agglomeration and spatial proximity are also related to the acquisition of skills in the district, where specialised knowledge and learning become part of the local culture, and to the intercommunication of ideas that underlies innovation. These often more esoteric qualities of the industrial district, associated with agglomeration, are what Marshall has referred to as "industrial atmosphere".

In the late 1970s, the work of Alfred Marshall on industrial districts was resuscitated by a group of academics at the University of Florence[2], who were looking for ways to explain the recent success in their region of localised, specialised systems of production. In summarising the debate that had evolved in Italy around organizational forms and economic development, Brusco proposed three models to describe these systems, based on their internal organisation and connections with the market (Brusco and Sabel, 1981; Brusco, 1982; Brusco, 1986; Brusco, 1990).

The first, or "traditional artisan" model is characterised by small firms, a traditional or mature product geared to a primarily local market, and low levels

2 Including Becattini, Brusco, Bellandi, Sforzi, sometimes called the "Florentine School".

of productivity attributable to labour intensive techniques and low levels of technology. Relations between firms were described as being governed by imperfect competition. The discussion of the traditional artisan was linked to a wider debate surrounding a dualism between the North and South of Italy, in which the small, "inefficient" artisan firms of the south were juxtaposed against the large, capital-intensive, high-wage, efficient firms of the North.

The second model, the "dependent subcontractor" (also referred to by Brusco as "the small firm in the shadow of the large") is said to have its origins in a process of productive decentralisation, which occurred in the late 1960s in Italy. Brusco stresses the "serious rigidities" associated with the increasing dominance of trade unions in the large firms in bringing this about, combined with expanding and diversifying markets. External sources of labour and supply afforded a level of flexibility not achievable within the firms. The large firms vertically disintegrated, and activities once performed internally in large factories were now undertaken externally, by sub-contractors, often located nearby. The sub-contractors provided intermediate goods to the large firms, which had the direct relations with the final market, which was generally national or international. Levels of technology and wages were a subject of debate, but Brusco (1990) argues that in the small firms, skill levels were frequently high, and a low wage was not necessarily a link to low productivity, but could co-exist with high productivity.

Inter-firm relations were characterised by "fierce competition" amongst firms involved the same phase of production. Between the small firms and the large, there was a monopsonistic situation, in which the large firms were able to squeeze and lower the small firms' profits. The discussion of the dependent sub-contractor was situated within the context of labour market segmentation, and a dualism between the large firms, viewed as high wage, with advanced technology, and the small firms, seen more as sweat shops. Brusco challenged this view, asserting that conditions were comparable between the two sectors, with the latter providing quantitative flexibility but not (except of course for the differences in the average size of firms) being of a qualitatively different nature (Brusco, 1982).

In his third model, "the small firm in the industrial district", Brusco returns to Marshallian concepts. In later work, he refined this model into"Mark I" and "Mark II" districts, with the former being characterized by market forces, while the latter type involve significant government intervention (Brusco, 1990). The Mark I industrial districts emerged in the mid-1970s, and were said to be comprised of: firms which produce the final product and have the direct relation with the final market; "stage-firms", which are each involved in a single phase of production; and other firms which may not strictly be classified in a particular productive sector but which nevertheless work solely in that sector (e.g. consultants, transportation). Thus "A district comprises a cluster of firms producing something which is homogeneous in one way or another, positioning themselves differently on the market. Thus the district could be defined as being a cluster, plus a peculiar relationship amongst firms." (1990, p.14)

After Piore and Sabel (1984), the innovative capacity of industrial districts is stressed. Levels of technology and average wages are comparable to the large firms, but there are wider wage differentials. Relations between firms are characterised by both competition and cooperation: "horizontal" competition between firms providing the same product or in the same phase of production; but "vertical" cooperation between firms involved in different phases of production.

In the Mark II industrial district, the impacts of new markets and technologies in the early 1980s for both large and small firms are viewed as having required significant government intervention. The innovative capacity of the district is seen primarily as a social process, reliant upon informal interaction. Brusco contends that this can be problematic in the adoption of new technologies, because there is no single power (as in a large, integrated firm) to dictate their introduction. This point is somewhat difficult to understand, given that each firm has an head, and if, as he claims, firms are independent, it is not clear why the introduction of new technology might be impeded. Indeed, as we shall see below, other observers argue the opposite view. In any event, Brusco claims that local governments have reacted by providing "real services" to firms, including information on markets, import specifications, assistance with international marketing and contract bidding, etc.

Brusco's industrial district models, particularly his Mark II model, draw on elaborations of Marshall's ideas in the Third Italy context drawn by Becattini, who was probably the first to make these connections. Becattini's main contribution is his attempt to integrate the economic rationale for industrial districts with its social context. Thus he sees the industrial district as "... a socio-territorial entity which is characterised by the active presence of both a community of people and a population of firms in one naturally and historically bounded area. In the district, unlike in other environments, such as manufacturing towns, community and firms tend to merge." (1990: 38). It is a localised division of labour, in which firms become rooted in the territory, and cannot be conceptualized independently of its historical development.

Industrial districts are characterized by self-containment, a progressive division of labour, and a permanent network of links between suppliers, clients and the district itself. In terms of the local community, Becattini emphasises the importance of a relatively homogeneous system of values and views, and a parallel system of institutions and rules, including the market, family, church, local authorities, unions, or political parties.

Characteristics particular to industrial districts are attributed to social foundations. For example, a high degree of mobility amongst labour within a district, particularly of skilled labour, is attributed to a social stigma attached to one under-utilising one's potential, and also explains the high productivity of the district. This finding of the place where each worker can maximise his or her potential is said to be characteristic of an industrial district, and not possible in an isolated firm or in "urban anonymity".

Further, because markets in the district operate on information other than just price, which in turn relies on shared values and institutions, districts are constrained to those areas of communities which adhere to those value systems. Indeed, Becattini contends that prices in intermediate markets between firms in the district are socially mediated at the local level. They are not only determined by the national and international market, but also local demand and supply conditions, and the "stabilising influence of local institutions", forming a hybrid between administered and market prices. Although, like Brusco, Becattini maintains that relations within industrial districts are characterised both by cooperation and competition, Becattini's description of the integration of these two characteristics within the same price mechanism, and its origins in the socio-cultural system actually permeating the market mechanism, is significantly different. And unlike Brusco, Becattini sees the social foundations of the district as being an aid to the introduction of new technologies, because it too is a social process in which all members of the district actively participate, and understand the tradeoffs.

Becattini compares the inherent adaptiveness of the industrial district to that of a large, integrated firm. While control over any phase in the large firm is hindered by "company sclerosis", the "social machine of the district...seems to be built for the purpose of that control" (1990: 46). This gets at the heart of Becattini's explanation for the industrial district: that unlike large companies (which are presumably defined by corporate culture and fundamental divisions between the owners of the means of production and the worker) industrial districts are first and foremost social entities, defined (geographically and functionally) by local community, shared values, institutions, and history.

Presumably, the geographical boundaries of these shared values and community are limited, which accounts for the localisation of production. Becattini seems almost to be saying that the social forces of community can overcome the inherent contradictions and conflicts that exist within the capitalist system of production, and that that is the key to their success.

On the opposite site of the coin, Becattini's position implies that large corporations cannot hope to achieve a sense of shared values or purpose, and this impedes their competitiveness. It also suggests that industrial districts would not be possible in culturally or socially diverse areas, such as large cities and metropolises. Aside from the fact that many would fervently attack the implication that larger urban areas and metropolises are lacking in community, shared values, institutions, etc., as we will see below, there are indeed examples of industrial districts within larger cities.

In his comments, Becattini hints that industrial districts are a superior form of economic organisation compared to the large, integrated firm. But neither he nor any other of the Italian observers extended their conceptualisation - either to situate it within the context of a larger context of economic theory, nor to suggest that the new industrial districts were an indication that a much more significant economic transformation was underway. This task was left to American commentators, in particular Michael Piore and Charles Sabel, who noticed the work of the Italians and interpreted industrial districts as a sign of a new kind of economic organisation, "flexible specialisation".

Flexible Specialisation

There is a high degree of overlap between the industrial district model of the neo-Marshallians, particularly Brusco's "small firm in the industrial district", and the "flexible specialisation" model proposed by Piore and Sabel in their seminal work, *The Second Industrial Divide*. While the latter shares specialisation as an essential characteristic with the industrial district model, for

Piore and Sabel the emphasis is placed upon flexibility as the defining, central concept of the emerging territorial modes of production, along with innovation. Flexible specialisation is defined as

> ...a strategy of permanent innovation: accommodation to ceaseless change, rather than an effort to control it. This strategy is based on flexible - multi-use - equipment; skilled workers; and the creation, through politics of an industrial community that restricts the forms of competition to those favouring innovation. For these reasons, the spread of flexible specialisation amounts to a revival of craft forms of production that were emarginated at the first industrial divide (1984: 17).

Piore and Sabel's post-Fordist, 'high-tech cottage industry' is organised spatially into districts, each of which specialises in the production of a range of related goods. Firms are very small, most employing from five to fifty skilled workers and advanced, multi-purpose production machinery, such as numerically-controlled equipment. Sabel argues that "Where Fordism calls for the separation of conception from execution, the substitution of unskilled for skilled labour and special-purpose for universal machines....specialisation often demands the reverse: collaboration between designers and skilled producers to make a variety of goods with general-purpose machines (1982: 194). Their work deals with examples of systems of production based on flexible specialisation are to be found not only in Italy, but also in Germany, or Austria.

The emergence of flexible specialisation is situated in the much broader context of post-1973 global crises, including the oil shocks of the 1970s, the move to floating exchange rates, and the simultaneous occurrence of high interest rates, world recession and debt crisis. However, these crises only made obvious the latent limitations that were already being reached by the mass production-based economy, including the saturation of consumer goods markets, and entrance of new sources of competition from the newly-industrialising countries, and fragmenting demand (Piore and Sabel, 1984).

A nation's ability to successfully adopt the flexible specialisation model was seen to depend upon that country's prior degree of adaptation to mass production. Italy was a relatively late entrant into mass production, and unification did not occur until 1961. Political instability and labour militance peaked in the 1960s, when two rounds of widespread strikes (in 1962/62 and 1968/70), culminating in the *autunno caldo* (the "hot autumn") resulted in labour rigidity and wage rates that were too high for an industrial structure that had derived its international competitiveness from cheap labour.

The intractability of the labour force problem under mass production is seen by Piore and Sabel (1984) as being the singlemost important factor in the decentralisation of production that subsequently occurred. They claim that decentralised producers were able to gain direct access to markets through devising their own products, and through a collective approach to production. Collectivism took the form of industry associations, for example, which provided services to small firms and allowed them to compete with larger ones. A high level of technological sophistication also provided the small firms a competitive capacity.

In Italy's case, four further "coincident factors" are viewed as central to the success of the small firms: the extended family provided economic stability to households through a diversity of sources of income; a view of artisan work as a distinct type of economic activity; the existence of merchant traditions connecting the provinces to world markets; and the willingness of municipal and regional governments to provide necessary infrastructure (Piore and Sabel, 1984).

Sabel (1988) has suggested a that large firms too are moving toward flexibility, signalling a convergence of the small firm and large firm models and a growing ubiquity for the industrial district model, "... an emergent corporate form which blurs distinctions between large and small firms is spreading -- in different variants and speeds in every country -- through the advanced capitalist world' (1988: 8).

Piore and Sabel's work thus made some sweeping claims and optimistic interpretations. While many of their specific observations can and have been called into question (e.g. the empowerment of the worker, the degree and importance of flexibility), their work served to move the issues into an international context, provoking a large scale debate, and it situated events such as the emergence of industrial districts within the context of a broader theory of long term, structural economic change. The Regulation School also position the issue within the context of a broader, comprehensive theory, though unlike Piore and Sabel's liberal economic approach, theirs is a Marxist-based theory of capitalist accumulation.

The Regulation School

The Regulation School has evolved since the mid-1970s, and has been concerned with the analysis of macroeconomic crisis generation, and the dynamics of the relations between capital, labour, and the state in a crisis environment (Moulaert and Swyngedouw, 1989). More recently, it has turned its attention to the analysis of regional and urban geography of economic restructuring under contemporary capitalism. While the approaches outlined in this chapter so far have sought to explain a single geographical/productive phenomenon, or a group of such phenomena seen as sharing similar characteristics, the Regulation School offers a broader theoretical approach, encompassing the nature of the capitalist system, and a variety of spatial patterns of industrial organisation, of which the industrial district is just one.

A central concept which underpins the regulationist approach is the "regime of accumulation", described as "the ensemble of regularities that assure a general and relatively coherent progression of the accumulation process. This coherent whole absorbs or temporarily delays the distortions and disequilibria that are born out of the accumulation process itself"[3]. These regularities include:

- a certain type of relationship between the forces of production and the relations of production;
- a certain type of sector and market organization;
- a certain distribution of produced value to assure the dynamic reproduction of different classes and social groups, and hence, the mode of production;
- a certain composition of social demand;
- a certain social and spatial division of labour (Moulaert and Swyngedouw, 1989).

Essential to the existence of any regime of accumulation is a particular set of norms, habits, laws, regulating networks, social processes, etc. , or "forms of adjustment of expectations and contradictory behaviours of individual agents with the collective principles of the regime of accumulation", referred to as the "mode of regulation". It is through an examination of the regime of accumulation and the mode of regulation that sectoral organization and spatial differentiation are understood.

Capitalism is seen as a succession of regimes of accumulation and modes of regulation. According to the regulationists, the post-war Fordist regime of accumulation was characterised by rapid and intensive accumulation, based on mass production and a mode of regulation consisting of regulatory state intervention in the form of the welfare state. In the late 1960s and early 1970s, this regime began to reach its limits, due to overaccumulation, falling rates of profit, and market saturation, and a crisis ensued. The collapse of this regime of accumulation was temporarily forestalled by a spatial expansion into new markets, and a "lower variable capital composition", resulting in a core-periphery relationship within and between nations, and spatially segmented labour markets (Moulaert and Swyngedouw, 1989).

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3 Boyer,R., 1986, La Theorié de la Régulation: Une Analyse Critique, Paris: La Découverte, quoted in Moulaert and Swyngedouw, 1989.

Though as we will see in Chapter Two, the Regulation School's analysis of the broader economic situation and allegations of crisis do not go unchallenged, their interpretation of events leads them to proclaim the emergence of a new phase of capitalist development in the 1980s. Like the flexible specialisationists, the regulationists see the defining characteristic of this new regime as flexibility - in products, the production process, and the regulation of labour relations. The flexible accumulation regime has brought a re-organisation of the production process, including the vertical disintegration of production, new forms of economic partnership, and different forms of spatial proximity; a flexible labour force; and new forms of regulation. Table 1.1 compares the 'regularities' of the Fordist regime with that of a flexible regime of accumulation, as outlined by Moulaert and Swyngedouw (1989). These can be viewed as the "necessary" elements of the respective regimes. This is probably the most definitive and complete description available of Fordist vs. flexible regimes, and will be employed in the final chapter as a basis for evaluating whether the production systems presented in the case studies can be considered consistent with a flexible, post-Fordist regime.

According to the regulationist approach, each regime of accumulation "produces a specific mode of spatial organisation profoundly different from the previous one" and "creates new or renewed forms of spatial crisis" (Moulaert and Swyngedouw, 1989: 330). Cities and regions in which old regimes predominated are subject to economic decline and adaptation, while new territories are "invaded" under the new regime, creating

> ... new socio-economic landscapes and a new division of labour... The characteristics and dynamics of newly emerging modes of organization of production, forms of technological change, and social differentiation provide us with insight into the specific pattern of uneven development." (Moulaert and Swyngedouw, 1989: 330-331).

Table 1.1

Characteristics of Fordist and Flexible Regimes of Accumulation

FORDIST	FLEXIBLE
The production process	
Based on economies of scale	Based on economies of scope
Mass production of homogeneous products	Small batch production
Uniformity and Standardization	Flexible and small batch production of a variety of product types (flexible automation)
Large buffer stocks and inventory	No stocks
Testing quality ex-post (rejects errors detected late)	Quality control part of the production process (immediate detection of errors)
Rejects are concealed in buffer stocks	Immediate rejection of defective parts
Loss of production time because of long set-up times, defective parts, inventory bottlenecks, etc.	Reduction of lost time; diminishing 'the porosity of the working day'
Resource driven	Demand driven
Vertical (and in some cases) horizontal integration	(Quasi-vertical) integration or vertical disintegration
Cost reductions through wage control	Learning-by-doing integrated in long-term planning
Labour	
Single task performance by worker	Multiple tasks
Payment per rate (on job-design criteria)	Personal payment (detailed bonus system)
Bureaucratic labour hierarchy	Individualized promotion schemes
High degree of job specialization	Elimination of job demarcation
No or only little on-the-job- training	Continuous on-the-job training
Vertical labour organization and internal labour-market segmentation (primary and secondary labour-market circuits)	More horizontal labour organisation for core workers
No learning experience	On-the-job training
Emphasis on diminishing worker's responsibility (disciplining through pacing by assembly line)	Emphasis on worker's coresponsibility (disciplining through cooptation of core workers)
No job security	High employment security for core workers; no job security and poor labour conditions for temporary workers; increasing informal activities

FORDIST	FLEXIBLE
Space	
Functional spatial hierarchy	Spatial clustering and agglomeration
Spatial division of labour	Spatial integration or division of labour
Homogenisation of regional labour markets (spatially segmented labour markets)	Labour-market diversification (in-place labour market segmentation)
Worldwide sourcing of components and sub-contractors	Spatial proximity of vertically quasi-integrated firms; formation of regionally specialised 'filieres'
Organisation of the space of consumption through suburbanisation	Organisation of the space of consumption through urban centralisation (the spectacle city)
Selective sociospatial integration	Polarisation of the social use of urban space
State	
Collective bargaining	Division or individualisation; local or firm-based negotiations
Socialisation of welfare (the welfare state)	Privatisation of collective needs and social security; the 'soupkitchen state'
International stability through multilateral agreements	International destabilisation; increased geopolitical tensions
Centralisation	Decentralisation and sharpened interregional or intercity conflicts
The 'subsidy' state or city	The 'entrepreneurial' state or city
Indirect intervention in markets through income and price policies	Extensive direct state intervention in markets through procurement
National regional policies	'Territorial' regional policies (third-party form)
Firm-financed research and development	State-financed research and development
Industry-led innovation	State-led innovation
Ideology	
Mass consumption of consumer durables: the consumption society	Individualised consumption: "yuppie culture"
Modernism	Postmodernism
Totality or structural reform	Specificity or adaptation
Socialisation	Individualisation: the "spectacle society"

Source: Moulaert and Swyngedouw, 1989

Some regulationists see a regime of flexible accumulation bringing about new forms of organisation of production, in turn leading to new spatial relationships, particularly spatial clustering and spatial integration, in a quite deterministic manner (Moulaert and Swyngedouw, 1989). Why must an new regime apparently *necessarily* result in the invasion of new regions and abandonment of the existing?

Others, however, see a more complex process unfolding under a flexible regime, in which a range of production organisation options are available to solve the problems of the Fordist crisis, based on approaches to the organization of labour, the wage relation, and the territorial organisation of production (Leborgne and Lipietz, 1988). Different approaches to each of these variables can be combined in various ways, leading to three predominant models, each which has a distinct potential spatial manifestation: I) a "specialised productive area" (territorial disintegration, scattered branch plants or agglomerations of sub-contractors around branch plants, e.g. Southeast Asia); ii) a "local productive system" (vertical disintegration with a tendency toward vertical quasi-integration, combined with territorial concentration, e.g. Silicon Valley); and iii) a "system area" (vertical quasi-integration in the form of territorially integrated, diversified, multisectoral network of specialised and principal firms, e.g. the Third Italy). These categories of production complex refer specifically back to Garofoli's (1983) typology. The major point the authors are trying to communicate is that though new production technologies induce specialised firms and vertical quasi-integration, these may be realised either through territorial integration or disintegration.

The "California School"

The so-called "California School" (after Storper, 1994), which includes Scott, Storper, and Christopherson, combines the Regulation School framework of regimes of accumulation, modes of regulation and institutions with other elements, particularly an emphasis on transactions costs. The first building block of their approach has to do with certain basic abstract tendencies, based on types of production system and internal and external economies, the primary source of the latter being the social division of labour (Scott, 1988a). Under specifiable conditions, fragmentation of production processes into specialised independent or quasi-independent units creates external economies. These economies are realised through transactions, which rearticulate producers into an interdependent complex (Scott and Storper, 1992).

However, "...because these transactions are spatially-extensive, they incur multi-dimensional costs that are positively related to distance... " (Scott and Storper, 1992: 266), hence producers will be induced to converge locationally around their own collective centre of gravity in order to minimise transaction costs. Where convergence or agglomeration occurs, "the external economies engendered by the social division of labour are transformed into and consumed as agglomeration economies" (Scott and Storper, 1992: 266). A necessary concomitant outcome of this will be the emergence of a local labour market (since workers are needed for production) and this acts to further consolidate local agglomeration economies.

The specific geographical patterns exhibited may vary, however, depending in part on the characteristics of the transactions. For example, in industrial complexes with much inter-linkage, there will be a tendency to converge around a territorial centre of gravity, especially where linkages are small in scale, unstandardised with respect to substance, rapidly changing in space and time, and therefore incur high unit costs. Producers without these characteristics (e.g. with standardized transactions) will be more spatially independent (Scott and Storper, 1992). It is interesting that a distinction is not made between transactions involving goods and transactions purely involving information, as this will surely have important implications with respect to the potential for spatial clustering. Neither are the potential impacts of telecommunications technology addressed. What would the spatial outcome be, for example, if all industrial districts were to be "wired" through a metropolitan area network, as is currently being put in place on an experimental basis in the textile district of Prato?

Having established these abstract "tendencies" with respect to the conditions under which externalisation of functions and agglomeration will occur, they are then situated within "technological-institutional systems" - the second major element of the California School approach. A technological-institutional system can be, for example, Taylorist or Fordist, but generally will consist of the following elements:

- given states of technology
- labour markets and industrial relations
- managerial cultures or norms
- market structures and forms of competition
- regulatory institutions at all levels (Scott and Storper, 1992).

These elements of a technological-institutional system have much in common with the 'regularities' of a regime of accumulation proposed by the Regulation School.

A great deal of emphasis is placed upon the last element, the role of institutions and culture: "...capitalist relations of production and exchange are always embedded in wider sets of social relations and cultural norms" (Scott and Storper, 1992: 16). There are essential ways in which institutions play roles in many of the key dimensions of "place-bound" economic and social life, that is, in inter-firm transactions, technological innovation, the local labour market, the organisation of the community etc. Inter-firm transactions are seen as relying on trust, which is supported by institutional infrastructures or social practice.

Scott argues further that flexible production complexes are most likely to be successful when they secure for themselves appropriate frameworks of institutional and collective order, and are superior to market-only based systems of interaction:

> "...flexible production agglomerations that approximate to this free market vision are liable to suboptimal outcomes, both because of their susceptibility to severe internal market failure and because there are superior benefits to be obtained by judicious mixes of competition and cooperation" (1992a: 223).

Instead of the typical Williamsonian tradeoff in which transactions can take place either through the market mechanism, or through non-market mechanisms of negotiation and command in hierarchical organisations, Scott argues for a third option, that combines varying degrees of centralized and decentralized decision-making, e.g. joint ventures, strategic alliances, multidivisional corporations, etc. The emergence of non-market forms of economic coordination are attributed to the fact that assumptions of perfect competition (e.g. full information) are never realized in reality, and that under certain conditions, competitive markets can subvert the possibility of efficient outcomes (e.g. when investment in R&D is avoided because it is not appropriable). "Without some governance structure that transcends market relations, problems like these will undermine general productivity levels" (Scott, 1992a: 225). A "collective order" is required, and "it is precisely those agglomerations that manage to build for themselves a complementary fabric of institutional and cultural infrastructures that are most viable and dynamic" (Scott, 1992a: 226).

In emphasising non-market forms of interactions, Scott seems to undermine his own explanation that geographical clustering is determined by the market-dictated force of transactions costs minimization. It is also not clear how a transactions costs explanation co-exists with changing market conditions, which tend to emphasize non-price factors of competition.

Untraded Interdependencies, Learning, and Evolutionary Economics

As we have seen above, Scott's analysis suggests market uncertainties invoke vertical disintegration, which generates inter-firm transactions and a new importance of the cost of those transactions, which firms then seek to minimize, leading to geographical agglomeration as a cost-reduction strategy (e.g. Scott, 1988b). A major critique that emerged to this approach was that as it relied on transactions to explain agglomeration, it could not explain instances that had been identified in which agglomeration takes place without significant, direct, local, inter-firm transactions (Storper, 1994). While Scott has identified different types of district (craft-intensive, hi-tech, services[4]), each with its own locational tendencies, he does not differentiate in terms of the dynamics which bring about the different spatial outcomes for each type.

The fact of agglomeration without transaction leads Storper, on the other hand, to begin to differentiate not only between different types of district but also the different types of processes inherent in each. In particular, he focuses on the "technologically dynamic production complexes", or what he calls "technology districts", which include sectors in which product technology is highly uncertain, (e.g. high tech districts) or in dynamic versions of a sector characterized by relatively mature technologies. Examples cited include semi-conductors in Silicon Valley, clothing and ceramic tiles in Italy, motion pictures in Hollywood, machine tools in Germany, and financial services in London (Storper, 1992). His "technology district" therefore cuts across Scott's and includes examples from each of Scott's types.

In these areas, the conditions of uncertainty are different than simple market fluctuations for two reasons:

1) a given transactional relationship is "more dense", because it involves knowledge that is not only not yet standardized, but often not yet developed; e.g. user-producer relations involve interpretation;
2) the whole transactional structure may be subject to redefinition as new types of products and new firms enter the structure, and as whole new "channels, nodes and codes of transaction" are defined - where "rapid

4 Described in more detail in Section 4 of this chapter.

learning" is taking place, transactional structure is likely to involve constant negotiation, renegotiation, dependence on achieved understanding (Storper, 1993).

But even these input/output transactions do not adequately explain agglomeration, particularly in cases where some agglomerations exhibit relatively low levels of direct inter-firm transactions. Such agglomerations are instead characterised by non-market or "untraded interdependencies". The basis for both complex transactional structures and "untraded interdependencies" is to be found in behaviours which promote "technological learning" as the key to innovation. It is the rules, institutions, and practices of key collective agents that enable local technological learning.

Here Storper draws on key elements of "evolutionary economics" recently developed by Dosi, Arthur, Soete and others[5]. His argument centres on "spillovers" and unfolds along the following lines (Storper, 1994). Technologies develop along "pathways" or "trajectories", which describe choice sets that are totally different from those of orthodox economics. It is impossible to predict outcomes from a starting point, even where actors are rational, and there is no single optimal outcome. Instead, outcomes are "path-dependent".

The particular path of evolution of a technology is the result of inter-dependent choices (e.g. between users and producers). They are therefore not always based on efficiency. Pathways are also the result of technological spillovers in the economy, with respect to knowledge or common practice, such that "...technological excellence comes in packages or ensembles. Since such excellence relies frequently on knowledge or practices which are not fully

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Referred to in Storper, 1994 and including: Dosi, G., K. Pavitt and L. Soete, 1990, The Economics of Technical Change and International Trade, New York: NYU Press; Arthur, W.B., 1989, "Competing Technologies, Increasing Returns and Lock-in by Historical Events", The Economic Journal, 99: 116-131; Arthur, W.B., 1990, "Positive Feedbacks in the Economy", Scientific American, Februrary, 9-99.

codifiable, the particular firms who master it are tied into various kinds of networks with other firms, both through formal exchanges and through untraded interdependencies" (Storper, 1994: 16). Untraded interdependencies include labour markets, public institutions, and locally or nationally-derived rules of action, customs, conventions, common languages, understandings and values aimed at developing, communicating and interpreting knowledge.

Technological learning is the key to reproduction of the technology district, and depends on conventions. These "practices, routines, agreements and their associated informal or institutional forms", define a local 'world of production' that underpins technological performance (Storper, 1993: 435). Conventions are said to have dimensions of identity and participation (Storper, 1993). Technological learning takes place on the basis of socially constituted identities. In the case of northeast-central Italy, the identities of key skill groups is associated with certain important institutions, e.g. the CNA (*Confederazione Nazionale d'Artigianato*), while participation involves "voice and community loyalty", and the "civic culture" which has been identified as being so strong in Emilia-Romagna (e.g. by Putnam, 1993).

The untraded interdependencies and uncertainty inherent in emerging industries are a primary source of spatial clustering of firms. While "input/output" or direct network relations <u>can</u> involve some degree of territorialisation, "...in <u>all</u> the cases where organizations cluster together in territorial space in order to travel along a technological trajectory, they have interdependencies which are untraded" (Storper, 1994: 18). Technological spillovers and their untraded interdependencies would be territorialised under certain conditions, notably where the technological trajectories are particularly open, with wide margins of potential variation.

In essence, Storper replaces a static, equilibrium neo-classical economics-based theoretical setting (transaction cost minimisation) with a dynamic, path-dependent setting in which the usual economic rules do not apply, and untraded interdependencies necessarily draw firms together into localised agglomerations.

Though the intent seems to be that technology districts are a particular sub-set of industrial districts, distinguished primarily by the evolving nature of the industry, the centrality of technological learning and the untraded interdependencies that both support it and cause clustering even in the absence of direct inter-firm relations, it is difficult to see how these characteristics differ fundamentally from other districts. Lack of standardization of knowledge, changing district structures, the need for ongoing learning, could be said to be characteristic of all districts. Indeed, aside from the fact that untraded interdependencies are primarily mobilized in aid of technological learning, the concept seems otherwise to be very similar to the Regulationists' "mode of social regulation", and of course has many commonalities with agglomeration economies. It also harks back to Becattini's (1987, 1990) emphasis on local culture, values and institutions, bringing the evolution of approaches to industrial districts full circle.

Clusters

While individual elements of the preceding body of theory tend to continuously build upon and incorporate approaches that have gone before, Porter's (1990) recent work attacks the issue from a distinct perspective, that of the competitiveness of nations. Porter is somewhat outside the post-Fordist debate described to this point. He proposes that the dynamics of national economic growth are such that an economy will evolve into groupings or clusters of industries, linked through vertical (buyer/supplier) or horizontal (customers, technology, etc.) relationships.

Clusters are primarily economic groupings; they frequently but do not necessarily represent geographical clusters. Clustering emerges directly out of the determinants of national advantage, which include four interrelating factors that make up what Porter calls the national "diamond". The points of the diamond consist of factor conditions (e.g. labour, natural resources, infrastructure etc.); demand conditions (e.g. overall demand levels, structure, sophistication); related and supporting industries (i.e. degree of competitive advantage in supplier or related industries); and firm strategy, structure and rivalry (e.g. firm management, degree of competition amongst national firms). Italy, for example, is seen as having clusters in textiles and apparel, household products, (appliances, lighting, furniture, ceramics, etc.), food and beverages, and personal products (jewelry, eyeglass frames, etc.). Italian industry is further characterised by the small to medium size of its export firms, and patterns of geographic concentration.

The growth of clusters takes place when a foothold in one industry helps to create other ones, engendering mutually supporting, multi-directional relationships, linkages and information flows. The most fertile conditions for growth occur when "exchange and flow of information about needs, techniques, and technology among buyers, suppliers and related industries... occurs at the same time that active rivalry is maintained in each separate industry "(1990: 152). Such information flow is a key to competitiveness, and can occur through many channels, including personal relationships due to schooling, community ties, trade associations or norms of behaviour. "Goal convergence" can also be achieved through family or quasi-family ties between firms, common ownership or interlocking directors.

Though clusters are economic entities first, Porter does emphasize the important role that geographical concentration can play in heightening the positive aspects and mutual reinforcement of the elements of competitive advantage. Geographic concentration can:

- provide a concentration of rivals, customers, and suppliers that promotes efficiency and specialization;

- improve innovation through contacts between buyers, suppliers, institutions, etc.;
- present sophisticated local customers who offer possibilities for transmitting information about needs and technologies;
- increase the speed of information flow and the rate of innovation diffusion, while simultaneously constraining the flow of such information outside the cluster.

Though Porter acknowledges the important role of geography, he defines the spatial dimension in a rather limited fashion, exclusively in terms of localised clustering of firms within a district. He does not acknowledge other critical spatial relationships, such as the geographical location of production centres vis-a-vis markets, or the role of existing patterns of local uneven development in production and competitiveness.

Porter then suggests that the process of national economic development also takes place in stages, according to the four elements of the competitive diamond: the factor-driven stage; investment driven; innovation driven; and wealth-driven. In each stage, different elements of the diamond come into play, in different ways, and each nation develops along its own path, not necessarily in the linear order of the model. Italy in the post-war period, for example, is seen to have skipped from the factor-driven stage to the innovation-driven stage, missing the investment-driven phase altogether.

While many of the other approaches have emphasized the unique aspects of cooperation observed in industrial districts, as does Porter, he also reasserts the role of competition. As will be seen in the case studies that follow, competition does indeed play a decisive role in pushing the social division of labour and specialisation to their extremes, as well as motivating a process of adoption of new technology, amongst other things. Coming at it as he does from a business perspective, Porter also points out the role of ownership and inter-firm managerial structures, a factor which the case studies will show to be important in determining elements of competitiveness, spatial patterns, but which tends to be under-emphasised in the other literature.

4. POST-FORDIST TERRITORY

If indeed, as much of the literature presented above suggests, we are in transition to a new economic order (be it a regime of accumulation or a technological-institutional system), and given the strong historical linkages between industrialisation and urban and regional systems, what does the post-Fordist era imply for the way cities, regions and territory are shaped? What role do territory, cities and regions play in the broader economic regime?

All of the approaches reviewed above refer to geographical clustering as a recurring element of post-Fordist system's of production, while some go further to attempt to explain localisation and its role in the functioning of the district. Yet while being central to so many of the arguments heralding the emergence of new, flexible ways of organising production and indeed central to the notion of the evolution of an entirely new regime of accumulation, the details of the spatial patterns are relatively unexplored in the literature, as are links to the role of the urban system and implications for its evolution. Terms are used loosely, leading to confusion. While there is a fair amount of theoretical conjecture, in the form of extrapolations from the other elements of the post-Fordist regime to spatial patterns, there is little actual empirical evidence. Are regions and industrial districts the same thing? Where are industrial districts located? How spatially constrained are they? What is their internal spatial arrangement? How do they relate to the urban system? Is it primarily an urban or rural phenomenon, large city or town? Does it suggest increased patterns of uneven development? At what scale? The literature which addresses these questions, such as it is, is summarised in this section.

Post-Fordism and cities

Marshall remarked upon the relationship between industrial districts and cities and towns, a link which has been lost to a large degree in subsequent research. He noted, for example, that productive specialisation of districts often became the productive specialisation of towns and cities, and that even within a particular industry, individual towns would be specialised in a particular sub-phase or intermediate product: "As is well known, fine spinning, coarse spinning, and weaving are localized separately.....Blackburn, Preston, Nelson and Oldham are centres of four different classes of staple cotton cloth, and so on"[6]. And he remarked upon the "...mutual influences of the localization of industry, the growth of towns and habits of town life, and the development of machinery"[7].

Indeed, there are many historical examples of metropolitan industrial districts: guns and jewelry in Birmingham (Wise, 1949); metal and engineering in the west Midlands (Florence, 1948); footwear in East London (Hall, 1962); or the Midtown garment district in New York City (Haig, 1927). Though some post-Fordists call these historical examples into evidence (e.g. Scott, 1988a) (and indeed some are still in existence today), with respect to post-Fordist industrial districts, on the other hand, the literature generally takes the position that flexible, localised production complexes tend to be a decidedly non-metropolitan phenomenon, systematically avoiding the major metropolitan centres of Italy, Germany, the U.S. and other advanced industrial nations. The usual examples cited are the Third Italy, Baden-Wurtemmberg in Germany, or Silicon Valley.

Though flexible production complexes are seen as marking a "definite spatial *reagglomeration* of production..", they occur only "...in selected areas, often based on the active evasion of labour pools that exist in areas previously

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6 From Industry and Trade, first published in 1919, quoted in Bellandi, (1989).

7 Principles..., quoted in Bellandi (1989).

dominated by Fordist modes of production" (Scott, 1988b: 14). Scott concludes that the locational tendencies of flexible production systems differ markedly from those of Fordist mass production and are "...almost always some distance - socially or geographically - from the major foci of Fordist industrialization" (Scott, 1988b: 14). This may explain the alleged anti-metropolitan bias of post-Fordist industrial districts as, as we saw earlier, the cities and especially the large cities were both the creation of and the locus of industrial capitalism, particularly in the machinofacture and Fordist phases.

Despite his claim that flexible production complexes are averse to Fordist space, it is ironically Scott's work in particular that cites metropolitan examples of industrial districts (1988b). He notes, for example, that high-level business services are found clustered in the central business districts of major metropolitan cities, as well as selected suburban communities. Clothing, furniture or jewellery is produced in the inner cities of metropolitan regions such as New York, Los Angeles or Paris, where new waves of immigration provide a ready source of low-wage labour. Other flexible, design-intensive craft industries occur in the towns of peripheral regions, such as the Third Italy, as well as in parts of Denmark, France or Portugal, or southern Germany.

High technology clusters, on the other hand, have materialised in a wide range of locations, including a number of suburban sites next to major cities in older and new industrial areas in North America and Western Europe (Silicon Valley, Route 128, M4 Corridor). Also included amongst high tech locations are small to medium-sized towns, in peripheral areas, such as Boulder, Colorado; Austin, Texas; Cambridge, England; Grenoble or Montpellier, France.

Scott (1988b) asserts that these examples fall into a three-part typology of districts, that is, I) flexible, design intensive craft industries, ii) high-tech clusters, and iii) business services. Each type of agglomeration is identified with its own geographical pattern, as suggested in the above examples, though the type-specific dynamic that underlies these spatial tendencies is not elaborated.

Others have claimed that flexible production complexes are appearing within major urban centres, such as the motion picture industry in Los Angeles, where it has been equated with a "reagglomeration in urban centres" (Christopherson and Storper, 1986). Citing this and other examples, particularly in Los Angeles, but also New York City, Japan and France, claims have been made that the new industrial districts represent a new model of "urban re-industrialization"(Sabel, 1988).[8]

Others see implications for the structure of the urban hierarchy. The emergence and growth of the high-tech industrial clusters are seen as turning the traditional urban hierarchy "upside down", as smaller and more remote cities attract an increasing share of economic activity (Moulaert and Swyngedouw, 1989). Producer services (banking, real estate, insurance, business services, etc.) are also seen as transforming and replacing the "traditional" urban hierarchy, which was based on manufacturing industry and social/personal services (Moulaert and Swyngedouw, 1989). Typically producer services are associated with the growth of the largest cities, so it is difficult to see how this acts to turn the urban hierarchy "upside down".

The pattern of districts

Aside from its relationship to the urban system, what do post-Fordist forms of production imply for larger scale patterns of development? What regions are likely to be the sites of post-Fordist production, and what regions might enter into a period of decline? How, if at all, is the relationship between regions affected? The current literature only begins to address these questions. The response is often answered in very general terms: post-Fordist production generates new spatial patterns, including spatial clustering and agglomeration,

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8 Quoting E.W. Soja and A.J. Scott, "Los Angeles: Capital of the Late Twentieth Century", Society and Space, September, 1986.

and spatial integration of all functions in the production process. This latter is seen as putting a premium on the spatial integration of functional firm levels (greater autonomy for branches) and/or an improved transactional structure (Moulaert and Swyngedouw, 1989).

Somewhat more specifically (and has already been noted), spatial clustering and agglomeration (in the form of recently emerging localised, flexible production complexes) have generally been observed to occur outside of the areas of Fordist accumulation (e.g. the U.S. rustbelt) and in "new industrial spaces" where there was no prior tradition of industrialisation (e.g. the U.S. sunbelt) (Scott, 1988a; Storper and Walker, 1989). These agglomerations have also emerged in areas formerly considered the "periphery" - that is, outside the Italian northwestern "industrial triangle" formed by Milan, Turin and Genoa; and in the northeast-central "Third Italy" (Arcangeli et.al., 1980).

For Italy, Sforzi (1989, 1990) has employed a multivariate analysis to identify 61 Marshallian industrial districts. His analysis generally supported the view that such districts were to be found outside the areas of Fordist accumulation; all the districts were located in or near the "Third Italy" , as can bee seen in Figure 1.1. The pattern of districts also clearly avoids the major urban centres, systematically locating outside these areas, as Figure 1.2 shows. However, some geographic clusters have been identified in the "Fordist" and metropolitan space of the Milan-Turin-Genoa industrial triangle, including a factory automation equipment cluster in Turin, and a jewelry cluster in Valenza Po (Porter, 1990).

It is interesting to note, however, that the areas that emerged as corresponding to the Marshallian definition of industrial districts were almost all in traditional industries, including textiles, clothing, footwear, leather goods, tanneries, and wooden furniture;

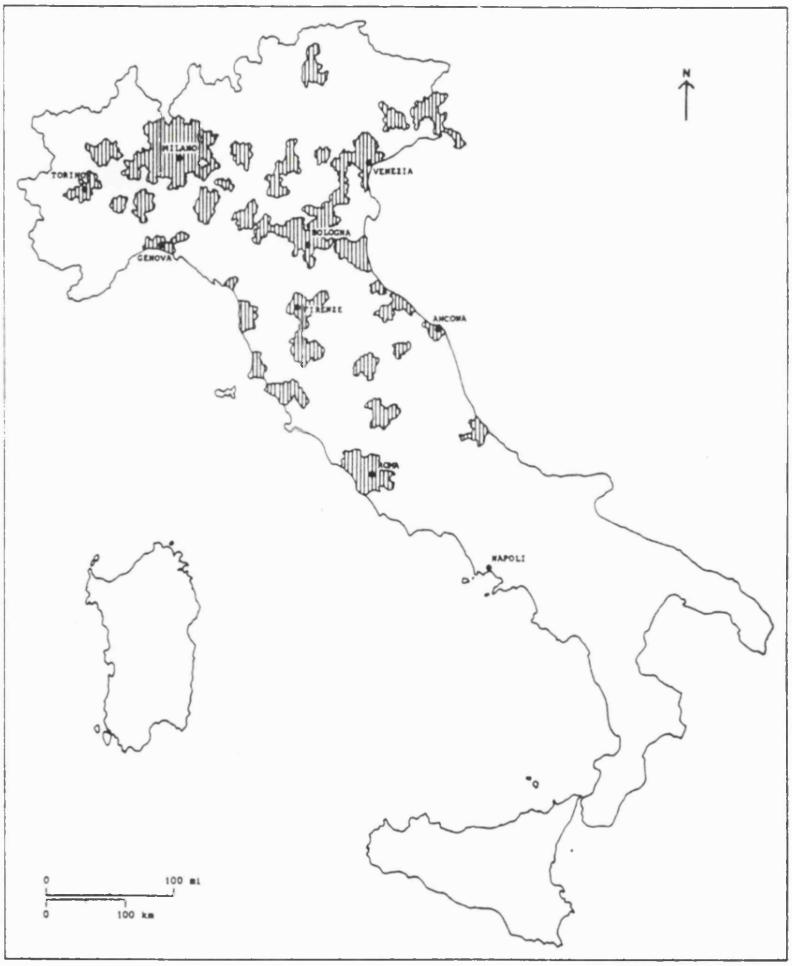
Figure 1.1

Marshallian Industrial Districts in Italy, 1981

Source: Sforzi, 1989

Figure 1.2

Urban Systems in Northern and Central Italy, 1981



Source: Sforzi, 1990

only a few districts emerged in other industries, such as metal goods, mechanical and electrical engineering (Sforzi, 1990). Despite the fact that the peripheral spatial pattern corroborates what Scott, for example, predicts for the "craft-oriented" production agglomerations, it raises an issue brought forward by the critics of the post-Fordist philosophy. That is, given the industrial concentration of these Marshallian districts in traditional industries, can they be considered to be post-Fordist spaces, or do they in fact precede the period of transition to post-Fordism?

The pattern <u>in</u> districts

Again, only a limited amount of empirical work has been devoted to examining the actual spatial patterns of industrial districts. The research to date presents a conflicting view of spatial patterns within areas of post-Fordist production. Three major spatial patterns have been identified at this scale in the literature: what could be called a pattern of "even development"; a pattern of concentrated development, and a pattern of core-periphery differentiation. The evidence in each case is summarised below.

In the limited analysis that has been done at the intra-regional scale, the overriding spatial characteristic that has been found in the Third Italy is non-concentration, and that non-concentration is cited as an essential element in the ability of the productive system to reproduce itself. Stated differently, local spatial concentration will lead to the demise of an industrial district.

Some researchers characterised the phenomenon as "diffuse industrialisation" in the "peripheral" Third Italy (see, for example: Arcangeli, Borzaga and Goglio, 1980; Coulet, 1978). Under this model, development in the Third Italy in the 1960s and 70s was linked to the northwest core, and it is the very lack of concentration which allowed the system to be reproduced. The dispersion of factories throughout the countryside was seen as a factor which allowed the region to maintain the original conditions and structure which attracted development. Thus the region was able to avoid problems of infrastructure shortage, for example, and the locational concentration of workers which could lead to capital-labour confrontations.

A similar pattern is described by Fuà as "rural industrialisation", though he emphasises endogenous factors and local conditions such as a large supply of available labour, and a territory rich in small and medium-sized towns over the "push" from the northwest (Fuà, 1983). Like Arcangeli et. al., the small scale, diffuse organisation of production, and the avoidance of concentration are seen as key to the reproducibility of the system, in avoiding upheavals in urban land markets and social structures, for example: "..we must avoid a situation in which the "area-systems" act as magnets attracting a concentration of population and activities, thereby causing congestion within the area and abandonment outside it; should this happen, the underlying conditions from which the NEC[9] model draws its strength would no longer exist" (1985: 363).

Coulet is one of the few to evaluate in detail the spatial aspects of the emerging systems of production, and concludes that diffuse production is characterised by an absence of concentration of establishments, of development poles, and on the other hand a diffusion over the entire regional territory of the workforce and small and medium-sized enterprises (Coulet, 1978).

The "Emilian model" of integrated small firms is characterised by "...the absence of a large metropolis, around which a structure consisting of large companies which decentralize to smaller companies generally develops, and the presence instead of a productive micro-structure system" (Bianchi and Gualtieri, 1990: 90). The pre-existing pattern of small towns and villages, evenly distributed over space, is seen as a factor in bringing about the Emilian model of production.

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9 North-east central.

The absence of concentration and of major urban centres, the almost "even development" of production units and employment within productive districts and across towns and villages, are reiterated as characteristics of the Emilian system of production. This reinforces points made earlier, particularly in the Italian literature, that such productive systems would not be possible in larger urban contexts or metropolitan areas, in what Becattini (1990), for example, describes as "urban anonymity". This idea appears to be put forward on two grounds: that a metropolitan context would not permit the social connections that are the fundamental basis for the industrial district, and that the a concentration of activity within the industrial district will lead to problems such as infrastructure shortage that would bring about its demise.

It should be noted that the pattern of "non-concentration" described by Coulet, Fuà, and Arcangeli et.al., relates to the overall pattern of distribution of employment and productive establishments for all manufacturing industries, not the pattern within particular industries or of individual industrial districts. Their evidence suggests that when many specialised, concentrated areas of production take place within the same region and overlap with one another, as is the case in Emilia-Romagna, that production becomes fairly evenly distributed over the region as a whole - that together these clusters ironically generate a pattern of even development.

Contrary to this body of evidence, Sforzi's (1990) analysis shows a high degree of spatial concentration of individual industries in the Marshallian industrial districts he identified. Using a "location quotient" which shows a locality's share of national employment in a particular industry in comparison to that locality's share of total national employment, he finds high degrees of concentration in all the industrial districts, with the exception of metal goods and engineering.

Sforzi also undertakes an analysis to define the boundaries of an industrial district, particularly where a district's boundaries may not correspond to those of a town, towns or region. Using Prato as an example, he overlays economic criteria with social criteria and journey-to-work patterns to define the geographical boundaries of that textile district. He found "...a system of firms which is spatially concentrated and industrially specialised and a population consistent with it and sharing the same geographical area" (Sforzi, 1990: 156).

The third major spatial pattern in evidence at the local scale is one of core-periphery differentiation. A handful of case studies of industrial districts have led to claims of spatial differentiation based on technological factors and firm size within districts, between their core and periphery. In the New York City garment industry, for example, plants are located in the core, while subcontract shops are scattered through the fringes of the Greater New York region. A localized decentralization of production which occurred between 1946 and 1956 was attributed to lower labour costs in the suburban areas. Decentralization was most pronounced among shops producing lower-quality and standardized outputs, and peripheral shops operated on a section-work basis (each garment made by deskilled, technically divided labour processes). On the other hand, central city shops worked on a "making through" basis, in which one operator produces the whole garment. Production in the high quality, high fashion segment of the market remains centralised in Midtown Manhattan (Scott, 1988a).

In the Tokyo car industry, a three tier supplier system was found, in which the tiers corresponded to a stratified set of labour processes, employment conditions and wage levels (Scott, 1988a). Labour market fragmentation was seen as a factor in this particular productive configuration. Producers are arranged throughout the region, not just one sub-area of the metropolis, in a pattern of intra-metropolitan nuclei and sub-nuclei.

Such evidence leads Scott (1988a) to hypothesize a "rough direct correlation between such plant characteristics as size and routinization, and distance from the core of the city". Large plants performing routine functions locate in the periphery, while small shops performing specialised, non-routinized functions locate in the core. He goes on to say "If true, this proposition suggests that technological or organizational changes in industry up or down the scale of plant size and routinization will tend to be associated with decentralization and recentralization" (1988a: 90). This last remark is particularly interesting, because it hints at the possibility for an urban recentralisation, the urban re-industrialization foreshadowed by Sabel (1988), Christopherson and Storper (1986). Such a potential would have a remarkable implication for the myriad inner cities of the advanced industrial nations that have, since the 1970s been devastated by de-industrialisation in a seemingly irreversible downward spiral that has for the most part been immune to policy and program attempts at their revitalisation.

Based on evidence from Orange County, California in the manufacture of injection-moulded plastics, circuit-boards and surgical and medical instruments, Scott further finds a positive relationship between fragmentation of labour processes and the locational clustering of units of production. But there are different patterns, associated with firm size. Small plants have an especially strong tendency to cluster together compared to large plants:

> "....any large industrial complex will almost certainly exhibit distinctive patterns of internal locational differentiation. These patterns will be likely at a minimum to consist of (a) a spatially dominant network of small plants in selected central areas of the complex, overlain by (b) a more dispersed distribution of large plants, the latter becoming dominant in peripheral zones." (1988a: 197)

Others have noted that the new hi-tech complexes tend to be dominated by a few core plants, surrounded by a host of dependent sub-contractors and suppliers (Moulaert and Swyngedouw, 1989). This pattern is attributed to higher unit transactions costs faced by small plants compared to large (i.e., smaller plants do not benefit from bulk transportation rates). Also, small firms were seen as more labour-intensive, so there was an inducement to gravitate toward the spatial centre of their main areas of labour supply. Large plants enjoyed economies of scale as a result of their higher levels of transactional activity, thus they were less locationally restrained than small plants. Large plants often required larger premises, which suggested lower-cost, peripheral locations (Scott, 1988a).

However, as will be shown in the case studies presented in Part II of this thesis, this pattern of clustered small firms and dispersed large firms is by no means universal. In fact, the case studies will present evidence of exactly the opposite pattern. This contradictory evidence is characteristic of the existing empirical spatial evidence as a whole. The somewhat scanty body of research is fraught with contradictions: are industrial districts a metropolitan or non-metropolitan phenomenon? Do districts occur in "Fordist" space or only in "non-Fordist" space? These issues will be taken up again in the case study and conclusions chapters. In the next chapter, the main themes and debates that appear in the literature and relate to these kinds of questions are presented.

CHAPTER TWO

THEMES AND ISSUES

I. POST-FORDISM AND ITS CRITICS

Chapter One began by looking briefly at the evolution of industrial capitalism up to and including the Fordist era, and how it has been decisively linked to the process of urbanisation. Recent developments in the economy and industrial organisation were then presented, according to the various schools of thought which address this so-called transition to post-Fordism. We then reviewed how these approaches deal with the urban, regional and territorial aspects of a post-Fordist regime of accumulation.

There is a high degree of concordance amongst the approaches outlined in the previous chapter, between the Italians, the flexible specialisationists, the regulation school, and the California school. The broad outlines of these approaches are the same and each tends to build upon the other[10], though there are differences in emphasis in explanation (stressing the role of social factors and local institutions vs. industrial organisation and transactions costs) and minor empirical discrepancies (the degree to which industrial districts support the adoption of new technology, or the degree of competition vs. cooperation). There is a high degree of consensus that the localised, flexible production complex is an important reality and it is evidence of a new, flexible, post-Fordist regime of accumulation.

Together, these approaches have been termed by its critics the "new orthodoxy" (Amin and Robins, 1990a; 1990b). The opposition to the new orthodoxy emanates from virtually a single, Marxist-inspired camp. It fails to present an equally coherent, alternative theorisation of developments described by the new orthodoxy group as post-Fordism. Instead, it adopts a defensive

[10] The exception perhaps is Porter's work, which approaches the issue from the vantage point of the competitiveness and evolution of national economies.

position of contesting particular points, or denying the existence of a new regime and resorting to re-asserting the on-going pertinence and dominance of the Fordist regime of mass production (Amin and Robins, 1990a, 1990b). Seen in this way, the debate is therefore dualistic in nature: the new orthodoxy versus its critics. No other approaches have been put forward to challenge these two predominant and opposing views.

Nevertheless, the literature raises a number of issues and there are several main points of debate. Some of these contested points are empirical in nature (the degree to which flexibility is actually exhibited by post-Fordist production systems, the degree to which new systems of production are characterised by competition or cooperation). However, most of the debate is focused on broader, theoretical issues relating to the economic significance of post-Fordism. From the perspective that the current thesis adopts, i.e. to understand the urban, regional and territorial implications of a post-Fordist regime of production in the same way that we understand the urban implications of industrial capitalist regimes prior to post-Fordism, a few key themes emerge from the literature. We need to know:

- what are the characteristics of post-Fordism and post-Fordist systems of production?
- do productive systems with these characteristics represent a qualitatively new and distinct phase of capitalist accumulation?
- how can the localised patterns of industrial organisation and concentration associated with post-Fordism be explained?

We must address these questions before we can get to the ultimate purpose, that is to understand the implications of post-Fordist production for cities and regions, and the dynamics that dictate this relationship. This chapter will now address each of these issues in turn.

2. THE CHARACTERISTICS OF POST-FORDISM

As noted above, there is a general compatibility of views amongst members of the 'new orthodoxy' group regarding the characteristics of the new regime of accumulation. Though the Italians (Brusco, Becattini, Sforzi, etc.) tend to focus only on the industrial district, other schools see the industrial district as just one piece of evidence of a broader 'flexibilization' that extends, for example, to large firms (Piore and Sabel, 1984), or that includes other potential industrial-spatial outcomes (Leborgne and Lipietz, 1988.) Below, we recap where the literature has arrived at in terms of the characteristics, definition and types of industrial district, and note two particular areas in which the characteristics of post-Fordist production are being especially challenged: regarding the nature and role of flexibility, and the nature of work.

What is an Industrial District?

In the literature presented in Chapter One, industrial districts tended to be defined primarily on the basis of their observed characteristics. While different approaches may tend to emphasize particular facets, the main elements of industrial districts include: small firms specialised by production phase, with a high degree of inter-linkages between them, producing a single type or range of products, clustered geographically. As such, "industrial district" can and has been used to apply to a wide range of productive agglomerations, including hi-tech areas, business services, complexes for the production of mature goods, as well as the Emilian-type industrial district. Indeed, Scott's (1992b) definition captures a broad range of production complexes: an industrial district exists wherever there is "a localized network of producers bound together in a social division of labour, in necessary association with a local labour market", arguing that while specific manifestations of districts may indeed vary, this definition captures the fundamental ingredients of social division of labour, external economies and agglomeration. This definition does not lead Scott to exclude any types of production complex that he formerly included in his three-part typology of craft industries, high-technology clusters, and business service complexes.

On the other hand, Brusco (1986) has attempted to be more definitive, suggesting indicators that would allow us to distinguish industrial district firms (and also equivalent to the flexible specialisation model) from dependent sub-contractors or traditional artisans. Indicators of the first group include: a high percentage of firms with direct relations with the final market; a high percentage of sub-contractor firms with a large number of clients; and the presence of firms that manufacture the production machinery used within the district (this last point also the defining characteristic of Garofoli's "system-area").

There is clearly a wide range of definitions. Given the centrality of spatial agglomeration, clustering, and localisation, it is surprising that spatial aspects of industrial districts are not a clear parameter of the definition. The definition of industrial district stops with the characterisation of spatial agglomeration - what this means in real terms, how boundaries might be defined or how districts might be differentiated from "regions" is not discussed.

Alongside Scott's sectoral typology, two others have been proposed, as reviewed above, including Garofoli's (1983) continuum of self-sufficiency (areas of productive specialisation, local productive systems, system-areas); and Brusco's (1990), which is really a typology of firms within districts (traditional artisan, dependent sub-contractor; industrial district firm). We can also add Storper's "technology district", which he differentiates from other kinds of industrial localizations, based on three criteria: 1) they have dynamic economies of scale, owing to the nature of technological change, that counteract equilibrium tendencies; 2) their production networks are frequently characterized by relationships other than markets or hierarchies; and 3) they have conventions of economic life that mobilize resources and regulate interactions so as to make technological learning possible (Storper, 1992: 90).

Storper's "technology districts" can include examples from each of Scott's three types, and it could be said, if innovation is a prime characteristic of industrial districts (as many claim it is, e.g. Piore and Sabel, 1984) that the concept does not narrow the range in any way. Meanwhile, a sectoral approach does not appear to offer a window with any explanatory power, able to address the economic or spatial dynamics of districts. As the case studies that follow indicate, industrial districts in three very distinct sectors all exhibit remarkably similar patterns of spatial and industrial organisation.

Indeed, the typologies have not been conceived or used in a way that would allow one to relate each type of district in a systematic way to an individual evolutionary dynamic or a particular spatial pattern. At present, they are merely categories. The body of literature has not come to any coherent determination on whether the many examples of industrial districts do in fact represent essentially a single, distinct type of entity, or whether they are comprised of several types. That is, are they just different breeds or are they different animals altogether? Do they operate according to the same fundamental, global forces, or according to individual dynamics? Indeed, as we will see below, the definition and typologies of industrial districts proposed by members of the new orthodoxy is challenged by its critics.

Flexibility

Flexibility is, of course, *the* central concept in the literature on emerging modes of production, the defining characteristic of the emerging regime of accumulation, a regime of 'flexible' accumulation. There is some empirical debate about the degree of flexibility actually exhibited by so-called 'flexible production systems', calling into question the possibility of a new regime with flexibility as its defining feature. Like the issue of spatial clustering, given the centrality of the issue to the broader debate, there has been a surprising lack of real empirical evidence in support of (or against) allegations of increasing flexibility.

This problem may stem from a lack of consensus on what flexibility is and how (or if at all) it can be measured. Some object to the dualistic juxtaposition of flexibility against "rigidities" (see, e.g. Pollert, 1991). Sayer (1989), has shown, for example, how seeming "rigidities" in Japanese mass production systems can actually generate longer term "flexibilities". Or at least, the two concepts should be seen as opposite ends of a spectrum, rather than polar opposites.

The literature often refers to different types of flexibility, with different sources, but without being explicit or specific. An important contribution is made in this regard by Sayer (1989), who differentiates between numerical flexibility (output, employment) and functional flexibility (changes in product configuration). These are sometimes referred to as quantitative and qualitative flexibility, although the latter also includes flexibility in the labour process. The sources of flexibility include labour markets, working practices, machinery, and organisational forms. Each source can exist and generate benefits to capital separately. And, as will be shown in the case studies that follow, the particular type and source of flexibility is intimately related to the territorial organisation of production.

Given the centrality of flexibility to the post-Fordist thesis, more systematic attempts at evaluating degrees and types of flexibility have emerged. One study of numerical flexibility (represented by the use of short-term contracts, sub-contracting and out-sourcing) by large companies found little *increased* used in these arrangements in the early 1980s, though initial use was already quite high (Marginson, 1991). Another study of labour flexibility found only "uneven" and "incremental" expansion of job demarcations, multi-skilling and labour mobility (Elger, 1991). While these studies are not necessarily representative, they are correct in their underlying assertion that flexibility as currently used in the post-Fordist debate is too vague a concept that can obscure other, potentially more definitive aspects of a system of production.

In one case in particular, the centrality of flexibility is challenged, not by the critics of the new orthodoxy, but by the evolutionary economics-based approach. This school does not so much position itself either in favour or against flexibility and the proposition of a new, post-Fordist era, but recasts the question and reinterprets recent economic history along the following lines (Storper, 1994). In the immediate post-war period, the U.S. held an absolute technological advantage in mass production industries, but as their technologies became imitable, the absolute advantage disappeared and a competition for comparative advantage ensued, based on a search for lower production costs *within* a given technological paradigm. Ultimately, however, competition began to take place on the basis of "...new forms of production, not based on mass production methods, but instead oriented again toward the *technological learning* which had once characterized competition within mass production..." (Storper, 1994: 17). As a result, technological trajectories were "re-opened" and the western world once again became a "learning economy".

At least within the "technology district", flexibility is cast aside as the central defining feature of the post-Fordist regime, to be replaced by technological learning. "But what is important is the notion that it is not flexibility per se that is the central theoretical element of the current age, but flexibility (and many other features of contemporary production systems) as a means to technological learning and the absolute advantages it is generating for learners." (Storper, 1994: 17). Indeed, as the case studies will show, there is some evidence to suggest that too much emphasis has been placed on flexibility, while other equally or more important factors have been downplayed. Flexibility has come to be portrayed as an end in itself, when in fact it is simply a means to achieve certain product or process objectives.

The nature of work

Of the empirical points of contention that emerge in the literature, the nature of work and the implications for workers of the newly emerging forms of production is probably the most hotly contested. On the one hand are those who look upon flexible specialisation as highly favourable to the worker. Sabel, for example, views the 'Emilian' organisation of production as democratising the workplace, reintegrating conceptualisation and execution functions for the individual worker, as in pre-industrial craft production. Workers are extremely skilled and the division of labour is described as fluid and informal, "the difference between them (workers) and their supervisors almost imperceptible" (Sabel, 1982). In short, it is a veritable worker's utopia:

> If you had thought so long about Rousseau's artisan clockmakers at Neuchâtel or Marx's idea of labour as joyful, self-creative association that you had begun to doubt their possibility, then you might, watching these craftsmen at work, forgive yourself the sudden conviction that something more utopian than the present factory system is practical after all (Sabel, 1982: 220).

Murray challenges Sabel's glowing characterisation of the nature of flexible specialisation, especially regarding the opportunities it affords workers for the reintegration of conceptualisation and execution, and the degree of improvements in the quality of work. He notes that the 'quality craft work' Sabel discovers is generally available only to one sub-group of the working population: middle-aged Emilian men. "For the vast majority of workers who do not possess the market power of an elite of male machinists, technicians, and designers, a shift towards a fragmented, informal or casual cottage industry spells a return to the worst excesses of industrial capitalism" (Murray, 1987: 92).

Murray argues that the degree of independence of small capital may be overstated, as well as the amount of market diversification. In addition, the geographical fragmentation of production and weak trade union representation tend to lead to a wide variety of working conditions, and maximum wage differentials between different groups of workers, which invariably occur along racial and gender lines.

Competition and Cooperation

Advocates of the new orthodoxy, almost without exception, emphasize the role of cooperation in the success of industrial districts, citing shared local values, norms, and rules, local institutions, associations, etc. (e.g. Becattini, 1990; Piore and Sabel, 1984; Moulaert and Swyngedouw, 1989; Storper, 1993, 1994). While indeed these factors play a unique role in the production systems of the industrial district, competition is also an important factor, as Porter (1990) points out. He notes how local rivalries can promote efficiency and specialisation. In the Third Italy, as the case studies contained in this thesis will demonstrate, local competition has a strong and dynamic affect upon the social division of labour, and the adoption of new technologies, and hence the local geography of production.

3. A NEW PHASE OF CAPITALIST ACCUMULATION?

As we saw in Chapter One, one of the major theoretical claims laid by Piore and Sabel was that the nature of the changes that they described relating to the division of labour, cooperation and collectivism, etc., was so fundamental, it signalled that the period of Fordist industrial capitalism was at a critical turning point, or "second industrial divide" in which two directions were available: a revival of mass production or flexible specialisation (Piore, 1990). This view is supported by the California School (see e.g. Scott, 1992a), and the Regulation School, who have extended the theoretical concept, heralding a new phase of capitalist "flexible accumulation" (Moulaert and Swyngedouw, 1989; see also Harvey, 1987; Harvey and Scott, 1988). Others have argued vehemently against the notion of a new phase of capitalism, reasserting the dominance of mass production. The main sub-themes of this debate are summarised below.

Post-Fordism is not pervasive

Those arguing against the possibility of a new phase of flexible accumulation do so not on the basis of countervailing theories of the new developments observed in industry, but by criticising the generalizability of the empirical evidence presented, arguing that the primarily Italian and German examples cannot be extended to other contexts and to claims of a new, flexible regime of accumulation. They assert that flexible specialisation is not and cannot be pervasive and hegemonic, so it therefore cannot represent a new phase of capitalist accumulation.

The issue of definition is relevant here, because it forms the basis for arguments regarding the pervasiveness of the flexible phenomenon: the broader the definition, the more pervasive flexible production spaces can be said to be. Critics maintain that a too-broad definition of flexible specialisation overstates pervasiveness and it is on the basis of these aggrandizements that claims about a new phase of capitalist accumulation are (falsely) laid: "... all kinds of different areas in different countries are being described as industrial districts in a bid to demonstrate that this form of growth is the globally enabling condition for a new post-Fordist economic regime...(and that)... the very laws of capitalist development are becoming, as it were, Marshallian (as opposed to Fordist)" (Amin and Robins, 1990: 199).

Critics therefore argue for a much more narrow view, limiting the meaning of industrial district to the kind of productive system found in the Third Italy only. They concede that Third Italy industrial districts represent "differentiated manifestations of one phenomenon: the widespread industrialisation, since the 1960s, of semi-rural areas and small towns with very similar social and economic structures (self-contained communities of artisans, peasant farmers and merchants, near or in towns with strong municipal traditions)" (Amin and Robins, 1990: 196). Even with this more limited definition, they argue, there are still problems. Significant differences exist between Marshallian industrial districts in terms of their origins and their consolidation as industrial districts (the basis of their competitiveness, for example) (Amin and Robins, 1990).

Certainly, argue the critics, the industrial district notion is not generalizable to areas outside the Third Italy, as in the flexible specialisation model, which also includes a broad range of other productive areas, from the high tech districts in Silicon Valley and Route 128 near Boston, to motion picture industry clusters in Los Angeles, to manufacturing districts in the "Second Denmark" and Baden-Wurttemberg in Germany, to the flexibilization of large firms. This catch-all approach has been criticized as incorporating fundamentally different phenomena, with different underlying processes of change (Amin and Robins, 1990).

Instead, it is argued that the flexible specialisation model is not pervasive, and the evidence put forward especially by Piore and Sabel has limited generalizability, on the basis of factors such as:

- the unusually small firm size of their production systems;
- that the industrial sectors cited are not representative, limited to traditional non-durables, specialised suppliers (e.g. metalworking) or luxury versions of mass production (e.g. German cars);
- that only niche markets were being served, in residual spaces left by mass producers; and
- that the specific historical and cultural conditions (e.g. pre-existing industrial skills, collective values) would limit applicability elsewhere[11].

On the issue of pervasiveness by firm size, some have argued that the emergence of flexible production districts is silent on this question, and that large firms are not inconsistent with flexible production; indeed they can play a key role (Scott, 1992b). The empirical evidence presented in this thesis supports this claim, with many firms in the 100 to 1,000 employee range playing key roles within an industrial district. Piore and Sabel have argued that the big firms too are adopting flexible techniques, leading to a convergence between big and small firms. To the critics this only represents a confusion of

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11 Summary of points from Storper, 1994.

flexible specialisation with a "general flexibilization of production" (Storper, 1990).

On the points relating to sectors and niche markets, if one accepts the position that markets are fragmenting, then these "non-representative" sectors and niche markets, though smaller perhaps than individual mass markets, are together accounting for an increasing share of total economic output, and even such venerable mass production sectors as steel are subject to this process (Piore and Sabel, 1984). Moreover, individual "niche" markets can still account for significant absolute levels of output, such that a niche knitwear district can account for direct employment of one out of every three employed workers in a town of 60,000, as it does in Carpi (CGIL, 1988).

The literature is less developed on the questions of geographical pervasiveness, though some research examines other kinds of regions, such as old industrial regions (e.g. Hudson, 1989), or mid-western U.S. manufacturing (Knudsen, 1991). Recent research on industry in Southern Ontario, Canada found many similarities with production complexes in the Third Italy, in terms of market demands, for example (Gertler, 1994). And as we saw in Chapter One, there is evidence of post-Fordist production not only in the "new industrial spaces" described by Scott (1988b), but also in large metropolises, and a few cases in older, "Fordist" regions (Kenney and Florida, 1992).

Critics claim that there is no evidence to suggest that flexible accumulation has established a 'systemic' or 'hegemonic' presence, and go on to show that this is particularly true in the UK (Lovering, 1990). In fairness, Scott, Storper and the other flexible accumulationists do not suggest that flexible accumulation is hegemonic in that it removes all vestiges of other modes of production, but rather it represents *dominant* principles (Storper, 1990). Moreover, even if it were true that examples of the Marshallian industrial district could not be found in the U.K., these critics do not address the validity of examples from elsewhere.

Fordism lives!

Some critics propose an alternative view which posits the existence of several types of new production complexes (not just the industrial district), each different, and "whose development is not guided by one overarching structural transformation" (a transition to post-Fordism) (Amin and Robins, 1990: 204). They then go on, however, to invoke their own, albeit different overarching structure, claiming that "what we are seeing in the present period are organisational developments that are in significant ways an extension of Fordist structures" (1990: 210).

The reassertion of the dominance of Fordism is taken up by others, presenting various arguments. On a theoretical point, it is argued that Fordism itself has not been clearly defined, and many of its supposed characteristics, including hegemony, have not been demonstrated. This makes it difficult to assert a post-Fordism (Sayer, 1989).

More importantly, it is argued that it is by no means clear that Fordism is in crisis, as claimed by the Regulation School and others; the alleged inherent limitations such as labour resistance and rigidity are doubtful, and mass production still flourishes. Economic and labour problems are seen as related to a specifically western Fordism, and are attributed not to internal inconsistencies, but competition from Japan and the newly industrialising countries (Sayer, 1989). It is certainly true that the macro-economic evidence is extremely mixed; certain advanced industrial countries have continued to expand economically (Japan, Germany), while others have had much more unstable economic paths (U.K., Italy). But Japan is a particular example because it combines elements of both Fordist and post-Fordist models - flexible mass production, mid-size firms, high use of sub-contracting, etc[12].

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12 See for example, Scott (1988a) on the Tokyo car industry.

Certainly there is ample evidence that the mass production sector is proving extremely resilient, adopting techniques of flexibility and increased standardisation at the same time, as is evident in the success of Ford's 'world car', for example, which includes standardised 'world' components but is customised for particular regional markets. Critics of the crisis of Fordism notion also make this point, asserting that mass production should not be assumed to be synonymous with inflexibility; flexibility can be an asset in the production of a fixed product range or a single product, and can be achieved in many ways, some of which may appear "rigid" at first glance (Sayer, 1989).

At the heart of flexibilization is computer technology, which allows for efficient changes to product or production process, increased productivity across virtually all sectors, as well as constituting a high-growth sector of its own[13]. The question is whether changes such as flexibilization or the application of computer technology in production and in the circulation of capital mark a transition to a fundamentally different regime of accumulation, or simply provide a "technological fix" for the existing regime, in the same way that a "spatial fix" was said to have been found in the internationalisation of Fordism, averting the previous impending crisis of the late 1960s.

A second stream of thought re-asserting Fordism argues that because most of the cited examples of flexible production agglomerations are recent in origin and outside areas of Fordist accumulation, the reasons for initial location as well as "subsequent externalisation" must be elaborated. It is argued that the initial reasons for locating in a given area often amount to "productive decentralisation", which has continuities with Fordism that are inconsistent with the flexible accumulation theory (Phelps, 1992). This point can be countered, however, with examples that predate the transition to post-Fordism (e.g. New York garment district, Bologna automatic packaging machinery district), and

[13] Indeed, it has been claimed that the information technology sector was generating the highest rates of profit in the history of economic activity, though this probably has more to do with the fact that the industry is in the very earliest stages of evolution.

other cases that were not "subsequently" externalised but established from the outset as disaggregated systems of production (e.g. Modena oleodynamic components sector).

A third stream cites examples of the early years of Fordist production complexes in the car industry, in places like Detroit, Turin or the U.K., which also exhibited tendencies to localisation and a highly articulated social division of labour. Critics argue that the objects of analysis are so broadly defined by the new orthodoxy that they can apply to earlier phases of industrial capitalism "whose economic and geographical logic is supposed to be antithetical to that of post-Fordism" (Amin and Robins, 1990: 203). This suggests that the new industrial spaces "do not reflect the structural or organisational requirements of a new post-Fordist economic regime which demands the vertical disintegration and flexible specialisation of production (Amin and Robins, 1990: 203). In other words, similar localised production complexes existed in an earlier phase of capitalism, so localised production complexes cannot now be cited as evidence of a specifically post-Fordist phase. Though, as noted above, Amin and Robins have a point about the broad definition of industrial districts, they do not provide detailed evidence on the localisation and extended social division of labour in the cases they cite.

Amin and Robins propose an alternative view, which suggests that the spatial containment of production need not be for reasons which are structurally or historically bound. They cite Walker's (1988) interpretation that the territorial production complex is seen as an independent and trans-historical organisational form, and not the necessary outcome of any particular form of industrial organisation. This seems to contradict their earlier statements re-asserting Fordism. Or are they suggesting that while localised production complexes are the result of independent and trans-historical forces, mass production systems and their spatial manifestations (e.g. core-periphery relationships) are tied to an overarching, necessary dynamic associated with a

Fordist regime of accumulation? This question begins to get at the issue of the respective roles of necessary versus contingent factors in the evolution of industrial districts, a question which underlies another major theme of debate, the relative importance of global versus local factors.

Global v. local

Critics of the new orthodoxy assert that flexible accumulation and industrial districts are not the result of any new regime of accumulation governed by necessary relationships. Instead, such developments can be explained contingent factors, and the presence of industrial districts cannot therefore be cited as evidence of a new regime of accumulation.

Specifically, they question whether the theoretical link forged between flexible accumulation on the one hand, and externalisation of production and agglomeration on the other, is a *necessary* one, arguing that the latter is not proof of the former. They differentiate between general forces leading to externalisation (market fragmentation, new technologies) and place-specific factors, the latter consisting primarily of "place-specific processes of cumulative causation which may be operative in existing centres of accumulation" (Phelps, 1992: 43). In other words, they reject the validity of flexible production situated in existing production complexes, attributing their emergence to pre-established forces of cumulative causation, which they view as a contingent factor. If place-specific factors are the real impetus behind the externalisation of production functions, then a flexible accumulation thesis cannot be argued. It is the failure of proponents to differentiate between these cases and the "... conflation of the role of general forces and the place-specific factors of existing ('Fordist?') agglomerations which leads the proponents of the flexible accumulation thesis into accepting some very different examples of agglomeration as instances of flexible production systems" (Phelps, 1992: 43).

This line of criticism, suggesting that flexible specialisation and associated flexible production complexes are the result of place-specific (contingent), not global (necessary) forces, is echoed by others. It may be attributed to a range of possible explanations, for example, the spatial logic of U.S. military-industrial capitalism (which presumably generated the high-tech districts of the US southwest) (Lovering, 1990). They propose that flexible specialisation may be but one of several coexisting forms in which capital accumulation can take place. In this 'experimental' and 'contested' period of change, a single clear direction of change is not foreseeable, and flexible specialisation can only be interpreted as a *contingent* local outcome, not an "inexorable process of contemporary capitalist development" (Lovering, 1990: 169).

The argument implies global forces are "necessary" forces, while place-specific forces are by definition "contingent". There is some danger in using these terms interchangeably, particularly when this argument ultimately rests on the assertion that industrial districts are the result of *contingent* forces. I would argue that it must be kept in mind that global/local and necessary/contingent are two different (but intersecting) concepts. There are necessary forces at both the global and local levels, and equally there are contingent factors at both levels. In other words, to maintain the critics' argument, it is not enough to argue that industrial districts are the result of local factors; it must be shown that industrial districts are the result of specifically contingent factors, which may or may not include "place-specific processes of cumulative causation".

The critics take issue with the positions put forward by Scott and Storper, for example, whose arguments imply that necessary factors at both the global and local scales are behind the evolution of industrial districts and technology districts. Storper (1994), for example, argues the necessity of regionalisation under certain conditions, while Scott (1988a, 1988b, 1992) ties market conditions to externalisation of production to geographical clustering as a necessary sequence.

These arguments form part of a much wider stream in the literature, which addresses the relative importance of global versus local factors in the evolving transition. While most accounts do acknowledge both global and local forces, generally one is emphasized over the other. Many accounts of flexible production complexes in the Third Italy stress local factors, institutions, and capabilities (Fuà, 1985; Becattini, 1990; Brusco, 1990, 1986). Sabel also emphasises the endogenous nature of the process:

> "...the region as an economic entity full of under- or unused resources that range from traditional artisanal skills to petty commerce. Prosperity depends, according to the new doctrine of endogenous growth, on developing these resources rather than importing the equipment and skill of a mass production economy from the rich exterior". (1988: 43)

Indeed, there is much evidence in the Third Italy of a rich local heritage including elements of a strong civic tradition; unique local politics (a long tradition of governance at the local level by the communist party); a history in education including a university dating back 800 years and a more recent system of technical schools; a history of local independence emanating from the region's past as a collection of city-states; a highly evolved, poly-centric urban system; and a powerful local and regional governance structure (see, e.g. Capecchi, 1990; Nanetti, 1988; or Putnam, 1993). The question is whether these contingent factors, on their own, are sufficient to explain the rise of industrial districts in the Third Italy, or whether some broader dynamic is also (or exclusively?) at work.

Against the preponderance of explanations which emphasise local factors are those that reiterate global forces. Amin and Robins (1990), for example, stress tendencies toward internationalisation, the global integration of local and national economies, the key role played by multinational corporations, increasing centralisation and internationalisation of capital, and deepening uneven development. These critics argue the co-existence of globalizing and localising forces, and a range of spatial strategies, but, unlike the flexible specialisationists' sub-text of the resurrection of local community, posit a loss of local autonomy in the face of worldwide economic actors.

Rebuttals to this claim do not deny the ongoing internationalisation of capitalism, but suggest that this process "has occurred alongside, and not necessarily in opposition to, the formation of industrial districts", and that multinationals play a facilitating rather than purely destructive role (Scott, 1992b). One way out of the conundrum emerges in "glocalisation", which attempts to capture the inter-related, simultaneous, "double movement" of globalisation and localisation (Swyngedouw, 1992). The notion that globalisation and localisation are in fact inter-dependent rather than in opposition is a compelling one: in an era of globalisation, the local actually becomes more important. When everyone, everywhere has equal access to global information through the Internet, for example, what becomes more valuable and the basis upon which localities can distinguish themselves is by availability of and access to *local* information. Or, as Porter puts it:

> While classical factors of production are more and more accessible because of globalization, competitive advantage in advanced countries is increasingly determined by differential knowledge, skills, and rates of innovation which are embodied in skilled people and organizational routines. The process of creating skills and the important influences on the rate of improvement and innovation are intensely local. (1990: 158)

In any event, the separation of global from local, necessary from contingent, seems somewhat artificial. A more reasonable and powerful approach may be to attack the issue from the point of view of the *interaction* of global and local, necessary and contingent forces, to produce specific outcomes. This is the approach taken to explain the case studies to be presented in this thesis.

A temporary condition?

Finally, there is little consensus on the future prospects for localised, flexible production agglomerations. Some see them potentially as a "transitional" phase that is destined to give way to the more powerful forces of global capital (Amin and Robins, 1988; Harrison, 1992). Amongst the threats cited are:

- Impediments to adopting new technologies (Brusco; 1990), (though others argue that districts ease the adoption of new technologies (Becattini, 1990; Porter, 1990).

- Takeovers and necessary tendencies to concentration (Amin and Robins, 1988; Harrison, 1992). This claim is countered by those who conclude that while there have been some takeovers, these do not constitute a threat to Emilian industrial districts (Bianchi and Gualtieri, 1990); and others who suggest that the presence of large producers in an industrial district by no means indicates a threat. Instead, "...industrial districts may comprise varying combinations of both large and small establishments and that large producers are often quite instrumental in inducing and sustaining agglomeration" (Scott, 1992b).

- New international competition, including an influx of products from newly industrialising countries (Bianchi and Gualtieri, 1990).

- New types of external economies and diseconomies which may be difficult to resolve at the local level, such as the need for more sophisticated inputs (technological research and information, financial services) (Triglia, 1990). Echoing Fuà (1985), this also includes the typical kinds of diseconomies which may be "new" to Emilia-Romagna, such as pollution, traffic congestion, etc.

The critics argue that, as a temporary condition only, industrial districts cannot be interpreted as evidence of a new regime of accumulation. However, in another context, these same critics have also argued that these forms existed in the Fordist era, which (if you accept that they are indeed similar forms) would suggest that while they may not be evidence of a post-Fordist regime of accumulation (as they claim), that at least the form has a certain longevity! On the other hand, there are many examples of industrial districts that were in existence in the Fordist era, and continue to exist today (e.g. the Bologna automatic packaging district, garment districts in many metropolitan centres). The major dilemma which emerges from this thread of the debate is whether a productive form which existed in the Fordist era (and pre-Fordist era, in the case of some districts referred to by Scott), can also be cited as evidence of a post-Fordist era. I would argue that such examples (if indeed they are truly comparable to Fordist or pre-Fordist examples, and this is questionable) cannot be summarily rejected on this basis. The economic context has been transformed, and there may be very unique reasons why the industrial district seems to be re-emerging at this point; it may well fit into the dynamic of capital accumulation and economic growth in a totally different manner, and surely faces internal (e.g. computer technology) and external (e.g. international competition) conditions that earlier forms did not.

That fundamental change has been underway since about 1970, representing a radical departure of previous evolutionary paths, seems unquestionable. The question is whether such change can be said to constitute a new regime of accumulation. The literature is divided into two clear camps on this question, which tends to dichotomize and polarize the issue: Fordist versus post-Fordist; global versus local; rigid versus flexible; mass production versus niche markets; integrated factory versus disintegrated industrial district. The reality is likely more complex and less bipolar. Processes of globalization and localization are more likely inter-dependent than oppositional. Fordism and mass production should not be taken to mean the same thing, as is frequently the case. There is plenty of evidence to suggest that the demise of Fordism may not mean the demise of mass production, as mass production industries become more flexible and increasingly customize their products. Is there not such thing as a post-Fordism which includes mass production and industrial districts?

4. THE REIGN OF THE REGION?

A further claim made by the flexible specialisationists is that this emerging model of production represents a "reconsolidation of the region as an integrated unit of production", based on the following evidence:

- the emergence of industrial districts in parts of Europe, USA, and Japan;
- the reorganisation of multi-national corporations;
- the convergence of large and small firm structures; through the flexibilisation of big firms and direct alliances between large and small;
- the transformation of local governments from welfare dispensaries to job-creation agencies; and
- the cooperation of the trade unions in the reorganisation of the large firms (Sabel, 1988).

The origins of regionalisation lie in increasingly volatile markets, which brought about the need for flexibility, which in turn led to the centrality and "reconsolidation" of the region (Sabel, 1988).

This region-centred view is extrapolated even further, in suggestions that the internationalisation of the economy has proceeded alongside the formation of industrial districts, and that "the world economy is increasingly reconstructed as a mosaic of regions consisting of localized networks of transactions (i.e. industrial districts) embedded in global networks of transactions" (Scott, 1992b).

The evolutionary economics-based approach seeks to explain why "..regions keep emerging as centres for new rounds of growth even as our capacities for transcending the frictions of space continue to improve" (Storper, 1994: 23). The response is said to lie in two points. First, the tension between respecialisation and destandardization of inputs and outputs, ceteris paribus, raises transactions costs. Second, organizational and technological learning is associated with agglomeration, which in turn has two roots. The first is the case in which direct transactions ("input-output relations") constitute webs of user-producer relations essential to information development and exchange, and hence to learning. A second (and more general) case lies in the untraded interdependencies which attach to the process of economic and organisational learning and coordination.

The region is a key, necessary element in the "supply architecture" for learning and innovation, and has "... a central theoretical status in the process of capitalist development which must be located in its untraded interdependencies" (Storper, 1994: 23). This means that these interdependencies are *necessary* to capitalist development and that they are, under certain conditions (e.g. particularly open trajectories), *necessarily* regionalised. Having made this claim, Storper goes on to say that this does not mean that there are not other reasons for regional economies to exist or grow, apparently that these "necessary" relations only apply in certain cases where regions do act first and foremost as a "nexus of untraded interdependencies".

The only challenge to this view of regions as the building block of the new economy comes from Porter (1990), who reasserts the importance of nations, arguing that the determinants of advantage are more similar within nations than between nations (e.g. policy, regulations, capital markets, factor costs, etc.), and that "...social and political values and norms are linked to nations and are slow to change" (1990: 158). Though there is much recent evidence which would support a view that social and political values may be even more strongly local/regional than national (e.g. the U.S.S.R. did not fracture into its constituent nation states, regional successionist movements in Spain, Italy, Canada, etc.), Porter maintains that "... it is the *combination* of national and intensely local conditions that fosters competitive advantage" (1990: 158).

Despite the sweeping nature of claims laid by Piore, Sabel, and Scott (and to a lesser extent Storper, as he is referring only to specific instances) with respect to the emergence of regions as the basic building blocks of the global economy, this aspect of the 'new orthodoxy' is probably the least theoretically developed. While the idea of regions as the basic economic units is intuitively appealing, particularly in an era in which nation-states continue to cede powers to supra-national organisations and multi-lateral free trade bodies, this stream of the literature on emerging economic regimes raises more questions than it answers. Some very basic questions are not addressed in the literature. What is the relationship between industrial districts and regions? What is a post-Fordist region? How does it differ from a Fordist region? Do relationships between post-Fordist regions differ from Fordist inter-regional relationships, i.e. are they relations of dominance and dependence, as the new international division of labour theory implies? What regions are likely to grow and what regions likely to decline under a post-Fordist regime of accumulation? These questions are taken up again in Chapter Seven.

5. EXPLAINING LOCALISATION

How is the geographical pattern of production - specifically the geographical clustering of firms into industrial districts - explained by the various approaches? There is a wide range of explanation amongst the various schools of thought.

Some camps only address this question in a general way, and avoid identifying specific mechanisms or dynamics which cause spatial clustering. While members of the flexible specialisation school, such as Piore and Sabel, do attempt to address the specific theoretical issue of localisation, their explanations deal primarily with the advantages of network production, and do not address or explain the reasons for spatial concentration. The link between the allegedly "re-emerging" regional economies and localised production systems is not one that is clearly elaborated by proponents of the flexible specialisation school, and so the explanations for each become muddled together. They do not tell us what they mean by "region" - is it the same as an industrial district? Or is it the area in which groups of such districts can be found? As such, explanations of the tendency toward spatial agglomeration at the industrial district level are quite muddied. Nevertheless, the flexible specialisationists can be said to link, implicitly if not explicitly, spatial agglomeration with the essential characteristics of their paradigm, that is, the need for flexibility stemming from volatile markets; the capacity to innovate; importance of trust and collaboration, and the learning advantages of networks (Piore and Sabel, 1984; Sabel, 1988).

The Regulation School, while noting that the crisis of Fordism could be resolved through productive organisations which involve either territorial integration *or* disintegration, nevertheless focus to a great degree on spatially integrated models. Spatial clustering is seen as necessary for fast, flexible and competitive changes in the production process, and as offering advantages such as the close monitoring of production and circulation processes. Technological linkages, networking, information and material exchange help to accelerate the pace of innovation. There is an emerging "interdependence which relates space to technological change in a very intricate way" (Moulaert and Swyngedouw, 1989).

Other schools of thought address the question of geographical concentration more explicitly. The explicit explanations can be categorized into three groups: social boundedness, agglomeration economies, and transactions costs.

Social boundedness

The Florentine school tends to suggest that because industrial districts are inherently social systems, that they are "bounded" by "natural" and "historical" features, defining common social characteristics, shared values and community (see for example, Becattini, 1990). As such, the geography of a given productive complex can only extend as far as the homogenous social system in which it is situated, acting to spatially constrain the industrial district. Virtually all of the "new orthodoxy" approaches have cited shared local values, rules, customs, etc. as a fundamental component of the industrial district. This concept overlaps with an agglomeration economies explanation, in that they both would include elements such as local institutions.

Agglomeration economies

Many explanations of geographical clustering in post-Fordist production complexes rely (implicitly or explicitly), on the concept of agglomeration economies. This includes Marshall's "industrial atmosphere", to the flexible specialisationists' emphasis on cooperation and institutions, the California school's emphasis on the institutional and cultural context, and Storper's "untraded interdependencies". Much of the literature merely cites examples of different types of agglomeration economies as being important to the industrial district, and the concept is treated rather vaguely.

If we are looking to explain spatial clustering it is useful to address the definition of the concept. Bellandi returns to Marshall's original work, to make an important distinction between "external economies", and "agglomeration economies", which are often taken to mean the same thing (Bellandi, 1990; Phelps, 1992). External economies relate to the general development of the industry, the development of the division of labour and inter-firm linkages, which derive from processes of externalization, remaining silent on the question of spatial clustering. Agglomeration economies, on the other hand, are benefits to production that result specifically from spatial clustering, from the existence of shared institutions other social or economic infrastructure (roads, airports), or as a result of improved interaction within a confined area, or other benefits of specifically localised production[14]. Bellandi cites three cases in particular in which agglomeration economies come into play, with respect to transaction, skill, and innovation. Transaction costs are reduced by agglomeration; skills and learning are spread through formal and informal interaction, and specialised local institutions; and innovation is supported by formal and informal information flows, contacts and institutions. Storper's

14 Though Scott (1992) suggests that where there is spatial agglomeration, external economies resulting from a social division of labour are transformed into and consumed as agglomeration economies.

(1994) concept of 'untraded interdependencies', for example (which includes labour markets, institutions, rules, values, etc.), is invoked to explain cases of clustering in technology districts in the absence of direct inter-firm linkages, is really just a particular sub-set of agglomeration economies.

Clearly, the post-Fordist era is said to mean the revival of the role of agglomeration economies. Under a Fordist regime, agglomeration economies were rendered obsolete, as production functions were internalised within the self-contained, vertically integrated, mass production organisation (Perrons, 1981). Now, as production vertically disintegrates and fragments, agglomeration economies move into centre stage (though this underlying point is made more implicitly than explicitly in the literature), and production necessarily becomes more place-bound.

Transactions allow external and agglomeration economies to be harnessed in production, serving to reintegrate an otherwise fragmented production system. This places an new emphasis on transaction costs.

Transactions costs

Perhaps because the California School addresses the question of spatial concentration most directly, it has attracted the most criticism. Though the California School adopts the macro-economic analysis of the Regulation School, it combines this approach with a micro-economic explanation of spatial clustering which focuses on transaction costs as the main explanation for agglomeration. Scott's approach is criticised on both fronts.

The neo-classical, microeconomic approach is attacked on the basis that it is an individualistic methodology that "...excludes from analysis those class and other social relations which are the preconditions for the atomistic choice it examines" (Lovering, 1990: 163). And while Scott notes the role of national governments in bringing about the restructuring of the regime of accumulation and a new mode of regulation, these elements are under-emphasised and do not form part of the theory. Scott's approach amounts to an ahistoric model which limits the ability to analyse the firm as a social organization, and does not allow us to interpret "empirical outcomes as complex and mediated expressions of 'strategies' intended to achieve goals" (Lovering, 1990: 164).

The link made by Scott between increasing market uncertainty and vertical disintegration is also challenged. Critics suggest that there is no *necessary* relationship between increasing uncertainty and declining internal economies of scale, and therefore no link to the externalisation of production that Scott suggests follows. "Whether uncertainty translates into rising or falling internal economies of scale therefore depends on the context of economic practices and institutions" (Lovering, 1990: 162).

Neither does a transactions costs approach seem to fit with the market framework of the post-Fordist regime in which it is situated, and in which competition takes place not only (or even primarily) on the basis of cost, but instead with respect to factors such as product quality or customisation, and time-based competition (see e.g. Gertler, 1992, 1994). While a transactions cost minimization explanation may have held some sway in the context of a Fordist regime in which competition was based primarily on achieving low cost through long production runs, in the post-Fordist context it seems a weak rationale for spatial clustering.

Sayer (1989) addresses the further link made by Scott between vertical disintegration, the development of inter-firm networks and localised agglomeration, critiquing the California School's "current blend" of Marxist and transactions cost analysis. He argues that vertical disintegration may in fact include vertical integration, if the actual organisational forms are examined. Firms that look vertically integrated (many divisions under one ownership) may in fact be very weakly organised, while firms under separate ownerships (vertically disintegrated systems) can have either weak or strong organisation. The key variables are how the market is used, how far prices govern relationships, etc. Sayer proposes that what we may be seeing is a rise in "vertical organisation", including both vertical integration and vertical disintegration.

Sayer's critique of a transactions costs approach is that "...it offers a largely unidirectional explanation, from cost patterns associated with markets and production processes to organisational forms - disintegration or integration" (1989: 679). He argues that the opposite direction of causality is often present: organizational forms are to some extent the creator of cost patterns. Similarly, the need for spatial proximity may be a function of productive organisation rather than a cause of it. The spatial organisation of any industry is influenced by pre-existing spatial forms. Neither can transactions costs explain the vastly different organizational structures within the same industries in different countries. Furthermore, as a static theory, transactions costs cannot take into account the development and maintenance of routines of knowledge and learning on which firms' longer term survival depends.

The linkages made by Scott between vertical disintegration and localisation are also a source of question. Critics argue that even if it can be shown that agglomerated forms are the result of the same general forces (that is, that they are not the result of contingent relations, and this is questioned), there is no necessary link between externalisation and localisation: "...there is no *necessary* reason as to why activities externalised by firms ... will be farmed out to the *local* suppliers" (Phelps, 1992: 40, emphasis added).

Other critiques focus on other aspects of the California School's emphasis on transactions cost as an explanation of localisation, arguing a number of points:

- this proposition applies only in instances of perfect competition which rarely obtain in reality;

- the type of empirical analysis undertaken does not and cannot support a transactions cost approach;
- that transportation costs are a small and declining cost of production and therefore not a powerful explanation of localisation (Phelps, 1992).

Finally, if, as Becattini and others suggest, transactions between firms in localised production complexes are not purely market transactions, but are socially mediated, how can a neo-classical economic approach explain them and the resulting spatial patterns?

According to the approach most recently espoused by Storper (1994), relying on evolutionary economics, agglomeration can be explained not just by economic factors such as the minimisation of transaction costs, knowledge spillovers and externalities, but also by technological factors (the need to avoid "lock-in" to a particular technology in a constantly emerging field and to retain flexibility, primarily achieved through production networks, based on elaborate and shifting inter-firm and inter-unit divisions of labour. His recent approach stresses the role of a third category of behavioural factors, the untraded interdependencies that include qualities of transactions and technological learning.

In short, although it is the most direct and precise explanation offered in the literature, the concept of transactions costs minimisation seems to be inadequate in explaining spatial clustering under a post-Fordist regime. In particular, it fails to demonstrate the necessity of spatial clustering, which would reinforce the argument made by the critics of the new orthodoxy, that industrial districts are the result of contingent factors like those that are contained in the "social boundedness" explanation.

6. THE URBAN AND REGIONAL IMPLICATIONS OF POST-FORDISM

While in the historical literature, industrial capitalism and urbanisation are clearly and strongly linked, with a wealth of empirical evidence upon which to draw, the (albeit younger) literature on post-Fordism has almost entirely sidestepped the issue of the relationship to cities, the urban system, and patterns of urbanisation. The same applies at the level of regions, and to patterns of uneven development in general. If the allegations of a new regime of accumulation are true, and if that regime has characteristics that are in many ways the antithesis of the Fordist regime, it would only seem reasonable to expect that not only would the pattern of territorial development be fundamentally and dramatically transformed, but that cities and regions take on a whole new centrality in larger processes of economic development. Such outcomes therefore have highly significant broader implications.

We would expect, for example, that some of the major observed patterns and tendencies associated with Fordist urbanism and regionalism would be transformed. These include:

- ongoing centralisation and urbanisation;
- suburbanisation and de-industrialization of the inner city;
- top-down relations of dominance in the urban hierarchy;
- rank-size stability in the urban hierarchy;
- relations between market size, production scales and cities in the urban hierarchy;
- core-periphery relationships between regions; and
- patterns of regional growth and decline.

The post-Fordist literature does not directly address these kinds of issues, although it is interesting to note that the "clean break" involving the reversal of long-standing urbanisation patterns begins at the same time as the start of the transition to post-Fordism.

The current post-Fordist literature, to the extent that it addresses issues of this kind, consists of many ambiguities and contradictions: Does post-Fordist urbanism represent a pattern of even or uneven development? Is it a metropolitan or non-metropolitan phenomenon? What are the implications for hierarchical relationships between regions or within the urban hierarchy? What is the relationship between industrial districts and regions?

In order to answer these questions, we need to understand the dynamic of urban and regional change, within the context of the relevant regime of accumulation. This cannot be achieved in the abstract; a detailed understanding is required of the territorial organisation of production, labour process, internal and external organisation of production, and types of inter-firm linkages in order to better comprehend spatial outcomes. This is what the following case studies attempt to do.

PART II

INDUSTRIAL DISTRICTS IN THE THIRD ITALY

CHAPTER THREE

THE EMILIAN ECONOMY AND INDUSTRY

1. INTRODUCTION

Part II of the thesis presents the empirical evidence, which consists of three case studies, each of a different industrial district. In this chapter, the case study approach and methodology are briefly outlined in Section 2, and the context for the individual case studies is set in Section 3 with a brief overview of the evolution of industry and the urban/regional system in Emilia-Romagna. The individual case studies then follow in Chapters Four, Five and Six.

2. THE CASE STUDIES

Approach

Following the approach of Massey (1984), Scott (1988a, 1988b) and many others, the division of labour is seen as central to understanding the territorial pattern of production, uneven development, the evolution of territory and patterns of urbanisation under capitalism. Massey in particular, has outlined a systematic framework which elaborates the concept of division of labour, and situates it within a broader understanding of the evolution of the industrial landscape.

Massey's elaboration of the organisational structure of capital was employed as the basis for structuring the field research which is presented in the three following chapters. The central elements of Massey's (1984) approach are:

- "economic ownership", i.e. the power to allocate investment capital;
- "possession", or control over the production process, including control over the physical means of production, and control over labour;
- the division of labour itself, that is, the degree to which production tasks are fragmented, specialised, and simplified;

- conceptualisation and execution, that is, the degree to which a worker partakes in both the conceptualisation and realisation of a product.

Although Massey employs these elements in the analysis of multi-establishment enterprises, they provide an equally useful basis for exploring the organisational structure of capital in the Third Italy. The field research addressed these elements, and in particular, attempted to identify them in a spatial and territorial context. As well, other basic and relevant aspects of the system of production were investigated, including:

- firm history
- basic firm characteristics (revenues, number of employees, export orientation etc.)
- indices of flexibility (in product and production process)
- management structures
- labour process, internal division of labour and technology
- occupational structure
- relations with other firms.

With this information uncovered, we can describe the broad outlines of the territorial organisation of production in the Third Italy.

Methodology

The case studies were deliberately selected to represent a range of products, industrial sectors, and urban centres. They are: the knitwear district of Carpi, the oleodynamic components district of Modena, and the automatic packaging machinery district of Bologna. The products include a mature, consumer product (knitwear), a relatively new industrial product with a medium level of technological content (oleodynamic components), and a more complex producer product, also with a medium level of technological content (automatic packaging machinery). Some of these products have historically been produced according to Fordist production techniques, some are currently mass produced at the same time as they are produced flexibly, and some were never produced according to a Fordist regime.

Each productive complex also centres on a different type of urban centre. The knitwear industrial district is based in Carpi, a city of 60,000 in the Province of Modena (Figure 3.1). The oleodynamic components district centres around Modena, the capital of the Province of Modena, and a city of 180,000. The automatic packaging machinery example is focused around Bologna, the urban centre and capital of the region of Emilia-Romagna, and a city of approximately 500,000. By structuring the research in this manner we can isolate the potential effects of city size on the territorial organisation of production, and the general relationships between industry, city size and urban hierarchy.

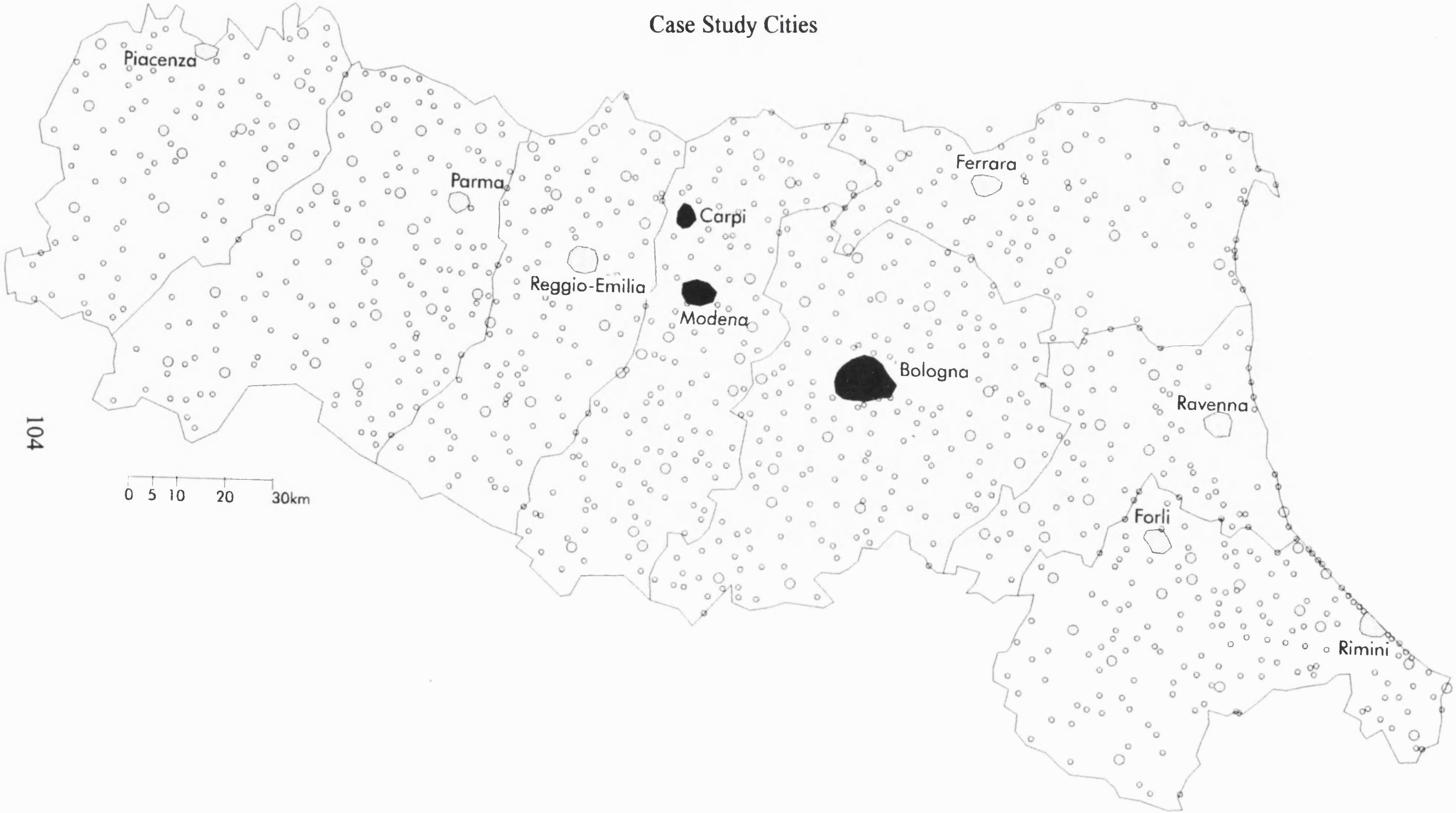
The districts are comprised of many clustered firms, which generally fall into two types: the lead firm or "*casa madre*", which has the direct relationship with the market, and subcontractor firms, which will generally be referred to herein as the "network firms". One *casa madre* was selected in each district for interview, as well as a selection of firms that make up its production network.

Intensive interviews were held with the key agents of the *case madri* and with the contacts they provided for the firms in their respective networks. For smaller firms, the key person was always the owner-manager. With the *case madri*, the owner-directors were interviewed for Oil Control and IMA, as well as IMA's Director of Production. For Carma, the Director of Production was interviewed. The field research was conducted between March and July of 1988.

An intensive interview process was necessary in order to obtain detailed qualitative and quantitative information regarding the internal organisation of the firms, their external relationships with other firms, as well as to establish a level of trust necessary to obtain more detailed information on the networks

Figure 3.1

Case Study Cities



themselves. A standard set of questions was asked of each firm, with the exception of some minor variations necessary between the *case madri* and the network firms. The outline of the questionnaire is contained in Appendix 1, and a list of interviews is contained in Appendix 2.

3. EVOLUTION OF THE EMILIAN TERRITORY OF PRODUCTION

Emilia-Romagna is an administrative "region" located in north-east central Italy, with the region of Tuscany and city of Florence immediately to the south, and Veneto, the city of Venezia, and Lombardy at its northern border (see Figure 3.2). The region stretches from Piedmont to the east, to the Adriatic coast at its western edge.

The region consists of eight provinces, each with their own capital city, which together constitute the major cities of Emilia-Romagna. In turn, the provinces are each comprised of *communi* (municipalities). The municipalities generally correspond with the boundaries of the major cities, but outside of these areas, the *communi* are generally comprised of several towns and villages.

Despite its modest area (22,000 sq.km.) the internal geography of Emilia-Romagna is diverse. The Appenine mountains stretch east-west along its southern edge, known as the 'mountain region'. Extending along the base of the mountains, is the "*pedemontana*" (foot of the mountain) region; this is the location of the via Emilia, an ancient Roman road that stretches from Piacenza to the Adriatic coast, and which forms the major transportation axis of the region. The lower regions of the Adriatic coast stretch from the river Po in the north to Cattolica at Emilia's southern edge, including the Ferrarese basin. The remainder of the Region is comprised of the *padana* or plain, which is its highly productive agricultural heartland.

Figure 3.2

Emilia-Romagna in Context

The pre-industrial era

Indeed, agriculture has historically been the defining activity in Emilia-Romagna. In 1901, 65% of all regional employment was in the agricultural sector (Table 3.1).

Table 3.1

Employment by Sector, Emilia-Romagna (%)

	1901	1951	1971	1981
Agriculture	64.6	51.8	20.0	13.4
Industrial	19.9	25.2	42.6	38.1
Services	15.5	23.9	27.4	48.5
Total	100	100	100	100

Source: Istat, quoted in Capecchi, 1990.

The organisation of agriculture in Emilia-Romagna took a distinctive form. In 1901, about 40% of those working in agriculture were waged workers (farm hands or labourers). The remaining 60% was comprised of workers on contract as share croppers (*mezzadri*), or on rented land, or were small farm owners (Capecchi, 1990). Thus a significant part of the resident labour force had some entrepreneurial experience, a factor which is often cited as playing a key role in the later, distinctive evolution of the Emilian economy (e.g. Fuà, 1985).

Though agriculture was the cornerstone of the regional economy, industry still had a steady presence, with the flowering in the 18th century of industries such as silk and hemp processing. Some of the current-day industrial districts can be dated back as early as the 1500s. Carpi, for example, was historically a woodworking centre, which led to a capability in straw braiding, and then a specialisation in the manufacture of straw hats. Sassuolo, a current centre for ceramic tile and tile production machinery, also had its roots in the 1500s, as a centre of pottery. The expansion of non-agricultural activities faced many obstacles, however, and industry was initially slow to grow. In the 40 years between 1861 and 1901, industrial employment grew by only 13,000 (Tassinari, 1986) (Table 3.2). Nevertheless, by the turn of the century, industry accounted for 20% of employment, or about 266,000 active workers (Capecchi, 1990).

Table 3.2

Industrial Employment in Emilia-Romagna[15]
(000s)

	1861	1901	1911	1927	1937-40	1951	1961	1971	1981
Population active in industry	253	266	336	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Industrial Employment	n.a.	n.a.	146	191	264	209	355	461	466

Source: Istat, quoted in Tassinari, 1986

The Emilian urban system was characterised by a highly developed, polycentric urban pattern, with the main cities oriented along the via Emilia. The pre-industrial urban system included many smaller towns and villages, evenly distributed across the region in almost perfect Christaller formation, but particularly in the northern half of the region, in the flat, agricultural, plain. These towns and villages acted as agricultural market centres, as well as residential areas for the farming population, where a high proportion of the labour force engaged in agriculture was not incompatible with an urban way of life. In addition to this base of small agricultural towns and villages was a layer of larger cities, which originated as the administrative centres for the small duchies and Papal states which existed prior to unification in

15 The source for this table is Tassinari (1986), who is quoting ISTAT data. The larger numbers in the first row seem to be the result of a demographic census, and would reflect total resident population active in industry, ie. including residents of Emilia-Romagna employed in industry outside the region. The smaller numbers in the second row are the results of an industrial census, and represent jobs in the region.

1861(Bianchi and Gualtieri, 1990). The city of Modena, for example, was the capital of the duchy of Modena, as was Parma the capital of the duchy of Parma (King, 1987).

The beginnings of industrial growth: 1900 to World War I

The beginning of the 20th century in Italy saw the takeoff of a belated process of industrialisation, which was particularly pronounced in the north-west and centred on the Genoa-Milan-Turin triangle. The effects of industrialisation were also felt in other regions, however, including Emilia-Romagna, where the population active in industry increased by 70,000 in the first decade of the century (Tassinari, 1986). While this represented a significant industrial expansion, with a ratio of industrial employees to resident population of 52 per 1,000, Emilia Romagna still lagged significantly behind the rapidly industrialising centres of Milan and Turin, with ratios of 200 and 127 per 1,000 respectively (Tassinari, 1986).

The process of early industrialisation grew out of the existing strengths and activities in the region, in particular its agricultural base. Food processing and related industries constituted the largest share of employment, at 16% in 1911 (Tassinari, 1986). Other key industries included agricultural machinery and motors, metalworking, and machine tools. These industrial specialisations were not in sectors which characterised the major thrust of industrial development in Italy generally, that is the electric, chemical, iron, and textile sectors.

The First World War reinforced the industrialisation of Emilia-Romagna, and created new centres of production between Reggio-Emilia and Bologna. In particular, the mechanical industries were strengthened, becoming the largest sector in terms of employment by the end of the 1930s, accounting for 49,000 workers (Tassinari, 1986). Even in the first half of the 20th century, the Emilian mechanical sector was characterised by customisation and flexibility, and in Bologna, for example, the majority of industries were oriented towards the production of custom-made machinery or the production of prototypes of automobiles or racing motorcycles (Capecchi, 1990).

As Figure 3.3 shows, even in the first decades of the 1900s the region was highly urbanised, with the 10 communes along the via Emilia accounting for some 26% of total regional population (Fregna, 1985). Figure 3.4 indicates the distribution of population in Emilia-Romagna in 1927.

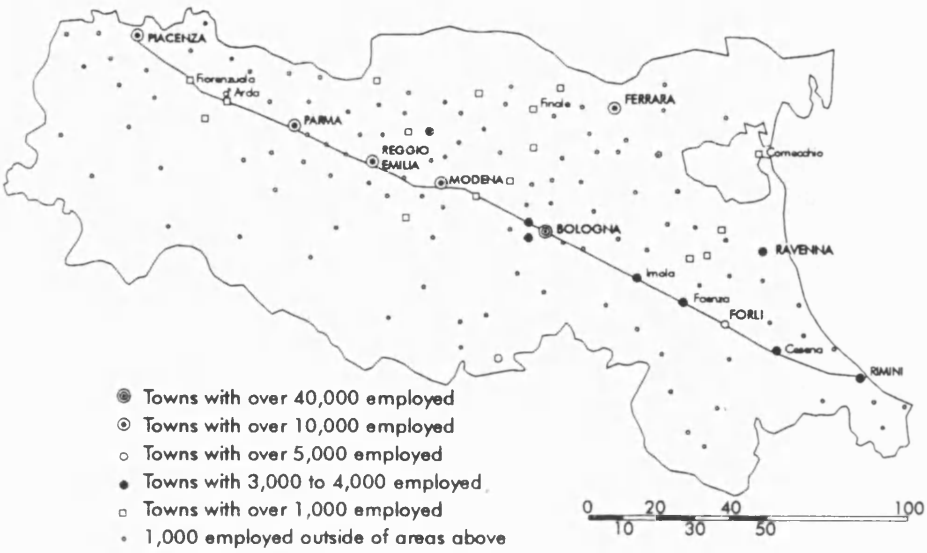
Industrialisation during this period was overwhelmingly an urban process, which was particularly focused on the provincial capital cities. The distribution of industrial activity in the first quarter of the 20th century is shown in Figure 3.5. Again, we can see a strong orientation along the via Emilia, as well as in the provincial capital cities of Ravenna and Ferrara. Carpi is shown as having a significant concentration in wood industries, the precursor of its later evolution into knitwear. By the end of the 1930s, the eight provincial capital cities accounted for 112,000 industrial workers (Tassinari, 1986).

The boom period: 1950-1971

After overcoming some problems in the immediate post-war period (such as converting the industrial apparatus back to non-military activities), the Emilian industrial system had by 1951 recovered its pre-war levels of agricultural and manufacturing production. The region, along with the rest of Italy, was poised for a period of intensive industrialisation and economic expansion that was particularly pronounced in the 1950s, but which continued apace through the 1960s. Industrial employment increased from 209,000 in 1951 to 355,000 in 1961, an increase of 146,000 (Tassinari, 1986). In Emilia-Romagna, per capita output increased by 84% in real terms between 1951 and 1960, compared to a national average of 63% (Tassinari, 1986).

Figure 3.3

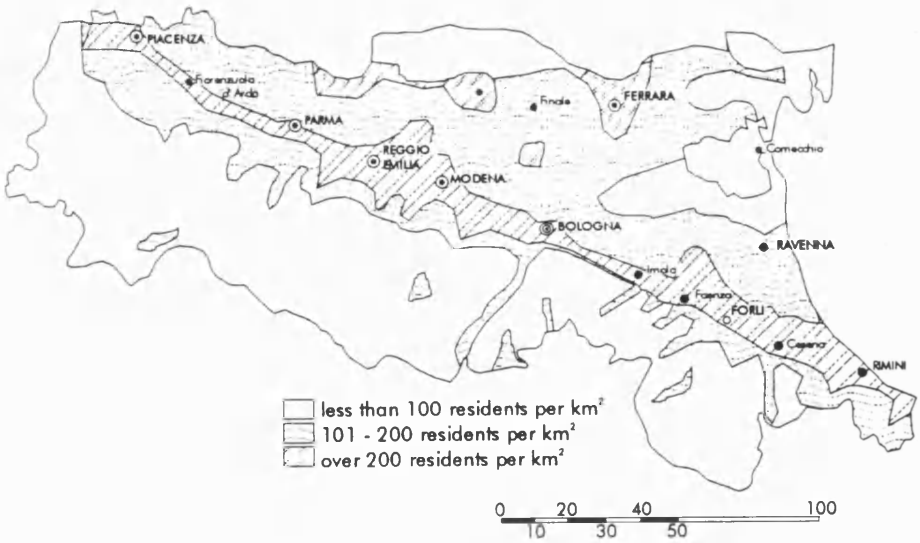
The Emilian Urban System in 1927



Source: Fregna, 1985.

Figure 3.4

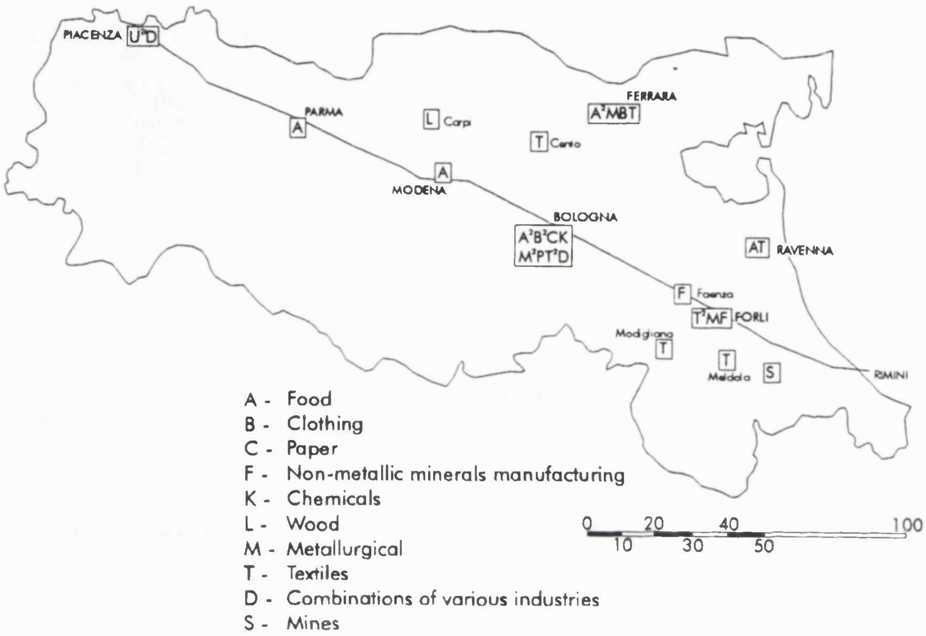
Population Density of Emilia Romagna, 1927



Source: Fregna, 1985

Figure 3.5

Distribution of Industrial Activity
Sectors with more than 250 workers, Emilia-Romagna, 1927



Source: Fregna, 1985

It was thus during this same period of bounding industrial productivity that Emilia-Romagna's transformation from an economy that was still dominated by agriculture (which accounted for 52% of employment in 1951 (Table 3.1)) to a predominantly industrial region took place. The reasons given for this rapid expansion are many, but some suggest that the explosion in productivity can be attributed to the prior dominance of backward technologies (Tassinari, 1986). Other explanations for the rapid industrial expansion include high profit levels deriving from low wages, and the rapid increase in exports. Industrial sectors which underwent particularly spectacular expansion included the metal-mechanical sector, in which 60,000 new jobs were created, chemicals (14,000 new jobs) and textiles 22,000 new jobs (Tassinari, 1986) (Table 3.3[16]).

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16 ISTAT manufacturing categories have been changed in every industrial census period since 1951, making long term sector comparisons difficult. Table 3.3 attempts to be as consistent as possible in showing grow for individual sectors.

The process of industrialisation was not one of productive decentralization from other regions, but continued to be linked with the region's agricultural foundations: rapid increases in agricultural productivity created a massive supply of surplus labour, as the population active in agriculture fell by 650,000 between 1951 and 1981 (Tassinari, 1986); the evolution of industrial industries directly related to agriculture (agricultural machinery, food processing, packaging machinery); and the availability of capital emanating from the agricultural sector for investment in industry.

This period of rapid industrialisation was accompanied by a strong process of urbanisation. While between 1935 and 1971 the population of the region doubled, the urban population grew by more than four times (Fregna, 1985). The urban boom period was the decade from 1951 to 1961 (see Table 3.4). Though the metropolises of the Italian industrial triangle also experienced an urban boom during this same period, this rapid growth can be attributed to migration from the rural south (the *mezzogiorno*). In Emilia-Romagna, rapid urbanisation was the result of internal migration, from the hilly and mountainous southern portion of Emilia-Romagna, the Ferrarese basin, and some depressed agricultural areas of the plain, primarily to the major cities along the via Emilia (see Figure 3.6). The pattern of urbanisation was also different in Emilia-Romagna than the regions of Piedmont and Lombardy, in that the destinations were a number of cities along the via Emilia, rather than a single central metropolis as was the case with Milan and Turin. The population of the provincial capital cities increased from 1,057,000 to 1,463,000 between 1951 and 1971 (Tassinari, 1986).

Table 3.3
Employment by Manufacturing Sector, Emilia-Romagna

	1951		1961		1971		1981
TOTAL	208,616		352,713		461,990		465,974
Food and related	34,755	Food and related	51,486	Food and related	49,620	Food	35,109
						Beverages and Tobacco	17,525
Tobacco	3,620	Tobacco	2,211	Tobacco	1,670		
Leather	1,215	Leather	3,273	Leather	3,760	Leather	6,399
Textiles	11,666	Textiles	24,448	Textiles	34,770	Textiles	39,602
Clothing	33,435	Clothing	45,785	Clothing	48,360	Clothing	52,719
Wood	21,421	Wood	34,793	Wood	36,010	Wood	37,258
Paper	3,567	Paper	4,967	Paper	5,856	Paper, printing, publishing	20,600
Printing/Pub.	4,596	Printing/Pub.	6,913	Printing/Pub.	10,246		
Photographic etc.	694	Photographic, etc.	1,304	Photographic etc.	1,721		
Metallurgical	1,263	Metallurgical	1,962	Metallurgical	4,990	Metal products	74,828
Mechanical	59,085	Non-electrical machines	49,855	Mechanical	158,180	Machines and mech. materials	96,481
		Mechanical workshops	42,931			Office machines/ computers	879
		Electrical/tel.	8,297			Electrical/ Electronic	31,067
		Precision mechanics	4,710			Precision mechanics	6,218
		Transport	8,946	Transport	15,380	Autos	13,168
						Other trans.	9,488
Non-metallic minerals	18,832	Non-metallic minerals	32,833	Non-metallic minerals	53,840		
Chemicals	10,113	Chemicals	17,670	Chemicals	16,970		
Rubber	1,848	Rubber	3,421	Rubber	3,767	Rubber and plastics	18,033
		Plastic objects	3,189	Plastic objects	9,758		
		Synth. fibres	1,556	Synth. fibres	2,137		
Misc. Mfg.	2,506	Misc. Mfg.	2,181	Misc. Mfg.	4,904	Misc. Mfg.	6,600

Source: ISTAT, Censimento Generale dell'Industria e del Commercio, 1951-1981

Table 3.4

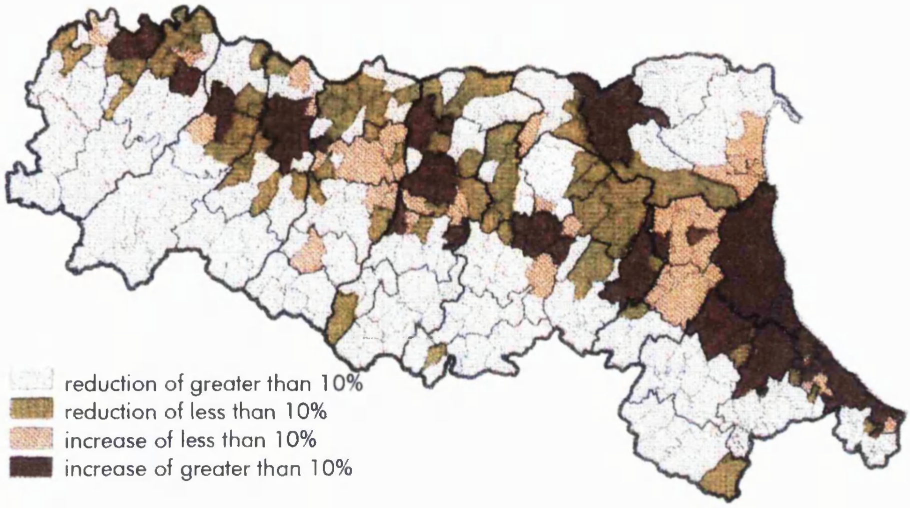
Post-war Urban Growth
(Resident Population)

	1951	1961	1971	1981
Piacenza	72,856	88,541	106,461	108,177
Parma	122,978	141,203	174,655	176,750
Reggio-Emilia	106,726	116,445	128,844	129,893
Modena	111,364	139,183	171,063	179,933
Bologna	340,526	444,872	490,036	455,853
Forli	77,508	91,945	104,892	109,815
Ravenna	91,798	115,525	131,878	137,597
Ferrara	133,949	152,654	153,119	150,265
Milan	1,274,245	1,582,534	1,724,173	1,634,638
Turin	719,300	1,025,833	1,167,968	1,103,520
Genoa	688,447	784,194	816,872	760,300

Source: ISTAT, Annuario Statistico Italiano, 1962, 1972, 1982

Figure 3.6

Internal Migration, 1951-1971, Emilia-Romagna



Source: Avellini and Palazzi, 1980.

The 1970s to 1980s

For Italy, like the rest of the industrialised nations, the 1970s was a period of extreme economic turbulence, which included "stagflation" as well as rising unemployment levels. The effects of the more generalised upheaval were not felt evenly across Italy, however. The north-west saw the lowest levels of growth in value added for industrial activities, and a drop in employment of about 5% in the manufacturing industries (Tassinari, 1986).

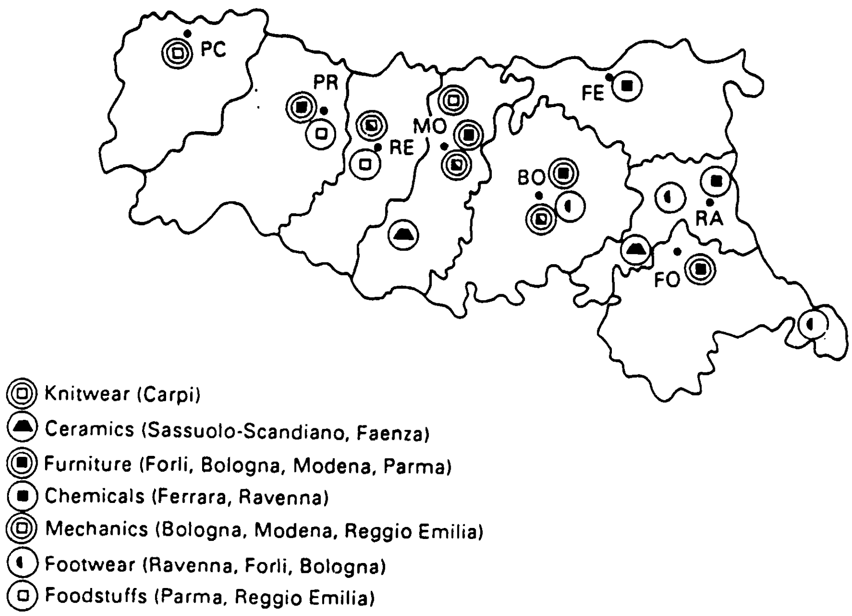
During this period, the region of Emilia out-performed the nation as a whole economically. Value-added increased 46% between 1971 and 1981, compared to 33% for Italy (Tassinari, 1986). This continued economic expansion was felt across all sectors of the regional economy, but was particularly strong in manufacturing, which increased its share of total regional output from 31% to 35% during the same period (Tassinari, 1986). This was related to ongoing improvements in productivity, which exhibited an average annual increase of 4.3% between 1971 and 1981 (Tassinari, 1986). Labour participation rates in Emilia-Romagna were 8% above the national average, while unemployment rates, at 7.3%, were notably lower than the national level of 14.8% (Tassinari, 1986).

The reasons for this sustained, above-average economic performance, particularly in times of more generalised economic upheaval, are of course the subject of considerable debate. Much of the discussion, not surprisingly, focuses on the distinctive manner in which production is organised in Emilia-Romagna, for it is this feature which most distinguishes the Emilian system of production from others. Though this will be discussed and illustrated in detail in the case studies, in general, the so-called "Emilian model" of production is characterised by production that is disaggregated by phase or phases, with each phase taking place in a small firm or firms, which form networks and cluster together geographically to form specialised industrial districts. There are several such districts in the Third Italy and Emilia-Romagna, producing products such as knitwear, automatic packaging machinery, ceramics, motorcycles, textiles, clothing, jewellery, instrumentation, oleodynamic components, biotechnology, etc. Figure 3.7. shows the results of one attempt to identify these districts in Emilia-Romagna.

In this period, the ongoing industrialisation continued the trajectories that had already been established, especially in terms of the sectoral composition of industry. Regional industrial specialisations included the metal-mechanical sector (including mechanical machines and equipment, other metal products - primarily industrial machine tools and agricultural machinery), food products, ceramics, and knitwear. Most of these sectors were export-oriented, and as a result, Emilia-Romagna was in 1981 the third most export-oriented region in Italy, behind Lombardy and Piedmont (Tassinari, 1986).

Figure 3.7

Industrial Districts in Emilia-Romagna



Source: Bianchi and Gualtieri, 1990.

These regional distinctions came to be recognised as defining a characteristically different type of productive system which fell into neither component of the dualistic core-periphery model that had been used to describe the Italian economy. While Emilia definitely shared little with the relatively under-industrialised south or "*mezzogiorno*", neither was it fundamentally similar to the industrialised northern triangle framed by Milan, Turin and Genoa. In the late 1970s, attention was drawn to the unique economy of the economic region which bridged the north and south. *La terza Italia* or the "third Italy", which included Emilia-Romagna, Tuscany, and the Marches, was recognised as a distinct region unto itself (Bagnasco, 1977).

Despite the fact that the pattern of urban growth in Emilia-Romagna was polycentric in nature compared to urbanisation in the north-west, which focused on a single regional metropolis, there were still marked territorial differentiations at the intra-regional scale. Industrial employment was focused on the three central provinces of Reggio-Emilia, Modena and Bologna, which together accounted for 60% of regional industrial jobs (Tassinari, 1986).

However, the most significant geographical differentiation does not take place on the basis of provinces, but, first, according to the various internal sub-regions of Emilia identified earlier (mountains and hills, mountain base region, the plain), and, second, according to an urban/rural dimension. The areas of industrialisation have been those located along the base of the mountains and the via Emilia, between Parma and Imola, including some areas of the plain in Reggio-Emilia, Modena and Bologna. But within these areas, the major focus of development has been on the provincial capital cities, forming industrial "rings" around the cities, while in other cities, there have not been signs of industrial agglomeration on a large scale (Tassinari, 1986). In Bologna, however, industrial activities have spread into the mountain regions, along the major autoroutes south to Florence. In other provinces, the mountain zones by and large have been left out of the industrialisation process (Tassinari, 1986).

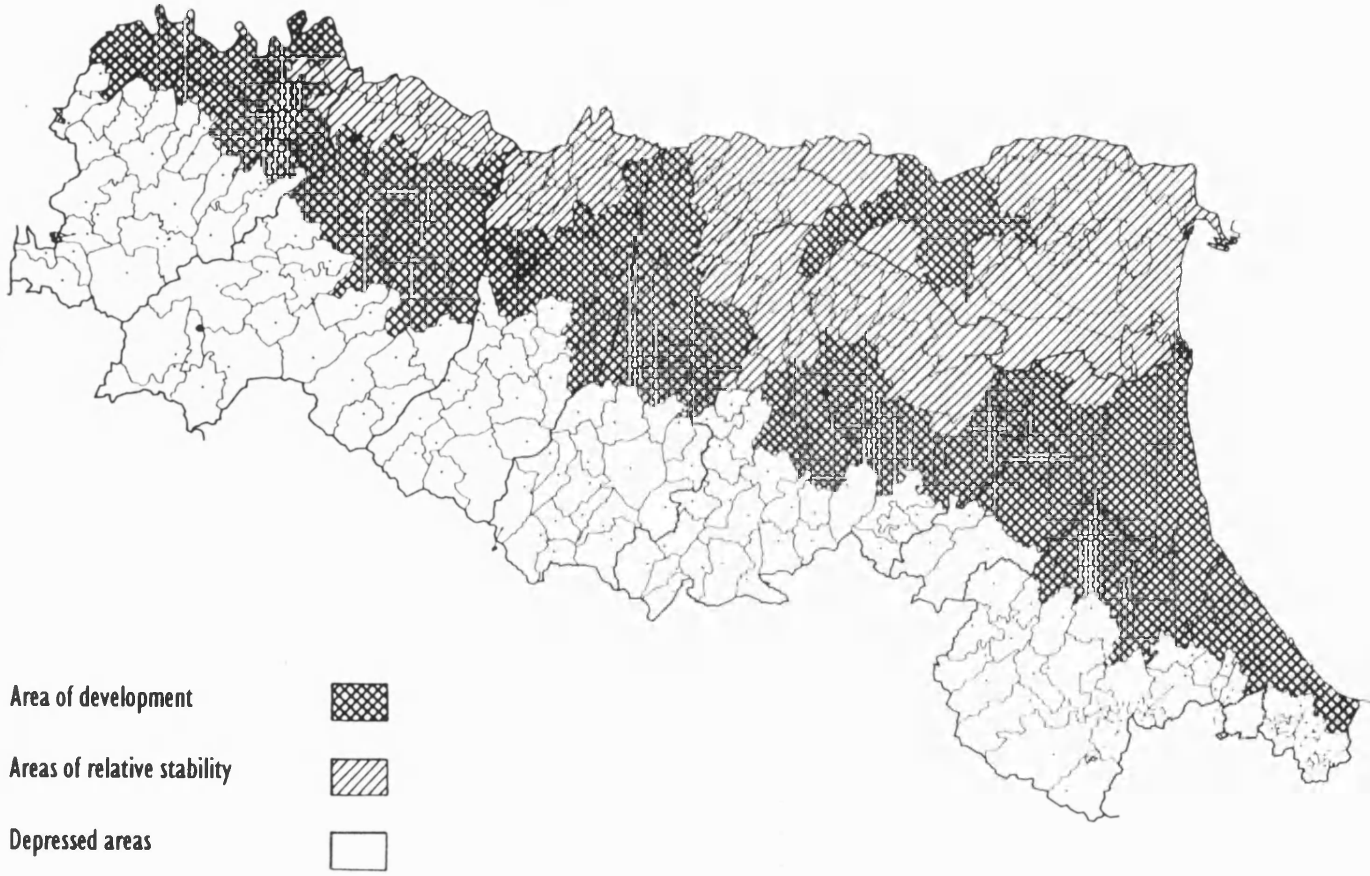
By the 1980s, however, the process of industrialisation and the concomitant growth of the provincial capital cities was giving way to the tertiarization of these urban centres, with the locations for industry moving from the urban centres proper, to the immediate fringes ("*circondario*"), to the peripheries, and finally to the mountains and low plain areas (Tassinari, 1986). There can be said, therefore, to have been two phases to territorial development: a first phase which ended around 1970, in which industrialisation proceeded directly with urbanisation of the major capital cities, and a second phase in the seventies and eighties in which industrialisation continued, but adopted a more diffuse pattern, less focused on the cities proper, and more on their immediately surrounding areas and fringes, smaller surrounding centres, and transportation routes (Tassinari, 1986). This pattern of suburbanisation and exurbanisation can be attributed to pressure from service industries competing for central city space, the need for large industrial premises, and local planning incentives to relocate industry to surrounding towns. This is not to say that the capital cities ceased to played a major role as industrial centres; in 1981, there was still industrial employment of 155,000 in the eight capital cities, or 27% of regional industrial jobs (Tassinari, 1986).

Several studies have revealed significant intra-regional variations in levels of development in Emilia-Romagna. One such study revealed three distinct groups of areas, which tended to form sub-regions: I) the depressed areas, which coincided with the hill and mountain regions; ii) the areas of economic and demographic development, situated along the base of the mountains and the via Emilia, as well as in the poles of Ravenna, Ferrara, Carpi, Sassuolo, the plain north of the via Emilia, and the Modenese hills; and iii) the areas of relative stasis; including the Emilian plain (Montanari, 1972, referred to in Truffelli, 1983) (Figure 3.8).

Subsequent studies have confirmed these findings, for example, that of Monti et. al. (1979), who found four sub-regional areas: I) large urban centres, rings and industrial centres; ii) zones of transition and developed agricultural or tourist areas; iii) zones of average depression; and iv) zones of maximum depression (Figure 3.9). A general conclusion of this stream of research was that all the areas of major depression were localised in the mountain areas, especially in the western reaches, versus a clear zone along the via Emilia (Truffelli, 1983). It was also concluded, however, that a major dimension of uneven development occurred on the basis of urban versus non-urban places (Truffelli, 1983).

Figure 3.8

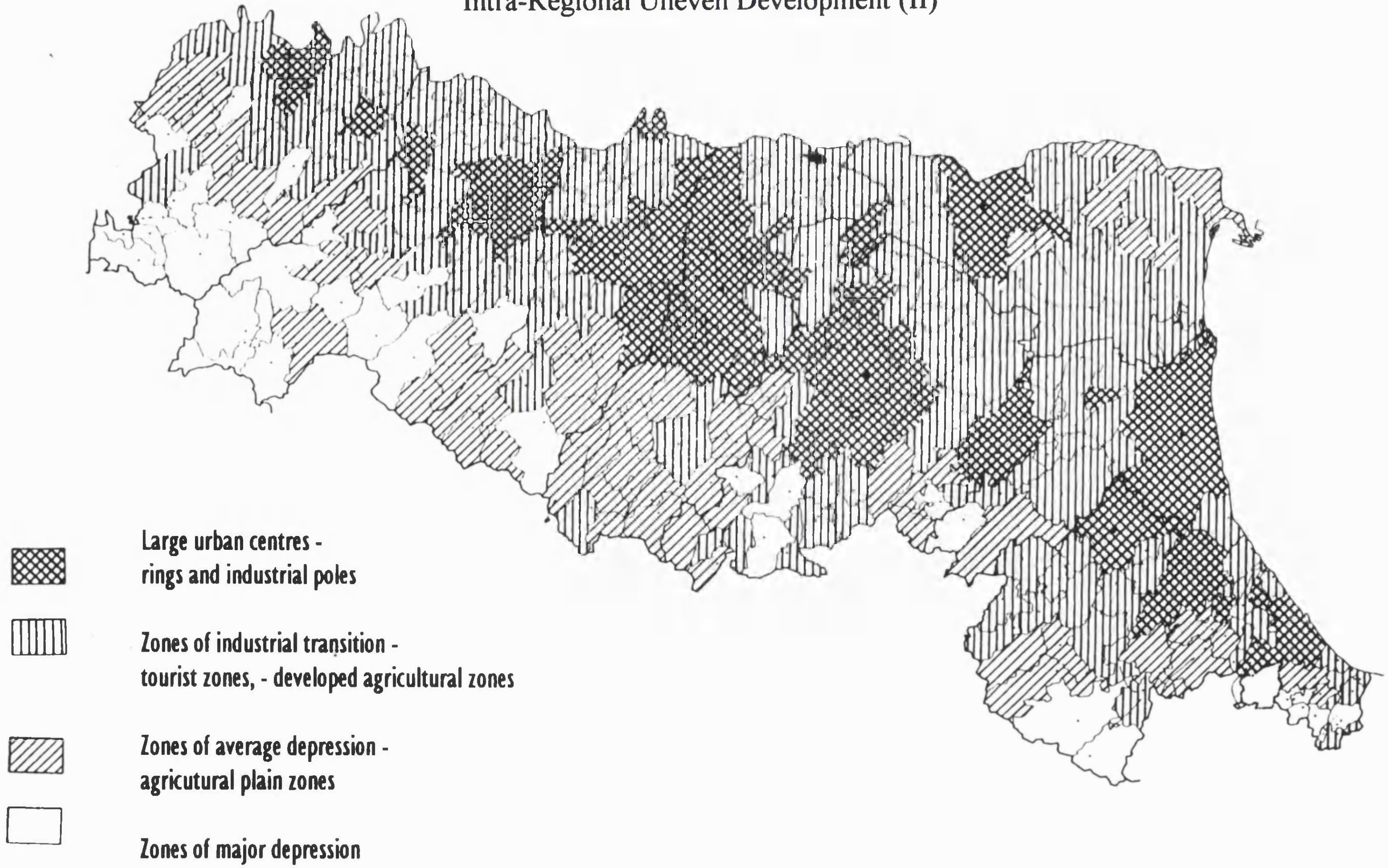
Intra-Regional Uneven Development (I)



Source: Montanari, 1972, reproduced in Trufelli, 1983

Figure 3.9

Intra-Regional Uneven Development (II)



Source: Monti et al, 1979, reproduced in Trufelli, 1983.

In Italy, the 1970s saw a dramatic turnaround in the trend toward urbanisation; every major northern centre lost population during this period[17]. This corresponded with a period of industrial decline, in which Milan lost 30% of manufacturing employment, and Turin 25% (Campos Venuti, 1986). A notable exception was Bologna. A slight increase in the number employed nationally in manufacturing in this decade was mainly attributed to industrial growth in the Third Italy, especially in the small and medium-sized towns (Campos Venuti, 1986). Manufacturing employment in Bologna increased from 110,000 in 1951, to 150,000 in 1961, to 162,000 in 1971, to 173,000 in 1981 (Zangheri, 1986: 295). There was significant population growth in Emilia-Romagna in this period, but unlike the preceding decades, it was the result not of natural increase and internal migration, but of migration from other regions of Italy (Tassinari, 1986).

While in Emilia-Romagna the two boom decades saw industrialisation distinctly related to a process of urbanisation, and in particular, growth of the provincial capital cities, the 1970s and '80s developments resulted in a tendency toward spatial diffusion of industrial activities, which have been decentralising from the cities to their rural fringes (Tassinari, 1986, p. 20).

By the 1980s, Emilia-Romagna was highly urbanised. The urban system was extremely articulated, with three main levels to the urban hierarchy: the regional centre of Bologna, the provincial capitals, and the myriad smaller towns and villages (see Figure 3.10). At a population of 450,000, Bologna was still, however, not in the same urban class as centres such as Turin, Milan or Rome. The cities and towns are remarkably evenly distributed over the territory of the region, in an almost classic Christallerian pattern.

[17] Although this decline may be overstated by statistical accounting methods, in particular, that the metropolitan areas eventually expanded well beyond the metropolitan census areas. Attempts to correct this shortcoming resulted in somewhat different outcomes: Milan was shown to have grown by 3%, but the population of Turin still dropped, albeit by 2% under the revised methodology (King, 1987: 119).

In the next chapters, the territorial organisation of production of three industrial districts in the region will be examined, so that we may uncover the dynamic of territorial evolution in the last two decades or so, the so called post-Fordist era, for which Emilian examples are often cited as evidence.

Figure 3.10

The Emilian Urban System in the 1980s

CHAPTER FOUR

LOCALISED DIFFUSION: THE CARPI KNITWEAR DISTRICT

This chapter examines the territorial organisation of production in the knitwear industrial district of Carpi. First, some background on Italian knitwear in general and the evolution of the Carpi district is provided. Section 2 examines the detailed organisation of production for one lead firm's production network: Carma S.p.a.. In the final section, the territorial aspects of the district as a whole and Carma are addressed.

I. BACKGROUND

I.I The Italian knitwear industry

The knitwear industry existed in Italy prior to World War II but in an artisan production form only, which consisted of small firms and the widespread use of homeworkers. In the 1960s, the sector expanded considerably, due to increased internal demand and exports. However, by the late 1960s, new international competitors for export markets, including those from Far East Asia, led to a fall in overall demand for Italian knitwear products. At this point, competitiveness was established on the basis of price for a standardised product, and competition from low wage countries reduced Italy's share of export markets. This was particularly true for the US export market, which in first half of the 1960s accounted for between 20 and 30% of Italian exports, but in the 70s and 80s ranged from only 1 to 7% (Maglia e Calze and SDA, quoted in Utili, 1988).

A restructuring ensued, resulting in an increase in the presence of private firms of medium to large scale, though the small firm was still predominant. In 1951, 97% of firms in the knitwear and hosiery sector had ten or fewer employees. By 1971, the same group accounted for only 86%, while the number of firms in the 11-100 employee range grew (Utili, 1988). With the restructuring, new poles of production emerged, including Emilia-Romagna, along with the neighbouring regions of Veneto and Tuscany. These areas were able to substantially increase their presence on the national scene in the knitwear/hosiery industry in the post-war period. Meanwhile, the traditional wool and cotton producing areas of the industrial north-west in particular lost substantial shares in the sector (Table 4.1). In 1981, Emilia-Romagna accounted for almost one-fifth of national knitwear employment.

Beginning in the mid 1970s, exports began to increase substantially, a trend which continued into the 1980s (Figure 4.1). By the mid 1980s the European Community constituted by far the largest export market for Italian knitwear, with 80% of exports going to EEC countries in 1984, especially West Germany and France (Maglia e Calze and SDA, quoted in Utili, 1988). The textile/clothing sector was very significant in Italy, employing well over half a million people in 1981 in over 70,000 establishments, while knitwear employment accounted for 261,000[18]. The average firm remained very small, at eight employees for the average textile/clothing firm, and six employees for the average knitwear firm (Table 4.2).

2.2 Emergence of the Carpi Knitwear District

The history of the Carpi textile/clothing district can be traced back to the 1400s, having evolved from earlier weaving industries, particularly weaving of straw. From the 1500s until the 1950s Carpi was known in northern Italy and Central Europe for its export of straw hats. The earlier straw industries permitted a stabilisation of family income by providing an alternative source to seasonal, agricultural earnings, and fostered a local entrepreneurial tradition, as well as a skilled working class (CGIL, 1988).

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18 This calculation based on ISTAT data, compiled to be comparable with the aggregation used in Bursi, 1983, for the Carpi textile/clothing sector statistics.

Table 4.1
National Distribution of Employment in the Knitwear/Hosiery Industry, 1951-1981 (percent)

	1951	1961	1971	1981
Piedmont	16.2	11.2	7.9	7.2
Lombardy	41.3	40.9	30.2	27.9
Veneto	10.4	9.2	15.2	15.5
Emilia-Rom.	9.5	15.1	17.7	18.7
Tuscany	4.9	6.4	7.9	11.4
Rest of Italy	17.7	17.2	21.1	19.2
All Italy	100	100	100	100

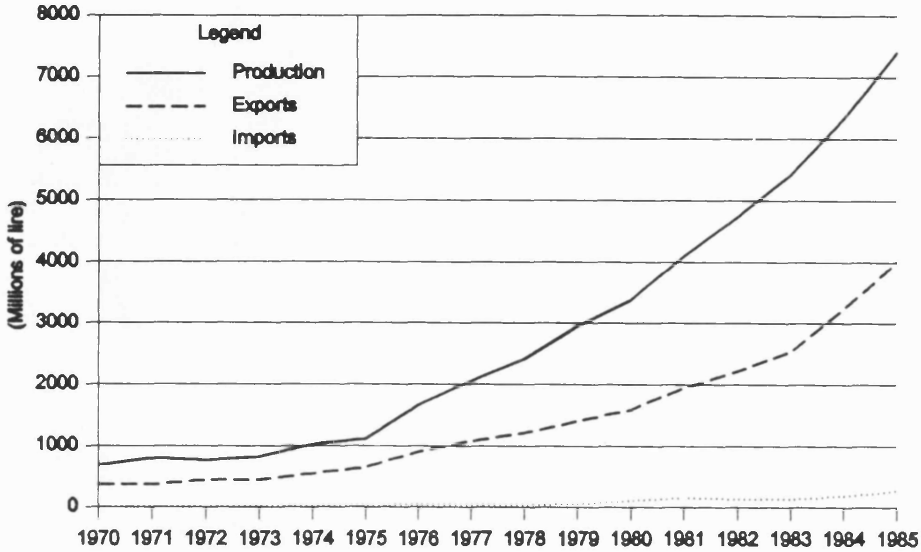
Source: Maglia e Calze quoted in Utili (1987)

Table 4.2
Knitwear Industry in Italy and Carpi, 1981

	Italy	Carpi	Carpi/Italy (%)
TEXTILE/CLOTHING			
No. of Establishments	70,717	2,425	3.4
Employment	592,161	10,250	1.7
Avg. Emp./Establishment	8.4	4.2	-
KNITWEAR TEXTILES AND ARTICLES			
No. of Establishments	43,884	1,654	3.7
Employment	261,361	6,820	2.6
Avg. Emp./Establishment	6.0	4.1	

Source: ISTAT, 1981 Industrial Census, and Bursi, 1983.

Figure 4.1
Knitwear Production, Exports, Imports
(Italy)



Source: ISTAT, Maglia e Calze, quoted in Utili (1987)

When, after the Second World War, the industry entered into an irreversible decline, the pre-existing organisational structures and commercial linkages were adopted for the new industry of *'maglietteria'* - the manufacture of standard jerseys. The *maglietteria* industry adopted the organisational forms of the straw industry, in particular, the use of homeworkers as the primary source of labour. The use of homeworkers expanded further in the 1950s, facilitating the formation of new entrepreneurs. Entrepreneurship was also a result of layoffs that occurred in the 1950s and 1960s as an anti-union maneuver (CGIL, 1988).

By the 1970s, the use of homeworkers dropped off, and the *maglietteria* industry diversified into other clothing, textiles and especially, knitwear, as the outline for the current industrial district began to take shape. This consisted of a decentralised structure of small workshops, operating as sub-contractors, specialising in a single phase of production (CGIL, 1988).

Since the 1950s there has been a substantial and steady rise in employment in the textile/clothing sector both in absolute numbers, and in the share of total manufacturing employment devoted to this sector (Table 4.3).

The Carpi industrial district in 1986 was comprised of 697 artisan firms with dependent workers, 375 industrial firms with dependent workers, and approximately 900 to 1,000 family owned and operated firms without dependents, for a total of 1,972 to 2,072 firms in the textile/clothing sector (FULTA data, quoted in CGIL, 1988)[19]. The artisan firms with dependents average about 3.9 workers per firm, while the industrial firms have an average of 15.5 workers. The overall average, based on census data, is 4.4 workers per firm. Firms are small in this sector generally, but in Carpi they are half the size of the national average (Table 4.2).

The total number of people working in the sector was estimated at 11,000, of which at least 8,500 are dependent workers (i.e. not owners) (CGIL, 1988). This means that more than one out of every six men, women and children resident in the Commune of Carpi works in the textile/clothing industry, particularly the knitwear sector, or one out of three employed workers, or one out of every two industrial workers. Note that these figures do not include the many homeworkers and other 'informal' workers. Carpi's share of national employment specifically in knit fabrics and articles is higher than its share for the textile/clothing sector as a whole[20].

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19 Some figures are available for only the textile/clothing sector, while others are available for the knitwear sector specifically, which is a subset of the former. In Carpi, however, the two are almost synonymous; in 1981, for example, knitwear accounted for 70% of all firms and workers in the textile/clothing sector in the Municipality of Carpi (ISTAT data quoted in Bursi, 1983).

20 This is a common measure of geographic concentration in a particular industry. It compares a given locality's share of national employment to its share of national employment in a given industry. If the latter is higher than the former, then a geographic concentration in that industry is said to exist. This is the approach adopted by Sforzi (1989,1990) in his identification of Italian industrial districts.

Table 4.3

Textile/Clothing Workers as a Percentage of Manufacturing Employment, Commune of Carpi, 1951-1981[21]

	Establishments	Employment	Textile/clothing workers as a % of manufacturing employment
1951	397	1,372	37%
1961	549	5,731	51%
1971	1,216	8,811	62%
1981	2,498	11,064	61%

Source: ISTAT (census data) quoted in CGIL, 1988 - Carpi

This is because of Carpi's extreme concentration of employment in the knitwear sector.

Rapid growth in exports was the primary cause behind the quick expansion of the district, and it remains strongly export-oriented. In 1986, the textile and clothing industry in the Province of Modena exported almost LIt. 950,000,000,000 (approximately £ 475,000,000 sterling) or 14.5 % of all Italian exports in this sector (CGIL, 1988). Most of these exports can be considered to come from the Carpi industrial district, and concentrated in the knitwear sub-sector. The largest markets for Modenese exports are the central European countries.

The functional area of the district includes Carpi, Novi di Modena, Soliera, Correggio and Cavezzo, but is focused primarily on the city of Modena and its immediate environs.

21 The figures presented here for Carpi are slightly higher than those presented in Table 4.2 because they include tinting and treatments, labels and other miscellaneous textile production activities not included in the earlier table.

2. THE CARMA S.P.A. PRODUCTIVE SYSTEM

In the Carpi industrial district, there are myriad systems through which production is organised. The system that will be presented below is, however, the most prevalent. In the late 1980s, only two firms in the area controlled production directly through ownership - all other major firms used indirect, network systems of production (Pagliani, interview, 1988). In basic outline, the predominant productive system consists of a '*casa madre*' or 'mother firm' which conducts all functions except production, and a network of smaller firms or artisans' workshops which undertake virtually all of the production involved. This case study examines the productive system which revolves around one *casa madre*, 'Carma S.p.a.'. This lead firm was chosen because it and its sub-contracting firm are generally representative of firms in the district as a whole. The term "network firm" will hereafter be used to refer to subcontractor, artisan and other secondary firms within a production network, as distinct from the *casa madre*. Before proceeding, however, a basic understanding of the processes involved in production is required.

2.1 The knitwear production process

In general, the knitwear production process involves the following major stages:

- product design;
- model-making, in paper;
- prototype making, in fabric;
- sample-making;
- selling of samples;
- acquisition of manufacturing supplies; and
- production.

The exact steps followed in the production phase will depend upon the complexity and design of the particular product. For example, some sweaters have buttons, some do not - some sweaters have embroidery while others will not. The steps that could be involved in production include the following, which are presented in the order in which they would be executed:

- '*tessitura*', i.e. the manufacture of the textile itself, which in this case is a knit fabric, and for simplicity sake this stage will hereafter be referred to simply as 'knitting';
- finishing of the textile itself ('*finisaggio*');
- pre-ironing of the textile;
- cutting of the textile into usable pieces;
- '*confezione*' or making-up, which includes the basic sewing and assembly;
- dyeing;
- embroidery;
- detailing: finishing up of seams, buttons and buttonholes;
- ironing the individual pieces;
- testing and inspection;
- packaging; and
- shipping.

Not all products will involve all of the production stages listed above. In other cases, a product will not proceed in linear fashion through the above steps, but will reach a certain stage, such as embroidery, and must return to the making up stage for further work before it can proceed to subsequent stages.

2.2 Carma S.p.a. - The '*casa madre*'

Carma is a firm located in the Carpi industrial district which specialises in knitwear for men, and at the time of interview employed 72 workers. In 1987, the firm posted sales of LIt. 17 billion (roughly £8.5 million sterling), about 35 percent of which was exported to EEC countries, the US and Japan. Carma sells its products to about 1,500 boutiques, no single one of which dominates sales. Carma is an independently owned, single establishment.

The firm was founded in 1962, at a time in which the knitwear industry as a whole was expanding in Carpi and in surrounding areas. By the mid 1970s, the firm employed about 300 workers, and produced a standardised, lower quality product for a wholesaler. A limited range of styles was produced in large quantities. The firm not only produced to supply immediate demand, but also produced for stocks, thereby allowing production in the firm to be undertaken on a constant and regular basis throughout the year.

During this period, all stages of production were undertaken within Carma itself. However, at certain particularly busy times of the year, outside firms were used to supplement the capacity of internal production. Within the firm, production was organised according to the various stages. A number of different groups of workers were each located in a specific part of the factory and responsible for a specific phase of production. Each group was controlled by a head or supervisor. There was no movement of workers between groups; each worker specialised in a given phase of production, for which specialised machinery existed.

Toward the end of the 1970s, new Third World and Eastern Bloc competitors emerged in standardized knitwear products, particularly China, Romania and Bulgaria. These competitors were able to produce a similar product at greatly reduced prices, which Italian producers could not match with their then existing productive structure, particularly higher wage rates. Carma was forced to adopt a new competitive strategy, and chose to differentiate its product from that of its new competitors. Carma adopted a strategy of moving up-market, providing a higher quality, more expensive product that could not be replicated in competitor countries.

A second factor which brought about the change in the product was the changing nature of demand. While in the 1970s a single style would have sold well for up to five years, because of the so-called 'fashion factor', this stable demand no longer existed. "Now it is fashionable for today and today only" (Morelli, interview, 1988). The sales system was radically altered to accommodate the rapid changes in demand. Continuous production for stocks and a wholesaler was replaced with production on the basis only of prior sales orders obtained by their sales representatives (ie. '*sul venduto*').

The Network System of Externalised Production

At the same time, toward the end of the 1970s, Carma instituted a restructuring of the system of production, in order to address the now rapidly changing demand, competitive pressures, and to suit the new types of product. The organisational response consisted of shedding all production functions, and all of the production workers in Carma were let go. All production functions were decentralised to external sub-contractors (Table 4.4). At the time of interview, the firm employed 72, versus the 300 employees before the restructuring. Production was decentralised to a network of small firms and artisans' workshops, many of which were started by ex-employees after the restructuring. Carma's network consisted of an active roster of about fifty such small firms, most of which are located in the immediate area, with a few in Veneto or Lombardy. However, a lesser number of firms would be employed in the production of a single order.

This decentralised production process is established, controlled and organised entirely from within Carma, where there is full-time production coordinator. The supplies are acquired by Carma, and are given to the network firms with the order. The product is returned to Carma for inspection after each stage. In this manner Carma controls the quality of the product. There are no direct or indirect links of any kind between artisan firms involved in production of the same item.

Table 4. 4

Stages of knitwear production - Carma S.p.a.

Stage of Production	**Internal** (Carma)	**External**
Design	√	√
Paper pattern	√	
Prototype	√	
Multiple samples		√
Selling		√
Acquisition of supplies	√	
Knitting of textile		√
Pre-ironing		√
Cutting		√
Pre-assembly		√
Embroidery		√
Assembly		√
Ironing		√
Quality inspection	√	
Packaging	√	
Shipping	√	

In general, the small network firms are extremely specialised; firms exist for each of the stages of production listed at the beginning of this section. The level of the social division of labour is therefore very high and in some cases, extreme. For example, there are firms that only make buttonholes and sew buttons onto garments.

The number of firms involved in the production of any one item will therefore depend on the level of complexity of the product. In some cases, for example where time is an especially important factor, more than one firm will be used to perform the same stage of production. Generally though, the *casa madre* strives to keep the number of sub-contracted artisan firms (*'artigiani'*) to a minimum, in order to keep the administration and management of the production process to a minimum also.

Carma will, from time to time, employ more than one firm in a given phase of production. This is because the production phase itself is often very compressed in duration, and occurs only at certain times of the year. By utilising more than one firm in a given phase, an order can be split and production can be completed within a reduced period of time.

The Internal Organisation of Production

Carma undertakes internally all pre- and post-production phases, including product design, paper model-making, prototypes, selling of samples, acquisition of manufacturing supplies, inspection and shipping. With respect to the internal phases of production undertaken by Carma itself, there is not a very great division of labour within the firm. Internal organisation is structured around individual clothing collections; each collection has a designer, and a corresponding team of workers of all types (production workers, clerk, supervisor), involved primarily in the manufacture of prototypes and coordination of production. Jobs are not rigidly defined, and there is a considerable amount of movement on the production side especially, between the various tasks involved in sample making, and even between production work and administration, for example.

Moreover, because of the seasonality of production (fall and spring lines are produced), there are seasonal changes in the type of work required. The firm produces in two annual seasons, each of about six months. Each season is comprised of three months in which the sample making takes place, and a subsequent three months in which production is taking place outside the firm.

This means that the type of work undertaken within Carma also changes every three months. The first three months are comprised of the product generation, and the next three months involve primarily exercising control over and coordinating production. Naturally these two diverse functions require different skills, yet the internal workforce does not change. The same workers must perform the different tasks associated with each seasonal phase.

Design and sample-making require a broad knowledge of all stages of production, and of all of the types of machinery involved in manufacturing. Computerized production equipment is used, with a direct link between the computer design function and production of the paper model. Carma has four such machines. Manually programmed machines are then used for the internal production of prototypes and some sales samples.

The management structure of this firm is relatively light, comprised of four division directors: a Director of Administration, a Commercial Director, a Director of Production, and a Director of Sales - which correspond to the broad divisions of the company. The four directors report to a board of owners, one of whom plays an active directorial role in the management of the firm. In addition to the five directors, the firm is comprised of 22 clerks, 10 "intermediates", and the remainder of about 35 being made up of labourers.

Decisions regarding what items will be produced are made jointly. First, it is the responsibility of the designer to judge what will be fashionable and sell well. Prototypes are made of these designs, then samples are produced and brought to clients to be sold. The sales representatives can and do also play a role in influencing the clients' orders. On the basis of the orders received, the Commercial Director then assesses which items will be economic to produce, and which will not. In this sense, Carma is highly integrated with the market and market response itself plays a major role in determining what the company will produce, before it produces it.

The remaining discussion in Section 2 describes a sample of firms from Carma's network, which are representative of the main phases of production.

2.3 Corazzari e Bruschi

The Internal Organisation of Production

This artisan firm produces the knit textile, in rolls or squares. The yarn arrives from Carma with an order. There are 20 automatic rectilinear knitting machines, some of which are numerically controlled and some of which are computer controlled. The machines are programmed to produce the order, usually by the owner himself, Sig. Bruschi, or the one senior worker who also has some programming skills. The yarn is loaded and the machines then knit the fabric, which is then checked, counted, packaged, and returned to Carma.

The firm's employees, according to Sig. Bruschi, break down into two groups: men workers and women workers. The four male workers operate and supervise the machines. Once the machines have been programmed, the machine operators will generally adjust the machinery for different sizes or types of yarn, and perform simple maintenance tasks. The seven women do the counting, checking, and packaging of the textile. There is no movement between these two groups, either on a day to day basis or in terms of career paths. All of the employees have been trained entirely within the firm itself. The working conditions in this company appeared relatively good. With regard to worker autonomy, there was no strict supervisory structure in place.

For the worker, the degree of integration of conceptualisation and execution is low. The product is conceived outside of the firm itself - either in the *casa madre* or by a freelance designer working for the *casa madre*. Conceptualisation of the product is therefore really confined to conceptualisation of the intermediate product, i.e. the knit fabric itself, and to determining the best way to produce a given item. There can however, be some flow of information back to the *casa madre* regarding the technical aspects or feasibility of producing given products. Because the designers do not generally have a full understanding of the process of production, they may design something that is impossible or problematic to produce. In these cases, C&B will provide technical support and advice to the *casa madre* on how to modify the product. Generally, C&B will try to preempt problems before they happen, so they will review the designs with the technical office of Carma and make any modifications necessary from the technical point of view before they accept the order for production. Often, the client approaches them without a clear idea of what they want produced, and C&B will provide advice on the technical limitations of the proposed idea. This technical feedback usually involves only Sig. Bruschi; so while there is some cooperation and interaction between the two firms regarding the conceptualisation of the product, this does not extend to the production worker.

Flexibility

The first numerical control knitting machines appeared at C&B between 1976 and 1979, replacing mechanical control machines, while the computer controlled machines had arrived on the market only very recently at the time of interview. The advent of numerical control, and then computer control, has had marked implications for the organisation of production, costs, and product.

The cost of reprogramming and downtime associated with numerical and computer control have been dramatically reduced. The cost of reprogramming a numerical control machine is estimated to be half that of a mechanically programmed machine - or about LIt. 500,000 versus LIt. 1,000,000 (approximately £250 versus £500), and less time is lost in resetting the machines (Bruschi, interview, 1988). While an unusual pattern would have taken 16 days to program on mechanical machinery, the same pattern could be programmed on computer machinery within two hours (Bruschi, interview, 1988).

As the machinery has become more sophisticated, both from the point of view of mechanics and control mechanisms, the range of products that can be produced economically has grown. By drastically lowering programming time and cost, numerically and computer controlled machinery has made very complex patterns economically viable. Therefore, the range and complexity of product has increased substantially as a result of numerical and computer control.

The numerical and computer control function has also had implications for the process of production. Because the article being produced can now be changed much more frequently, the labour process also changes more often. The new machines are also more specialised, designed for more specific, precise tasks than the mechanical control machines.

The range of changes in the production process varies from changing the size of the piece being produced, to changing the style. Changing the size of the piece may occur several times a day, while the style is changed (and the machines fitted with a new program) every five to seven days.

At the time of interview, the firm was producing about 300,000 knit pieces per annum. The orders were relatively small, ranging from 500 pieces to 1,500 pieces, and averaging about 1,000. Because the firm itself specialises in a certain type of knit fabric (*'maglieria lavorata'*), the orders produced tend not to be very large. Usually, a small batch will be produced and put forward onto the market by the *casa madre*. If the item sells well, then a second batch will be produced, and so on. This is permissible because the turnaround time afforded by the particular organisational structure is very short. So while, at the end of a given production period, the quantity of a given item produced may be relatively high, it is likely that it would not be produced all at once, but rather in several smaller batches.

The firm has been able to work steadily throughout each year, with one month of holidays. However, in order to achieve this, labour flexibility is required. Some workers must work 25 to 30 overtime hours in some months, while other periods are relatively 'thin'. The workers must therefore be available to work flexible hours, to work more intensively and longer hours and weekends in certain periods of the year, in order to meet deadlines. Typically, September, October, January and February are less busy periods.

Origins and Management

C&B was founded in 1972 by the two partners (after whom the firm is named) who continued to own and direct the firm at the time of interview. One of the partners had developed some expertise in the field by working previously in a knitting machine repair shop, and so became well versed in the mechanics and maintenance of the machines. They originally started by buying two used knitting machines from Germany, and operated out of a shed in the countryside near their current location, which is the small town of San Prospero, near Carpi.

The company employed eleven workers at the time of interview. Their revenues for 1987 amounted to about LIt. 500,000,000 (or approximately £250,000 sterling). On average, C & B would have about 15 clients in a given year, located primarily within the immediate environs, including Carpi, Modena, Reggio-Emilia, and Bologna, but sometimes as far away as Milan. No single client firm dominated, but four or five firms accounted for approximately 70% of their work.

The 'management structure' of this firm, such as it is, consisted of the two owner operators. Sig. Corazzari was responsible for the accounts, administration, and the organisation of work, while Sig. Bruschi provided the technical support, prepared the computer programs for the machinery, and maintained the machinery.

Investment decisions and the general direction of the firm are undertaken by these two partners. However, according to Sig. Bruschi, decisions regarding the acquisition of new machinery are in essence made within the marketplace for the final product. Certain types of machines are best suited for certain types of products, and when those products are demanded in the marketplace, the *casa madre* asks the sub-contractor to produce them, and the manufacturers need the machines that can best produce those products. This can be problematic for the sub-contractor, however, in that the demand for that given type of product may be short lived, compared to the economic life of the machine, and the sub-contractor is left with machinery that is underused. Nevertheless, C&B follows a policy of replacing machines every five to six years - not because they cease to function, but because the technological advances require this replacement in order for the firm to stay competitive.

The External Organisation of Production

There are no formal, written, or long term arrangements between C&B and Carma - even though their relationship spanned many years. Each order is negotiated separately regarding timing and price, and a contract entered into. There are no formal guarantees made by the *casa madre* to the artisan for a certain amount of work over a long period of time - they contract work when they need to. Given the short turnaround time, this means that the artisan firm can plan its work only one to two months in advance. Continued relations depend upon the quality, reliability, timeliness and pricing of work.

For the organisation, planning and setup involved in the production of a new order, Carma will generally pay the artisan by the hour for his time. Then the artisan estimates a price per piece for the actual production, which is negotiated with the *casa madre*. The *casa madre* includes this component in its calculation of the total price for the garment it will ask when it pre-sells the item through its sales representatives. The artisan is committed to the price he has given, yet when he sets his price he does not know how many pieces of the article he will have to produce - this depends on the sales. If the numbers are high, then he will make money, but if the numbers are low, his fixed costs remain the same and will make less or no profit on the order.

Because C&B specialises in a type of work that not many other firms perform, they can command a relatively higher price per piece. With more common or standard items, the prices are also standard, and the artisan firm cannot influence the price. Despite their leverage regarding price, ultimately the price per item is imposed upon C&B by the *casa madre*. The price that can be obtained by the artisan firm depends upon the market for intermediate goods. In periods of low demand, the *casa madre* will offer an order to the artisan firm at a given price, which the artisan can either accept or decline. If they decline, the work will simply be offered to another firm. At the time of interview, the type of knitwear in which C&B specialised was not doing particular well on the market, so the artisan firm had lost its ability to influence the prices it could command for its work. In such periods of low demand, the *casa madre* can and does impose lower prices upon its artisan firms.

As the artisan firms usually specialise in a single phase of production, there is a market created at every stage in the production process. The relationship between artisan firms working in the same phase is therefore one of 'ferocious competition' (Bruschi, interview, 1988). C&B has <u>no</u> direct relationships of any kind with any other artisan firms involved in Carma's production network. It deals only with the *casa madre* itself. Even after having worked for Carma for many years, C&B's intermediate product is always sent back to Carma - it is never sent directly on to the next artisan.

The one exception is that, during exceptionally busy periods, when C&B cannot handle all of the work it has been given and still meet deadlines, it will sometimes sub-contract its work out to another artisan in order to get the work done on time. In such cases, C&B will provide the sub-sub-contractor with the numerical control or computer program which it has prepared itself, for the second artisan to use with his machinery. Such instances are rare, however.

C&B attributed its success to its continual and regular investment in new technology. This, however, can occur only in periods of high demand, in which the artisans can command prices high enough to provide them with a profit which they can then reinvest in new machinery. Due to a slow market, C&B had not been able to invest in new machinery in the two years prior to interview. The ability to secure reasonable prices for their work was therefore cited as one of the major problems the firm faced, along with falling demand and the disappearance of some markets, such as the USA, and the emergence of greater international competition from countries like Spain and Portugal.

2.4 Fanny Confezione

This firm specialises in the *'confezione'* phase of production, which consists of assembly, sewing pieces together, and some detailing. Pieces of knitwear arrive already cut, and Fanny closes the seams, applies the labels, pockets and collars, and does any required finishing. In some cases the item will be returned to Carma as a finished product. In other cases, where treatments or embroidery may be required, the item is left with the main seams undone, returned to Carma, which will then send it out for embroidery, is returned again to Carma, which then sends the item to Fanny for final seam closing.

Located in a modern building in a rural location about three kilometres outside of Modigliana (Province of Forlì), Fanny Confezione is a cooperative, with a total of eleven members, nine of whom are workers, and two directors. The last available revenues were given as LIt. 200,000,000 (£100,000 sterling approximately).

All of the members of Fanny Confezione were originally employed within Carma itself. In 1980, Carma established a branch company in a separate building, but in 1983 informed branch employees that the operation could no longer be maintained and all of the workers were laid off. The 24 employees were faced with a choice of either losing their jobs completely or going into business for themselves. Eleven of them stayed on to form the cooperative that became Fanny Confezione. Carma maintained ownership of the building and machinery, indicating that the restructuring was aimed primarily at shedding labour. Only the number of workers in the operation has changed since becoming a cooperative. The same type of work is conducted, using the same processes, skills and machinery. However, a few related stages of production were lost, including ironing and buttonholing, which are undertaken by other specialist firms.

The two directors manage the cooperative's daily affairs. The female head oversees production, and the male head is responsible for administration and conducting business with the *casa madre*. They use an administrative consultant in Faenza, who takes care of much of the administration and documentation.

All aspects of the production process such as products, materials, machinery, etc. are virtually decided by Carma. As noted above, the building and equipment are owned by Carma and 'on loan' to Fanny Confezione; the cooperative could not afford to purchase the machines. Fanny can, of course, make decisions regarding the hours of work and staffing, though they have maintained exactly the same workers since the cooperative was formed. They do exercise their ability to influence the hours of work, and permit a certain amount of flexibility in the daily schedule, for the most part to accommodate the nine women workers who also have family responsibilities.

The Internal Organisation of Production

Depending on the complexity of the garment, the number of steps in production varies, with eight an average number. Each machine is highly specialised, doing one type of stitch or one function. For example, a separate machine is used for each of the following tasks:

- internal shoulder seams;
- external should seams;
- side seams;
- applying the collar - one basic kind of machine, for which there are about four different sizes, one for each size of knit;
- label application.

The garment has to follow a specific sequence, and may return to the same machine one or two times during the making up.

There are about 40 machines in the establishment, none of which are electronic. The technology has not advanced much in this sector in recent years; with marginal improvements, the machines are basically the same as they were 35 years ago. The areas in which significant improvements have been made relate to machinery for more standardized production, which cannot be used for Fanny's generally small, designer orders.

All of the production workers are women. Each one received their training within the establishment itself, directly under the woman director, and would likely be classified as semi-skilled. Generally, each worker will know how to operate three or four machines. However, each will also usually have one machine on which she is particularly competent, where, whenever possible, she is kept, except in special circumstances, such as when someone is absent or there is a rush or special order. The technical division of labour is thus extremely high.

As the product, materials, and machinery are determined outside of Fanny Confezione, in the *casa madre*, there is no opportunity for the worker to participate in the conceptualisation of the product and process of production. There is, however, upon occasion, a flow of information from Fanny

Confezione back to Carma, though this generally occurs only when there is a problem with production or a mistake in the materials provided.

Flexibility

The firm makes about 500 different articles each year (or about 10 per week). The number of articles made annually fluctuates, but there is no discernible trend in number upwards or downwards.

The number of pieces of each article made also varies, depending on the type of article. Fanny makes Carma's sales samples; in this case the number of pieces per article will range from 1 to 20, but will typically be between 10 and 20. For regular production of designer items, from 12 to 200 or 300 pieces can be made. And for more standardized items produced for Carma's internal label, up to 1,000 pieces of a single article can be made, though these will subsequently be dyed different colours. These figures compare to an average of 2,000 pieces per style prior to restructuring.

Given the high number of different articles being produced at any one time and small batch sizes, and particularly at times of the year when samples must be produced at the same time as regular orders, the process of production must change very often - several times a day. This means moving workers amongst machines, resetting and rethreading machinery. To set up machinery for a new style of item can require a day. A high proportion of time is thus spent setting up the machinery and new production process. And the seasonality of the industry results in a concentration of work in June and July, when a high proportion of the annual revenue is earned, which covers the less busy periods.

Once the machinery is set up, the work itself is routine and repetitive. The workers can control the pace of their own work and there is no constant supervision. A very serious and professional environment prevails on the shop floor, as the workers sew in silence. The underlying philosophy is that there must be maximum concentration and attention to detail in order to ensure the high quality of the garment . The quality of the product effectively provides the basis upon which Fanny can compete with other similar firms, and in turn, upon which Carma can differentiate its product and compete in the international marketplace.

The External Organisation of Production

As Carma has maintained ownership of the plant and machinery, this gives them effective "ownership" (in Massey's sense of the word, as in the ability to make investment decisions regarding plant and equipment) of Fanny. Internal control over the means of production is also forfeited, at least in part, to the *casa madre*, as Carma determines the nature of machinery, and therefore, the labour process. The other aspect of possession, control over labour, is maintained within the cooperative. However, as a cooperative, there is a sense of shared responsibility, and there did not appear to be any need for internal supervision. There is indirect, external supervision to the extent that Carma examines each product returned from Fanny. The pace of production is also determined externally, by Carma, as they give orders to Fanny Confezione when and as they need work done, not on the basis of providing an even flow of work to the small firm.

Fanny works exclusively for Carma, and has always done so. However, there is no long-term contract - each piece of work is contracted and paid individually. Although Fanny is free to work for other *case madri* (and indeed have received many offers to do so), they do not see an advantage in this, as all *case madri* pay essentially the same prices for the same types of work. In this respect the directors of Fanny feel that there is collusion amongst the *case madri* on the prices offered to artisans.

For regular production, Fanny is paid by the piece, regardless of the size of the order. Because of the set-up costs involved, the profit on smaller batches is therefore reduced. The price is negotiated with Carma, and Fanny does attempt to ask a higher per piece price if the order is small, but it not always able to achieve it. Though they claim that they are paid better than other sub-contractors, the directors of the cooperative feel that these prices are too low; indeed, they cite this as their primary problem.

All inter-firm communications are directly with Carma, never with other sub-contractors in the network. According to the directors of Fanny, Carma frowns upon any communications between sub-contractors, fearing information sharing will lead to higher price demands. Generally, the only contact with other Carma artisans is through chance encounters when intermediate goods are delivered to the *casa madre*.

Fanny does not use outside workers (i.e. domestic workers) or sub-contract their work to other firms. This is because homeworkers and sub-sub-contractors cannot ensure a sufficiently high level of quality, nor timeliness. Neither are they interested in expanding the number of internal workers to take on more work, as the cooperative nature of the establishment makes this difficult, and the cost is high. Expansion is not a goal; in fact, the main goals stated were survival, and a pension. Competition from underdeveloped countries was cited as a problem. This placed greater emphasis on the high quality and precision of items produced by the Carma network, in order to differentiate their product from that of other producers. The general picture that emerges is one of a firm that survives, rather than prospers, by hard work and diligence, and is dependent on and controlled by the *casa madre* in almost all aspects.

2.5 Luciana Ricami

Luciana Ricami was established in 1980, near to its location at the time of interview in the owners' house in Carpi. Before 1980, the owners of the firm worked for Carma, but in *confezione* rather than embroidery. They switched to embroidery as they felt it seemed to have more of a future than *confezione*, which was then moving to Veneto, where the costs were half those in Modena.

After buying some second hand machinery and establishing themselves in embroidery, their reputation grew by word of mouth in the Carpi community, where 'everyone knows everyone else'. At the time of interview, the firm consisted of a total of eight: two directors, and six employees. Revenues for 1987 were in the LIt. 500,000,000 to 600,000,000 range (£250,000 to £300,000 approximately). On average, Luciana Ricami has about 15 clients in a year, all of which provide roughly equal amounts of work.

The 'management structure' of the firm consists of the two owner-operators. They coordinate the production process and conduct relations with the *casa madre*. They also employ the services of a consultant in Carpi, who does their accounts and provides them with commercial advice. They do not use the artisans association, although they are members; they find it too expensive and that the assistance provided is not good.

The Internal Organisation of Production

After the article of clothing has been made up by Fanny Confezione, it is returned to Carma and checked, then sent to Luciana Ricami for embroidery. In general, a sweater will arrive semi-finished, open so that it may be placed on the machines. It is then embroidered by machine, and sent out to have the embroidery threads trimmed and the paper used with the embroidery removed. This must be done manually, so the firm employs two homeworkers who engage in this work.

Unlike other stages of the knitwear production process, embroidery production has been subject to technological advancements, and Luciana Ricami had the latest available technology at the time of interview. The firm had four German-made electronic embroidery machines, and six operators. The machines are programmed externally - either by Carma or by an outside company that specialises in this. The job of the operator therefore consists primarily of placing the sweater on the machine and removing it, and supervising the machine while it operates. All of the workers do exactly the same kind of work. They have all been trained within the firm itself, a process which requires about three years in order to produce a fully capable worker.

The directors have some input into the embroidered component of the product before it is produced. They generally consult with the *casa madre* to determine what kinds of embroidery would be suitable for a given type of sweater. They effectively provide technical advice to Carma on the suitability and technical feasibility of certain types of embroidery for certain articles. For the worker, however, there is little integration of conceptualisation and execution. He simply operates a machine that he cannot program or control, and produces a product into which he has had no input. He has little autonomy in this regard, though there was no overt supervisory structure in place in the firm, and working conditions appeared to be good, though the machines in operation were very loud.

The electronic embroidery machines were purchased in 1983 and 1984. The main impacts of the switch from the mechanically-controlled machines which were used previously was found to be in the higher quality and precision of the product, and the ability to undertake more complex patterns. In addition, these machines work faster than the previous ones. They did not however, bring about a reduction in costs as they are very expensive. The directors claim that the decisions to buy new machinery are effectively made in the marketplace. As was the case with the knitting machines, certain types of machine are best suited for certain types of embroidery- the demand for certain types of machines is therefore dependent upon the demand for certain types of embroidery in the knitwear market.

Flexibility

The type of embroidery produced changes very frequently - about 20 different designs per month on average, but the pattern can change up to three times per day. For each design, quantities in the range of 200 or 300 up to about 3,000 can be produced. The batch size has been falling, however, thus the diversity in the number of different patterns produced had been rising at the time of interview. Big orders no longer appeared. Despite the advanced and flexible technology, there are costs associated with the changeover from one pattern to another, relating to the down time of the machinery, and other start up costs such as programming. Costs are therefore higher for smaller quantities.

It is impossible for the firm to work regular hours throughout the course of a year. The nature of the work is seasonal, and during busy periods, there will be longer hours or weekend work, up to 12 or 13 hours per day. There are regular busy periods annually, but it still remains impossible to predict or plan for the work cycle. At one point during a 'busy' period, all of the work was completed and production simply stopped - though this stoppage has never been for an extended period.

The External Organisation of Production

As was the case with other Carma sub-contractors, there are no long-term contracts between Luciana Ricami and the *casa madre*, and each order is negotiated on a price per piece basis. The sub-contractor's price demands are moderated by the fact that they must remain competitive with other sub-contractors. The relations between artisans in this same phase of production is therefore one of competition - on the basis of price but also regarding timeliness and quality of work. However, Luciana Ricami does use other artisans, to which it sub-contracts work when it cannot accommodate the workload itself. Because it needs these other embroidery artisans from time to time, Luciana Ricami must maintain good relations with them. For example, Luciana will sometimes turn down work in order to provide work for other embroidery artisans when they need it. The sub-sub-contractors are small artisan firms similar to Luciana, and employ the same kind of machinery. Like other Carma network firms, Luciana Ricami has no direct relations with other artisans involved in the production filière. All orders are returned directly to Carma.

The firm claimed to have no major problems, other than finishing the work on time. Neither did they aspire to expansion, which they believed would make it more difficult to control the quality of the product, and therefore jeopardise their competitive edge.

2.6 Tosatti e Bacci

After the embroidery phase is complete, the sweater is returned to Carma, where it is checked and the pieces counted, and then sent out to be ironed. Tosatti e Bacci is a firm which consists solely of a husband and wife, who do ironing only, in a small workshop at the back of their Carpi home. The stated annual revenues for the firm were LIt. 40,000,000 annually (approximately £20,000 sterling). Tosatti e Bacci work exclusively for Carma.

The labour content of the ironing process is high - it does not lend itself easily to automation, particularly when the articles being ironed are frequently changed. Generally, the item is placed and pinned on the press, steamed, shaped by hand, and pressed. The machine must be adjusted for different types of sweater, different textiles, and different colours. Frequently, the *casa madre* relies on the ironing stage to correct any irregularities or mistakes in the articles that have been made at earlier stages of the production process regarding the sizing or shaping of products, which makes the ironing phase even more exacting.

The skills required for this kind of work are learned on the job, on one's own, through a process of exploration and experimentation, trial and error. Through this process, T&B have developed expertise in certain areas, for example, with certain problematic textiles, so that they tend to get all of the work available which involves this textile. Because of this specialisation, they are more likely perhaps than other artisans to work with a given textile for a longer continuous period of time, though the styles and colours they work with will still change. They will iron three or four different articles a day, on average. The norm is small orders, small quantities, and quick turnaround, often in the same day. In order to speed the process, the *casa madre* will often distribute an order of say, 500 pieces amongst four or five artisans. While this reduces the turnaround time for the *casa madre*, it adds to the variability of the artisan's work and increases costs that are associated with frequently changing the articles. At the time of interview, the average order consisted of 25 or 30 pieces, in contrast to the pre-restructuring period, in which the orders were large and the kinds of sweaters few.

The firm began in 1966, but has gone through many transformations over the years, including a period in which they employed workers. A decision was made to restrict the firm to the husband and wife, who are its owner operators, workers and managers. Tosatti e Bacci rely heavily on the assistance of the artisans' association for administration, advice and information, regarding changes in legislation, trends in the industry, etc. Only the daily accounts and signing of bills are undertaken within the firm; all other administration is conducted externally by the artisans association on a fee for service basis. The association also orchestrates the artisans' purchases of machinery, so that they can purchase in higher numbers and secure price reductions. It also provides a point of contact and interaction for artisans in the same field and phase of production. The artisans' association T&B deal with is the umbrella group CNA - the National Confederation of Artisans, which incorporates several smaller organisations, including LAPAM, CASA and FAM (Artisan Family).

Investment decisions, which relate primarily to the acquisition of new machinery, are made within the firm itself. The *casa madre*, however, will make suggestions from time to time to T&B that a certain type of machinery should be acquired, for specialised work that may be forthcoming. T&B generally ignore such suggestions, however, as they believe the machinery to be too expensive and too specialised to have a full economic lifespan. They prefer to use only generic machines which can be used for a wide variety of articles. If specialised machinery is required, they say, then it is up to Carma to buy it for the artisan. At the time of interview, the firm had automatic press machinery, and a *vaporetta* - a smaller steam machine for more precise work.

External Relations of Production

Even though the costs to the artisan will be greater if the size of order is small, the prices paid by Carma are on a piece basis, do not vary with quantity and are negotiated separately for each new order. The prices asked by the artisan depend upon the complexity of the piece, and the quality of the work.

There are no long term contracts between T&B and Carma; from the artisan's point of view, his best guarantee of regular work is the high quality and reliability of his work. The work is, by definition, seasonal, and there are busy and slow periods throughout the year. T&B could not sustain a prolonged lack of work - 15 days would be the maximum. Carma recognises this, and in order to be able to continue to work with the artisan when they need them, will provide them work in 'thin' periods to keep them occupied. This they will do only for the better artisans.

T&B have no role in product conceptualisation, and complain the ironing process is often made needlessly difficult by certain design features of the garments. There is no prior consultation with Carma regarding the design of an item as there often is for other stages of production. Only when a piece is particularly difficult will T&B go to Carma to demonstrate the difficulty and the need for a higher price. But this input does not effect subsequent design changes in the product.

The relationship between artisans within the ironing phase of production is characterised by competition. Some artisan firms will try to undercut others. T&B compete on the basis of reliability, honesty and quality. Previous attempts amongst artisans in this phase of production to organise, or agree on standardized prices have failed, due to a lack of consensus. T&B do not give out work to homeworkers or other artisan firms.

As always, there are no direct linkages between T&B and other artisan firms in Carma's filière. The exception occurs when there is a particularly urgent order - in such cases, the order can sometimes be brought directly from the *confezionatore* (maker-up) to T&B. This poses a problem for T&B, however, as the pieces have not been previously checked and counted by Carma, thus T&B may be forced to accept responsibility for mistakes that are not their own.

The main problem T&B face is meeting the more exacting work demanded by the new, higher quality, costly products. T&B felt that the future prospects for their work were bleak, viewing their existence as being completely tied to and dependent upon the *casa madre*. "I think there are no prospects for the single artisan in the future, because we have to meet the interests of the *casa madre*. This is what determines the artisans' work, makes them associated or not, determines whether to buy a certain machine or not. Even in an indirect way, they decide for you...." (Tosatti, interview, 1988).

3. SYNTHESIS

3.1 The Inter- and Intra-Firm Organisation of Production

The Carma network system of production is shown schematically in Figure 4.2. It is a highly decentralised system, with the production of a given product distributed amongst the *casa madre*, and several small artisan firms. The *casa madre* undertakes the pre-and post-production phases, while a complex network of small, extremely specialised artisan firms and micro-firms undertake all of the production. There is then a third tier network, as many of these small artisan firms also have relations with other small firms, usually operating in the same phase, which provide quantitative flexibility. The sub-contracted artisan firms may also employ independent homeworkers for manual, labour-intensive tasks. The relationships between artisan firms in the same phase of production are characterised predominantly by competition, but there is also an element of cooperation, in that they do need each other from time to time for reasons of quantitative flexibility.

All contacts and transfer of intermediate goods takes place vertically - between a given artisan and the *casa madre* only. Despite the fact that many of the different artisans have been working for the same *casa madre* for many years, there is virtually no horizontal contact between them nor direct transfers of semi-finished products. The production filière is illustrated conceptually in Figure 4.3.

The Division of Labour

The Carma productive system represents an extremely high social and technical division of labour. The social division of labour is expressed along two dimensions: between the *casa madre* and network firms, and between network firms. A third dimension of the social division of labour could also be said to exist, between the network firms and homeworkers.

While each artisan firm specialises in a single phase of production, the phase of production itself can be very narrowly defined, and we see firms specialising in the making of buttonholes and application of buttons, or packaging only. In addition, as we have seen in many of the artisan firms profiled above, the artisans tend to develop specific expertise and further specialise within a single phase, as a competitive strategy, in order to differentiate themselves from other artisans working in the same phase. This was seen in the case of Tosatti e

Figure 4.2

The Carma Network System of Decentralised Production

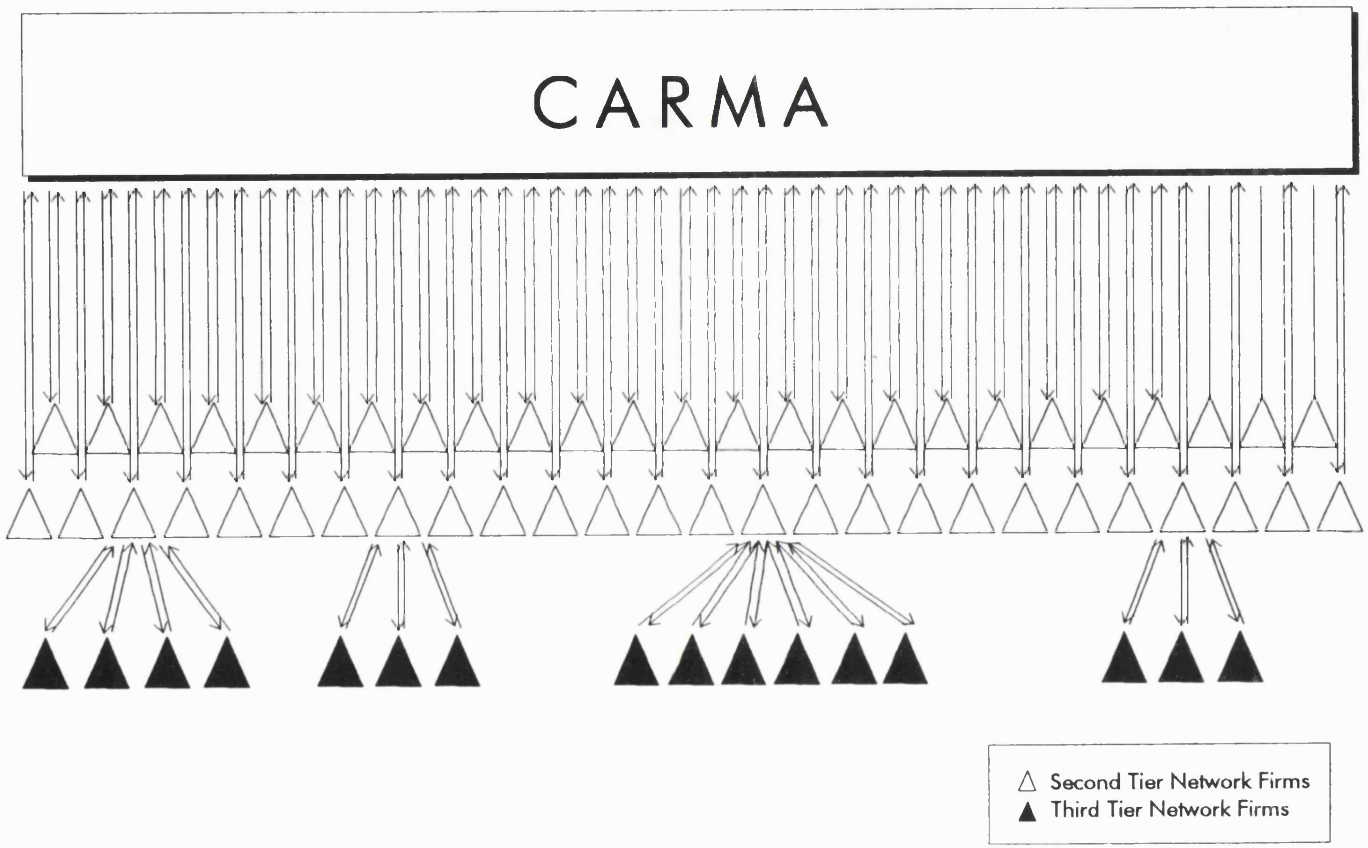
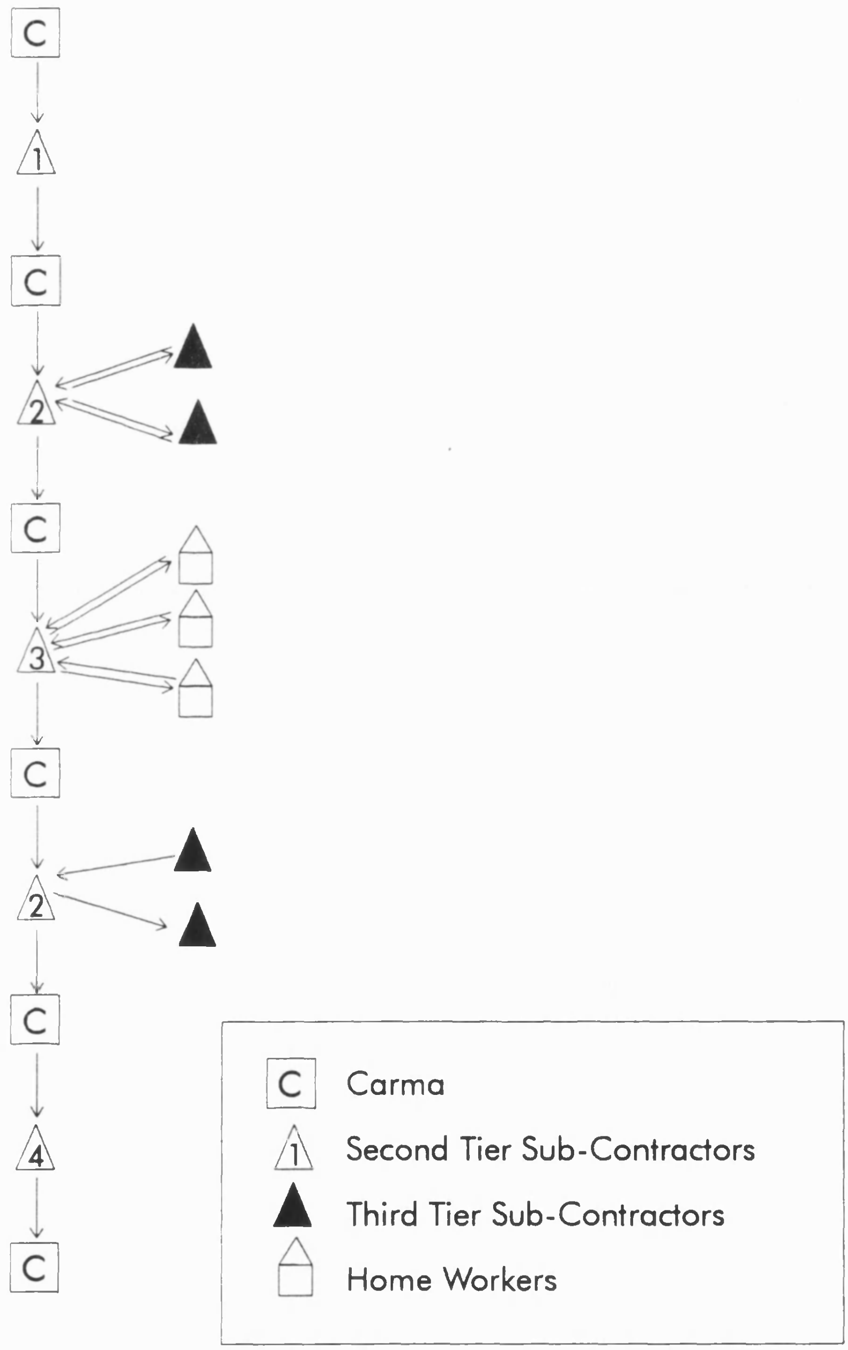


Figure 4.3

The Carma Productive Filière



Bacci, which had developed a specific expertise in the ironing of certain textiles, and with Corazzari e Bruschi, which specialised in very complex, difficult knitting patterns.

In addition to these specialisations which exist at the level of the firm, there is a further division of labour within the firm. In general, the machinery which exists in the artisan firm tends to be very specialised for certain precise tasks. The owner of the small firm aims to have workers develop high levels of competence on certain machines, in order to increase efficiency and output. There is little movement between tasks or different areas of the firm on a day to day basis, nor is there a progression from certain types of jobs to other types of jobs within the firm, in a long term career path. The division of labour can also be based on gender lines, as was the case with Corazzarri e Bruschi, where there was a strict division of labour between the men, who operated the machinery, and the women workers, who checked, counted and packaged the product.

In some cases, even if the worker is assigned primarily to a particular machine in the work process, it is not unusual for him or her not to have full control over that machine, particularly if the machine is programmable. In neither of the two firms with programmable machinery did the machine operator himself program the machinery. It was either programmed by someone else in the firm, or by an external firm specialising in this service.

The exception to this rule of very high division of labour seems to lie within Carma itself. This is the one case which seems to correspond more closely with Piore and Sabel's idea of fluidity of job tasks, and diminished division of labour. While there were still definite divisions of labour within the *casa madre*, the variability of work was greater, both on a day to day basis, and according to the seasonality of production. In addition, the nature of the functions undertaken by Carma, such as developing prototype products, demands a full knowledge of all stages of production. This fluidity of work takes place primarily within the production sector, as opposed to between the production sector and other sections of the company, such as administration or marketing.

In addition, the workers in the *casa madre* enjoy high levels of pay, especially compared to the workers in the artisan firms. This high pay is offered on the understanding that the workers will work when needed, flexible or extended hours, and that there will be no involvement with the union (Artioli, interview, 1988).

Ownership and Possession

The productive system depicted above is also a hierarchical system, with Carma at the apex of the hierarchical pyramid. Referring back to Massey's terminology, aspects of ownership and possession are centred in the *casa madre*, as well as elements of the labour process itself.

To begin with 'ownership', i.e. the power to make decisions regarding investment, we have seen that Carma exercises complete control in some cases, to influence over such decisions in others. In the case of Fanny Confezione, Carma owned all plant and machinery, and virtually no changes or new investments had taken place in the five years between the formation of the cooperative and time of interview. It is not an uncommon practice for the *casa madre* to provide machinery '*in commodato*' (on loan) to their artisan firms. In some cases, such as ironing, Carma would suggest certain machinery or equipment purchases to the artisan, who made the ultimate decision whether to proceed or not.

The *casa madre* also holds the upper hand in determining the pricing for the artisans' piecework. This is due primarily to the extremely competitive relationship that exists between firms in the same production phase, which acts to moderate the artisans' price demands, or at times even leads to undercutting. On the other hand, at least for more standard items, it appears that the *case madri* operate according to a standard set of prices for certain types of work. The low prices offered to artisan firms was a common complaint, and seen as one of the most significant problems they faced. It should be noted that the pricing issue, in turn, by determining the profitability of the artisan firm, has an impact on the ability of the artisan firm to make new investments, particularly in new machinery.

With respect to possession, or control over labour and the production process, this too is forfeited by the artisan, at least in part, to the *casa madre*. The *casa madre's* demand for work in this sector is by nature cyclical, and varies even within the usual annual seasons. In general, the *casa madre* is not concerned with maintaining a steady, regular supply of work to the artisans; it commissions work when it is required, usually on short notice and with very short turnaround times. The artisan firm can either accept such work, or decline it. But a common feature of the artisan firm was irregular hours, overtime and slow periods. The artisan firm must usually accept work when it is offered, even if it is already overburdened, because it knows there will be periods of little work, and the extra work during peak periods is needed to cover the leaner times.

Finally, the *casa madre* exercises virtually total control over the product, and the artisan firms have only very limited input into its conceptualisation, if any at all. In the best cases, at the outset the *casa madre* will seek the artisan's technical advice on the feasibility of producing certain product designs. This was the case for the knitting process and embroidery. In other cases, there will be a flow of information between the artisan and the *casa madre* only when there is a problem with the order or in production (as in the *confezione* stage). Or, the artisan offers his input to improve the product and decrease production problems, but the input is ignored (ironing). Even where there is a priori consultation with the artisan regarding a proposed product, this consultation generally involves the owner of the artisan firms, and not the workers who will actually be undertaking the production. There is therefore, for the production worker, an extreme disengagement of conceptualisation and production, and for the artisan firm as a whole, only minimal input into the conceptualisation of the product. Though it had not apparently been a problem, this lack of integration of product conceptualisation and production could represent a longer-term weakness in the network system.

Looking at the other side of the coin, the degree of dependence or independence of the artisan firm is indicated by several factors, particularly relating to their client profile. The number of clients, their geographical and industrial diversity, and the existence or absence of a dominant few clients provides a good indication of the autonomy of the artisan firm (Brusco, 1986). Firms interviewed in this case study fell into two groups. The knitting and embroidery firms each had about fifteen clients annually, no single one or few of which dominated their revenues. On the other hand, in the making-up and ironing phases, both artisans worked exclusively for Carma, indicating high dependence.

In general, the degree of dependence or independence of the artisan firm seems to relate, at least in part, to the stage of production in which the firm finds itself, and particularly, to the degree of technological advancement of the machinery used in that stage. In this case study, the weakest, most dependent firms were found in the ironing and making-up stages, in which the machinery has remained virtually unchanged in the post-war period. The more independent firms were found in the knitting and embroidery stages where computer technology had been applied. It seems that firms that acquired new technology had a competitive edge; where there was no new technology firms could not differentiate themselves and their positions remained weak.

The degree of autonomy of the artisan firms therefore varies, but is in any case limited by the exercise of control by the *casa madre,* namely over investment decisions, pricing, product conceptualisation, and pace of work. The most dependent firm, Fanny Confezione, exercised control over the daily hours of work, and the division of labour within the firm. The most independent firm, Corazzari e Bruschi, was able to control or at least influence most aspects of its production, within the parameters outlined above. It was also able to freely and easily move to new clients, if necessary - a freedom that Fanny Confezione would not enjoy, as Carma owned the building and machinery.

3.2 The territorial organisation of production

Figure 4.4 shows the spatial pattern of textile/clothing *case madri* as it relates to the urban system. The lead firms show an extremely high degree of spatial clustering in the town of Carpi, where the vast majority of firms is located. Other lead firms are scattered in the immediately surrounding towns, including Correggio, Soliera and Rio Saliceto.

Figure 4.5 represents the territorial distribution of the entire Carma production network. The map shows the central location of the *casa madre*, and the locations of the artisan firms to which it sub-contracts production. The artisan firms are both clustered within the town of Carpi, as well as dispersed throughout surrounding small towns, villages and rural locations. A significant number are located in the lower-wage regions of Veneto and Mantua, to the north of Modena. None are located in urban locations larger than Carpi itself.

Figure 4.6 illustrates the territorial organisation of Carma's network for a single product. The *casa madre* is located in Carpi, the functional centre of the industrial district, and the artisan firms are dispersed within Carpi and in the surrounding areas.

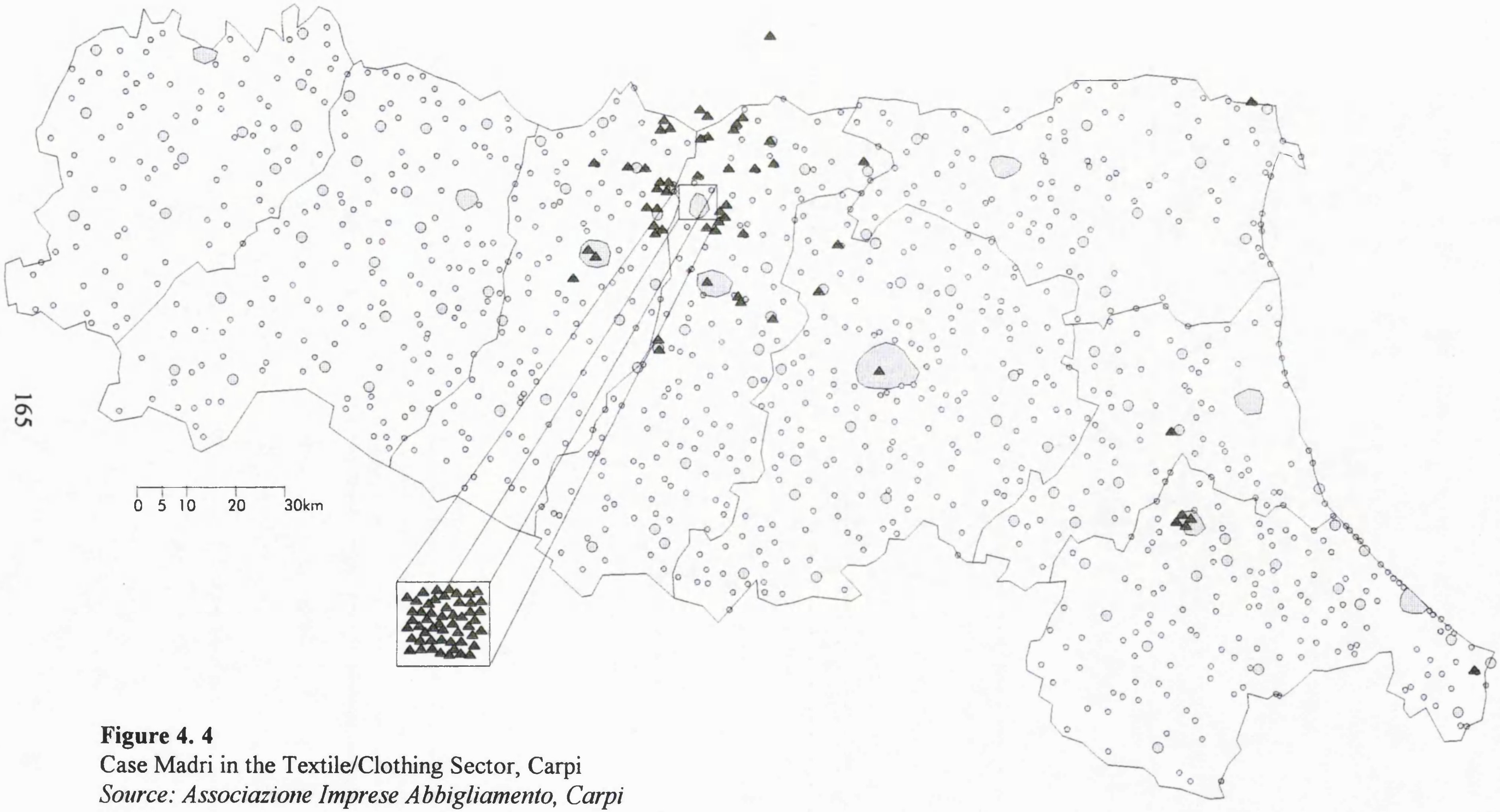


Figure 4. 4
Case Madri in the Textile/Clothing Sector, Carpi
Source: Associazione Imprese Abbigliamento, Carpi

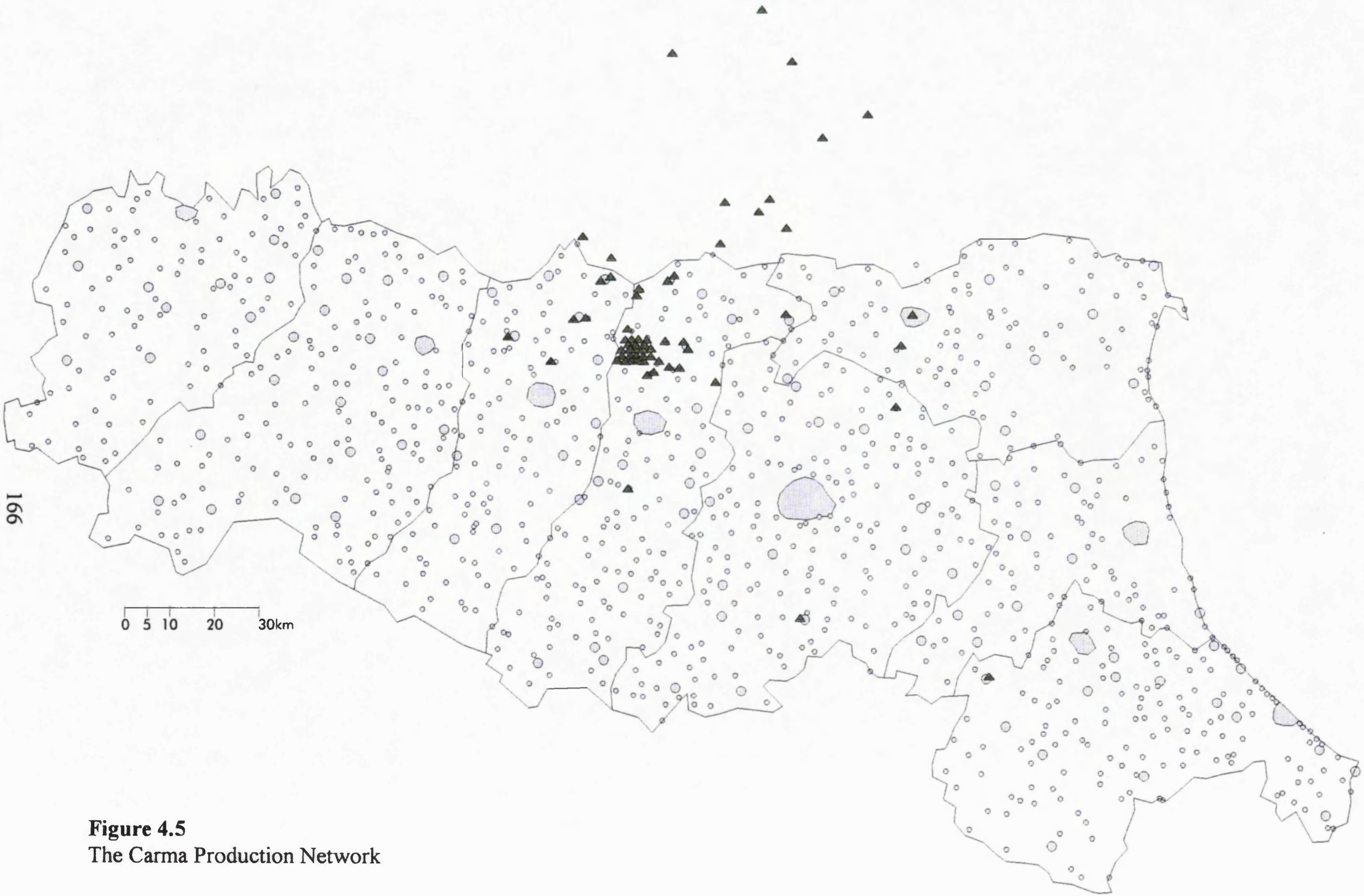


Figure 4.5
The Carma Production Network

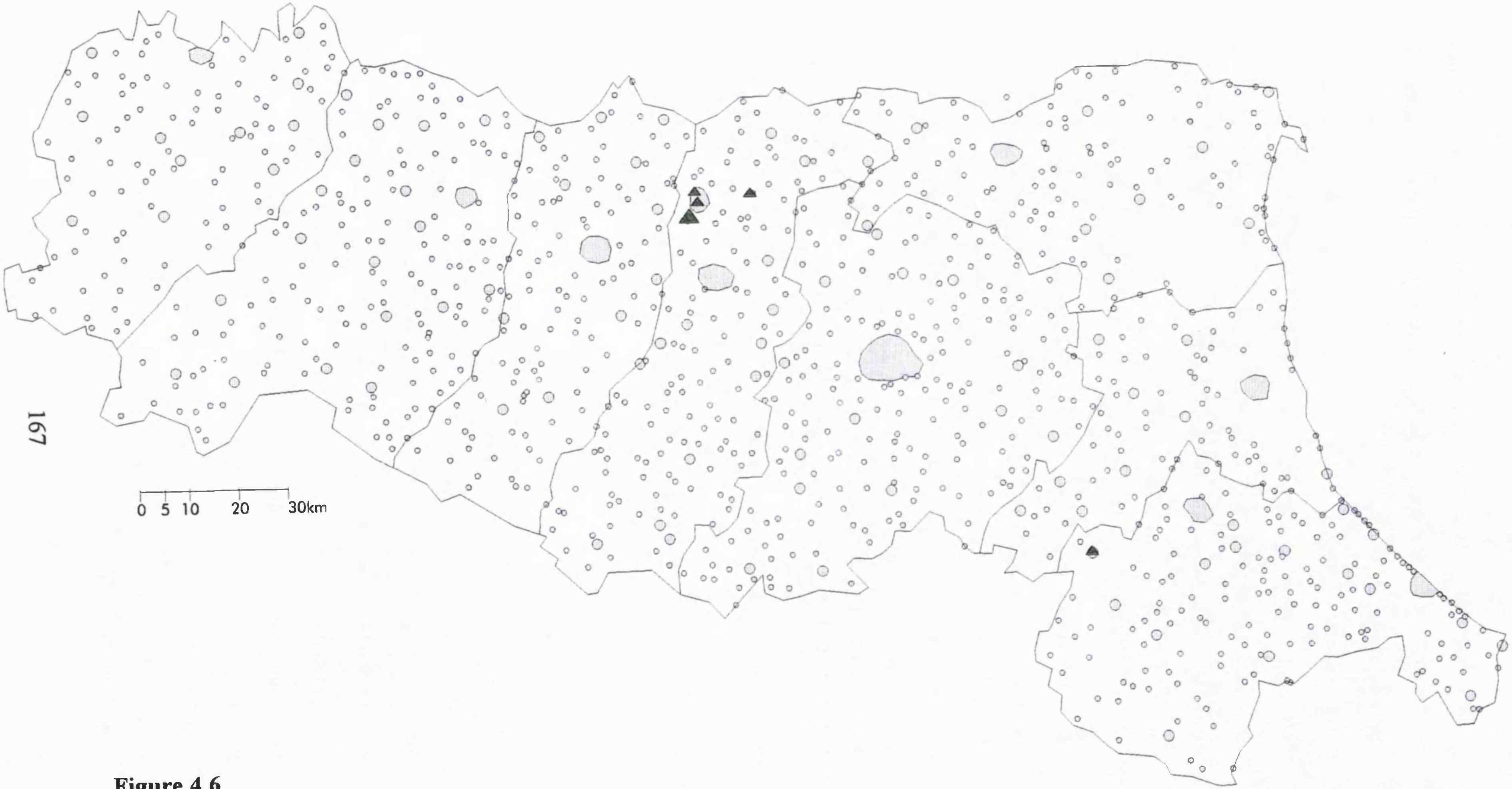


Figure 4.6
The Carma Single Product Network

The relations described above of the dominance exerted by the *casa madre* over the artisan firms are expressed spatially in the dominance of the urban centre (Carpi) over the surrounding towns, villages and urban areas. Aspects of ownership and possession are concentrated in the urban centre. That is, there is a remarkable degree of concentration of control functions, combined with a highly decentralised and dispersed network structure. This relationship implies the control and dominance of the single urban centre over its dependent hinterland of surrounding towns and villages.

It also represents a highly articulated territorial division of labour. At the most basic level, control, design, administration, marketing and business service functions are concentrated in the urban centre (in the *case madri*). Production functions, on the other hand, are more widely dispersed throughout surrounding towns, villages and rural areas (in the artisan firms), though some of these are also located in the urban centre. Many aspects of internal control functions, relating to management and administration, for example, which one would ordinarily expect to find within an independently owned establishment such as those of the small artisan firms, are absent in this case. Instead, they are relinquished to the *casa madre* or to private consultants or artisans' associations located in the urban centre.

Within the sphere of production, there also is a highly defined territorial division of labour. Each firm specialises in a very specific, given phase of production, and these firms are dispersed throughout the hinterland, providing a variegated development pattern. This pattern is in contradiction to earlier empirical evidence (e.g. Coulet, 1978) which equated the absence of development poles and an even distribution of employment with an equalised development pattern. Rather, the evidence from the Carpi case suggests a differentiated, variegated development pattern.

The more distant network firms - those outside the Province of Modena - are generally located in lower-cost locations. The most distant sub-contractor firm is Fanny Confezione, which was originally established as a Carma branch plant in a low cost location. With the possible exception of Fanny, which still maintains a "special" relationship with Carma as the *casa madre* continues to own the plant and machinery, there is evidence that the more distant firms perform the more standardized, low cost, labour-intensive and less time-sensitive operations.

Towards an explanation

How can this clustered pattern be explained? In the case of Carma, certain market exigencies are apparent: the need for quality, design content, time-responsiveness, and price. It is on the basis of these product characteristics that Carma has been able to succeed in a very competitive market, particularly one characterised by low entry barriers, easy replication, and intense international competition, including that from newly-industrialising countries.

The main response observed in the Carma case was the transformation from a vertically-integrated to a vertically disintegrated system of production. Design, sales and marketing, and production coordination are undertaken internally, while all production functions take place outside the firm, in a dense network of small, specialised producers.

While Scott might say that economies of scope and scale would explain this productive structure, several questions would remain unanswered with this approach. First, there would be economies of scope to be gained from integrating production under one roof. Pieces would proceed more quickly between stages of production and clearly this would be a faster system, which is a key concern where time is an important competitive factor. Second, would integration not allow better control over quality? Third, the machinery does not lend itself either to very great variations in scale economies by stage of production, so an explanation of variations in economies of scale by phase does not support resorting to externalisation of production in this case. Clearly, there must be some other explanation.

A vertically integrated productive structure could not respond to the unpredictability of demand, the seasonality of production, and the associated fluctuations in labour requirements. On the other hand, the vertically disintegrated system of production improves product quality because of the high levels of specialisation of firms under the network system. Because the firms in a specific phase are in a competitive relationship, they seek to differentiate themselves from each other by increasing their level of specialisation. This increases the social division of labour in the district and leads to improvements in quality which benefit the *casa madre*. Carma relies on the quality of its product to distinguish itself from its competitors. This would only happen when there is a competitive, market relation between sub-producers and artisans in the same phase or phases of production. It would not transpire under a vertical integration scenario. This is specifically the kind of external economy that was referred to by Marshall, and reiterated by Scott and others.

The decentralised productive structure permits an extremely rapid turnaround time, which has several advantages for the *casa madre*. It provides an additional competitive edge in the fashion industry, where responsiveness to the market is a major factor. It allows a marketing structure which reduces Carma's risk substantially. Because the turnaround time is short, the *casa madre* can sell its product through its representatives first, before production orders are made, and still get the product on the market in a timely manner. If a particular product does extremely well on the market, repeat orders can be made and delivered in very short periods of time. This both reduces the risk to Carma, and maximizes revenues.

Vertical disintegration addresses other market requirements as well, such as cost, which is a factor in this market, with its low entry barriers, continuing competitive pressure from low wage markets, and widespread competition. Because the artisan has contracted to produce a certain product for a certain price per piece, regardless of the size of order, he absorbs the cost of this high flexibility and product diversity. Indeed, as was shown above, the artisan contracts a piecework price before he knows how many pieces he will have to produce. A fundamental key to the Carma productive system is therefore that the *casa madre*, which essentially controls the productive structure, has constituted a system not which reduces the importance of economies of scale, but which passes on the costs of flexibility and diseconomies of scale to the artisan firm. It is not that minimum economies of scale are reduced or of lesser importance in view of this decentralised productive structure (though they may have been reduced by other factors, such as technology), but that the *casa madre* has effectively succeeded in forcing the artisan firm to absorb these costs.

This price relationship is sustained by two important factors: the use of geographical space as a regulating mechanism, and competition in the district. Worker organisation and high wage demands were one of the primary factors which led to the restructuring of the productive system in the 1970s. Even though a different product, competitive strategy, and productive structure were adopted at that time, the continued success of the Carma model depends upon low to moderate wages in production. If the artisan firms were to cooperate, to set standard prices, for example, or if the artisan firms were themselves to become highly unionized and impose rigid working schedules or high wage demands, the products would not be able to enter the market at competitive prices, and the system would fail.

The Carma model effectively inhibits unionisation, by the fragmentation of the workforce into small independent workshops, and prevents coordination on the part of artisans by pitting them against one another in a competitive relationship. Of course, territorial aspects such as the polycentric urban structure play an important role in this regard.

Fierce competition in the district between artisans or other sub-contractors in the same phase or phases, is combined with lack of flow of information and lack of organisation between these same artisans. Spatial segregation of network firms impedes the flow of information and resists organisation amongst sub-contractors. The *casa madre* can control the spatial distribution of its network system by selecting certain firms over others.

Case madri can further minimise production costs by taking advantage of existing uneven development, particularly in the form of cheaper labour sources in nearby regions. There was evidence of this in the spatial distribution of Carma network firms, which extended into the neighbouring regions of Veneto and Mantua, known to be lower-cost locations.

In other words, the spatially disaggregated network system acts to regulate the organisation of labour, restrict the power of sub-contractors and the potential for collective action or collusion on piece-work prices, take advantage of low-cost labour associated with uneven development, and control the ultimate cost of labour. This is important for Carma, given that cost is a factor in the competitiveness of the final product in the market. This use of territory and space is closely tied to the firm's weak position in the global marketplace, and its resulting competitive strategy.

These tendencies toward vertical disintegration and territorial diffusion are, of course, ultimately countered by tendencies of spatial clustering. The high degree of spatial clustering observed in the Carpi industrial district has much to do with the constant re-invention of the product; an entirely different product line is created and produced every six months. This, combined with small batch sizes for any single product, which are often further divided amongst repeat orders, creates a situation in which it is impossible standardize final or intermediate products, or routinize the ongoing transactions between firms. It is primarily this inability to routinize which causes spatial clustering to occur.

It is important to note that the network structure extends beyond firms that are only involved in production, to include service-providing firms, as well as non-market organisations, such as industry associations and local government institutions. Given the extremely small size of many of the knitwear network firms, administrative and other management functions could not be accommodated within the firm. Administrative functions were performed by private consultants or local industry associations. Industry associations, and a local government industry-specific agency called CITER also provided strategic advice, information on new textiles or technology, collective purchasing, etc. Access to the this localised infrastructure is another factor behind spatial clustering.

Finally, simple access to the district, which is the primary source of competitiveness is also a localising force. In the Carma case, it is clear that it is the organisational structure that provides the key mechanism for addressing market exigencies, specifically a vertically-disintegrated network system of production. While other elements of the organisation of production can and indeed come into play, such as advanced technology, or flexible work hours, evidence of these elements was much more uneven, and generally their contribution was much less significant. The decentralised productive system provides the basis upon which Carma can compete in the national and international market.

CHAPTER FIVE

A SMALL CITY DISTRICT: OLEODYNAMIC COMPONENTS IN MODENA

This chapter examines the territorial organisation of production in the Modena oleodynamics district. It begins with a review of the industry and the local district, describes the organisation of one firm and its production network in detail (Oil Control, S.p.a.), and concludes with some comments and interpretation.

I. BACKGROUND

I.I The Oleodynamic Components Industry in Italy

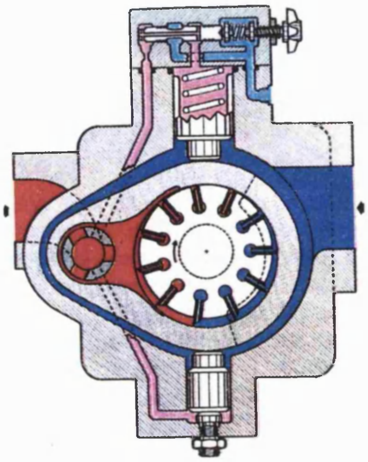
Oleodynamic components and systems are used primarily in a wide range of mobile machinery, such as agricultural machines, earth-moving machines, or lifting machines, as well as in fixed machinery, primarily industrial equipment such as machine tools (Figure 5.1).

An oleodynamic component consists of a system which transmits and controls power through the use of fluids under pressure, inside a closed circuit (such as a metal box or cylinder). The system includes components that execute the function of generators (converting mechanical energy to hydraulic energy, sending the fluid under pressure), and/or components for the control of energy, and/or components for the use or distribution of energy. There are many different types of oleodynamic components, including valves, distributors, pumps, cylinders, accumulators and filters.

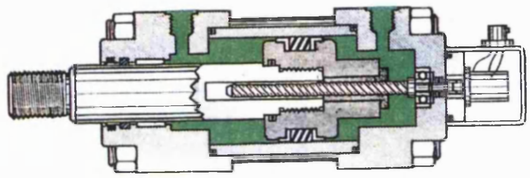
The first firms to produce oleodynamic components emerged in Italy immediately after the Second World War. It was not until the 1960s that the industry was firmly established, beginning a period of rapid expansion in which growth in sales averaged 15-20% annually (ERVET, 1986). Expansion in this

Figure 5.1

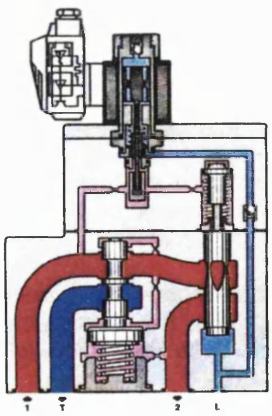
Oleodynamic Components



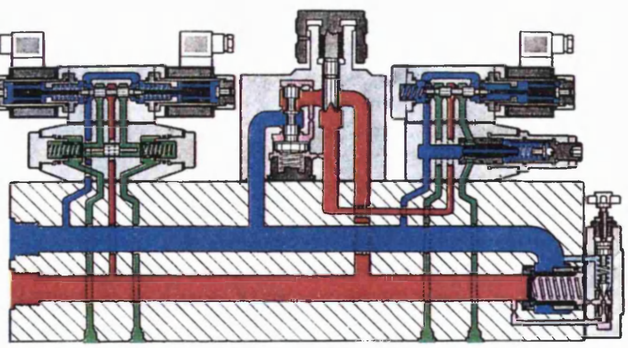
Pump



Oleodynamic Cylinder



Proportional Hydraulics



Complete system

Source: ERVET, 1986

period has been attributed to the growth and diversification of demand, which led to the birth of many small firms, each specialising in the production of a particular type of oleodynamic component.

By the 1970s, however, foreign competitors began to make strong inroads into the domestic Italian market, and the share of national demand satisfied by domestic producers began to drop, from 69% in 1976 to about 50% in 1983 (Comune di Modena, undated). The growth of imports was attributed to the increasing technological capacity of the foreign suppliers, aimed at the growing portion of market demand for sophisticated, higher quality products. The foreign producers, particularly large multinational firms from Germany and USA able to finance R&D, sold high performance, standardized, long series products at very competitive prices. This reduced Italian producers' share of the domestic market, and contributed to their dominance in the more traditional and simple oleodynamic product sectors (ERVET, 1986).

The early 1980s were characterised by increasing foreign trade: while imports were increasing at about 7.3% annually between 1980 and 1984, exports increased at a rate about double this (15.2%) (ERVET, 1986). However, the increase in exports was primarily in the area of low cost, low tech components (Comune di Modena, undated).

Data for 1986 show a total of 90 major firms in the oleodynamic sector in Italy, with a total employment of 4,150 persons (Databank, 1987)[22]. The value of production, at factory prices, for the 90 Italian oleodynamic producer firms was estimated at LIt. 340 billion for 1986 (i.e. approximately £170 million sterling at 1986 exchange rates) (Databank, 1987). About 40% of the value of production was exported in 1986 (Databank, 1987).

22 The Databank source is the sole detailed source of information available on the oleodynamics sector in Italy, and is the main source used by local and regional government. It is provided by a consulting company, and based on interviews with a sample of firms. It also tends to focus on the larger companies.

The sector is dominated by smaller firms, particularly in comparison to foreign competitors; 62% had less than 49 employees, while 20% of firms had between 50 and 149 employees (Databank, 1987). Employment, on the other hand, was more evenly distributed, with 19% accounted for by the under-50 employees category, 35% in firms of between 50 and 149 workers, 28% in firms of between 150 and 250, and 17% in companies with more than 250 workers (Databank, 1987).

The larger Italian oleodynamic component producers are localised in two regions: Lombardy (especially the provinces of Milan and Varese) and Emilia-Romagna (particularly Reggio, Modena and Bologna). The region of Emilia-Romagna was the most significant area of oleodynamic components production in Italy, accounting for 44% of all firms in the sector in 1986 (up from 38% in 1983)[23]. Emilia-Romagna increased its share of national employment in the sector in the mid-eighties, from 33% to 41% between 1983 and 1986[24]. Meanwhile Lombardy's share of national employment in the sector diminished somewhat (from 33% to 28% of employment, though its share of firms increased from 34% to 36%)[25].

Each region has its own productive specialisation: the Emilian firms produce primarily gear pumps and motors, and distributors, with 80% of production aimed at mobile machinery such as earth-movers and agricultural machinery (Databank, 1987). While gear pumps and motors are relatively low cost, standardised and mature, distributors are generally highly customised. The Lombardian firms, on the other hand, produce pump components primarily for fixed industrial machinery, a sub-sector in which the domestic Italian market is dominated by foreign producers, and so the two regions are not in direct competition with one another.

23 Databank, quoted in ERVET, 1986 for 1983 data; Databank, 1987 for 1986 data.

24 Sources as for previous statistics.

25 Sources as for previous statistics.

In the mid 1980s, original productive forms began to emerge in this sector, particularly in Emilia-Romagna. The characteristics of the Emilian oleodynamic components industry are explored in more detail below.

I.2 History and Profile of the Modena Oleodynamic Components District

The Modena oleodynamics district was selected for detailed study for primarily two reasons: it offered a district in a medium-sized, provincial capital city, falling between the other cases study cities of Bologna and Carpi; it was accessible and information was more readily available, as the municipal government took an active interest in the evolution of the local industry.

Evolution of the District

The evolution of the oleodynamic components sector in Emilia-Romagna and Modena has been described as consisting of three primary phases of development (Comune di Modena, undated; CGIL, 1988.) The Emilian oleodynamic components sector can be traced to the Province of Reggio-Emilia, where in 1957 the first oleodynamic firm, "Irma", was started. Irma's products were aimed exclusively at the agricultural machinery and equipment sector which existed in the area and which had begun integrating oleodynamic regulating devices on their machinery for the first time (ERVET, 1986). The first firms, including those which emerged a short time later in the Province of Modena, such as "Roseo", followed by "Fabbi" and "Salami", developed their products in close collaboration with the agricultural machinery sector. Yet more firms developed in this initial phase (e.g. SAI, Technol, Sighinolgi), continuing the specialisation of components for use on mobile agricultural machinery, and gradually expanding their product range to include components with applications on a wide variety of mobile machines.

The second phase occurred towards the end of the 1960s and in the 1970s, in which there was an expansion and segmentation of demand, particularly in foreign markets. This market condition, combined with the accumulation of technical expertise that had taken place over the preceding years, set the stage for the establishment of new firms and the effective disaggregation of production. Some accounts describe this phase as a "haemorrhage" of technicians - either previous partners or employees of the first firms - establishing their own new companies (Comune di Modena, undated). These new firms often positioned themselves in competition with the big firms, though with respect to just a portion of the larger firm's product line. Other accounts stress the role of the pioneer firms in actively establishing the specialised new firms, through ownership or in accordance with a company strategy of diversification, risk reduction, or specialisation (ERVET, 1986). In other cases, the birth of new firms can be attributed to the identification of particular gaps or niches in the market, such as the case of electrovalves (Comune di Modena, undated).

Specific conditions are cited as contributing to the development of the sector in this phase, including: a diffuse entrepreneurial spirit, a high level of professionalism in the work force, the exploitation of reciprocal processes of learning and the diffusion of information, and a specialisation in the various phases of the productive cycle that permitted a high level of flexibility (Cavallini, 1988). "This type of organisational structure, which based its strength on the so-called "economies of contiguity", pointed firms toward those segments of the market that require personalised products or at least less standardised products" (Cavallini, 1988). Still, some older Modenese and Emilian firms grew to large sizes due to increases in demand from sectors requiring components of high quality but lesser technological sophistication.

A third phase began in the late 1970s, and stretched into the 1980s. At the beginning of the 1980s, the increased foreign competition in the national domestic market was felt directly by Emilian and Modenese oleodynamic producers. It was at this point that domestic market share filled by foreign suppliers reached a peak of 50% (Databank, 1987). The insurgence of high quality, competitively priced foreign goods forced local producers to redefine their competitive and market positions, strategic directions, inter-firm relations, and to improve and rationalise production techniques (CGIL, 1988.) This was therefore a period of restructuring, leading to new and original modes of productive organisation, such as that developed Oil Control.

The District in the mid-1980s

ERVET (1986) estimates that in October, 1984, there were 103 producer firms in the region of Emilia-Romagna in the oleodynamic components sector, accounting for employment of 3,615 workers - or 3.3% of all workers in the regional mechanical sector[26]. Most of these firms are concentrated in the Provinces of Modena, Bologna and Reggio-Emilia, with 35, 31 and 24 respectively.

The vast majority of these firms are small or very small. Two-thirds of the Emilian firms had less than 20 employees (about half of which were above and half below 10 employees), while a total of 87% had fewer than 50 employees (Figure 5.2). Conversely, about two-thirds (67.5%) of Emilian oleodynamics workers were employed in the largest firms, while the smallest of firms (with less than 9 workers) accounted for only 5% of employment (ERVET, 1986).

In the Province of Modena, which is the primary location for the case study to follow, most firms fell into the 10-19 employees category, while only five firms had more than 50 employees, only one of which, "Salami", had over 100 workers (ERVET, 1986 and Comune di Modena, undated)(Figure 5.3). The

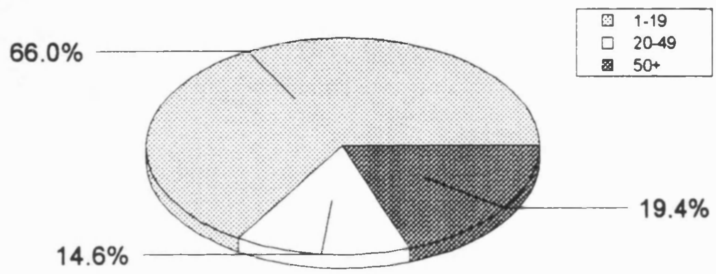
[26] There are three primary sources of data on the oleodynamics sector in the region of Emilia-Romagna and the Province of Modena. Databank provided a survey of Italian firms in the sector in 1983, and then again in 1986.

ERVET (1986) builds on the 1983 Databank analysis, and adds its own research to arrive at a more complete picture of the sector in the region, primarily by including the smaller firms in the data. Hence their figure, for example, of 103 firms in Emilia-Romagna (for 1984), alone while the Databank figure for all of Italy is 90 firms (for 1986).

The data at the provincial level compiled by the Comune di Modena and presented in their report, relies primarily on information provided by the union, their own data collection and interviews with firms. Their data represents only producer firms (excluding distributors), and those firms that work only as sub-contractors (*conto terzi*).

Figure 5.2

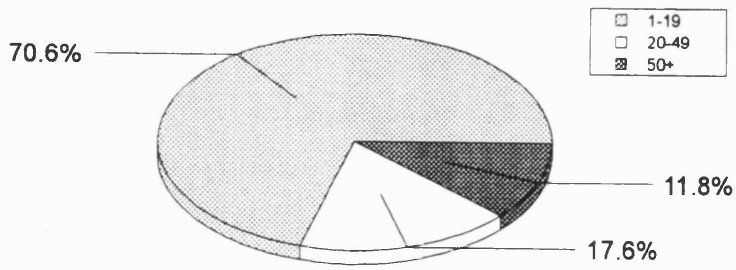
Oleodynamic producer firms, Emilia Romagna
by number of employees (1986)



Source: ERVET

Figure 5.3

Oleodynamics Producer Firms, Modena, by number of Employees



Source: Comune di Modena

Comune di Modena (undated) estimates that total oleodynamics sector employment for the Province was 869 in 1984, down about 8% from 950 workers in 1981. This was not a generalised decline, however, but involved primarily the older firms, while the younger ones increased employment levels.

Total output for the region of Emilia-Romagna is estimated at LIt. 293 billion for 1984 (approximately £150 million)[27]. The sector exhibited moderate growth between 1981 and 1984 - an average annual increase of about 6% in current (not real) terms (ERVET, 1986). Much of the expansion - which occurred during a time of decline in production at the national level - can be attributed to exports. The value of Emilian oleodynamic exports increased 26% over the period, and as a share of total production, exports increased substantially from 21% of output in 1981 to 36% in 1984 (ERVET, 1986).

It is interesting that the smaller firms of less than 50 employees increased their share of total output over the same period, while the share of output attributed to firms with more than 50 workers decreased about 10% (ERVET, 1986). So the small firms - not the large- can be credited with maintaining growth in output during the early 1980s. But the few big firms still accounted for the lion's share of output: firms of over 50 workers accounted for 62% of regional output, while firms of between 10 and 40 workers contributed about 30% (ERVET, 1986).

For the Province of Modena, total output in 1984 is estimated at LIt. 75 billion (£37 million, approximately) - or about one-quarter of regional output in the sector (Comune di Modena, undated) (Figure 5.4). Provincial output had declined in real terms during the recession years of 1981 and 1982, but rebounded to exceed 1981 levels by about 10% in 1984. This improvement is attributed only in part to the more favourable economic conditions in 1984 - it

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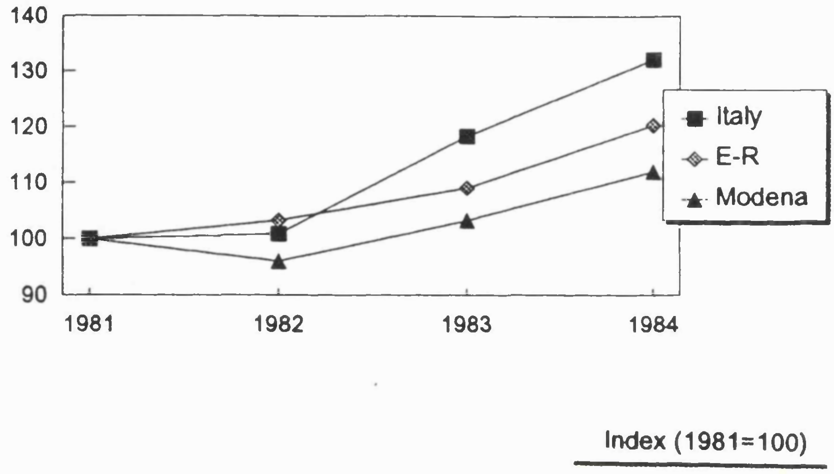
27 ERVET points out that there is some risk of this figure being over-estimated due to double-counting, given the high degree of exchange between firms in the region.

was also due to an improvement of competitive capacity (Comune di Modena).

Figure 5.4
Oleodynamics sector output, 1981-84



Sources: Databank, ERVET, Comune di Modena

Compared to the national profile for the sector, Emilian oleodynamic producers were relatively more concentrated in the sub-sectors of pumps (21% of the regional oleodynamic sector output), valves and distributors (21%), cylinders (19%) and motors (14%) (ERVET, 1986). Each sub-sector has its own range of products, markets, and production processes. Cylinders, for example, are the simplest among the range of oleodynamic components, but also the most customised, designed and manufactured according to the specific needs of users (Comune di Modena). Main uses include agricultural machinery, earth-moving machines, building and road construction machinery. The valves and distributors sub-sector caters to the same users, but in Modena there is special emphasis on distributors, and electrically controlled valves (electrovalves), the production of which replaced more traditional mechanical valves beginning in the 1970s (Comune di Modena).

There is therefore little homogeneity within the Emilian oleodynamics sector in the type of product (in terms of sub-sector, quality, price, technological sophistication), its stage of development (whether mature or leading edge), or in the degree to which it is standardised or customised. As we shall see, standardised, long series products can be produced alongside the more customised.

In the Province of Modena, production was concentrated in valves and distributors (at 30% of provincial output) and cylinders (at 27%) (Comune di Modena, undated), suggesting further sub-regional specialisations in different aspects of the sector. Despite these intra-regional variations, at about 32%, the share of Provincial output exported was similar to that for the region as a whole, and increased somewhat (from 28% to 32%) between 1981 and 1984 (Comune di Modena). However, the level of exports varies significantly by sub-sector. The valves and distributors sub-sector exported about the same proportion of production as the Provincial figure (31%), while for cylinders the share was less than the average (19%) (Comune di Modena, undated).

In the mid-eighties, ownership of firms in the Emilian oleodynamics sector tended to be private, independent of large national or foreign groups, and usually involving a local family or families (Databank, 1987). This was also true for the Modenese firms, including Salami, SAI, Oleodinamic Modenese, and Roseo. There are often ownership linkages between firms in the region, though it is not common for one firm to be completely owned or controlled by another.

No single source provides estimates of economic concentration at the provincial or regional level, but a rough estimate can be produced by combining Databank figures for sales of the largest firms with ERVET and Comune di Modena estimates for total regional and provincial output for the same year. Adopting this methodology, the following table results:

Table 5.1
Economic Concentration of Oleodynamic Producer Firms
Share of Total Sector Output
Emilia-Romagna and Modena, 1984

	Emilia-Romagna		Modena	
	LIt (billions)	%	LIt (billions)	%
Top firm	19	6	12	16
Top 1-4 firms	58	20	27	35
Top 1-8 firms	95	33	-	-
TOTAL	293*		76**	

* *ERVET (1986)* ** *Comune di Modena (undated)*

From these rough figures we can see that while there is a group of larger firms operating in the oleodynamics sector in Emilia-Romagna, there is not an exceptionally high degree of economic concentration. This value is higher for the Province of Modena, in which there is one very large firm (Salami) and a few large firms. For the most part, as was noted above, the sector is characterised by very small to medium-sized firms, and while there is occasional participation of some firms in the ownership of others in the same region and sector, this does not translate into direct control of one firm over one or several other firms. Neither is the regional picture dominated by foreign ownership or the presence of multinationals amongst the producer firms, though there are some examples.

Turning to the labour process and aspects of the internal structure and organisation of firms, the Modenese oleodynamics sector is dominated by male workers, particularly those 25 to 45 years of age, while women represent about 19% of those employed (CGIL, 1988). About 70% of employment is in blue-collar categories, and 30% in white-collar or clerical roles (CGIL, 1988).

The level of unionisation in the Modenese oleodynamics sector is about the same as that for the province as a whole; 62% in oleodynamics versus 61% for the Province of Modena (CGIL, 1988). This proportion is quite high, especially considering the small average firm size. The composition of membership indicates a greater presence of *'impiegati'* i.e. clerks and white-collar workers, compared to the all-industry Provincial data. Nevertheless, the level of blue-collar union membership is high, at about 80% of all male workers and 66% of female workers. Membership amongst workers with clerical/white-collar qualifications in the two largest firms (Salami and Oil Control) is also good (CGIL, 1988).

The introduction of advanced production technology was perceived as having various effects, depending on the market segment, product strategy chosen by the particular firm, the technologies adopted, and the organisational structures (including the criteria of internalisation vs. externalisation of specific firm functions). In the area of management, the process of *informatizzazione* or computerisation of elementary information functions was more advanced. On the shop floor, the introduction of innovations had brought about an occupational polarisation, with a limited number of workers with authority, in charge of more skilled functions, including programming the machines, versus a large number of low-skilled workers primarily in charge of loading and unloading the machines, and with minimal control (CGIL, 1988).

The productive process is characterised by disaggregation, with production usually taking place through a network of highly specialised producers, generally under the control and direction of a lead firm or "*casa madre*" (mother firm). The lead firm takes on the roles of product design, coordination of the production process, quality control, and marketing strategy.

The productive relations between firms have been described, however, as surpassing simple, traditional, hierarchical sub-contracting relationships, "achieving forms of division of labour according to the diverse capacities and productive specialisations, and of real cooperation..." in areas such as product development (Comune di Modena, undated: 88). The evolution of cooperative links in the mid-1980s is heralded as signalling a reaggregation and integration of different production activities. While there is evidence of "*filiazione dalla casa madre*" or the lead firm directly establishing spinoff firms, accords and coordination between financially and legally independent firms are more common (Comune di Modena, undated).

2. THE OIL CONTROL PRODUCTIVE SYSTEM

As noted above, there are myriad types of oleodynamic components, and the sector is divided into several sub-compartments based on these product distinctions. In the case study below, we will explore the productive system associated with a network of firms that produces oleodynamic valves. The lead firm is called "Oil Control S.p.a.", and heads a network of firms located primarily in the Province of Modena.

Though there is a range of types of productive structure existing in the Modena district, the most common type is similar to that of the Carma model, involving a lead firm and a network of subcontractors. However, in the Modena district, interlocking ownerships amongst lead firms are quite common, perhaps as a means of presenting a more complete product range on the market.

Oil Control's network is unique in that its relationships with sub-producer firms run much deeper than the traditional sub-contractor/client relationships seen with Carma. In this case, the second tier firms were created by Oil Control to fulfil specific production functions, and evolved with the *casa madre*. The firms are further linked by a pattern of interlocking ownerships, with Oil Control owning controlling shares of the network firms, who in turn have a financial interest in Oil Control. The network firms which are involved in joint ownership arrangements with Oil Control will hereafter be referred to as the "family firms" (as indeed Oil Control calls them), to distinguish them from other firms involved in production but not linked through ownership. So while the Oil Control example may be somewhat unique, it will provide a case that helps to isolate the effects of ownership on the territorial organisation of production.

2.1 The Process and Organisation of Production

The process of production varies depending on the type of valve to be produced. The process described below represents a schematic view - a typical case of a more complete valve or "block" consisting of an external body or aluminum block, with various cavities inside. The cavities contain control devices, cartridges, and single valves. The main stages of production are:

- marketing;
- evaluation of technical feasibility of a given product;
- design;
- production planning;
- acquisition, of raw materials and standard components;
- production, including:
  - fabrication of the oleodynamic "box" or container from steel or aluminum bars;
  - drilling or boring of channels in the box;
  - manufacturing of the individual parts, such as valves and cartridges;
- assembly of the specialised steel components, standardised components and aluminum block;
- testing, including tuning, weighing; and
- shipping.

First, it should be noted that the process of production is not a strictly linear process, as the above outline would suggest. For example, many different manufacturing processes can be undertaken simultaneously. Second, the specific production process will naturally vary depending on the exact nature of the product. Third, and most important, the production process does not take place within a single firm, but is dispersed amongst a network of firms. Certain functions are performed "internally", that is, within Oil Control, while others are undertaken externally in specialist firms. Indeed, this is probably the singlemost important defining characteristic of the system of production.

The Oil Control network can be seen as consisting of three levels. At the top is Oil Control itself, the *casa madre*, which is responsible for sales and marketing, product development, production planning, testing, along with some manufacturing and assembly. In the second tier are a small number of family firms, each which specialises in a particular phase of manufacturing. These firms are: TARP, Edi-Systems, CCO, and TCB. In a third tier are a number of sub-contractors and suppliers, which interact only with the second tier enterprises.

2.2 The *casa madre* - Oil Control, S.p.a.

Oil Control S.p.a. is a firm of approximately 90 employees, which specialises in the production of oleodynamic valves for mobile machines. It is located in the small town of Nonantola, some 10 km. east of the city of Modena, in the Province of Modena. The firm is autonomous and privately owned, by a small group of partners.

The valves produced by Oil Control fulfill primarily a function of controlling load. This serves a security role, for example, by ensuring the stability of heavy machinery should another component break. Their most typical product is the "balancing valve", as well as valves that control the motion of a machine. Balancing valves account for approximately 65% of Oil Control's sales, 70% of which is comprised of valves for earth-moving machinery, and 30% of which controls suspended loads, primarily for lifting machinery.

In 1986, total sales for the firm amounted to LIt. 11.9 billion (about £6 million), having demonstrated a remarkable average annual increase since 1982 of 34% (in current lire), from LIt. 3.8 billion. The steady growth of the market for Oil Control's product is linked, in part, to the widening application of safety standards to mobile machinery in Europe and elsewhere. About 50% of Oil Control's sales was exported, of which about 75% went to the (then) EEC and other European countries, 15% to Australia, and the remainder to a variety of destinations including Canada, the US, Israel, Mediterranean countries and the Far East.

History

Two of Oil Control's current owners started the firm in 1973. They had both worked in the largest oleodynamics firm in the province, "Salami", before setting up their own sub-contracting company in the late 1960s. One of these partners was the director of the technical office at that firm and developed a significant experience and expertise in design.

After having established their own firm, the partners began looking for a product that they could produce themselves directly for the market. They observed the success of an Italian firm that imported certain kinds of oleodynamic products from the U.S.. They also judged that this firm knew little about the possible applications for its product, and that the potential for this kind of product in Italy was not being exploited.
The product was aimed especially at the Italian market, and Emilia-Romagna itself. The Emilian market particularly tended to consist of small firms, representing a fragmented demand, which contributed toward the notion of producing customised products. Adapting the product to fulfill the precise needs of clients was therefore a fundamental idea behind the formation of Oil Control in 1973.

Most valves produced by Oil Control are designed and developed for a specific client and for a specific function. They began by producing valves for controlling load and motion, particularly for the mobile machinery sector, and especially for lifting machines. Often, this meant providing solutions for a client's particular problem, and hence a high degree of customisation of the product. Oil Control's products differed from those in the marketplace provided by the large multinational corporations operating in the sector, which concentrated in other kinds of oleodynamic components, such as pumps or cylinders. "The fact is that the great multinationals were not interested in Italian firms. We produce a kind of component whose function is to improve and fine tune the machines, and usually it must be customised, or modified according to the kind of machine, so it is a kind of product that the multinationals are not interested in." (interview, Storci/Ferrari, 1988).

Indeed, Oil Control has a very high number of components in production - about 5,000, of which 2,000 are manufactured essentially in their entirety. About 1,000 to 1,500 components are planned and designed on average each year. These numbers suggest the extreme variability of production and high degree of flexibility of the productive structure. The productive cycle is organised around lots of small to medium size of from 500 to 2,000 pieces, repeated from 3 to 12 times in a year.

Because Oil Control's products are developed to respond to the particular needs of a user, a close relationship with the client is required. The direct and intimate relation with the client, and the consultant service offered to the client by Oil Control are seen as the keys to the success of the firm.

Because of the high degree of customisation, and the close contact with the client that this requires, the evolution and improvement of the product is continual, and becomes a natural offshoot of this relationship. The quest for a solution to a particular firm's problem leads Oil Control to conduct research and experiment - which in turn can lead to improvements that are more widely applicable. The constant innovation and experimentation with the product is evidenced in the fact that in its short life, the firm has deposited over 30 patents for the European market. As each product has a very specific function, such new discoveries tend only to increase the firm's product range rather than eliminate existing products. The orientation towards resolving a particular client's problems constitutes a major stimulus for product innovation.

However, the firm does not only produce customised products; standardised oleodynamic valves are produced in about equal measure. These are produced with little to no contact with the client, on different, dedicated machines, in long series, regular production, are warehoused and sold through catalogues and other indirect means, and therefore with little knowledge of the final uses to which the valves will be put.

The firm's main competitors are Italian, and include primarily other firms in Emilia Romagna, such as Comatrol and Oleostar, both of Reggio-Emilia. These firms form part of larger industrial groups: Hidroirma and Casappa, respectively. The US also produces competitive products, but they do not have a large presence in Europe. Some British producers have recently developed a capacity in the oleodynamic valves sector, including Sterling Hydraulics and Integrated Hydraulics.

Oil Control believes itself to be the "leader" firm in its sector in Italy. Competing firms produce their oleodynamic valves externally; only design and sales are undertaken internally. Production and assembly are executed by independent firms, and the *casa madre* cannot exercise as much control over the productive process compared to Oil Control's productive structure. "So they don't have direct control over production. According to Fiat philosophy, this is the right way, but for oleodynamics we consider it a handicap. Even if it is more expensive, it is more important to directly control production to control the quality" (interview, Storci/Ferrari, 1988). The competition also tends to be less specialised in oleodynamic valves, and attempts to use standardised, rather than customised components in their final products.

Oil Control's competitive position can therefore be said to rest upon the differentiation of its product from other major producers, in particular avoiding markets dominated by the large multinationals, and its continual development of new uses, applications, and extensions to the product range to meet changing, specialised market demand. This differentiation rests on two pillars: the high quality and customisation of the product.

Oil Control has a commercial network which has been created over the years, which extends all over the world. Representatives essentially buy Oil Control's standardized products, and sell them in individual markets. The final price is therefore not decided by Oil Control itself, but by the various representatives. If the client has specific problems that require a customised valve, then Oil Control must intervene directly through their consulting section. The representatives, however, are all qualified technicians that can serve as intermediaries. Oil Control has its own commercial structure in one foreign country only - England - where it has established Oil Control U.K.. This direct commercial structure was one that was seen at the time of interview as likely to be extended as a part of a strategy for dealing with continuing European integration in 1992.

The Internal Organisation of Production

The overall management of Oil Control is headed by a three-member "administration council", which consists of three of the partners who jointly own the family firms. This small group is the governing and decision-making body of the firm. One partner presides over the technical aspects of the product, guiding the commercial technicians, and overseeing sales, marketing and product design. A second partner is responsible for production in general, and the operation of the workshop. The third partner is senior manager and responsible for administration, though the other partners also oversee the administrative function and are primarily responsible for the general management of the firm. Though this represents a substantially centralised management structure, one of the goals at the time of interview was to decentralise the decision-making apparatus within the firm, with the two active partners acting more as "consultants" to other managers and employees.

As noted above, not all of the functions involved in the production of Oil Control's oleodynamic valves are undertaken within the firm itself. Of the list of steps outlined above, the main stages undertaken internally by the *casa madre* are:

- marketing and sales;
- product evaluation and design;
- development of prototypes;
- acquisition of materials and standard components (for itself and external producers);
- some production phases, e.g. the forming of the steel container block or box;
- assembly (adding the standard pieces acquired);
- testing; and
- warehousing and shipping.

The internal organisation of the firm reflects these functions. A Technical Office is responsible primarily for design of products and experimentation. A small office of "Times and Methods" had recently been initiated within the Technical Office, but the planning, organisation and scheduling of production was still primarily left to the workshop, where the pieces are studied again from the point of view of the productive cycle, the specifications for each piece are entered into the data bank and translated into control programs for the production equipment which can be accessed from the work centres. The management of the data and programs to control the machinery is therefore currently undertaken in the workshop. There is also an Office of Production, in which production of standard products only is organised in accordance with orders and statistics. The administrative office also includes the sales office.

Oil Control has been working to develop an integrated computerised information management system. At the time of interview, they had recently switched to a single system that took care of virtually all aspects of information management, from planning the workloads of the machines and stocks to billing and managing orders. The firm has a direct computer link to Oil Control UK. Orders are sent directly by computer from England to the factory in Nonantola, where production planning begins. This also allows Oil Control to work with minimal stocks, and reduce costs as much as possible.

In the pre-production phases, there are several types of worker. Due to the high technological content of the product, the sales office requires workers with an elevated degree of technological knowledge; these employees are referred to as "commercial technicians". There are technicians who engage in product design, according to the needs of the client, while other technicians analyse the design and determine the best and most efficient productive cycle for the piece. At the time of interview, the firm had two CAD stations, and were awaiting the arrival of two more. However, the CAD function was not directly linked to the production equipment. Another type of worker develops the computer programs for the computer-controlled production machinery that will execute the required piece.

Actual production involves primarily machine operators. The machine operator's job consists of preparing the machine for production, including organising the pieces that will be worked (in groups, rather than single pieces), selecting the appropriate tools (with the help of a worker who specialises in this task), loading the appropriate control programs, and supervising the machine in operation. Once prepared, the machine can operate on its own for several hours, so a single machine operator can be responsible for more than one machine, a situation that was not possible with traditional machines.

Oil Control requires two broad types of production machinery, reflecting the two main categories of product: standardized and customised. Dedicated machinery is used to produce the standardized products, and is used only for this purpose. These "transfer machines" were highly productive, and used to produce long series, of thousands of standard pieces, often requiring one or two months to do so. These machines were relatively low cost, but required a highly skilled operator.

On the other hand, flexible machines are used to produce the customised products, and these machines account for 90% of Oil Control's stock of machinery. According to the partners, Oil Control has always followed a program of investments in high technology, especially in computers, and has been systematically adding computerised machinery to its inventory since the late 1970s. Included are both NC/CNC machines and computerised work centres. The latter have the ability to store programs, and execute automatic tool selection. At the time of interview the firm had five computerised work centres, one computerised grinding machine, and one cleaning centre planned to resolve pollution problems. These machines did not form part of a network linked to other machines, or to administrative functions, but were isolated production centres. However, there were cases of partial integration, particularly in the first phases of production, where for example the cutting of the bars and grinding the valve were linked by robot.

As the firm's strength is customised oleodynamic valves, Oil Control produces a large number of small components. The flexible, computer-controlled work centres and machinery play a critical role in permitting the diversity of product, short production runs (usually 5 to 100 pieces), and the frequent product and process changes that these imply, while maintaining production efficiency. These machines are also credited with significantly reducing turnaround times ("today you start the production of one piece and tomorrow you can give it to the client, even if there are manual operations involved" (interview, Storci/Ferrari, 1988)).

Of the 65 workers involved directly in production, there are eight or nine who program the machinery - the "*periti industriali*", or industrial technicians (generally graduates from a technical high school). There is a single "*attrezzatore*", who selects the proper tools for the machines. The *attrezzatore* must ensure that the tool is operating correctly and that the resulting pieces are correct, and have not been influenced by build-up of material on the machine, for example, and that the appropriate lubricants have been used. A total of about seven or eight of the direct production workers are seen as being highly skilled, and with a high level of experience.

Workers at Oil Control generally have some kind of diploma, most often from a technical high school. Their staff includes only two engineers with a university degree, and one other employee with a university degree in business, who assists in the general management and administration of the firm. The firm has a policy of not hiring highly skilled and experienced workers; rather, they prefer to assume workers straight out of school, and look primarily for a positive attitude rather than specific job skills. Most new workers are assumed as apprentices under the "*contratto di formazione di lavoro*"[28].

As most new workers are recent graduates of high school or technical school, much of the worker's training takes place within the firm. This is not just a case of on-the-job learning, but Oil Control also provides more structured training through courses, both within and outside the firm. There are two streams of courses, one for those workers who are in contact with the clients, such as the engineers and the technical-commercial staff, and the second stream comprised of courses for production workers. The latter courses are organised by Oil Control's engineers, and deal primarily with technical issues.

New production workers also receive on-the-job training by working for the

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28 This is an apprenticeship program in which the state covers tax and insurance contributions for the worker, which essentially lowers the cost of the worker to the employer.

first two years on traditional machinery. In this way, the owners feel, the workers develop a greater understanding of the work process, the proper tools, materials, lubricants, etc. and the principles at work. Even computer programmers whose eventual job will not be to directly operate a machine are subject to this training, so that they gain an understanding of the entire production process, of the actual pieces that emerge at the end of a working process, and can relate that to how the machine has been programmed. This training period is necessary for all production workers, even though technically, only a few days' training would be sufficient for a new worker to learn how to operate a computer-controlled machine. New workers are trained with other workers using the same kind of machinery, and with the assistance of the technicians and designers.

According to the president of the company, the long term career path of the worker is not dependent upon his level of qualification upon entering the firm, but rather upon the level of skill he demonstrates and particularly his "willingness". There are examples in the firm of section heads that have only intermediate higher education, while the more highly trained *periti-industriali* may take much longer to reach the same position.

There seems to be a fairly high degree of movement of workers between different tasks, particularly in production. This generally consists of the technical, programming and design staff also operating the machines in production, rather than the machine operators occasionally performing programming functions. In fact, the machine operators do not generally program their own machines - this is the role of the technicians. With the automated, computer controlled work centres, the function of the machine operator is primarily the loading and unloading of batches of parts on the machine. So while the operator's function is narrowed in one sense - that he no longer programs the action of his machine - the fact that the machine can operate by itself for several hours means that the operator can look after more than one machine at a time. However, the "work centres" also have automatic tool selection and mounting, replacing yet another function that was previously performed by the machine operator himself.

For the production worker, there was only a limited degree of integration of conceptualisation and execution, through two primary channels. First, the production worker tended to and in fact was encouraged to work with the designer and the computer programmer in the execution of the components. This consultation took place after the component had been designed, however. A second channel for worker input was the regular firm meeting, which all production workers and management attend, to discuss organisational and technical problems and their resolution. Workers were asked to identify problems, and to suggest solutions. Management stated that it did take the views of workers into account when making decisions on these matters, and when workers' views were not acted upon, the rationale behind the decision was presented to the workers. "If you make the worker state their opinion on how to resolve the problem, you must take their opinion into account, and if you choose another solution you must be sure that it is the right one, and you must explain the decision to them and the reasoning" (Storci, interview, 1988).

The External Relations of Production

As noted above, most of the production functions are undertaken outside the *casa madre*. Production can be broken down into two primary types of component. First, there are standardised pieces, which are acquired from outside suppliers. These are generally smaller pieces such as washers, springs, caps, etc. which are simply ordered as is from existing suppliers. The second kind of component encompasses all other pieces required to produce the valves, both in the case of standardised and customised valves. These pieces are produced within the network of small firms linked to Oil Control.

The "family firms" in the Oil Control family consist of:

- Edi-Systems, Modena;
- TARP, in Sant'Antonio di Pavullo;
- TCB, Nonantola; and
- CCO, located in Modena.

Each of the firms is devoted to a particular area of production or manufacturing process. CCO specialises in particular manufacturing processes in component-making, especially rolling; TARP in the production of sub-components and valves that form part of the final oleodynamic "integrated block"; Edi-systems in electrovalves, and TCB in thermal treatments. As a partner of Oil Control puts it, each firm represents a "microscopically differentiated production" (interview, 1988).

These network firms started to be formed shortly after Oil Control itself was founded, with the first one started three years thereafter. In general, they were each actively established by Oil Control as part of a wider organisational strategy and to fulfil a specific need. Two of these firms will be described in more detail below, Edi-Systems and TARP. Because of their significant differences, the internal organisation of each will be described separately below.

2.3 Edi-Systems

The Internal Organisation of Production

Created in 1980, Edi-Systems specialises in electrovalves. The founder of the firm had gained his training and experience by working at the major local oleodynamic firm, Salami, for 10 years, as a mechanical engineer. Following this experience, he became a salesman for a U.S. oleodynamics manufacturer (Smith), which was exporting electrovalves to Italy, and in so doing he identified the potential for producing similar valves locally at a lower cost. Edi-systems was created for this purpose.

Oil Control's interest in this area appears to be twofold. First, it saw the opportunity, through Edi-systems, to diversify its product range by the addition of electrovalves. Secondly, Edi-systems offered the potential to explore what it saw as the emerging market area of electronically-controlled valves, which were an extension of the electrovalve.

Edi-Systems' major product is electrovalves, although they also produce other kinds of valves. Part of the range of valve products is standardised, long series production and a part of it is customised. The electrovalve itself is a standardised "cartridge" in the oleodynamic component. Integrated blocks are also produced, and account for the lion's share of the firm's revenues. The main users are primarily the agricultural machinery and mobile machinery sectors, which account for 90% of revenues, while the remaining 10% is used in industrial production machinery, including the ceramics machinery sector.

The market is divided into three types of orders: single commissions, repeat commissions, and production on spec. The normal mode of operation is to work only on commission, even for the standardised products. For a piece that is already in existence the turnaround time is about four to six weeks.

The competitors that were cited were primarily local firms, including Oliostar, Cometrol and Oilsystem, all of Reggio-Emilia. Numerous foreign competitors were also noted, including those from the U.S., England, Germany and France.

The relationship between Edi-Systems and Oil Control is a unique one. In some ways, Edi-Systems acts as a supplier to Oil Control, and is in a secondary position. Yet with respect to its own internal organisation of production, it also takes on the role of a *casa madre*, in that it designs and develops products. Moreover, it does not undertake any actual production in-house, but sub-contracts all of the production functions to external producers. This organisational form has been in effect since the inception of the firm; production has never occurred internally. In-house functions include only:

- design
- development of prototypes and experimentation
- assembly
- testing.

Given that there is no actual manufacturing that takes place in Edi-Systems, most of the staff are not production workers. Of the 25 employees, there are two directors: one for administration, and one for marketing and sales. There are three engineers in the technical office, one of whom is a highly skilled designer. The sales and marketing office has a staff of two. Two employees are responsible for experimentation, one of whom is a mechanical technician. Two employees oversee the acquisitions of parts and materials, and another controls the warehouse. Computers were much in evidence, from the CAD stations used in design to the fully computerised administration, orders and stock systems.

Direct production at Edi-Systems involves only the making of prototypes, and assembly of the final products using parts commissioned from sub-contractors. The production of prototypes involves a single lathe operator. There are eight assemblers, including one "assembly coordinator" who is responsible for the planning and distribution of work. One worker is responsible for hydraulic testing and inspection. Given Edi-Systems' specialisation in developing new valves and non-production aspects of the process, the skill levels are quite high. The accountants and mechanical engineers have university degrees, and there are seven industrial technicians. Formal training is not perceived as being sufficient, however, so there is also an intensive internal training program for all workers, which requires one and a half years, on the theory and practice of *oleodinamica*.

The external relations of production

Edi-Systems uses Oil Control's marketing and sales network as their primary access to the market. Edi-systems products appear in the Oil Control catalogue, and the two firms coordinate on marketing and sales activities. Oil Control, in turn, considers this relationship as an opportunity for product research, in particular for the development of knowledge and potential products in oleodynamic components controlled electronically.

Despite its relationship with Oil Control, Edi-Systems exhibits a high degree of independence, developing and overseeing production of its own products. Its own network of production sub-contractors includes TARP, as well as other local firms in the Provinces of Modena and Reggio-Emilia. There are about seven such firms in all, including three specialising in lathe-work and others involved in different manufacturing processes.

2.4 TARP

The Internal Organisation of Production

TARP is a firm of 60 employees located in the small mountain town of Sant'Antonio di Pavullo, in the southern part of the Province of Modena. The firm specialises in the production of components for the oleodynamic valves, including cartridges which are inserted into the integrated blocks, and small valves. Annual revenues for 1987 were in the range of 4 billion lire (£2 million). Since its founding, the firm has been owned by a group of five partners, only one of whom plays an active role in the management of the firm; this partner effectively heads the firm and is its top manager. He oversees all day-to-day operations, as well as investment decisions, though these are made in consultation with the other partners.

The firm was initially founded in January, 1977 and moved to Sant'Antonio di Pavullo from Modena, in a building shared with Edi-Systems, in October of 1980. The reason given for setting up the firm in this small town was that the active partner and his wife were originally from Sant'Antonio, and it had always been a goal to return there.

The firm was essentially self-financed from the start. It did not rely on government assistance nor help from development or industrial associations. Rather, it raised capital privately, securing loans against private possessions. Now that the firm has achieved a level of stability, it has fewer problems obtaining financial assistance from banks.

On average, TARP produces 2,000 different kinds of pieces each year. These pieces are the basic components which are assembled into valves; each valve is comprised of from 10 to 15 pieces. The average lot size is about 5,000, but ranges from 100 to 50,000. There are usually about four placements every day (over two shifts). Despite the "flexible" NC technology, smaller lots are more expensive to produce due to the costs of equipping of the machine, and a premium is charged for these small series to reflect the setup costs.

The production process followed at TARP is generally as follows. An order is received by the Production Office, including specifications for the component. The production planner then analyses the piece, and determines what the production process for that piece will be. He will also determine what standard pieces will be required from other sources and orders them. Production itself usually involves the following stages:

- lathe-work
- boring/ drilling of cavities
- secondary lathe operations
- thermal treatments
- grinding
- coupling/matching of parts
- assembly
- testing.

Primary and secondary lathe-work account for about 60% of the work process, while grinding and thermal treatments account for the remaining 40%. All of these processes are conducted in-house, with the exception of thermal treatments, for which there is no internal capacity. This function is performed at TCB, the firm in the Oil Control "family" established by Oil Control for this purpose.

TARP has an extremely lean support structure; 54 of the 60 employees work directly in production. Under the owner/manager, there are five or six section heads - one for each major production process undertaken by the firm, including lathe-work, grinding and testing. The remainder of the employees are involved primarily in administration, which is undertaken internally, except for special tasks such as for calculating the VAT and for the annual declaration of revenues, which are performed by a private consultant. In addition, the firm makes use of a generic consultant from time to time. The consultants are located in Modena and Reggio.

As noted above, the firm is organised around the various production processes. At the time of interview, TARP had some of the very latest and highest quality production equipment available, augmented by traditional equipment for specific tasks. Their inventory includes:

- for lathe-work, 20 traditional machines and 7 NC machines;
- for secondary lathe-work, all are transfer machines built especially for their needs;
- for grinding, two NC machines;
- and a large number of other traditional machines for specialised tasks.

The firm began acquiring NC equipment in 1981 and added one or two of these machines each year. There is one central computer which manages the programs for the NC machines. This computer stores programs for all the NC machines, sends the appropriate program to the NC machine for a given production procedure, and then receives the program again when the procedure is completed. This saves enormous amounts of set-up time for repeat orders, for which all that must be done is to call up the appropriate program from the central computer.

The machine operators, which make up almost the totality of the firm's employment, tend to be extremely specialised. It is a policy of the firm to specialise workers on individual machines, so that they can develop a high level of competence. "We teach him a particular task, and then we leave him there for a long time, because he needs a long time to acquire skills" (interview, Venturelli, 1988). Despite regular changes to the production process, the workers remain highly specialised and devoted to very specific machinery and tasks.

TARP is unique in that a large number of its production workers are women; there are 23 women employees in the firm, and 21 work directly in production. The hiring of women has been a deliberate policy of the firm's management. However, the management also believes that women are more suited to the more repetitive and less demanding tasks.

Generally, workers are assumed straight out of a technical high school, usually with a five-year diploma. All workers receive on-the-job training. TARP tends not to hire workers with a great deal of previous experience, but looks instead for young workers with a "love for work".

The introduction of NC machines tools is perceived to have made it much easier to train new workers. The quality of work achieved with NC machines is less dependent on the worker himself, because the machine performs many functions previously undertaken by the operator. Thus the training time for an operator of an NC machine is six months, compared to ten years for a traditional machine operator. The operator of a traditional machine must know applied mechanics and the mechanics of the machine, while the NC machine operator is more like a computer operator. At TARP the machine operator plays a greater role in programming the machine; the manager feels that it is a "great mistake" if the programme is made up by a programmer in the office and the worker has only to equip the machine.

Other perceived impacts of NC technology include the ability to produce extremely complex pieces, and very significant saving in production time, due to reductions in the time required to set up the machine for a new procedure and the fact that NC machines are more similar to one another. This last point is seen as very important when small series are being produced. The NC machines are not viewed as leading to reductions in costs, however, as they are very expensive to buy, maintain and operate. A final perceived impact of computerised production technology is a reduction in the number of steps involved in production, because NC machines are able to do many more operations compared to traditional machines.

The External Organisation of Production

Oil Control maintains a financial interest in the other firms in its "family" network. Nevertheless, the firms seem to operate quite independently. Oil Control does not play a direct role in the management of TARP, certainly not in the day-to-day management. But there is common ownership amongst the two firms and Oil Control could conceivably have influence over major decisions regarding investments, for example, or budgets.

The firm does not produce its own products, only those of Oil Control. Oil Control undertakes all of the design functions for the components, and provides the specifications to TARP. TARP has no input into the design of the components which it produces. TARP's manager indicated that there is not really any exchange of information between the two firms regarding production. If there is a problem in production, there is no inter-firm response to solving the problem. And as TARP have no input to the design process at the outset, they have little opportunity to prevent the occurrence of problems through a joint design process.

TARP does not work exclusively for Oil Control, though its primary commitment is to that firm and their work takes precedence. Oil Control accounts for about 60% of TARP's total revenues. When it has extra capacity, TARP undertakes production for five or six other firms in the Province and the Region, sometimes for other artisan firms.

There are no formal contracts or long-term arrangements regarding the provision of work to TARP, though the joint ownership arrangement does effectively secure TARP's workload. It is difficult for Oil Control to provide TARP even with a longer-term prediction of workload. The *casa madre* does provide TARP with a "maximum program" with a three or six month outlook, but this only provides an indication of the possible future work. There is no formal guarantee or commitment of work by Oil Control.

TARP is a member of a single industrial association - API - the Association of Small Firms. This organisation essentially fulfills an information-providing role, circulating information bulletins and reports on issues of interest to small firms.

With respect to its relations with other network firms, TARP has stated that it does not have direct relations with the other firms in the Oil Control family. However, Oil Control indicates that the family firms are responsible for organising their own production process, which would suggest that at least in the case of thermal treatments performed by TCB, TARP would have a direct relationship with that firm.

In extreme cases, particularly when their workload exceeds internal capacity, TARP sub-contracts excess work out to other small artisan firms located in Bologna and Modena, but find that usually this results in more difficulty than assistance. This is because the sub-contracted firms do not supply the level of quality required and often do not meet deadlines, and TARP has little leverage it can exert over these external firms. However, in addition to the need for quantitative flexibility, and perhaps more frequently, TARP sub-contracts other firms to provide qualitative flexibility, particularly in cases in which other firms have specialised machines more suited than TARP's to a particular production process. Undertaking such work inside TARP would be less economical than sub-contracting in this case.

2.5 The Third Tier

The third tier of firms consists primarily of artisan firms, which do not have a direct ownership relation with Oil Control, but provide quantitative and qualitative flexibility. One such firm, "RGP", acts as a sub-contractor to TARP. RGP was interviewed in order to round out the profile of the system, and is fairly typical of the sub-contractor / artisan firms.

RGP is an independent firm owned by two partners, and with eight employees. Annual revenues for 1987 were LIt. 250,000,000 (£125,000, roughly). The firm was established in Lama Mocogno, in the hilly southern reaches of the Province of Modena, as this is where the two owner-partners lived.

The firm was founded in 1980, and specialises in lathe-work, working solely for other companies. One of RGP's partners worked in Milan for ten years as a seller of machine tools, and so was very knowledgeable of the machines, and of those used by competitors.

The firm is managed entirely by the two owner-partners, who make all investment and other key business decisions, independently from other firms, such as major client companies. The management of the firm is influenced by the competitive environment; competition is stronger for more common, generalised work, but weaker for specialised or precision work. RGP's competitive strategy was one of differentiation, based on acquiring high quality machines that differ from those of its competitors, in order to compete on the basis or providing specialised, precision work. Aside from providing a competitive edge, this was also viewed as more lucrative, as precision work commanded higher prices.

All administrative functions are conducted externally, by the industry association to which the firm belongs, *LAPAM* (Pavullo office). The firm's policy of hiring only apprentices is a form of assistance, as the contributions to tax and benefits are reduced, and their wages are also lower than those of qualified workers. RGP has also made use of a national government program that offers a low-interest loan for the acquisition of new machinery.

Though RGP specialises in a single manufacturing process (lathe-work), it also performs milling. RGP's stable of machinery includes ten automatic lathes, which perform various shaping operations on metal and steel rods as they turn. These automatic machines are mechanically programmable, however, not computer controlled. The continual introduction of new machinery was seen primarily as permitting new types of transformative processes which were not previously possible. There are no computer-controlled machines in the establishment. There are also manual lathes, for which each piece must be worked separately by hand, as well as manual secondary lathe machines, and milling machines. There are no computers in the firm of any kind - either in production, managerial or administrative functions.

All of the workers began in the firm as apprentices. The workers tend to stay in the firm for long periods, compared to other firms in which firms actively sought apprentices in part to keep costs down, and replaced them with new apprentices when they became qualified. Part of the reason for this approach is the close-knit local culture, which makes it very difficult to lay off any worker.

In general, the workers are responsible for operating the machinery, loading the pieces and supervising the automatic machines. Only one of the workers does the *attrezzatura* (preparation and equipping of the machine), along with the two partners. All workers know how to operate all of the machines, however. Skills cited as necessary for the work included a knowledge of design (especially how to read a design for a part), and of calibration of the machine.

RGP produces about 200 to 300 different pieces annually. This number has not changed in recent years. About 100 pieces are standardized, and are ordered repeatedly from year to year. Lot sizes vary from 500 to 6,000 pieces, but the preferred lot size is from 1,000 to 3,000. There is considerable variability in the production process. On average, retooling occurs two or three times a day, and must be undertaken for each new series. The variability in the production process does not come without costs, however. The main cost incurred with shorter runs is the cost of retooling which generally requires three to four hours per machine.

The External Relations of Production

The firm does not manufacture products of its own design or initiation - it works only as a sub-contractor. On average, RGP would have about ten clients annually. However, these ten firms tend to be in different sectors; TARP was the only client in the oleodynamics sector. Other clients included Ferrari, the ceramics machinery sector (which predominates in not-to-distant Sassuolo) and the medical machinery sector (there is a bio-medical district to the north). In general, no single client accounts for over 20% of RGP's revenues. The owners felt that attributing too great a share of total firm revenue to a single client would leave RGP vulnerable. Client firms tended to be located in the region, in Modena, Bologna, and Reggio-Emilia.

There are no long-term contracts between RGP and its clients; each order is arranged independently. Prices are set for each order by TARP, leaving RGP in the position of accepting or declining the work at the quoted price. In some cases, there are discussions between the two firms regarding price.

Neither do RGP make use themselves of sub-contractors; all of their orders are filled internally. Both of the partners take it upon themselves to coordinate orders and relations with the clients. There is consultation with the client regarding the production process when a problem is encountered. In addition, there is consultation with the client on the design of the products themselves, in which RGP provides input on the transformation processes. The owners felt that the designers do not take the production process into account when designing products because they are not familiar with the machines and their tolerances, and that they can therefore design dimensions or parts that are not achievable on the machines. In other cases, they design parts that would be unnecessarily expensive to produce. RGP offers suggestions to the client regarding more economical use of the machines. However, it is likely that this upward flow of information applies primarily to clients other than TARP, as TARP's pieces are designed further up the production hierarchy by Oil Control.

RGP does not have direct contact with other firms involved in TARP/Oil Control production. As noted above, its relationship with other artisan firms similar to itself is characterised by competition, particularly for more general orders which can be fulfilled by many artisans.

In the longer term, the market for RGP's work has proven to be somewhat unstable, despite the sectoral diversity of its client base. Even in periods of high demand, there is a reticence to take on new workers, because of the cultural difficulties involved in layoffs. Periods of high demand are managed by the two partners themselves playing a greater role on the shop floor, and working longer hours.

3. SYNTHESIS

The Oil Control filière is shown in Figure 5.5. The picture that emerges of the Oil Control network is of a disaggregated production process organised around a highly articulated network of specialised producers. In all, the network consists of about 20 to 25 firms involved directly in production (excluding suppliers of raw materials and standardised parts): the *casa madre* itself, the four "family firms", and about fifteen to twenty third tier sub-contractors (Figure 5.6).

Within the productive network, skill levels are high, there are extensive on-the-job training programs, and there are active programs of acquiring the latest types of automatic production equipment. There is a remarkable consistency in this throughout the system; these characteristics were apparent from Oil Control itself, through the "family firms", to the third-tier subcontractor.

3.1 The Inter- and Intra-Firm Organisation of Production

The Social and Technical Division of Labour

Of the distinctive characteristics of the Oil Control network, one of the most striking is the "microscopic" degree of specialisation. First, the oleodynamic sector itself is a specialised one. Oil Control produces products within one sub-compartment of this sector - hydraulic valves. The social division of labour further occurs between Oil Control and Edi-Systems, each specialising in a particular aspect of the product range, and between these two lead firms which undertake design and marketing, and the network of artisans and small firms that undertakes the actual production. These network firms are themselves specialised by phase of production or manufacturing process. In the third tier of the network, we arrive at a point where a company specialises in a single manufacturing operation, and further specialisation or fragmentation of the productive process is virtually impossible.

Figure 5.5

The Oil Control Filière

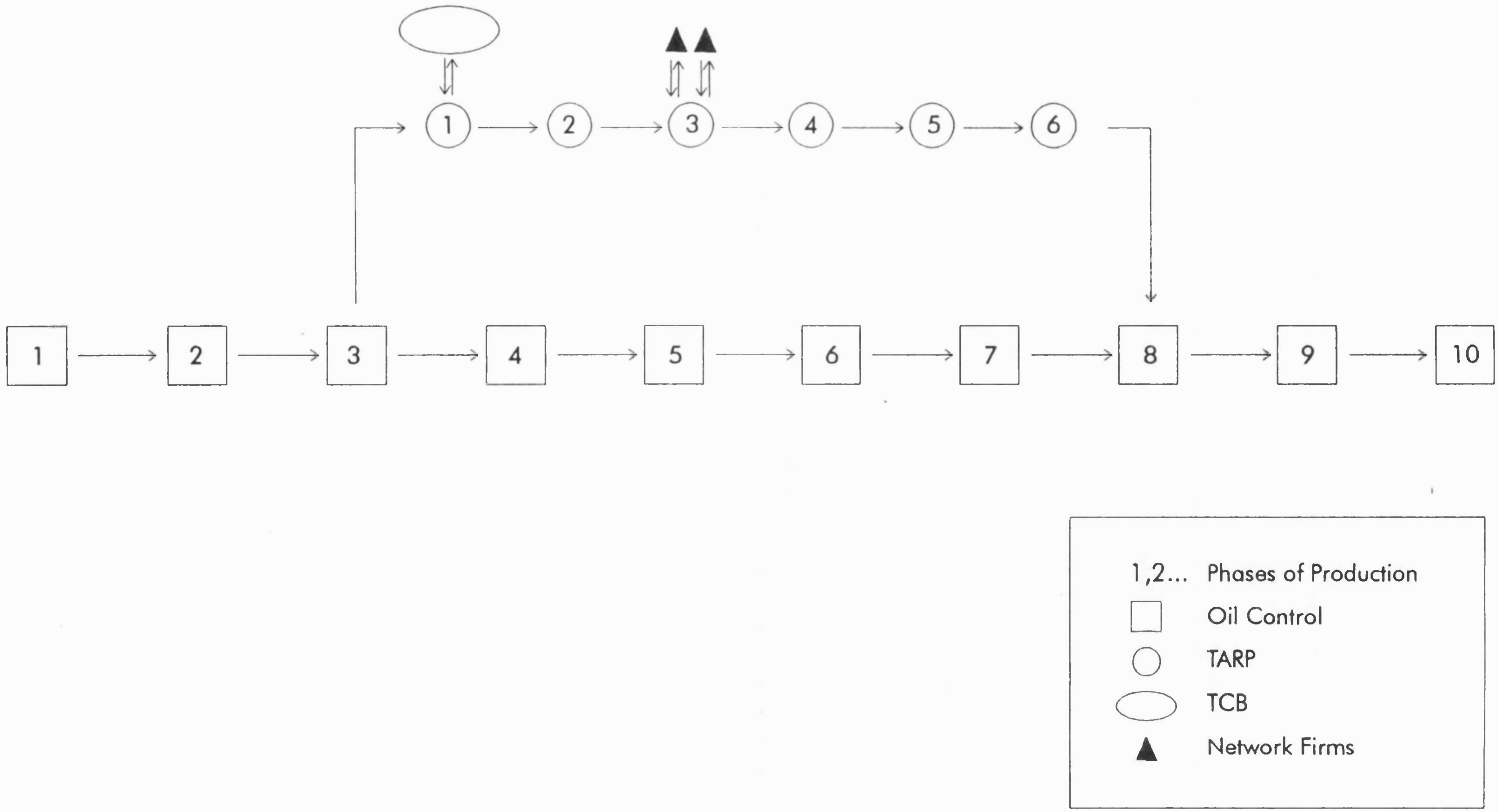
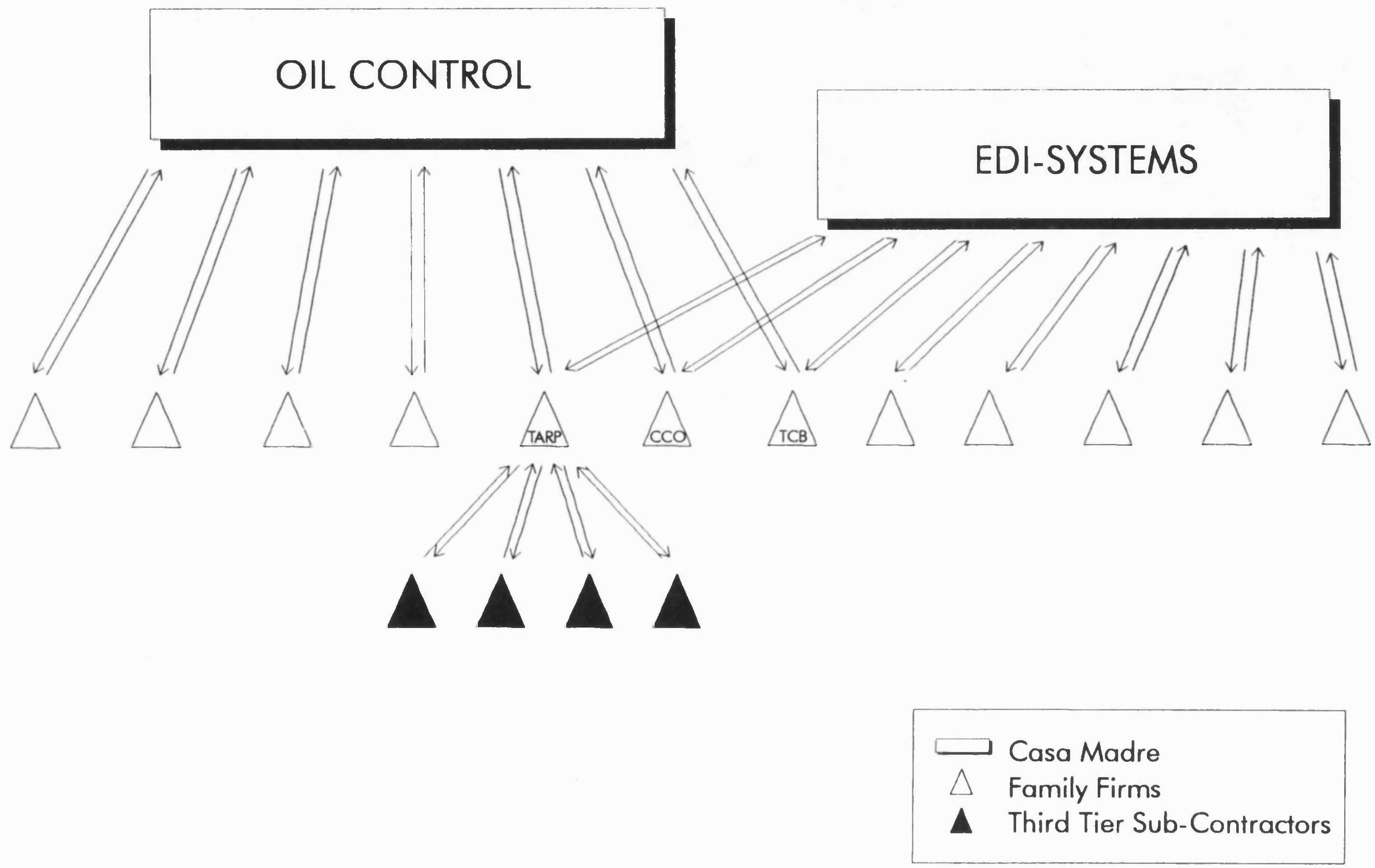


Figure 5.6

The Oil Control Network



Within Oil Control and the producer firms, the technical division of labour is also pronounced, with workers tending to specialise on certain types of machines. The advent of computer-controlled machine tools has had mixed effects on the technical division of labour. On one hand, computer-controlled machinery allows a single worker to operate several machines at once, but seems generally to be accompanied by a de-skilling, removing several of the traditional machine-operator's functions, such as tool selection.

Such a fragmented, specialised system requires means of reintegration if production is to be executed successfully. In this case the reintegration is achieved by means of Oil Control's coordination of the overall production network, and through joint ownership relations between the *casa madre* and the family firms. Because of the reciprocal ownership arrangements amongst these firms, their relationships are characterised by cooperation. The family firms are guaranteed work so long as Oil Control itself has orders; they do not have to compete with other firms for this work. At the same time, they have an interest in producing a high quality product, on time, for Oil Control, to ensure its continued success in the market, and their own existence. The reciprocal ownership arrangements could be seen as a mechanism of ensuring joint interest in the production process and in the success of the final product in the marketplace.

To a certain extent this is true of sub-contractors without special relationships with the *casa madre*. But in the case of joint ownership, the onus is placed more upon the *casa madre* because of its ownership interest in the family firm. The artisan firm, on the other hand, has little control over the final success of the *casa madre's* product, except insofar as it can guarantee the high quality of the components it supplies.

However, outside the inner family of firms, the other firms in the network are not involved in joint ownership arrangements, and are not so much part of the cooperative aspect. These firms must compete against other suppliers or specialised producers for work from Oil Control or its family firms. The overall network is therefore characterised both by relations of cooperation and relations of competition, depending upon the firm's position in the network.

Ownership and Possession

Despite the joint ownership structure, all of the firms in the network also exhibited a high degree of independence. Each was entirely responsible for their own internal management and organisation of production. Ownership in Massey's sense did not extend between firms; each firm made its own investment decisions independently. One of the family firms, Edi-Systems, developed and designed its own products, though TARP relied on designs and specifications provided by Oil Control. Both TARP and RGP had clients other than Oil Control, and would more than likely survive in the event that Oil Control ceased to provide them work.

Control over the labour process, or what Massey calls 'possession', was also determined entirely within each firm. However, the family firms and the other network firms could not exert control over the general distribution of work over the longer term; they could only respond to Oil Control's orders by adjusting their internal labour processes. Aside from being in a responsive position only to the overall flow of orders, the family and other network firms had a high degree of control over their internal labour processes.

The network system essentially precludes the integration of conceptualisation and execution, as these functions take place within different firms. Conceptualisation takes place in Oil Control and Edi-Systems, while all production functions occur within the network firms. With rare exceptions, the network firms have little input into the product conceptualisation and design. For the production worker in the family or network firm, the relationship with the product design is remote. For the worker within Oil Control or Edi-

Systems, however, there is at least some integration, in that the prototypes are produced internally, and the production process controlled from within these firms.

3.2 The territorial organisation of production

Territorial patterns

Beyond the acknowledgment of the tendency of productive systems such as the Modenese oleodynamic sector to localise, scant attention has been paid to the spatial aspects of the system and to the territorial pattern of production. As mentioned previously, firms tend to be concentrated in the three Provinces of Reggio-Emilia, Modena, and Bologna. Figure 5.7 shows the location primarily of lead firms in the oleodynamics sector in the Region, though it also includes some smaller firms. There are two strong, tight clusters, however, in the provincial capital cities of Reggio nell'Emilia, and Modena, where most of the firms in these provinces are located. In Bologna a different pattern is evident, with firms being dispersed in a ring around the city, and virtually no firms located in the city of Bologna. There is also a "tail", trailing off in an linear fashion along the via Emilia. In general, the larger firms tend to locate within the urban centres of Modena, Reggio-Emilia and the suburban Bologna ring, while smaller firms tend to be more scattered in surrounding towns and villages (Figure 5.8).

When firms located only in the Province of Modena are examined, including many smaller and artisan firms, a strong pattern of localisation in and around the town of Modena is apparent (Figure 5.9). However, a number of firms are also dispersed in smaller towns and villages around Modena.

This pattern of extreme localisation is particularly startling, given the fact that another concentration of firms within the same sector (oleodynamics) exists in the neighbouring Province of Reggio-Emilia. Yet these two districts function

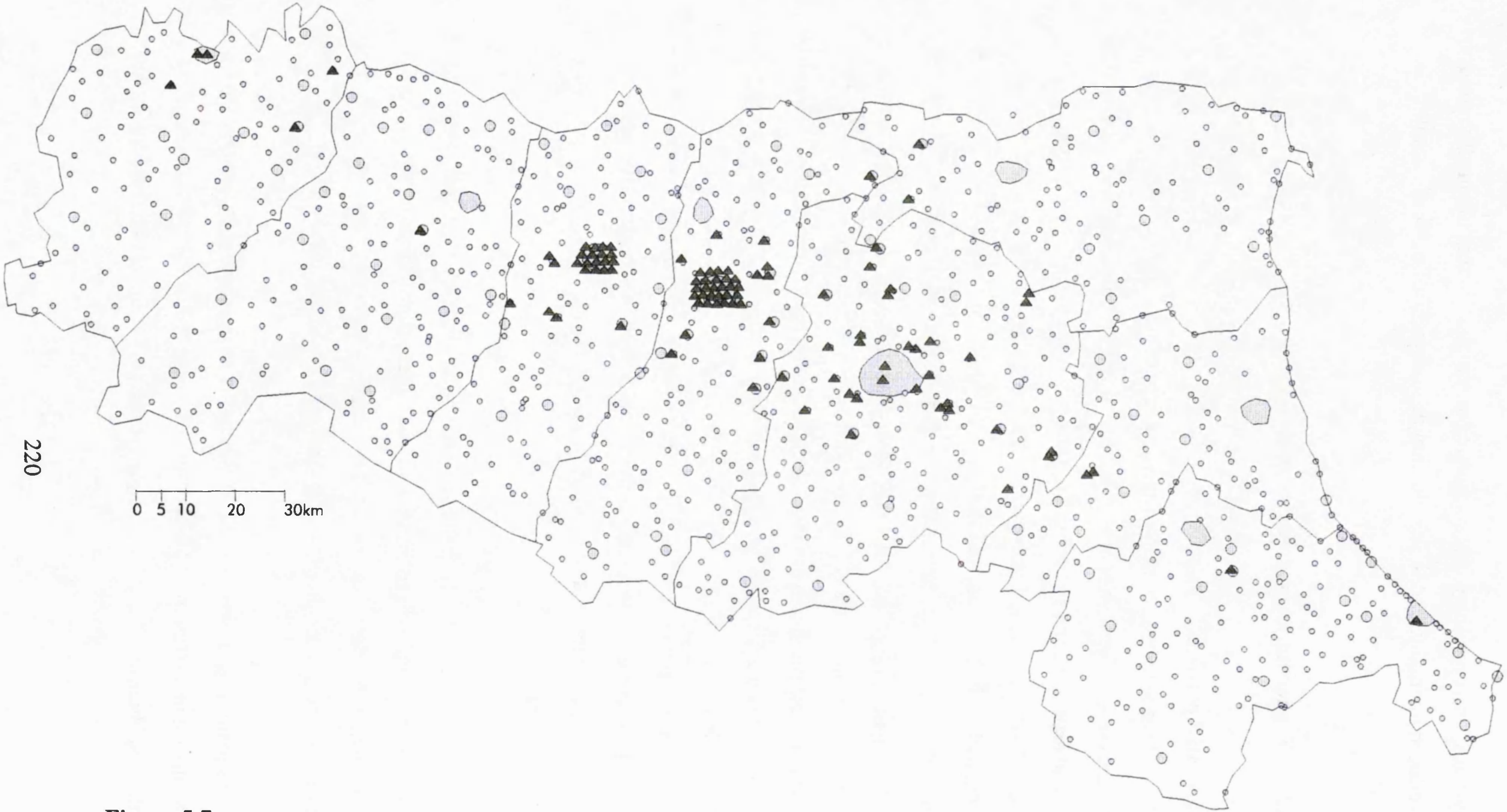


Figure 5.7
Oleodynamic Producer Firms in Emilia-Romagna

Source: ERVET, 1986

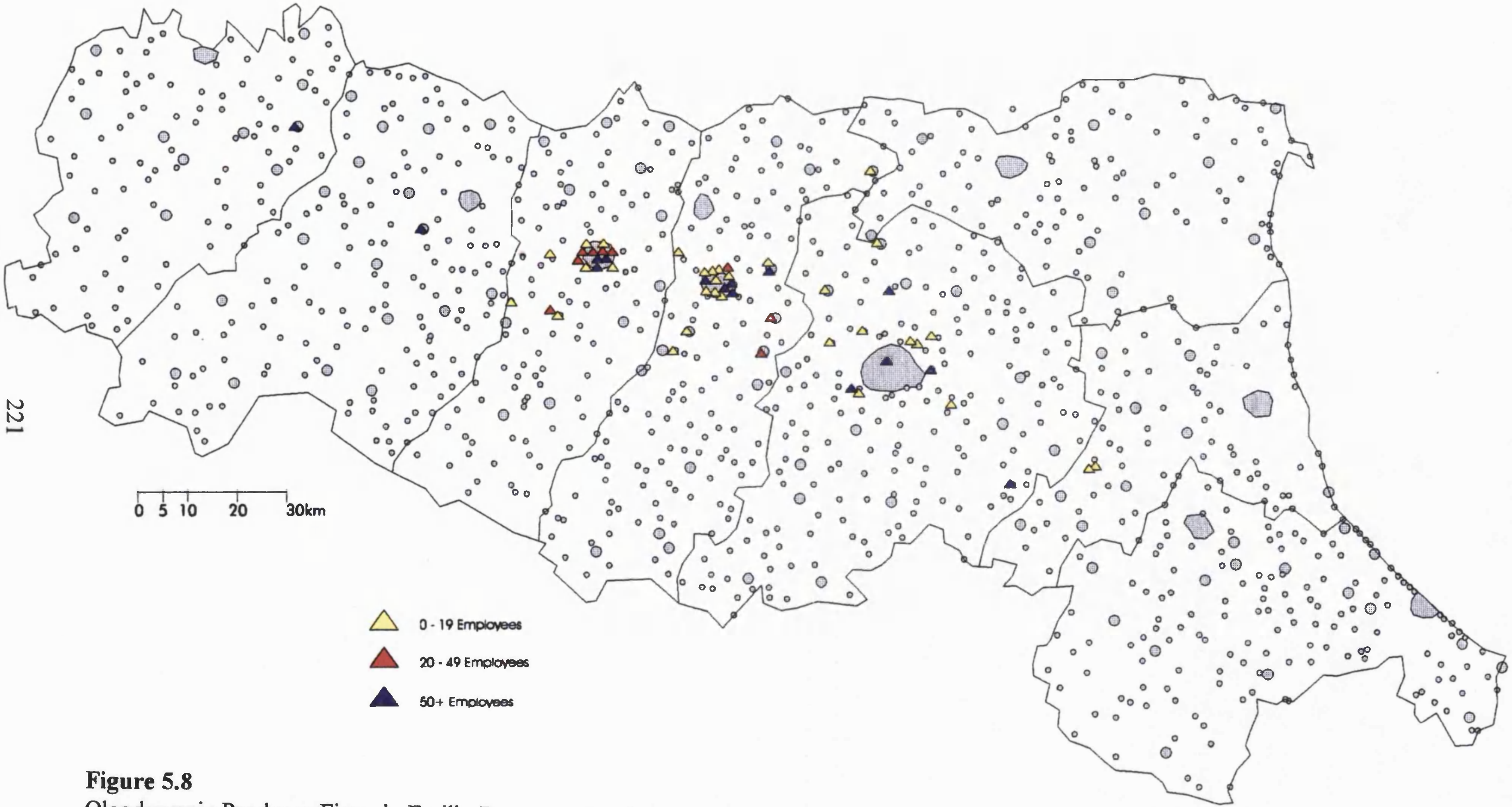


Figure 5.8
Oleodynamic Producer Firms in Emilia-Romagna, by size

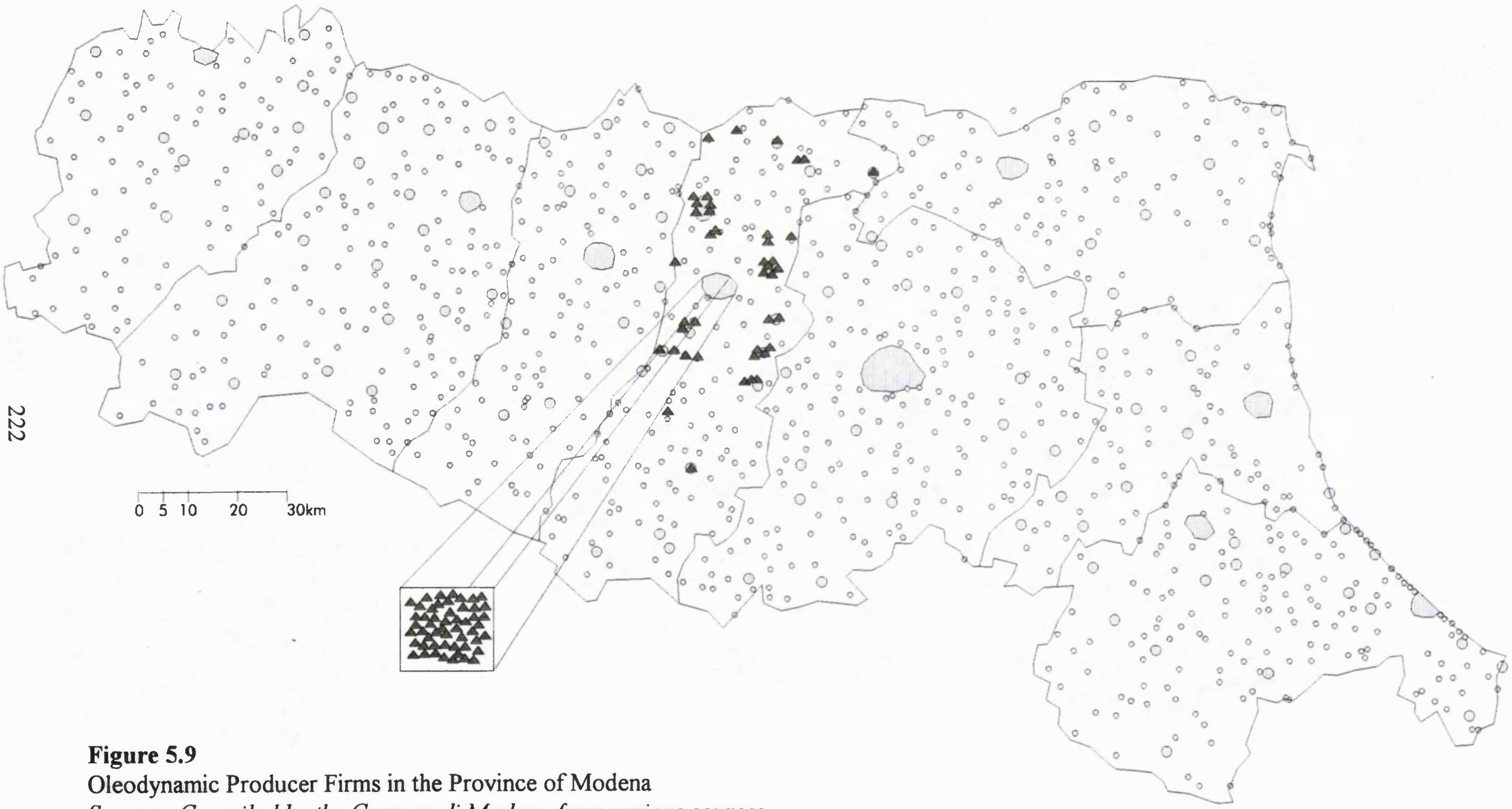


Figure 5.9
Oleodynamic Producer Firms in the Province of Modena
Source: Compiled by the Comune di Modena from various sources.

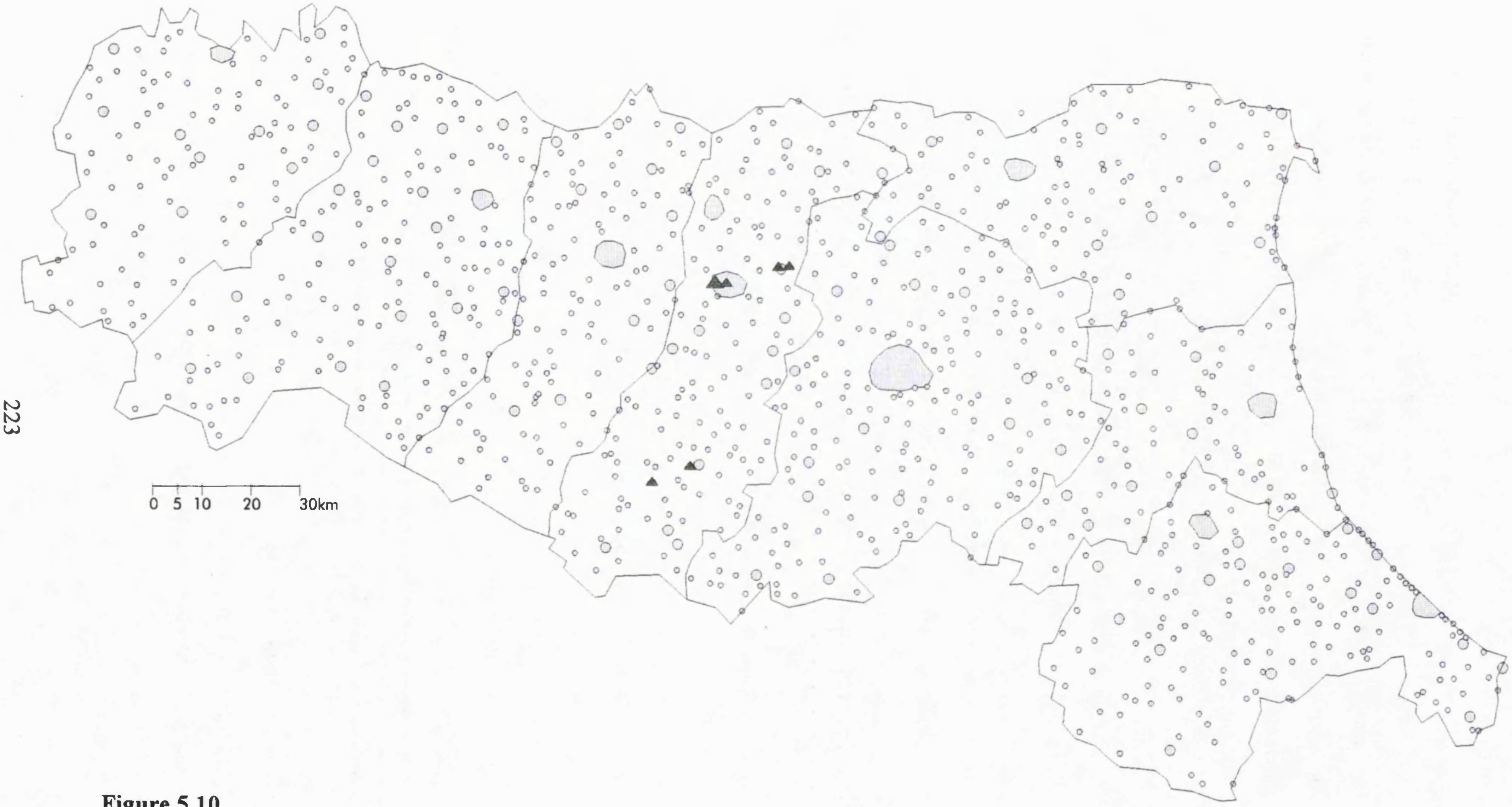


Figure 5.10
Firms in the Oil Control Network

virtually independently of one another, with little interaction or interlocking ties between them. The one exception is the use of some Reggio-Emilian sub-contractors by Oil Control firms, such as Edi-Systems. In fact, the relationship between oleodynamic firms in Modena and those in Reggio-Emilia is characterised primarily by competition; Reggio-Emilia is first and foremost the location of direct competitor companies.

The location of firms in Oil Control's network is presented in Figure 5.10 The first thing to note is that, despite the disaggregated production process, the firms in the Oil Control network are highly localised. Of the firms interviewed all are located in or near the city of Modena, with the exception of TARP and RGP in more distant Pavullo. So despite the high degree of disaggregation of the production process, there is a high degree of spatial agglomeration and proximity amongst these firms. Yet they are not centralised around one urban location but dispersed amongst the central city, small towns and villages. There is less of a direct relationship between particular functions, skill levels, technologies, etc .and the position of particular places within the urban hierarchy.

By and large the Modena district is highly centralised immediately around the city. This is where the more high skilled, innovation, design, control and coordination functions tended to be performed in or near the centre of the district, in Modena and Nonantola. Two of the case study firms were among the few located somewhat outside the closely forged district, in the periphery. These consisted of one firm that required a low-cost, un-skilled, female workforce (TARP), and a dependent sub-contracting firm.

Towards an explanation

How can this territorial organisation of production be explained? Oil Control's successful insertion into the international market rests on primarily two aspects of its product: quality and customisation. As a result of this strategy of product differentiation, the firm maintains a strong market position, and is able to charge a premium for its products. Oil Control often creates products to solve problems where no products existed before, and product duplication by other firms is difficult. The strategy relies on a high degree of integration with the market. However, a significant share of the market is also local, particularly in the local agricultural machinery industry.

The productive system is vertically disintegrated, with Oil Control undertaking design, production control and sales and marketing, while separate establishments perform the different phases of production. It maintains a strategic alliance with Edi-Systems, which produces a different part of the product range and also controls its own external production network. Aside from these structural similarities with both Carma and IMA, the Oil Control system is unique in its intertwining ownerships between the various firms.

Why was this specific territorial organisation of production established and not another one - either fully integrated or governed by the more usual sub-contractor relationships of outsourcing? On one hand, the Oil Control structure is very much like a multi-national corporation, with joint ownership of different establishments, each undertaking different functions. But instead of being dispersed across the globe to take advantage of specific conditions in relation to the functions performed (eg cheap labour) all the establishments are localised within a single province and a 15 kilometre radius of one another. Why especially break apart the productive system, only to reunite it under reciprocal ownership arrangements?

A "diseconomies of scope" explanation which is often cited generally for the existence of disaggregated production systems, but especially in Emilia Romagna, is that a fragmented production system is a means of breaking the strength of organised labour, which until the late 1960s had exerted a powerful role. This rationale does not appear to hold true in Oil Control's case, however, as union membership levels are still quite high, even within the small firms, and there is a high degree of responsibility toward maintaining workers once they are hired.

And while it is true that there are significant fluctuations in demand, and that demand cannot be predicted, even over the short term, the intertwining ownership arrangements suggests that this cannot be the reason for the vertically quasi-integrated system of production, as no additional flexibility is secured. The joint ownership means joint responsibility for workers; the *casa madre* is partly responsible for the worker in TARP, and vice-versa.

Given the ownership relation between firms, there can be only two reasons that would explain this particular productive structure, in terms of its superiority over vertically integrated or vertically disintegrated alternatives. First, it provides the ability to achieve and control product quality, and second, it is the result of the search for a workforce with specific characteristics.

High product quality was seen by the owners of Oil Control as a primary aspect of their competitiveness. The specialisation of firms in the Oil Control "family" promotes higher quality and productivity levels in each phase; each firm can concentrate on limited tasks. At the same time, the two lead firms, Oil Control and Edi-Systems, can pool their production needs and share the resources of the manufacturing firms (TARP, CCO, TCB), which increases the ability to achieve economies of scale in these production firms, where the advanced flexible machinery is expensive, or where the minimum scale of a specific process is unlikely to be economically supportable by a single firm (e.g. CCO's heat treatment processing). For example, by acting as a sub-producer for both Edi-Systems and Oil Control, TARP was able to operate on a double-shift schedule, which supports the economic viability of their advanced production equipment. This might not be the case with a vertically integrated structure. That is, specialisation and high quality can be achieved at the same time as economies of scale in production are maximised by combining the production demand of the two lead firms.

This relationship is further solidified by the reciprocal ownership arrangements between the firms. There is a shared interest amongst all firms in ensuring high quality product that will succeed in the market. Oil Control owners complained that when work was sub-contracted out to non-family firms, the quality was often not acceptable. Indeed, Oil Control believes its ownership structure to provide a competitive edge with respect to quality, compared with its competitor firms, which are mostly local.

Unlike other productive systems, because of the ownership relationships, the network firms are less subject to cutthroat competition within the district. There is also more of a partnership relationship between all firms in the family, rather than a control relationship exerted by the *casa madre* over the network firms. In other words, the breaking apart of the production process allows for specialisation which produces the high quality required, and joint ownership provides the means of re-integration and control.

The directors of Oil Control confirmed in interview the importance of the quality factor in setting up this particular productive structure. They felt that a vertically decentralised system in which needed components were sub-contracted from existing producers would not guarantee the required level of quality. The productive structure established, with each firm specialised in a particular phase of production, and with added control through joint ownership, was seen as important in ensuring the high level of quality that formed the competitive basis for the products on the market.

In short, Oil Control views its market position as relying less on price and more on the quality of its product. The quality of the product can be assured both through the high degree of specialisation of the various productive units in individual phases of production and through the reciprocal ownership arrangements, which provide an added measure of control over production quality and ensure a shared interest in the success of the final product. These results could not be achieved under either a single, vertically integrated operation, nor under vertical disintegration that relied upon traditional sub-contractor relations.

A second reason for the system of vertical quasi-integration is that, even under a reciprocal ownership arrangement, this system allows the exploitation of local uneven development, specifically territorial variations in the labour market. Oil Control directors cited as a rationale for their productive structure the availability of a workforce with specific characteristics, particularly, they said, a workforce looking for long term employment. We have also seen how the family firms have specifically targeted low-cost labour, with no prior job experience, and a 'love for work" as the main criterion. The assumption of this kind of labour is facilitated by the advanced production equipment, which is primarily computer-controlled and can be operated by low-skilled workers. However, it is evident that for these functions, a low-cost, agreeable workforce was sought. Such a workforce was to be found not in the *pedemontana* region, where Oil Control itself is located, but in the depressed mountain region, which has been generally outside the process of industrialisation, has higher levels of unemployment, and in which pools of low-cost, often female labour exist. As we have seen, this is where TARP had recently located, in a very small, isolated mountain town. As noted earlier, TARP is relatively unique amongst industrial firms in its use of female labour to operate production machinery.

In other words, the establishment of separate enterprises, though still linked through ownership, allows local uneven development to be exploited in the production process. The externalisation of certain phases of production was designed to take advantage of local yet marked uneven development, in the form of spatial variation of labour force characteristics, especially excess and female labour in the mountain region.

It may be that at the time of interview, the advanced technology such as that found in TARP was relatively new to the district, especially the work centres. To the extent that the introduction of this type of advanced production machinery proceeds in establishments involved primarily in production, a pattern of peripheralisation to low-wage locations or district spreading might be expected[29].

Oil Control's vertically quasi-integrated productive configuration therefore responds to the need to achieve a high level of product quality, and in part, the search for a pliant, low-cost workforce. The fluctuation in production process that results from customisation, on the other hand, is accommodated internally, within individual enterprises, through flexible labour (e.g. dual shifts), and in particular, advanced, computer-controlled production technology.

While still highly localised, the territorial pattern of Oil Control's network was perhaps less tied to the tightly clustered district found in the city of Modena. Given its interlocking ownership structure, it is perhaps more of an independent, closed production system and less dependent on the district per se and the sub-contracting firms to be found there, or upon the shared infrastructure that exists in Modena, and is thus more free to construct a different territorial organisation that relies less on access to these concentrated resources. Instead, firms in the Oil Control network rely on access to each other.

Other firms in the district, however, generally do not share in joint ownership arrangements of production establishments, and rely on the more typical sub-

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29 In establishments that design and market their own product higher skill levels are required and a central location might be sought.

contractor relationships with specialist producers and artisan firms, and the other resources that support production that tend to be found in the urban centre (local government, industry associations, etc.). Access to these firms and resources is made especially critical in the context of constant product innovation which is characteristic of the district. As we saw with the Carma case study, the constant invention and re-invention of the product, ongoing problem-solving, infinite product range, and small batch sizes result in an inability to standardize transactions. Above and beyond the now universal demand for quality, customisation and timeliness, the constant innovation and resultant inability to standardize components or transactions between firms creates a situation in which geographical clustering is essential to the operation of the district and production.

Local competition comes into play here, both between the sub-contractor firms, and between the *case madre*. The highly localised collection of competitor firms in the same industry acts as a propulsive force, promoting ongoing innovation, development of new products, differentiation, and adoption of the latest production technology, all of which perpetuates and reinforces spatial clustering.

It is curious that while in the Provinces of Reggio-Emilia and Modena, the lead firms were very tightly clustered, almost exclusively in the capital cities, but in Bologna, they were scattered in a ring around the city. This is likely due to the fact that Bologna is a larger, more services- intensive city, than the smaller, provincial capital cities, and industrial establishments cannot compete successfully in the urban land market for central city space.

This pattern suggests that small and medium sized cities such as those found in Emilia Romagna are particularly conducive to clustering and district formation, because the urban land market in these smaller locations actually permits very close proximity of related firms, institutions, consultants, etc. in central locations. In larger metropolitan areas, industrial workshops would be forced out to the suburban rings or beyond, which are typically low density and more expansive, acting to separate related uses.

CHAPTER SIX

A METROPOLITAN INDUSTRIAL DISTRICT: AUTOMATIC PACKAGING MACHINERY IN BOLOGNA

This chapter examines the territorial organisation of the automatic packaging machinery industry in Bologna. Following a general introduction to the industry and the district, it focuses on the productive system of one firm, Industria Macchine Automatiche S.p.a. ("IMA"). IMA is fairly representative of the many automatic packaging machinery companies located in the area, although it may be among the larger firms. The range of IMA's network firms presented herein is quite varied, and likely representative of the range of smaller metal-mechanical firms located in the district. The chapter ends with a description of the territorial pattern of the district.

I. BACKGROUND

I.I The Automatic Packaging Machinery Industry in Italy

The industrial sector this chapter deals with is that concerned with the manufacture of automatic packaging machinery for various other industries. These are machines that execute many different forms of packaging, for foods and tobacco, powders, liquids, pills and capsules - in boxes, bottles, bags, wrapping and all other forms of packaging for final products destined for consumer use.

Production in this sector in Italy is estimated at LIt.1,300 billion for 1984 (or roughly £650,000,000 sterling). Approximately 65% of this total is exported, a rate almost double that of Italian manufacturing industries as a whole, which exported 37% of output in 1984 (ERVET, 1987). Italy is the second largest producer and exporter of automatic packaging machines in the world, with a market share of about 19%, trailing West Germany with 35%. However, in the late 1970s and first half of the 1980s, Italy was increasing its share of the global market, while West Germany's share was falling (CGIL, 1988).

In Italy as a whole there were an estimated 528 firms in this sector in 1981, with a total employment of almost 14,000 (ERVET, 1987). Most of these firms were small; over 90% had less than 50 employees, but they accounted for only 35% of total employment. Firms of over 500 employees were responsible for 27.2% of employment in the sector (ERVET, 1987).

The international position of the Italian automatic packaging machinery (hereafter referred to as "APM") industry has always been good, as it is a world leader in certain specific compartments of the industry, where it has had little competition. In the 1980s, however, large multinational groups (notably the Germans) began to challenge the Italian firms' dominance, particularly through significant investments in developing the use of electronics in the machines. This is an area in which the Bolognese have traditionally been weak, excelling instead in the technical and mechanical aspects of the industry (CGIL, 1988).

1.2 History and Profile of the Bologna Automatic Packaging Machinery District

The first firm, "ACMA", was founded at the beginning of the 1920s. Soon after four other firms appeared in Bologna, and these five still exist today, and are leaders in the sector. Of a sample of 47 APM firms in Emilia-Romagna, these five were founded before 1935, only one was started between 1936 and 1950, thirteen appeared in the 1950s, twelve in the 1960s and 14 in the 1970s. The 1980s saw a diminution in the number of new firms, with only two of the sample founded in that decade (ERVET, 1987).

Of the first five entrants, only one, ACMA, was established explicitly for the production of APM, while two others, Sasib and Zamboni, were in the areas of railway materials and food products, respectively. It was only in the 1930s that these firms began to produce APM.

The birth of many of these firms is attributed to the departure of planners and technicians from the 'founder' firms, who set up their own firms with a concept for a better or different kind of product.

> It must be emphasized that one of the factors that greatly favoured such a process was the existence of a diffuse and efficient network of mechanical supplier firms, from which the new firms could demand a large part of production, conducting internally only the operations of planning, assembly and testing. It is obvious that in such a context the necessity of effecting considerable fixed investments and the risks connected to that were strongly redimensioned (ERVET, 1987: 71).

Indeed, Bologna is centre to an extensive metal-mechanical sector, which serves a wide range of final industries. In 1981, there were 79,285 employed in this sector in the Province of Bologna (ERVET, 1984).

The District in the 1980s

In 1981, the industrial census counted 284 of the nation's 528 APM firms (54%) in the region of Emilia-Romagna. The region also accounted for 68% of all national employment in the industry in 1981, and 68% of national output (1984 figure) (ERVET, 1987).

By far the largest concentration of firms and output in the APM industry in Italy is located in the Province of Bologna, and more particularly, in and around the city of Bologna. The Province of Bologna itself accounts for 52% of all firms in Emilia-Romagna, 69% of total regional output, and 69% of all workers in the regional industry (ERVET, 1987: 70)[30]. The Province of Bologna would therefore represent roughly 47% of both national employment

30 Data from ERVET, 1987 for or within the Region of Emilia-Romagna referring to the number of firms, employment, output and exports, and levels of concentration is based on a survey of a population of 121 APM producer firms conducted by ERVET between March, 1985 and April, 1986. The total universe of APM producer firms in Emiila-Romagna found by ERVET consisted of 152 firms. Further research was undertaken on the basis of interviews with a sample of 47 of the 121 firms, providing qualitative and historical information.

and output - approximately 6,500 workers and LIt. 611 billion[31]. The Province of Bologna would also account for about 148 APM firms (or 28% of the national total)[32].

Almost 90% of Emilian firms had less than 50 employees - 58% had less than ten employees, figures similar to those for Italy as a whole (ERVET, 1987: 29). However, the largest Emilian firms (over 500 employees) accounted for 40% of total employment versus 27% for Italy as a whole (ERVET, 1987: 29). This is related to the fact that many of the firms in Emilia-Romagna are amongst the oldest, and are therefore likely to be larger than newer firms. Nevertheless, average firm size dropped by half between 1971 and 1981 in this sector in Emilia-Romagna, from 66 to 32 employees (ERVET, 1987: 26).

The export propensity in Emilia-Romagna is even higher than the national average for the APM industry, and is estimated at about 71% of total sales (ERVET, 1987: 31)[33]. Western Europe is the largest export market, accounting for about one-third of exports, with India/South-east Asia, Africa and the USA taking the following three positions, with about 13% or 14% each of total exports. In the early 1980s, exports to the USA had doubled, while the share of exports to Western Europe declined by about 10% (ERVET, 1987: 62-63).

The two major client industries for Emilian APM firms are the tobacco industry, and the food industry, each accounting for just over one-third of total sales. Other important sectors include pharmaceuticals, cosmetics, and chemicals/detergents (ERVET, 1987: 53).

31 The Province of Bologna accounts for 69% of Emilia-Romagna's 68% share of both national employment and output, equal therefore to a Provincial share of national employment and output of 47%.

32 That is, 52% of the 284 firms in Emilia-Romagna.

33 The remaining data in this section refer to the region of Emilia-Romagna as a whole, but as we have seen, the Province of Bologna accounts for the lion's share of regional employment, output and firms. These figures will therefore fairly accurately describe the Bolognese situation.

A critical and revealing aspect of the Emilian APM industry is found in its pattern of ownership. Despite the level of maturity and world dominance of many of these firms, the most-common form of ownership remains the family-owned firm. Over one-half of firms were directly controlled by a single family - either in whole, or through a majority interest. In a remaining one-quarter of cases, the ownership was shared among two or three families. About one in four firms were controlled by finance companies but in most of these cases, the finance company headed a local family-owned group. Only two of a sample of 47 Emilian APM firms were owned by national industrial groups, and two by American companies (ERVET, 1987: 74).

At the same time, these sample firms were linked with 25 other firms, either directly, through controlling shares, or through their respective finance companies. The large majority of these firms are localised in Emilia-Romagna and operate in the same sector.

Despite the large number of small firms and strong product differentiation that characterise the APM industry in Emilia-Romagna, there is quite a high level of economic concentration. The largest firm accounted for 20% of total sales, the top four firms, 43%, and the top eight firms 55% of total sales (ERVET, 1987: 67). This is attributed to the presence of a few very large firms that operate in all sectors of the market. The level of concentration is even more marked in the sub-sector in which the case study firm, IMA, finds itself. In this sub-sector, of 22 firms, the top firm accounted for 43% of sales, and the top four represented 82% of sales (ERVET, 1987: 69). The sub-sector therefore seems to be oligopolistic in nature.

Employment in the Emilian APM industry increased 2.7% between 1981 and 1985, compared to a decline in regional manufacturing employment as a whole of 7% during the same period (ERVET, 1987: 75). In the Emilian APM sector, of 5,829 employees, 45% were clerks and technicians, and the remaining 55% were labourers. The proportion of technicians and clerks versus labourers were almost equal in IMA's sub-sector, at 49% versus 51%, respectively (ERVET, 1987: 76). Of the clerks and technicians, 29% were planners/designers (28% for IMA's sub-sector).

About one out of two workers in the industry belongs to the union, but incidence of unionisation is lower amongst technicians and clerks. The union contracts exist at the level of the firm, not territorially. The unions have not succeeded in building a continual alliance with workers in the small artisan firms. Other issues include wages, profession levels, shifts and hours of work, which the union feels its has made good progress on. Recent figures indicate workers in 25 firms involved with the union, for a total of about 3,000 individuals (CGIL, 1988).

Under the typical organisational structure of the local industry, production takes place in a decentralised, network system, with a division of labour between the *casa madre* and smaller artisan firms involved in the actual production. The *casa madre* firm executes the following functions internally:

- planning and design of the product;
- assembly;
- testing;
- commercial functions and marketing.

The remaining functions are generally performed outside the *casa madre*, in a network of small firms and artisan firms. These phases include mechanical processes and development of electronic components (CGIL, 1988).

2. THE IMA PRODUCTIVE SYSTEM

2.1 The *Casa Madre* - Industria Macchine Automatiche S.p.a. (IMA)

History and Profile

IMA was founded in 1965, and after two moves from nearby locations, settled at its current location in Ozzano, a small town just outside of the city of Bologna, in 1972. At the time the firm was being established, there was an economic development plan in effect for the area. The government offered special fiscal incentives, and assistance in building factories. In addition, proximity to Bologna, which was viewed as an important centre for communications, was cited as an important locational factor.

The firm progressed through three stages of evolution (interview, Leoncourti, 1988). The first was the owner-operator stage, in which the industrialist played the many roles of planner, director-general, and owner, and in which decision-making was very rapid, but not thoroughly evaluated. The second phase was that of the 'managerial firm', in which a more structured decision-making system was organised, and formalised data collection and analysis techniques were introduced. This led to precision in decision-making, but much slower reaction time. The third phase, in which IMA found itself at the time of interview, focused on 'practicality', that is, combining the need for thorough evaluation and timeliness, with a view to balancing the two requirements in practical manner and through a practical industrial structure.

Marked changes occurred in the 1980s in the system of production. Until the early 1980s, the *case madri* produced standardised machinery, for the warehouse, not by order. Competition was based first and foremost upon cost. The production process was ruled by the production technicians, who determined output based upon economies of scale in production, and optimum output per worker. However, this system was abandoned because of the high carrying costs of the unsold stock of machines, which outweighed the insubstantial savings from producing several machines at a time. Fragmentation of the market and consumer demand for more customised APM also came into play. By the mid 1980s, IMA thus began to produce machines on the basis of orders only, one or a few at a time. The keys to competitiveness were now customisation, quality of product and timeliness of delivery.

The firm employed 430 workers at the time of interview, and specialised in the manufacture of two types of automatic packaging machinery. The first type of machine packages tea in bags and then boxes it. IMA estimates that it accounts for about 50% of tea packaging machines sold in the world, and therefore places itself as the world leader in this sector. The second kind of machinery produced is that which does 'blister packaging', e.g. the kind of packaging that is commonly used in the pharmaceuticals sector for tablets and capsules. IMA claims also to be one of the top producers in the world for this product.

Annual revenues for 1987 were LIt. 55 billion, with revenues for 1988 forecast at LIt. 60 billion (approximately £27.5 million and £30 million sterling, respectively). This represents an increase from annual sales of LIt. 24 billion (£12 million) in 1982, when total employment in the firm was 320 workers.

The firm is extremely export-oriented, with approximately 95% of all production sold in foreign markets such as Germany, USA, USSR, Canada, China, France, and England. The firm has approximately 50 to 100 clients on average in a year. For tea packaging machinery, there may be roughly fifteen clients that are more important, in that they buy machinery regularly or they buy more than one machine at a time. On average, about 100 IMA packaging machines in total would be produced and sold in a given year. The client roster is mainly comprised of pharmaceutical industries, tea companies, and some sub-contractor packaging companies (which specialise in packaging for manufacturers). Individual clients do tend to change on an annual basis, except for the very largest ones, as the machinery has a very long life.

IMA produces about ten different models of machine. The number of models produced has increased steadily from when the firm started, when only a single type of machine was produced. IMA finds that whereas once it was able to dictate the product to the market, this is no longer possible. The market's demands are much more specific and exacting, which has led, in part, to the increase in the number of models. Clients have also become much more explicit about what kinds of features they want to see in their packaging, and therefore in their packaging machines. There are myriad varieties even within the same type of packaging, and the machines IMA makes must accommodate this. In addition, there are different safety and other requirements that must be met in the different countries to which IMA sells its products, which further imposes the need for customisation and diversity of product.

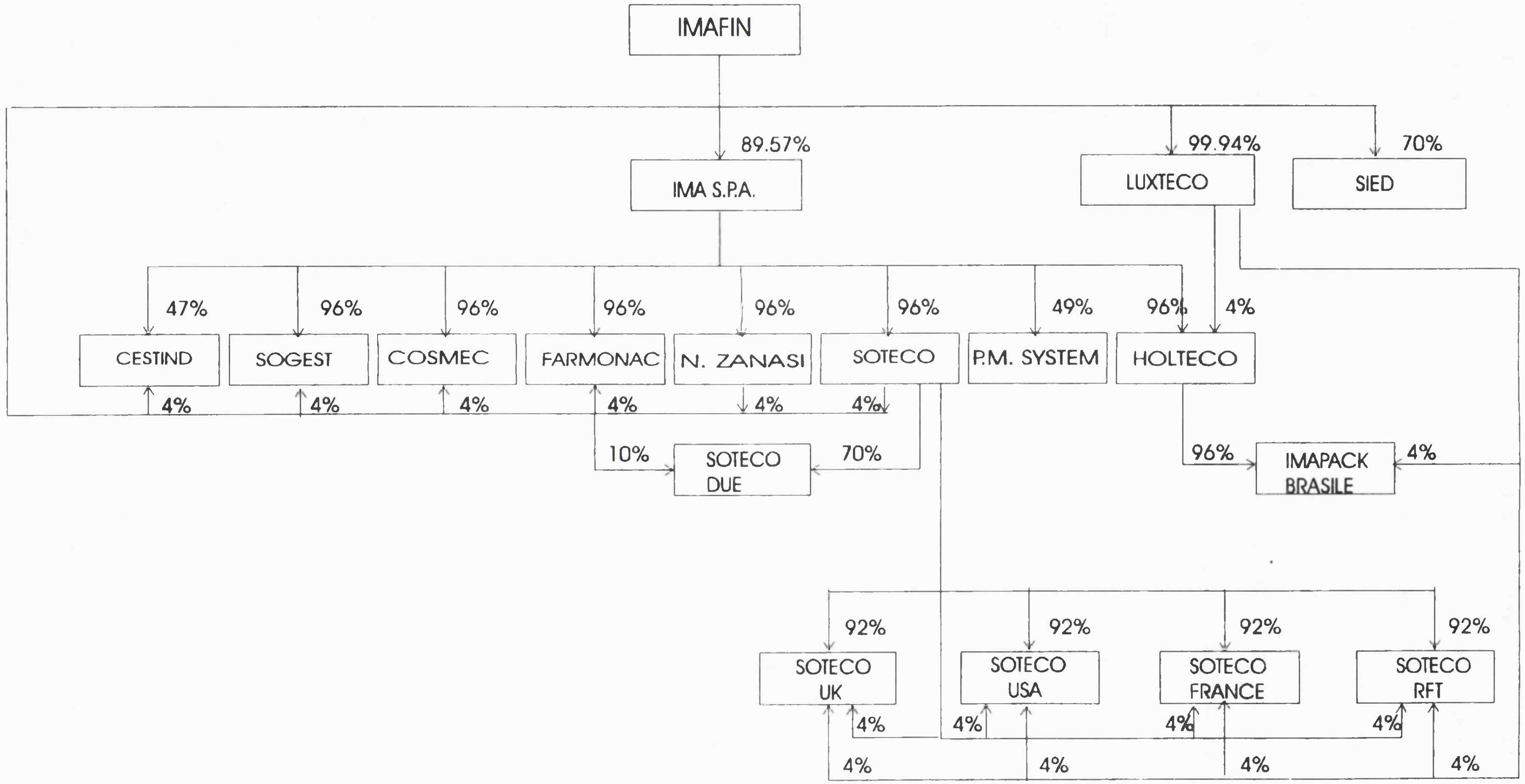
The quantity produced for each machine is quite small - from six to twelve machines on average. Even with these low numbers there are still economies of scale - if more than one of the same type machine is produced, economies of up to 30% of the total cost can be saved. The optimum lot size was placed at about eight or ten machines.

In 1985, IMA initiated a plan of expansion through acquisitions. IMA is part of a larger industrial group headed by "Imafin", a financial holding company, and is 89.57% owned by that company (Il Sole, 21 Jan., 1988) (Figure 6.1). In July of 1988, Saffa, a firm which produces cardboard, bought a large number of shares of IMA (though still a minority interest), further diversifying the group. IMA itself is the central firm in the group; decisions regarding the distribution of profits and investments are made here. IMA also maintains a marketing and distribution arm, "Soteco", with various geographical branches.

In addition, IMA has acquired other producers of automatic packaging machinery, each of which produces a different kind of machine. In all but one case, it holds a 97% interest in these companies (e.g. Cestind, Sogest, Cosmec, Farmomac, N. Zanasi). There are no functional or production-related relationships amongst these firms, only an ownership relationship. The exception is that the Technical Office of one of the firms, Cestind, and IMA collaborate on some projects. There is a further firm in the group, "Sied" which is an IBM computer distribution company, which provides for IMA's

Figure 6.1

IMA Corporate Structure



Source: Il Sole, Jan. 21, 1988

information management and computer needs. The final relationship between the firms in IMA Group is that they share some common suppliers, and are developing a common procurement policy in order to reduce costs.

The program of corporate acquisitions was seen as necessary to respond to clients' requests for other kinds of machines that IMA could not supply. For example, IMA produced machines for only a single kind of packaging for the pharmaceuticals industry. Through acquisitions, it hoped to expand its packaging machines from blister packaging to include bottle-filling machines, boxing machines, and machines that could package powders, pills and capsules, thereby filling out the product range for that client sector.

The Internal Organisation of Production

The following stages are involved in the production of automatic packaging machines:

- marketing;
- study;
- planning and design of the components;
- production of the components;
- assembly;
- customisation;
- testing.

These stages refer to the generation of prototype machines; once a prototype has been developed and regular production begins, the study, planning and design phases are not necessary. However, the above phases also comprise many sub-stages. For example, the production phase includes acquisition of materials and dies (forms), entering into agreements, production of the components, testing and inspection, and warehousing.

Not all of the phases listed above are undertaken internally by the *casa madre*. In general, they undertake only the pre- and post-production phases, including planning, marketing, research and study, and development of prototypes. Some production is undertaken internally, but only to cover urgent orders. The acquisition of materials and coordination of the production process through agreements with producer firms is also undertaken internally. The product consists of a base machine, which is standard, and a customised component. The production and mounting of the customised component of the machine, and final testing and inspection of the machine are also executed within IMA. Essentially all of the standardised, regular, 'series' production is executed outside the firm.

IMA's workers can be divided into three main groups: manufacturing (which includes the Technical Office), management of the warehouse and stocks, and acquisitions. Each group contains different types of workers. At the lowest level there are those who do some manufacturing and control the stocks. The next level is the coordinator, and then the manager. For each position there are four different levels, except two levels for managers, which correspond with the national standards set by the unions.

Of the 430 employees at IMA, 180 are directly connected to production - in assembly, application, and mounting of the customised component of the machine. In the production section, the majority of workers are labourers, primarily machine tool operators. The more advanced machine operators control the more complex machines. Engineers produce the computer tapes which control the machines. In general, the machine operators are not capable of programming the machinery they oversee. Even in the few cases in which they may have some programming ability, the logistics of production do not permit them to do their own programming, as it is often a lengthy and complex process that precedes actual production, and can take up to one month.

The firm had begun to look for more multi-dimensional workers who can not only operate machines, but who had decision-making ability. Attitudes and skills were viewed as more important than raw labour power. A greater degree of integration between workers was emerging due, in part, to a change in the structure of the firm involving the decomposition of a centralised administration.

There is no mobility of workers between the various departments of IMA, though the management think that this would be desirable. There is, however, a certain amount of mobility within the production division, between the various machines. It is also usual for the worker who has worked on the production of a component to be involved in the assembly of the machine, or to work on the adjustment (fine-tuning) of the prototype machine.

IMA maintains a diversity of production machinery, including both numerically controlled and traditional equipment. These are the general types of mechanical machinery, and are not very specialised, such as lathes, grinders, or milling machines. IMA maintains about five of each of these machines.

The first numerical control machines were acquired starting in 1982, and have been found to be particularly suited for series production of some standard components. The main impact of the NC machines was stated as an increase in the number of workers, because of growth induced by the machines. The other impact cited was the need for more engineers, and therefore a 'heavier' firm structure with a greater proportion of more qualified employees.

Decisions regarding the acquisition of new technology are investigated by a special office in the company. They decide upon the most appropriate kinds of machinery, arrange the purchase of new machines, and organise changes in the production process that the new machines precipitate.

Only one of the individual machine tools is controlled by computer - a milling machine which can receive instructions directly from a computer in the technical office. IMA does, however, have a CAD-CAM system, and a network of about 100 personal computers.

Management Structure

IMA is headed by a Director- General, who oversees the firm as a whole. Under the Director - General, the firm is divided into four main divisions, each with its own Director: Production, Administration, Technical Office, and Personnel. The General Direction decides what kind of products to produce, while the Technical Office decides how the machines should be produced.

The Technical Office is primarily responsible for the planning and design of the prototype machines, while the Production Division is responsible for coordinating the actual production. This includes manufacturing, planning and the coordination of outside production, and some assembly. Naturally there is close collaboration between these two divisions. The production division is further divided into sections corresponding to the various stages of production. Marketing and sales functions are undertaken outside of the firm, by Soteco.

The levels of management begin with the '*capo di parte*' or section head, then proceed to inspector, and director - of a sub-section of one of the four main divisions. IMA prides itself on its policy of promoting from within, and cites the case of an assembler with little formal education who subsequently became the Director of Assembly.

The organisation of the Technical Office is somewhat different. The structure of this department was reorganised several years ago, and the role of 'project leader' was introduced. The project leader organises the relations between the officials in the planning office and the outside firms.

The External Organisation of Production

As noted above, the actual production of IMA's automatic packaging machinery is undertaken outside the firm itself, through a network of small firms and artisan firms that manufacture the components for the machines, and also do the assembly. IMA's active production network is constituted by about 100 such small mechanics firms. However, their aggregate roster of supplier firms, including all firms that have been used in the past, are in current use, are planned for use, or could be used, includes about 800 firms.

There are no long term contracts or commitments between the *casa madre* and the network firms. Despite this, relationships may and often do endure many, many years. IMA orders pieces from the artisan firms when it needs them, but does usually show the artisan firms a work plan for future months so that they will be able to plan their own work. This is not a written commitment of work, but a "moral commitment". "In many parts of Italy this relationship wouldn't work, in Piedmont or Milan, for example, but here there is still an agricultural economy, and a handshake still has value" (Miselli interview, June, 1988).

One exception to the rule of no long term contracts is found when an artisan works exclusively for IMA. These artisans have specialised machinery suited to IMA's requirements. IMA provides these firms with sufficient work so that they can work continuously, with no gaps in production, in order that the exclusive relationship can be maintained.

For the *casa madre*, the greatest requirement regards timing. If the artisan maintains speed and timeliness in his work, this is his guarantee of further work. According to IMA, to guarantee work to the artisan is "dangerous", because this would place the artisan in a position of power and could affect the production process. Because of this situation, the *casa madre*/artisan relation was described by IMA as a 'love-hate relationship'.

Artisan firms are researched by the *casa madre* and selected on the basis of their professionalism, timeliness, the quality of the product, and their price.

Emphasis is placed on the precision of the components produced. IMA will compare a component produced by an artisan with their own prototype component produced internally, in order to judge the quality of the artisan's work, and what the price should be.

IMA's relationship with the artisan regarding the productive cycle varies. Some artisans IMA will provide with the materials and the order, while they will acquire semi-finished goods directly from other artisans, without providing the materials. The tendency is toward the latter kind of relationship, as this saves time, planning and administration for the *casa madre*.

The external production process is controlled and organised within IMA, under the Director of Production. After working for several years to develop a computer system to aid in the coordination of the production process, the first results of this endeavour were just beginning to be seen at the time of interview. The computerization of the production control process was seen as a necessary step in reducing the long production time. Previously, production control was done manually and only at the end of production. However, at the time of interview, only the individual stages were computerised, e.g. there was a separate system for planning, and a separate system for production management, with no linkages between the two. Nevertheless, computerisation has made it easier to monitor the production process, and 'snapshots' of the process are made every two to three weeks. A full-time position was created and devoted to monitoring the production process and artisans' deliveries, providing the opportunity to recoup any lost time. In some rare cases, the artisan firms are linked to IMA by computer, but most often, according to IMA, the artisan does not want to buy a PC.

With the advent of computer production management, IMA introduced a practice of just-in-time inventorying. But this is not only a case of arranging delivery of the components for a certain day when they will be required for production, but of arranging for the production and delivery of the components with only a few days lead time before they are required in production. The production management computer program follows the production process and determines when certain components must be ordered. Then, usually the same day, the precise type and number of pieces required for the machines in production are ordered, and delivered. In other words, this is not simply a just-in-time delivery system, but also a just-in-time manufacturing system, which demonstrates the extreme responsiveness, flexibility and rapid turnaround of this system of production. For the artisan firm, this system implies very small orders comprised of a number of different components. Moreover, though the artisan may have to produce the same piece say, 20 times, he is not likely to be able to produce all 20 pieces at once under this system, thereby causing him diseconomies of scale.

The other firms which make up the IMA corporate group do not undertake any of the production functions for IMA. Instead, IMA organises a network of small artisan firms which undertake all production of components and assembly functions. Similarly, each of the other producer firms in IMA group organises their own network of artisan firms independently.

The number of firms involved in the production of a single machine is likely to be quite high, given the complexity of the machines, the high degree of customisation, and the vast number of components required to produce a single machine. The artisan firms tend to specialise, usually in different types of processes or different components. For example, the artisans interviewed for this study specialised in milling, gear-making, finished components, and assembly.

About 95% of IMA's network firms are located in the Province of Bologna and Imola, with the remainder in Tuscany, and between Veneto and Milan. In general, IMA tries to use firms that are located in the very immediate area, in order to maximise connections. Only in special cases, where no appropriate local production capability exists, or where larger, more capital intensive facilities are involved (e.g. foundries) will IMA go farther afield.

In general, there are no direct links between the various artisan firms in the network. The exception occurs when an artisan firm finds that it is not capable of producing a certain piece, and the artisan will ask for a second artisan's assistance (i.e. qualitative flexibility). This relationship is not one that is instigated or controlled by IMA, however; it occurs only between the two artisans. It occurs particularly for exacting processes or treatments, where extreme precision and specialised production equipment is required.

Unlike the Carma case, where production was initially undertaken within the firm and subsequently restructured and externalised, IMA has, since the firm began in the 1960s, relied on external producers for production. There have always been a number of machines within IMA, used primarily for the development of prototypes and customised components. What has changed is the ratio between internal and external workers, from an initial ratio of about one to one, to a current ratio of about one to ten. This has more to do with the relative expansion of production compared to product development functions as the sector matured and expanded, than a conscious decision on the part of the *casa madre* to increase the external component. That is, it is simply that the functions executed externally expanded more rapidly than the internal functions.

IMA attributes its success to the high technical level of its product and the ability to produce products that were particularly 'right for the moment'. For example, the IMA machines are much more compact than its competitors': one of IMA's machines is about 1m by 6m in size, while the similar machine produced by a competitor is 24m long by 6m wide. IMA's other strength, especially for tea packaging machines, is that they produce a full range of machines, while each of their competitors generally produces only one kind of machine.

IMA's product strategy depends on the sector - tea or pharmaceuticals. For tea packaging machinery, in which IMA is the world leader, the strategy is to constantly renew and improve the machine, in order to maintain leadership and stay ahead of the competition. For pharmaceuticals, were the competition is particularly strong, the strategy is to compete on the basis of technical improvements, rather than price cutting, so as to enlarge market share.

A sample of firms performing different functions in IMA's network are described below.

2.2 Gianni Andalò

The firm of Gianni Andalò produces finished components, primarily for mechanical equipment of all types. At the time of interview, the firm had recently hired three workers, bringing the total employed to 18. Revenues were LIt. 1.5 billion (£750,000) for the previous year. Sig. Andalò is the owner and operator of the firm, which is located in Imola, in the Province of Bologna.

The Internal Organisation of Production

The firm undertakes the usual mechanical finishing functions, including cutting, milling, lathe-work, and grinding, as well as assembly, measurement and testing of the finished pieces. The raw material used is generally steel bars, which are then cut, and the raw pieces formed using one or more of the milling, lathe or grinding machines. The pieces may also have to undergo thermal treatments or surface treatments, for which there is no internal capability, so the pieces must be sent out to other artisans for these processes. Then they are assembled, tested and measured, and returned to the client firm.

Fourteen workers are directly involved in production. Of these, ten are characterised as 'super-skilled', and the other four are less qualified apprentices or workers assumed under a '*contratto di formazione*'. All of the workers were unskilled when they began to work for the firm, and have been trained completely within the company.

The firm has four NC machines, all linked to a central computer. It also has a number of other traditional machines, such as two grinding machines. The workers tend to move about the firm, working with different kinds of machinery and different materials. The client will provide the specifications for the piece with the order. The machines are programmed by Sig. Andalò himself, or with the help of an external programmer.

Andalò's strategy regarding the use of the machines, particularly the use of the NC machines, is not to strive to produce large quantities of the same piece, but rather to produce the best individual piece - "...not the philosophy of mass production, but maximum flexibility" (Andalò, interview, 1988). At the same time, he tries to achieve high aggregate levels of output. This, Andalò believes, is the optimal way to make use of NC machines. The use of a central computer for programming and control of the machine tools reduces the programming time, and places the programmer in a key position in the firm. Andalò strives to achieve economic flexibility through a variety of channels, e.g. in the way the computer programs are managed and modified, in the machines and the PC, and in the choice of tools for the machines that can be used for many different, consecutive production processes.

Indeed, the firm produces a large number of small series pieces. From January 1 to June 26, 1988, the firm had completed 265 orders, each of which could have contained orders for one to twelve different pieces. The quantities of each piece generally produced range from a single piece to about 100. However, because Andalò produces pieces for mechanical equipment, which is a 'lumpy', expensive product produced in very small quantities, the quantity of a given piece produced by his firm will be quite small, at around ten pieces.

Despite the apparent flexibility in the division of labour and technology, the hours of work remain rigid and a strict schedule of regular hours is maintained. This, Andalò claims, puts him at a disadvantage compared to other small firms in the same sector which have more than one owner. In these cases, the owners themselves can work flexible hours, which can make the firm itself more flexible and provide shorter turnaround times.

The 'management structure' of the firm consists in essence of Sig. Andalò himself, who makes investment decisions regarding new plant and machinery, and undertakes the basic day-to-day management. Administration functions are also undertaken within the firm.

The firm has about ten regular clients, not including those who submit orders on an infrequent basis. There is a conscious strategy of avoiding a situation in which one or two clients dominate, in order to reduce the vulnerability of the firm. However, such a situation cannot always be controlled, because orders depend on how the clients' products are doing in the market, and the clients often are subject to business cycles, as they tend to be concentrated in the 'lumpy' products of expensive machinery. When a long-standing client receives a large order, Andalò cannot refuse the work.

Andalò has also produced its own products from time to time. For example, it had won a contract to design and produce an instrument for use by the Italian coastguard, to measure the holes in fishnets for compliance with the law. These in-house products account for a small proportion of the total revenues, and are viewed mostly as a way to attract new clients. The marketing of such products is seen as very difficult, and producing directly for a final market involves a greater risk than producing on the basis of orders.

History

The owner began the firm in 1968-69, after having worked for eight years for a state participation company, "Savio". For the first two years Andalò continued to work as a sub-contractor to Savio. In recognition of a need to diversify his client base in order to maintain the security of the company through economic downturns, clients in new sectors were sought. The company diversified its client base to include the sectors of textile machinery, automatic packaging machinery, ceramic tile machinery, the nuclear energy industry, the precision instruments industry, and automation and robotics.

The firm is located in Imola, because this is where Sig. Andalò came to work for Savio from his home some 10 km. away. He settled in Imola, not considering alternative locations when he established his own firm after leaving Savio. The firm has moved twice since its foundation, but has always remained within 500 metres of Savio.

Aside from the skills learned at Savio, Sig. Andalò has been primarily self-taught. He does, however, make it a practice to continue with regular education, and enrols in two courses every year, one on management, and one relating to technical matters. The technical courses have dealt with issues such as surfaces of materials, emulsive oils and the environment, and computers, while the management courses have covered topics such as communication, relationships with financial institutions, procurement, and publicity.

The External Organisation of Production

There are no formal or long-term contracts between Andalò and IMA. Neither are there direct links with other small firms or artisans involved in IMA's network. The order comes to Andalò, is produced, and returned to the *casa madre*. As noted above, however, Andalò does sub-contract some phases of production to other artisans or small firms for specific treatments or processes which cannot be performed internally, but this is not coordinated in any way by

IMA.

The relationship between Andalò and other firms in the same sector seems to be one of intense competition. Andalò employs a competitive strategy of specialisation, not by sector or manufacturing process, but by batch size. That is, he specialises in small and very small orders, often single pieces, and in very difficult or complex pieces, which other firms are less interested in. As outlined above, a firm structure and a policy regarding the use of NC machines that accommodates this was strategically adopted, unlike other artisans which still seek to achieve long series production, even with the more flexible NC machines. In short, he has sought to embrace small orders and flexibility and adapt the structure of his firm to it rather than attempt to overcome it.

A second strategy which Andalò employs gives a further indication of the competition between small firms. Andalò is constantly seeking out new types of machinery, and experiments with it. He tries to prevent his competitors from learning what kinds of machinery he acquires, and as a condition of purchase will ask the supplier not to sell the machine to another firm in the area for a period of one year. "So I try to defend myself with these kinds of strategies - best quality, and I look for the best kind of equipment, and I don't let my competitor know what kind of machine I buy. I am often a 'mouse' - I experiment with new machinery for the first time" (Andalò, interview, 1988).

2.3 Ramazza

This is a small firm of six employees which specialises in the making of gears for machinery. It is owner-operated, by Sig. Ramazza, and had total annual revenues of between LIt. 450 and 500 million (approximately £225,000 to £250,000). The workshop (which is under the owner's home) is located in the small town of San Lazzaro, near Bologna.

The firm was begun in 1955 by Sig. Ramazza and his brother. They had both worked from a very early age (14 years) in a metal/mechanical firm in Bologna. Sig. Ramazza worked there for 12 years, picking up skills and an understanding of the production process. In 1955, this firm failed, and Sig. Ramazza and his brother decided to set up their own workshop in nearby San Lazzaro, where they lived at the time. Some of the first metal/mechanical establishments had been set up in the area, and parcels of land were available for industrial uses. They set up shop in a basement, with a small loan, and slowly began to acquire machinery one piece at a time. The firm has been in the same location since 1969.

The Internal Organisation of Production

Production is generally organised in the following way. IMA brings the order and the raw materials to Ramazza. The order specifies the kind and number of pieces, and a delivery date. The production of the piece is then organised by Sig. Ramazza. They begin with the unrefined steel metal, which then must undergo 'normalisation' with thermal treatments. The piece may then have to be tempered (i.e. heat treated to bring the steel to the desired elasticity and hardness). The piece is then shaped on the lathe, pre-milled, and then the teeth of the gears are formed. The piece may then undergo a second thermal treatment, and the teeth themselves will be ground.

There is no capacity for thermal treatments inside the firm; this must be done externally, but is organised by Sig. Ramazza when he receives the order. Once Ramazza receives the order, he is responsible for organising all aspects of its production; IMA has no role in this.

All of the six workers and Sig. Ramazza himself are directly involved in production. Two workers are classified as lathe operators, and three are milling machine operators. The sixth is an apprentice who has not yet specialised in a certain type of operation.

The tools and machinery employed in the workshop include a hacksaw for cutting the pieces of steel, a drill, two or three milling machines, four lathes, and several different types of grinding machines for gears and gear teeth. None of the machines are numerically controlled, but one is automatic (i.e. mechanically programmed).

The workers learn their skills on the job, though generally they will also have some technical training before arriving at the firm. As noted above, the workers are specialised in certain types of machinery. Two of the workers are relatively more skilled, and can change their positions. The degree of diversity of work an employee enjoys depends upon his level of skill; the more skilled workers take part in a wider range of tasks, while the less skilled are confined to fewer, less critical tasks, such as preparation work.

Ramazza tends to produce small batches of a wide variety of pieces. Orders for the same piece may range from one to about fifty pieces, but are often less than twelve. This is attributed to the nature of the automatic packaging machinery sector, in which the product machines are produced in small numbers.

The production process must constantly adapt to the changing requirements of the diversity of pieces being produced. Different pieces require various processes, some are more complex than others and require the use of many more machines or external treatments. Some require parts of the process to be done by hand.

This constant changing of product and production process adds costs to the production. The machines must be reset for each different type of piece, which adds a high fixed cost to small or single orders. This means economies of scale in production are rarely achieved. However, Ramazza tries to achieve a pricing of the piece that reflects the higher per unit costs.

Ramazza finds the manual machines that make up his inventory of equipment more suited to production in limited series compared to NC or CNC machines. He believes that electronic machines would only be useful for him if he had to produce long series. "As the orders are small, I keep on producing the pieces in my way, the clients are satisfied and so am I... If I produced 1,000 pieces I would buy automatic machines and try to have competitive prices, but here it doesn't matter" (Ramazza, interview, 1988).

Sig. Ramazza is responsible for the day-to-day management of the firm, and virtually all decision-making, including investment decisions. The administration and accounting functions are done by his wife. They do not make use of the artisans' associations or other agencies, but have in the past used outside sources of financial assistance to finance the purchase of machinery.

The External Organisation of Production

Ramazza has about 50 or 60 clients annually, but most of these are irregular, coming only once or twice a year with 'emergency' work. IMA is the dominant, stable client, and accounts for about 50% of Ramazza's total revenues. The clients are all located in Emilia-Romagna, mostly in Bologna. The same clients tend to be maintained from year to year. On an annual basis, the firm is able to work continuously and regularly, though there is a certain 'cyclical' nature to the production process.

The firm has, in the past, produced pieces of their own design, generally in conjunction with a client firm that has a certain kind of problem, but no plans or design for a component that will resolve it. In addition, Ramazza provides equipment maintenance and repair services to other companies in the area.

In the 25 years Ramazza had worked for IMA, there had never been any written contracts or long-term agreements amongst the two firms. The *casa* *madre* had consistently given the small firm the equivalent of three or four months of work, every year. In Ramazza's view there is no need for a written agreement. If IMA or other major clients suffer a downturn, Ramazza is able to turn to other clients to pick up the slack, or initiate work on their own products, until orders arrive. When the orders arrive, work on internal products ceases. Generally this strategy has been successful in dealing with the variability of work, and the lacunae in production have not lasted more than a week or so.

There is little exchange of information between IMA and Ramazza regarding matters relating to the production process, or, say, potential improvements to the intermediate product. Occasionally the *casa madre* will ask for information regarding the production process, but the materials and specifications are decided within IMA, with no input from the artisan firm. This means for the workers at Ramazza, there is little opportunity for an integration of conceptualisation and execution.

There are no direct filière linkages between Ramazza and other firms involved in IMA's productive network process. The orders are delivered to and retrieved from Ramazza by IMA. The artisan firm does not pass on its intermediate products directly to another artisan firm in the filière.

Ramazza does, however, have direct production relations with other firms that provide both qualitative and quantitative flexibility, but such relationships are organised by Ramazza, and do not involve the *casa madre*. In terms of qualitative flexibility, Ramazza sends pieces out for processes for which he has no internal capacity, such as thermal treatments, and certain grinding and shaving processes for the gear teeth. Ramazza also provides qualitative flexibility to other small artisan firms, including those that work for IMA. They solicit Ramazza's assistance in the gear-making process and in slotting work.

From time to time, Ramazza has also employed four or five outside artisans when he has had too much work and deadlines could not otherwise be met. This is relatively infrequent, however, and he prefers to accept work that can be conducted internally, without resort to other artisans. The relationship is reciprocal, and Ramazza has also provided quantitative flexibility to other artisan firms from time to time. These secondary artisan firms are located in Bologna, and San Lazzaro.

Ramazza's production has not changed radically over the years. The firm has always worked with very small orders. For the most part, new technology has not been aggressively adopted, nor has Ramazza sought to alter his client base.

A major problem cited was the demands placed upon the artisan regarding the timing of delivery - a timing which Ramazza found extremely demanding. This is attributed to the fact that IMA now produces by order, not for the warehouse, and so turnaround times are being constantly reduced. At the time of interview, Ramazza's deadlines were usually thirty or forty days. Ramazza complains that such a schedule is often difficult to achieve, particularly given the increasing complexity of the components. The *casa madre* places great pressure on the artisan firm to complete components on time, warning that the assembly process will stop if the pieces are not delivered on the date specified.

2.4 Meccanica Sarti

Meccanica Sarti is an owner-operated mechanical firm, which specialises in precision mechanical processes, in particular milling, rather than in specific intermediate products. The firm is located in suburban Bologna, employs 40 workers, and had annual revenues of between LIt. 1.5 billion and LIt. 5 billion in 1987 (£750,000 and £2.5 million, approximately).

The firm was started by the current owner's grandfather in 1932. The current owner, Sig. Sarti, began working in the firm in the early 1970s, after attending technical school. The company has remained in the same location for the last 25 years. At the time Sig. Sarti began working for the company, the work performed was much more diverse, including carpentry, grinding, lathe-work, and many others functions.

The Internal Organisation of Production

Meccanica Sarti has nine NC work centres, as well as three NC milling machines. In addition, the firm maintains testing and measuring equipment, to confirm the precision of the finished pieces. The firm began acquiring NC machines in the early 1970s. At the time, Meccanica Sarti was relatively weak in milling; the acquisition of NC machines was intended to overcome this weakness. These initial machines served the changing market well, so a decision was made to continue acquiring this kind of machinery. Meccanica Sarti began to specialise in the milling process, and acquires a new NC machine tool every year. The NC machines were also seen as improving the precision of the work and the replicability of the piece.

Most of the 38 production workers are machine operators. Because there is a high level of automation, particularly with the 'work centres', the function of the machine operator is primarily to load and unload the machine, and supervise its operation.

All of the workers are taken on directly out of school, are trained within the firm, and are often sent by Meccanica Sarti to attend specialised courses. Workers from other firms are never assumed. There appeared to be a considerable amount of fluidity within production with the workers "all doing everything". However, there was a plan underway at the time of interview to restructure the nature of work in order to reduce the number of tasks for which each worker is responsible. This was to allow the worker to perform a few specialised tasks with high levels of competence, and improve the organisation within the firm, making sure the worker knew his responsibilities, who his superior was, etc.

Data on the range of different types of pieces produced annually was not available. However, Sig. Sarti stated that one of the goals of the firm was to follow the market (for intermediate goods) closely, and characterised the firm by its "extreme adaptability to the market". The series size ranges from single pieces to quite large lots. At the time of interview, the firm had current orders for lots varying in size from three pieces to 1,500 pieces, and "all the numbers in the middle".

Though the lot sizes produced here are larger than for other APM artisans, there is still a considerable degree of product variability, which translates into ongoing changes to the labour process. Generally, the machines must be reprogrammed at the start of every day. There is also considerable flexibility in the hours of work. At present, the firm works in two full shifts, one daytime and one evening. This creates problems for the firm with the unions. In fact, the flexibility afforded by the two shifts was seen as one of the keys to the success of the firm, in particular in its ability to always accept work offered, and as a competitive strength in comparison to other firms that work a single shift and rigid hours. It is not unusual for the firm to produce beyond the two regular shifts, working into the early morning or on weekends. According to Sig. Sarti, this is a state of affairs that the worker has always accepted.

On a longer term basis, Meccanica Sarti also succeeds in working consistently, without gaps in production. Aside from the strategy of never declining work, the other approach is to take on slightly more work than the machines are capable of handling. In this way, if orders arrive late or other problems arise, the machines are still operating at full capacity.

All management activities and investment decision-making are performed solely within the firm, by Sig. Sarti himself, though sometimes in conjunction with some of the more senior employees in the case of acquisitions of new technology. Of the forty employees in the firm, fully 38 are directly involved in production. One of the remaining two does all of the administration functions. There is no recourse to outside consultants or associations for assistance of any kind.

The External Organisation of Production

The firm has approximately 100 clients, in three primary sectors: automatic machines such as those produced for IMA, transportation, and textile machinery. These three sectors account for about three-quarters of Meccanica Sarti's annual sales. Most of the clients are located in Emilia-Romagna, but there are also other foreign clients, in France and Germany, for example. The firm works only on a subcontract basis for other firms; it does not produce its own products.

There are no formal or long-term agreements between Meccanica Sarti and IMA, (nor with any other *case madri*). Prices for each order are determined in advance, and are negotiated between IMA and Sarti. Unlike other cases we have seen in which the price the artisan can ask does not vary with the total number of pieces in the series, Meccanica Sarti charges different prices, depending on the lot size. "We have a price for each kind of order so we are able to produce from one to 1,000 pieces" (Sarti, interview, 1988).

In the past, the price for an order was determined '*a consuntivo*', i.e. after the work had already been completed - a final balance. The amount of time spent and the value of the pieces was discussed by the small firm and the *casa madre*, and a price determined. However, this after-the-fact approach frequently led to disagreements between IMA and Sarti. An approach was adopted in which Sarti provides an indication of the likely final price before the work has begun, and also indicates the size of order that will be required in order to achieve that price.

Another advantage Sarti has regarding price (compared to other sub-contractor firms) is a direct result of his strategy of client selection. Clients and client sectors in which quality is more important than price are deliberately selected. "We prefer firms that produce durable goods, they will appreciate the importance of quality components in their machines, and they are able to sustain certain costs for their pieces. Agricultural machinery is not like this, so it is of no interest to us." (Sarti, interview, 1988). Such a strategy gives the small firm some additional leverage in price negotiations with the *casa madre*, which allows it to recoup in whole or in part the costs associated with producing in short series.

Meccanica Sarti conducts 95% of its work inside the firm itself, and views this as necessary for protecting the high quality of the product. However, a small proportion of production is conducted outside the firm, in cases where specific technologies other than those available internally are required.

The relationship between small or artisan firms specialising in the same phase of production is characterised predominantly by competition. Some small firms will try to compete on the basis of price, by attempting to find out the prices a firm like Sarti charges, and undercutting them. Or, often a *casa madre* will send out a limited tender to several firms for a certain piece of work, and will choose the respondent with the lowest price.

Meccanica Sarti has lost work in this way, but their competitive strategy is not one based on price but on the quality of product. The choice of phases of production in which to specialise, technology, and the organisation of the firm around the technology are critical in achieving this competitive edge, and these are the tools Sarti employs to compete against other firms in the same sector. The high level of sophistication of the NC milling machine tools and work centres require an in-depth technological knowledge, and a productive organisation that supports and exploits the technology. These are qualities are not easily achieved by all firms, and are not achievable in certain production processes, such as lathe-work, where the technology is not as complex. In this way, Sarti tries to compete with other firms through sophisticated technology, internal firm organisation, and high product quality - features which are not easily achievable or reproducible by other firms.

Meccanica Sarti attributes its success to following its own path, policies and line of reasoning, as well as a consistent plan of investment in new technology. However, they are now at a point where they have invested substantially in the years leading up to the time of interview, and further growth through more investment and addition of equipment would necessitate restructuring the firm. So the firm had adopted a policy of improvement without further expansion (i.e. maintaining the same machinery and work force), and embarked upon a program of restructuring the labour process, more narrowly defining tasks and increasing the technical division of labour.

2.5 Vignoli-Roda

This is a firm of six employees which specialises in the assembly of automatic packaging machinery. It is owned and operated by Sig. Vignoli, and is located in San Lazzaro. This location was seen as favourable as it is near to IMA, but more importantly, is near to a technical school which is the primary source of labour for the firm.

The firm was founded by Sig. Roda in 1961. Sig. Vignoli joined the firm in its second year, and was made a partner five years later. Sig. Roda then left the firm, and currently works in IMA's planning office. Sig. Vignoli underwent some initial training at a local technical school before entering the firm, but most of his skills and knowledge were learned on the job.

The Internal Organisation of Production

The firm works exclusively for IMA and only undertakes assembly of automatic packaging machines. All of the components are sourced and delivered by IMA, in order that the high quality of the product can be assured. Vignoli-Roda assembles the entire machine except the electronic component, tests it, and provides it to IMA ready for installation of the customised component and final testing.

As the focus is upon assembly, there is little machinery or equipment present in the firm. Some tools are kept on hand, such as a lathe and drills, so that components that are not quite right can be modified on the spot. If the defect is more severe, however, it is returned to IMA.

All of the six employees are directly involved in the assembly of the machines. Vignoli-Roda acts as a kind of training school for IMA, taking on young men directly from the nearby technical school, which has a three year program. Once trained (and expensive) the workers are passed on to IMA. Many of these young workers fall under the '*contratto di formazione professionale*'. This both keeps Vignoli-Roda's labour costs to a minimum, and also serves to provide IMA with skilled workers, already very familiar with the product. This relationship between IMA and Vignoli-Roda is the result of an informal agreement between the two firms. In exchange for providing IMA with skilled workers, and keeping assembly costs low by using less experienced labour, IMA ensures that Vignoli-Roda works continuously. This arrangement is not the subject of a written contract, but is just an 'agreement' between the two firms.

For this reason, and also due to the nature of assembly work itself, the workers at Vignoli-Roda are not highly specialised. The emphasis is on training, so the young workers must cover all parts of the assembly process and all workers do essentially the same kinds of work.

Vignoli-Roda assemble all but the two very largest machines of IMA's product line (due to space limitations) - about six common models. The total number of machines assembled in a year falls between 30 and 40, depending on the complexity of the particular models. A complicated machine may take up to three months to assemble. For less complicated models, an order of eight machines may be assembled in two months.

The hours of work appeared to be flexible, often extending into the weekend. Because the workers are not very experienced, Sig. Vignoli must always be present to supervise the assembly process. "So it's a great sacrifice, I can't stay home if I am sick, for 20 years I have never stayed home" (Vignoli, interview, 1988).

Over the longer period, the firm is able to work consistently throughout the year. This is necessary, because of the relatively low price they are paid by the *casa madre* for their work. "We couldn't keep these prices without a guarantee of work, without continuous work" (Vignoli, interview, 1988). However, this guarantee of work is not a written commitment. At the beginning of each year, IMA provides Vignoli-Roda with its production plan for the year, and estimates the number of hours of work the artisan will receive monthly. Vignoli then organises his firm according to IMA's projection, e.g. taking on new workers, if necessary. Gaps do sometimes occur, however, for example when the delivery of components required for assembly is late. Such gaps are filled either by taking holidays at that time, or IMA will provide alternate work to the firm.

The firm's management structure essentially consists of Sig. Vignoli, who is responsible for day-to-day management, production coordination, investment and staffing decisions, and supervising the assembly process. His wife does all of the internal administration, and their accounts are done externally, in part by the artisans' association, and in part by an independent accountant.

The External Organisation of Production

There are no formal written or long-term agreements between IMA and Vignoli-Roda but, as noted above, there are obviously strong ties between the two firms and there is an unwritten agreement involving the provision of training for IMA workers and low pricing in exchange for continuous work.

Vignoli-Roda determines its price on an hourly basis, the rate being the same for all the types of machines. The price is therefore determined after the assembly has been completed, rather than before work commences.

Though investment decisions are taken finally by Sig. Vignoli, the *casa madre* is usually consulted in the case of major investments. Because the firm works exclusively for IMA, the *casa madre* is asked to provide projections, in order that Vignoli-Roda may get an indication that the investment will be worthwhile.

Vignoli-Roda is usually responsible for undertaking the first production assembly (as opposed to prototype assembly, which is conducted within IMA) for new IMA models. In such cases Vignoli is able to offer suggestions for how the machine might be modified to make assembly easier. There is a certain amount of inter-firm collaboration on design in this regard, and Vignoli stays in close contact with the technical office at IMA. However, this input tends to relate primarily to minor modifications to the design to improve assembly.

Vignoli-Roda has no direct linkages with any other artisan firms involved in IMA's production; it deals only with IMA itself. All assembly is completed within the firm, no external artisans are ever used, for example, in the assembly of sub-components. Internal assembly is seen as necessary in order to maintain the quality of the product.

Because the firm works exclusively for IMA and is essentially guaranteed an adequate amount of work, Vignoli-Roda has almost no relations with other firms in the same phase. Their relationship is neither one of competition nor cooperation, but might best be described as isolationist.

Little has changed in this firm in the last twenty years - the same client has always been maintained and they have always specialised in the same phase of production, which has not been subject to technological advances. "We have always worked in the same way" (Vignoli, interview, 1988).

Vignoli's modest business goal is to follow the path of his ex-partner: find a new partner to take over the firm, and pay off debts. A move to nearby expanded premises was being planned at the time of interview, which would permit the firm to assemble the full range of IMA products, including those that were too large to be assembled at the existing premises.

3. SYNTHESIS

3.1 The System of Production - Inter-Firm Aspects

A detailed schematic picture of the IMA network is presented in Figure 6.2. In the IMA productive system, the social division of labour takes place at two levels. First, there is the division of labour between the *casa madre* and the network firms. IMA undertakes the product design, prototype development, coordination of the production process, some assembly, and marketing. The network firms undertake the actual production of the automatic packaging machines.

The second aspect of the social division of labour occurs between the network firms. In other case studies, each small firm generally specialised in a certain phase or phases of production, as was the case with Meccanica Sarti. However, specialisation in the APM district also occurred along other dimensions too: certain types of components (e.g. Ramazza), batch size or complexity of work (Andalò). In one way or another, each of the firms was highly specialised.

For the above reasons, we can say that the social division of labour in the IMA system is very pronounced. Because of the complexity of the product, the production filière is also highly complex (Figure 6.3).

The social division of labour is conditioned by the nature of the market for the intermediate goods produced. For the most part, the nature of the relationship between firms in the same phase of production is one of competition. The network firms adopt specialisations as a competitive strategy, as a means to compete against other, similar firms.

There is also in IMA's productive system a regular recourse on the part of network firms to other small or artisan firms offering specialised services. This third tier network of small firms provides qualitative flexibility, is coordinated from within the second tier network, and forms a consistent component of the productive structure. This differs from other cases, such as the Carma case, in which the third tier was only an occasional feature, and provided primarily quantitative flexibility to the primary firms.

The competition between network firms in the same phase of production is therefore mixed with elements of cooperation: between these same firms when they need additional capacity; between firms in different phases for specialised production processes; and of course between the network firms and the *casa madre*. A final aspect of the network system relates to economies of scale. It has been demonstrated that the individual firms produce very wide product ranges, mostly in short series. This is due primarily to the nature of the product, i.e. a lumpy, high value good, which itself is not produced in large series. Though there are varying approaches amongst the network firms toward the use of flexible machinery, particularly NC machine tools,

Figure 6.2

Schematic Diagram of the IMA Production Network

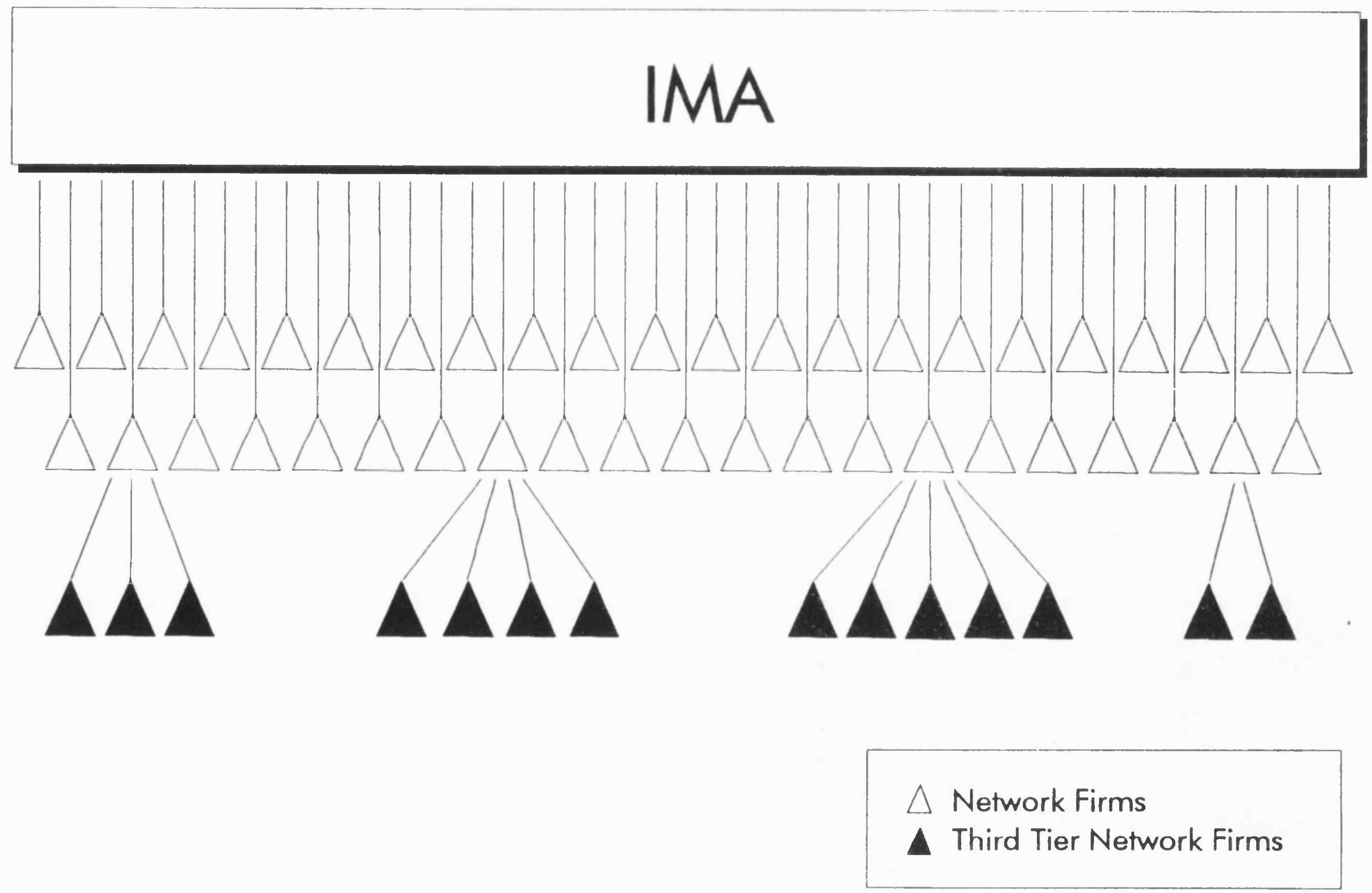
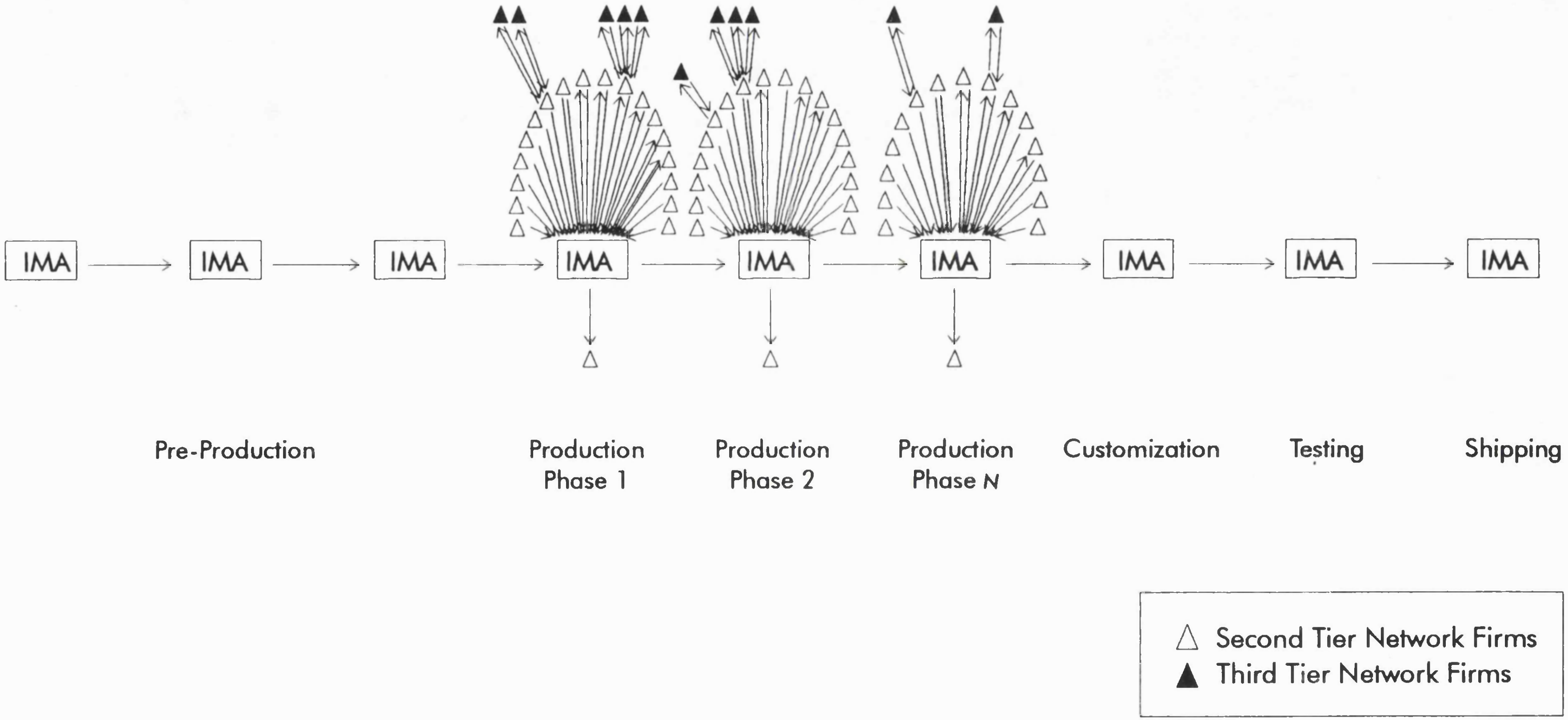


Figure 6.3

The IMA Production Filiere



the small and diverse orders do incur higher costs than standardized, long-run production, primarily because of the time involved in re-programming and re-setting the machinery. This is true whether the approach is to try to produce the best single piece, while maximizing total output on a machine (e.g. Andalò), or whether NC machinery is seen as ill-suited or unnecessary for short-run production and traditional machines are employed (e.g. Ramazza).

Unlike other productive network systems (e.g. Carma's), IMA does not - or is not able to - pass on the costs of diseconomies of scale to the network firm. In most cases, the network firm was able to charge a price which reflected the actual costs incurred - including one-time or other set-up costs.

Ownership

There is no direct legal ownership relationship relation between the *casa madre* and the network firms, either in the sense of outright ownership, nor in the sense of partial ownership, say of building or equipment. Each firm surveyed was fully independently owned. Neither is there much ownership control in Massey's sense of ownership (that is, power over investment decisions) exercised by the *casa madre* over network firms. In all cases investment decisions were made completely internally. The exception was Vignoli-Roda, which had IMA as a sole client, and consulted the *casa madre* regarding major investment decisions, but the final decision remained within the network firm.

Possession

As defined by Massey, possession relates to how the physical means of production are to be used, and control over the authority structure within the labour process (i.e. supervisory structure). IMA's possession over network firms is quite limited. The *casa madre* does determine the product, with only minimal input from some network firms, but the internal labour processes of network firms are left up to the firms themselves. On the second aspect, there is, of course, no direct supervisory linkage between the *casa madre* and the network firm. The *casa madre* does, however, check the network firm's product, and sets the appropriate delivery dates, which amounts to a kind of indirect supervision and control.

Regarding other aspects of the labour process, such as conceptualisation and execution, this system of production offers little integration for the network firm. The product is conceptualised and designed within the *casa madre*, with only minimal input from the producer firms, and when this did occur it would be only after the design process was complete. The *casa madre* also determines, to a significant extent, the pace of work, because it fully controls when orders are made and due.

To summarise, the IMA system is characterised by a very elaborate social division of labour, both between the *casa madre* and the network firms, on the one hand, but also in the division of labour between network firms themselves. The *casa madre* controls the entire system, coordinates production, determines whether and when to sub-contract work to certain firms, etc. It can alter or modify its network of production firms as it pleases. However, it has little control or influence over the internal organisation of those firms. This outcome differs with that for other cases, such as the Carma case, in which the *casa madre* was able to exert control in both senses.

Looking at this another way, the network firms in this case are significantly more independent than was apparent in the Carma case. This can be attributed in part to the fact that the network firms have a greater number of client firms; on the whole, their client firms were more diversified, representing many different industrial sectors. The APM network firms also exhibited a degree of initiative, capability and independence in the fact that some had developed their own products for sale on the market. The higher number and diversity of clients means both that the network firm is more able to weather an economic downturn in one or more sectors, and, should one client discontinue his orders to the firm, additional work could be picked up from other clients. The fact that the network firms did not absorb the costs of diseconomies of scale associated with short production runs is further evidence of their relative independence. This is also related to the strong competitive position of IMA on the world market, and its ability to charge a premium for its product quality and customisation.

3.2 The Intra-Firm Organisation of Production

IMA

As described above, IMA is a large, complex firm, with a highly defined organisational structure. The technical division of labour is quite pronounced, with a primary distinction between production (i.e. prototype producers) workers, and planners and designers. Each group is further broken down into many sections, each with specific responsibilities. There is, by virtue of the complexity of the firm and the production process, little movement on the part of the worker between the various functions of the firm, broadly defined. On a long-term basis, however, it appears that there are opportunities for upward career mobility from the shop floor to directorial roles.

Again, because of the high degree of complexity of the product, there is little opportunity for an integration of conceptualisation and execution on the part of the IMA worker. First, IMA does not produce the machines internally - only the prototype. Secondly, even with respect to the production of the prototype, the production worker would have little input into the conceptualisation of the product. Product design and planning are undertaken by an elaborate team of highly qualified engineers, supported by computers. This latter group plays a central role in the firm, and their relative numbers are increasing.

The skills associated with the production of IMA's automatic packaging machines therefore vary greatly, from the semi-skilled production workers, machine tool operators and assemblers (who tend to learn on the job), to highly skilled designers, planners, computer programmers, and production coordinators (who tend to have university degrees).

Network Firms

Aside from the division of labour between *casa madre* and network firms, and in production between network firms themselves, there is a further division of labour within the network firms. Even in the smallest firms, there was an attempt to specialise certain workers for certain machines and tasks, though there was at least amongst some workers, a degree of interchangeability. In one case where there appeared to be more fluidity of workers amongst the various machines and tasks (Sarti), there was a move underway to restructure the labour process to create more well defined tasks and responsibilities for individual workers, in order to increase their competence and productivity.

For network firms, there is little opportunity for integrating conceptualisation and production with respect to IMA's product. Only in one case, in which the firm worked exclusively for IMA and therefore had a special relationship with the *casa madre*, was there a flow of information regarding the design of the machine back to the *casa madre*. Even in this case the information regarded only small adjustments or improvements to the design, and occurred after the design phase was completed. In general the network firms are not consulted during the design phase regarding the design or production of specific components, or the machine as a whole (from the assembler's point of view).

The functions performed in the network firms would generally represent skilled or semi-skilled jobs. There is some need for higher level skills and/or programming skills in firms with NC or computer-controlled machinery. However, there was no incidence of highly skilled, university educated engineers working in these firms. Most workers were taken on at a young age, directly from a technical school, and were trained on-the-job.

3.3 The Territorial Organisation of Production

The most striking feature regarding the geographical organisation of production is the high degree of spatial centralisation of the productive system. There is a very high degree of centralisation of the leading, *case madri* firms in this sector in and around the city and Province of Bologna (Figure 6.4). The APM industry is clearly centred around the city of Bologna and its suburbs, as well as immediately surrounding towns and villages. Other APM firms are located in the major cities, such as Parma, and clearly along the via Emilia axis. Several Bolognese firms are located in the city proper, but most are located in the suburban ring that extends around the city. There is a small cluster of firms in Parma as well, in which firms are localised in the city, not in suburban or fringe locations.

Figure 6.5 shows the same firms distributed by size. In general, there is a relationship between central city location and firm size: the bigger the firm, the more centrally located it is likely to be. The largest firms are located in the city of Bologna, and other large firms are located in Parma. Small and medium firms are scattered more toward the urban periphery and in smaller intervening towns and villages.

Figure 6.6 shows the location of the network firms interviewed. There is a correspondingly high degree of spatial concentration of network firms, which are closely located in neighbouring towns along the via Emilia[34]. In addition, IMA indicated that the vast majority of their network firms were located in the immediate area - in the Province of Bologna, and Imola, with a small number in Tuscany.

This is a metropolitan industrial district: a highly spatially concentrated system and a tightly defined industrial district, focused primarily around the central Emilian city of Bologna.

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[34] A full list of the location of IMA's 100 network firms was not available.

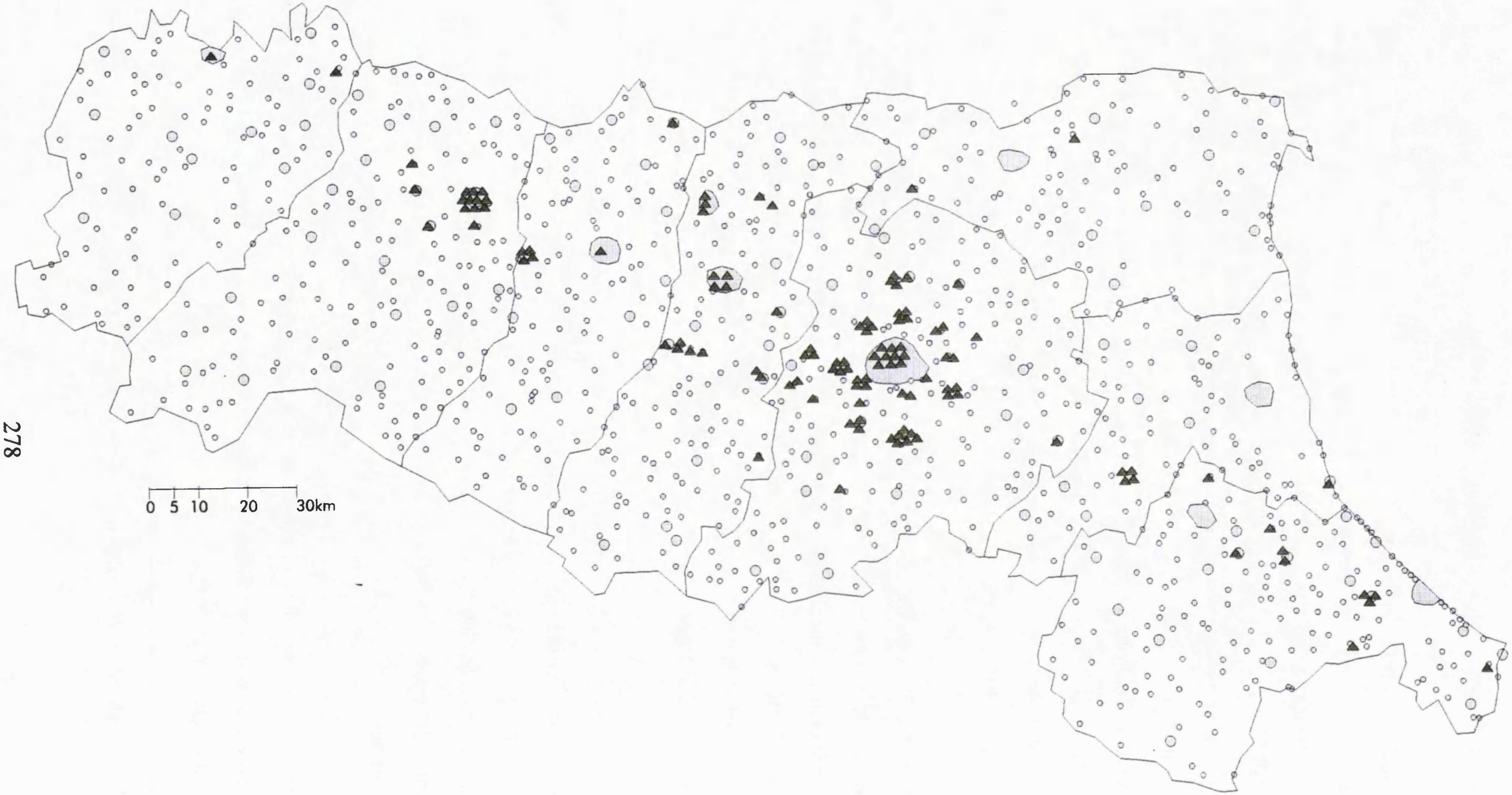

Figure 6.4

APM *Case Madri*, Emilia-Romagna

Source: Data from ERVET, 1987.

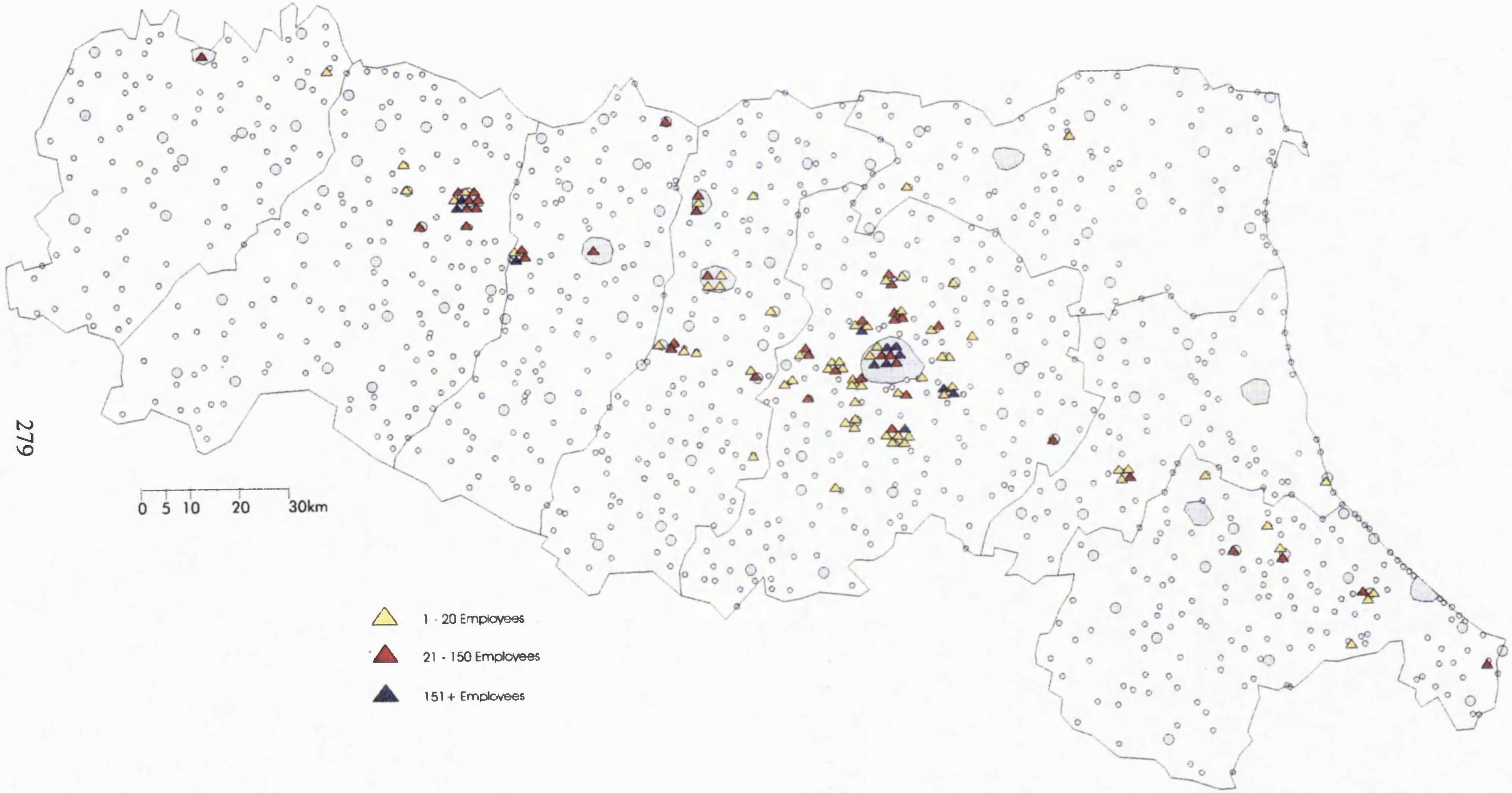

Figure 6.5

APM *Case Madri*, Emilia Romagna, by Number of Employees

Source: Data from ERVET, 1987

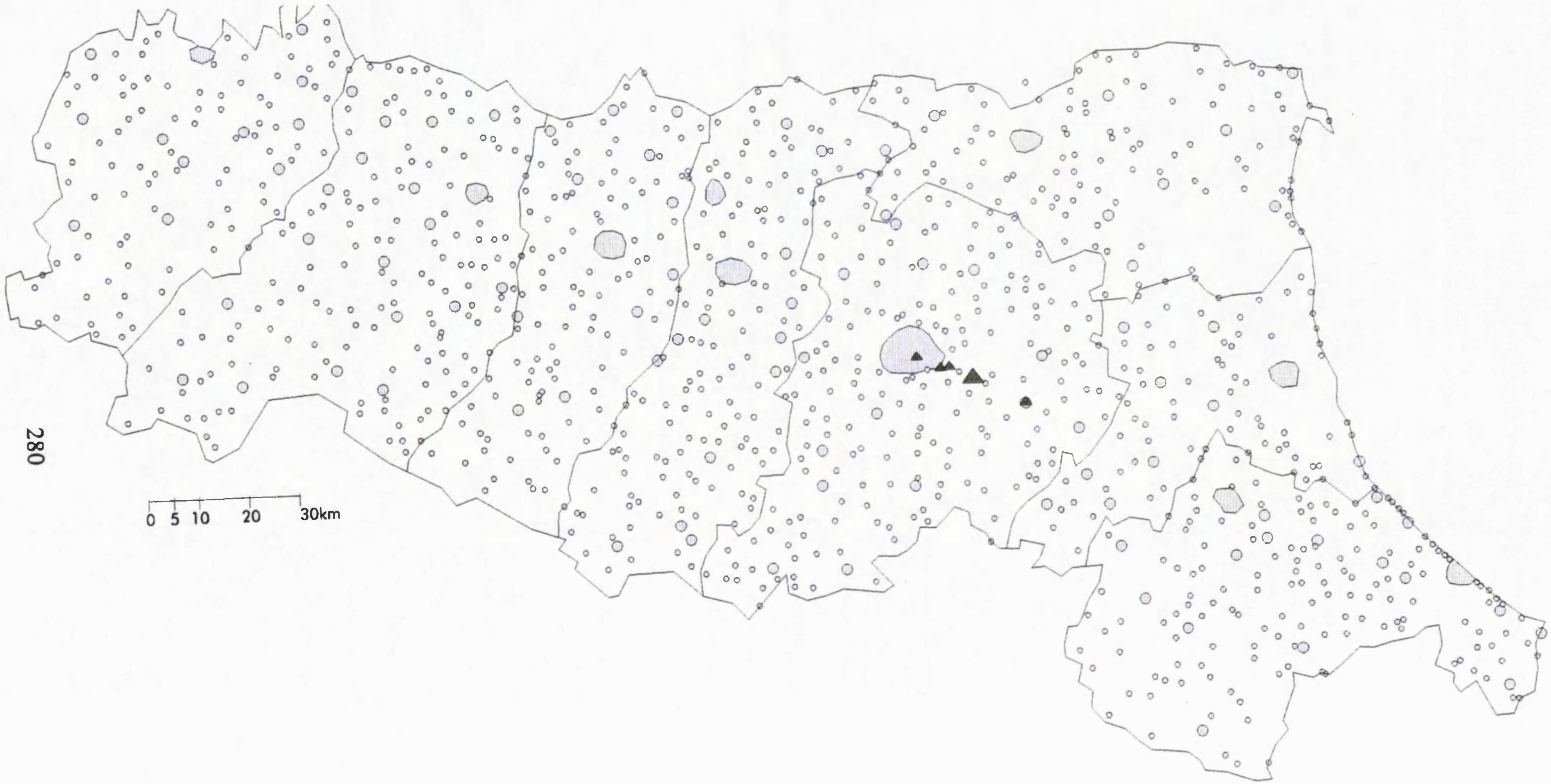

Figure 6.6

IMA and Network Firms Interviewed

Given the relative independence of network firms in this district, with many potential client sectors to work for and the ability to charge a premium for short production runs, the industrial relationship does not translate into a situation of city/hinterland dominance/dependence. Rather, there is a high degree of city/town/village inter-dependence Neither is the productive centre in Bologna dominated by a control centre outside the region; full ownership remains local and the city of Bologna represents the apex of the APM system.

However, the larger firms are where the higher paying, more skilled design, engineering, and management functions tend to be located and the production process controlled and coordinated, while production functions are more dispersed.

Towards an Explanation

The competitive basis of IMA's automatic packaging machines rests upon their technological content and continual updating, quality, customisation, product range, and timely delivery. Competition is both global and local; Bologna is the world's largest concentration of automatic packaging machinery producers, but there is also global competition from Germany, the U.S. and elsewhere.

IMA's productive structure is one in which the *casa madre* undertakes design, sales, and customisation, and controls a large network which undertakes all production and basic assembly. IMA's production has always been organised on this kind of a network basis, dating back to the firm's origins in the 1920s. In part, this can be attributed the existence, even at that time, of a substantial and highly developed metal-mechanical sector in Emilia-Romagna, particularly in Bologna, that could undertake all production functions, minimising set-up costs for new firms such as IMA.

A significant change did occur, however, in the early 1980s, when IMA switched from its long-standing system in which production was based on achieving economies of scale, and machines were stored in the warehouse until subsequently sold, to a system in which production only occurred on the basis of prior orders. This change was brought about because the economies of scale achieved by producing the optimal number of machines at the same time were outweighed by the costs of carrying unsold inventory. This placed a new emphasis on the ability to manufacture and deliver the product quickly.

After moving from speculative production to an advance sales approach, IMA's production process could no longer be regularized, because demand was unpredictable, particularly given the "lumpiness" of the final product. The network system of production is seen by the directors of IMA as providing the firm flexibility in the face of this unpredictable demand. A vertically disintegrated productive system permits the *casa madre* to deal with the irregularity of demand and lumpiness of the product in a way that would not be possible if production were internalised. A huge internal workforce would be required, and it would be impossible to regularise the production process to keep these workers consistently employed throughout the day, week and year. As we have seen, some months several machines can be produced at once, while in other months, there may be no machines at all in production. The labour needs associated with this would also vary significantly, from no workers to perhaps 1,000 workers. Through vertical disintegration in the district, IMA can maintain a minimum of workers inside the firm (even though this minimum currently amounts to 400). Aside from providing maximum quality, then, the vertically disintegrated production system provides quantitative flexibility; the *casa madre* can increase the number of orders or order size for individual network firms, or increase the number of network firms involved in a given phase of production as required to have production undertaken in a timely manner. In other words, in the context of an industrial district, the vertically disintegrated productive structure provides quantitative flexibility.

IMA's relatively broad product range is a result of its corporate structure and the relationships it has forged with other APM producers. But IMA's own internal product range requires a flexible and responsive productive structure, which can continually change product and alter production process in accordance with very small batch sizes. Unlike Carma's situation, however, IMA's strong market position allows a premium to be charged for a customised product, and the network producers can recoup the costs of diseconomies of scale from IMA. In other words, IMA's network structure and relations with the industrial district provide overall quantitative flexibility and qualitative range, but the network structure itself does not solve the problem of small batch size.

Furthermore, even if IMA were somehow successful in predicting the quantity of demand, it would be very difficult if not impossible to predict the nature of demand. One of the apparent trends in the industry was that clients were becoming much more precise about the kind of machines they want, and the requirements they must meet. Each machine therefore has a customised component, geared specifically to the client's product, which cannot be determined in advance of the order.

Customisation is linked to the specialisation of the different establishments in the network. The customisation capability resides within IMA, where the product is designed and where the relationship with the client takes place. IMA can specialise in the design, customisation and administration of production, without having to concern itself with production itself . It makes sense for customisation to reside and remain in the *casa madre*, where there are economies of scope with design and sales.

The high degree of specialisation throughout the system ensures maximum proficiency, skill and product quality. The *casa madre* is able to concentrate on design and customisation, while the network firms are able to refine their particular role in the production process. As we have seen, the level of specialisation, social and technical divisions of labour are extremely high, and continually evolving under the competitive pressures between artisan firms in the district. The *casa madre* has an extensive pool of local expertise upon which to draw, in the dense agglomeration of metal/mechanical firms which exist in the Bologna area. We have seen that IMA's full network roster numbers some 800 such firms.

It is worth noting that the fluctuations are not as pronounced in the tea packaging machinery sector, where IMA is more established and has a larger market share, hence a more stable demand. In the pharmaceuticals packaging machinery sector, however, where IMA's position is not as strong, there is greater variability in demand.

Time-based competition was increasingly important, given that production took place only in response to orders, and because of the complexity of the product, often required several months to a year. IMA attached a high level of importance to the prompt delivery of components by artisans, and indeed required very demanding turnaround times. Again, the vertically disintegrated productive structure can play a key role in time-based competition, as the network can be expanded or contracted in any given phase, and orders divided amongst many firms, if necessary, to speed production. Of course, the spatial concentration of network firms is also key for time-based competition, and as we saw, 95% of network firms were within the immediate area of Bologna and San Lazzaro.

Again, we see that it is the organisational structure, specifically a vertically disintegrated, network system of production within a district environment, that provides the main means for dealing with competitive and market imperatives. The contribution of elements residing within individual firms, such as labour practices or technology, played only a minor role, and there was considerable variation in the adoption of new technologies or use of flexible labour practices. Access to the district will therefore be an important consideration for firms. In this case, the pattern of agglomeration was established very early, with a significant cluster of metal-mechanical firms which served the APM industry in existence as early as the 1920s.

Once a productive system has been disaggregated, it must however be recombined in some fashion in order to continue to function. In the Bologna APM district, the system is recombined through market transactions for intermediate goods. Aside from the now usual market pressures of time, quality and customisation, the APM industry must deal with the constant re-invention and modification of the product, small batch sizes, and an inability to routinize the myriad transactions that are required. Under such circumstances, spatial clustering is a key aspect of the competitiveness of the system, as it allows for flexible and fast movement of goods and information between companies.

In this regard, a shared culture, mutual trust, and common norms of behaviour seem to play a strong role in the functioning of the district, permitting very informal transactions, the proverbial "handshake". Most firms that worked for IMA seemed to have long term relationships with the company but under very informal arrangements, and in many cases, the price paid for work was only determined after the work had been completed. These types of transactions allow the production process to operate under intense market and competitive pressure, and the cultural norms and trust act as a way of standardizing transactions.

There is an apparent relationship between centrality and firm size: the larger the firm, the more centrally-located and urban it tends to be. This is a reversal of common patterns found in most advanced industrial cities, where larger industrial firms tend to be located in suburban locations. This may be accounted for by the fact that the larger firms tend to also be the oldest, pre-war firms, including ACMA and Sasib, which existed in Bologna before the development of extended suburban rings. The decentralised production system also explains their ability to remain in these locations even though output has expanded enormously; expansion of production requires expanding the external network rather than the internal facility. As the city grew, younger firms, on the other hand, would have been precluded from central city locations by high land values, and set up instead in the suburban rings, or other medium-sized towns. This is the apparent pattern for the medium-sized companies.

PART III

CONCLUSIONS

CHAPTER SEVEN

NETWORKS, DISTRICTS, CITIES, REGIONS

In this concluding chapter it is argued that the industrial districts described in the case studies are indeed examples of post-Fordist production, but that there are some deviations from the post-Fordist ideal that has frequently been portrayed in the literature. Then, an explanation is offered for the particular territorial organisation of production seen in the three industrial districts, which ties the districts directly to the logic of post-Fordism, as well as certain key contingent factors. Key characteristics which unite the three case studies as one type of district and allow them to be distinguished from other species of district are proposed. In the penultimate section, the implications for cities and regions are explored. The chapter closes with a summing-up of the thesis.

I. THE THIRD ITALY: POST-FORDIST BUT NOT PERFECT

Can the systems of production that have been described be called post-Fordist? Are they consistent with a new regime of accumulation, with a distinct dynamic and characteristics? This section adds to the empirical literature on post-Fordist districts, and finds that while in broad outline there are consistencies with the "textbook" model of post-Fordist production[35], there are also certain significant departures.

I.I Markets

Post-Fordism is often associated with the break-up of mass markets, and the attainment of market saturation for certain products (Piore and Sabel, 1984). The case studies suggest that changes in the market have been fundamental and far-reaching - stemming in part from new sources of competition in emerging industrial nations. This was also found to be true not just in sectors like knitwear, that had previously been organised along Fordist lines, but also in the

[35] Primarily as described by Moulaert and Swyngedouw (1989) (see Chapter One, Table I.I.), but also by Piore and Sabel, (1984).

automatic packaging machinery sector, which had been characterised (even during Fordist times) by small production runs. The case studies suggest new markets characterised by a number of conditions, outlined below:

- *Variability in distribution of demand over time* There appears to be increasing variability in the distribution of demand over time, in terms of the quantities of a given product that may be demanded in any given period. The quantity and arrival of orders for automatic packaging machinery was always relatively unpredictable, given its lumpiness and high cost. However, IMA's replacement, in the early 1980s, of a system in which machines were produced consistently and on the basis of achieving economies of scale with a system in which production occurred only once orders were secured, suggests that the earlier method was no longer competitive. There is also evidence of built-in market cyclicity. In the knitwear case study, there was a switch to a non-standardised product, which meant new cyclicity according to fashion seasons.

- *Variability in the qualitative aspects of demand* Even if the quantities of certain products demanded at any given time were roughly knowable, there is an added element of variability in the specific nature of demand. This is evident in the Carma case, for example, where new international sources of competition forced a total rethinking of the product and repositioning in the global market. The nature of demand became extremely unpredictable, especially in this case where fashion and taste were involved, necessitating a change in the commercial system to begin production only once orders had been secured, and further, to produce second or third rounds directly in response to market reactions.

- *Greater demand for customisation of products* A greater demand for customisation of products resulted from competition in final markets, which placed increased emphasis on product differentiation, brand recognition, etc. The Oil Control product, for example, is by definition customised, designed to respond to specific client needs. In the case of IMA, a requirement for a higher degree of customisation in the automatic packaging machines emerged - itself the result of intensified competitive pressures in the final demand sectors (tea, pharmaceuticals). It could also be said that the increased incidence of customisation is also the result of supply-side forces, in that computer-controlled technology makes customisation more cost-efficient, and permits it where it would not have been economical otherwise.

- *Time-based competition* The great importance attached to timely market delivery was evident especially in the cases of knitwear, where there was extreme pressure to get goods to market, and automatic packaging machines, where production only after orders were received led to a need to minimise the usually long production time required for this complex piece of machinery. Indeed, in all of the case studies, speculative production was non-existent, having been replaced with an approach in which production takes place only on the basis of prior orders. In a volatile marketplace, this is an effective risk reduction strategy, but it places a high degree of emphasis on the ability to produce and deliver goods to market quickly.

- *Greater emphasis on product quality* In all of the case studies, high product quality was seen as a key competitive factor, and a means to differentiate particular products on the market.

What these new market conditions signal is a fundamental change in the basis of competition, from competition primarily based on achieving the lowest possible price for a standardised product, to competition based on a number of factors, primarily high quality, timeliness, and customisation. For the producer, this creates a situation which makes it extremely difficult to predict production requirements over even the short term.

1.2 Product differentiation and range

While the post-Fordists and flexible specialisationists have maintained a broadening product range and increased product diversity (Piore and Sabel, 1984; Moulaert and Swyngedouw, 1989), others question these trends or even suggest that an opposite trend of product range rationalisation and reduction (Smith, 1991).

The case studies show a high degree of flexibility in the product - large and increasing product ranges, increasing degrees of customisation of the product, one-offs to medium batch sizes. The Carma example showed a complete rethinking of the product and change from a standardised product with a market life of five years, to diversified clothing lines redesigned semi-annually. Oil Control exhibited a very broad and constantly expanding product range. Even the case of automatic packaging machinery saw a marked increase in the number of basic models offered, as well as further customisation of each machine producéd. In instance, broader product ranges and customisation involved greater degrees of integration with the final market, working directly with the client to respond to their needs or a particular problem, in the cases of automatic packaging machinery and oleodynamic components, or responding more quickly to market demand, in the knitwear example.

1.3 Flexible systems of production?

The post-Fordists maintain that as a result of these new kinds of market conditions and diversifying product ranges, a flexible production process is required, replacing the quest for standardisation, economies of scale and cost minimisation that were characteristic of Fordism. Product diversification and customisation have necessitated flexible systems of production that can adjust rapidly and accommodate changes in process required for smaller batches, quick turnaround, or when the nature of the product itself is constantly evolving. It is these characteristics which have been more generally described in the literature as "flexibility". Flexibility is seen as the defining characteristic of the new regime of accumulation and is placed at the centre of production (Piore and Sabel, 1984; Moulaert and Swyngedouw, 1989). Flexibility can come in many guises, however, and can stem from technology, the labour process or organisational structures. The evidence from the case studies on the degree of flexibility and its sources is summarised below.

1.3.1 Flexibility from labour

The post-Fordists' view of flexible labour processes includes claims that both job demarcations and the technical division of labour are reduced as workers perform multiple tasks (Moulaert and Swyngedouw, 1989). The flexible specialisationists have claimed that the new forms of labour represent a re-emergence of craft production, skills, and a re-integration of conception and execution (Piore and Sabel, 1984).

The case studies show that quantitative labour flexibility does not reside primarily within the individual firm. Whether *casa madre* or sub-contractor, firms were very conservative in assuming new labour, even in times of expansion, given the difficulties in shedding labour in downturns, and preferred to rely on the agglomeration of firms found in the industrial district to deal with periods of high demand.

There were some exceptions, however, where workers within the *casa madre* or network firm were expected to accept some flexibility in hours of work, and especially to work overtime when needed. Another mechanism for dealing with this was the self-exploitation of the owner/operator, who would often take it upon himself to work extended hours in periods of high demand, while employees worked regular hours.

With few exceptions, there was little evidence in the case studies of a reduction or weakening in job demarcations, nor of qualitative flexibility in the form of interchangeability amongst workers in the same establishment. First, the extremely evolved (and constantly deepening) social division of labour continues to reduce and limit the range of activities within any given establishment. Within the individual establishment the overwhelming trend was the specialisation of workers in individual tasks, or on specific production machines. This sometimes occurred along gender lines. Women were used for counting output and packaging in the knit textile producing establishment (C&B) and for overseeing more automated machines at TARP. In knitwear network firms, and in the metal-mechanical sector, workers were always trained to specialise on a particular machine or group of machines. In the one case in the metal-mechanical sector where this was not the situation (Meccanica Sarti), a policy was being implemented to define tasks more precisely and specialise workers. As one owner put it, a "microscopic" technical division of labour prevailed, and the tendency was to the ongoing deepening of this process.

However, there were some exceptions to the rule: within Carma itself, where the production of prototypes and the seasonality of production required workers to be more generalised; owner/operators of the small network firms often knew how to operate all the machines, program them, as well as manage the company; and where they existed, work centres often resulted in the integration of previously separate tasks and the ability for one worker to operate several machines, though this generally also involved the de-skilling of the operator.

There was no evidence in the case studies to support the claim that a re-integration of conception and execution was underway, as Piore and Sabel (1984) have suggested. In each case study, conception, product design and planning were undertaken in the *casa madre*, while virtually all production functions were performed externally. In most cases there were no feedback mechanisms in place between the production firms and the *casa madre*, and where they did exist they tended to be ad hoc or weak.

1.3.2 Flexibility from technology

The Piore and Sabel (1984) view suggested advanced, multi-purpose production machinery, and a return to craft-type production but in an advanced form. Indeed, new technology, especially computer-controlled production machinery, is frequently seen as a major source of flexibility, and in the extreme, as removing the relevance of economies of scale, replacing them with economies of scope (Moulaert and Swyngedouw, 1989).

The case study evidence on this point is less dramatic, and varies according to sector, and even by production phase. In the case of the knitwear industry, while certain phases of the production process have been party to technological advancements (knitting, embroidery), other sectors have proved extremely resistant to automation and the application of computer technology. In the sewing/making up phase, for example, the machinery has remained virtually unchanged in the post-war period. The machinery in this industry remains extremely specialised, often dedicated not only to particular tasks, but also specialised according to the size of the piece, or the specific fabric. This was true of new equipment as well as the older equipment. There was frequent pressure exerted upon the artisan firms to purchase specialist machinery, as the changing fashion required certain kinds of fabrics, styles or finishing, for which dedicated machines were available. The purchase of such specialist machinery was resisted by the artisans because it was not economic; the amortisation of the machine would extend far beyond the actual need for the machine, given the short fashion "life expectancy" of a given style, and the small batch sizes would not warrant such a purchase.

The oleodynamics case study exhibited very advanced machinery, generally the latest available in NC, CNC and integrated computer-controlled work centres.

This may be due, in part, to the relatively recent establishment of Oil Control compared to Carma or IMA; as a younger firm it was not burdened by an existing stock of older machines. As noted above, the work centres in particular were highly flexible, able to undertake several different processes sequentially with different tools and components. They also represented a partial re-synthesis of the labour process, re-combining previously separate tasks or stages of production. Alongside these machines, however, were dedicated machines producing in long series.

The product customisation and concomitant constant innovation occurs primarily in Oil Control and Edi-Systems, and stem from their direct relation with the market. Ongoing innovation implies the need for a flexible productive structure, one that can adapt to frequent changes in the product and production process. Flexibility is in this case primarily provided by the production equipment, which is CNC, the most advanced available, and can be operated by low-skilled workers.

In the automatic packaging machinery case, there was a high degree of variability, from network firms that had only traditional machinery, to other firms which maintained some NC and/or CNC machine tools.

In terms of technology, then, the case for an "advanced" craft sector à la Piore and Sabel is uneven at best. The adoption of new technologies is variable across firms and between sectors, and there is little evidence of a reintegration of conception and execution.

Economies of scale and scope

It is often suggested that "flexible" production technology or organisational structures eliminate the importance of economies of scale. Certainly, there was much evidence in the case studies of very small to medium production runs - including single pieces, and sometimes, small orders that were split amongst more than one artisan by the *casa madre* to reduce turnaround times.

While economies of scale have been reduced by new technology where it appears (e.g. vastly reduced set up times for machinery), particularly for repeat orders on NC or CNC machines where an existing program can be reused, there are still costs involved in frequent changes. New pieces require new control programs to be written, and the machines must be constantly re-set. The smaller the number of pieces in an order, the more frequently this must be done.

The common view amongst network firm owners was that the advanced "flexible" machinery was generally not worth the high costs of investment, because the artisan firm's batch sizes were so small that the cost could not be justified. There were, of course, exceptions, particularly in Oil Control and TARP, where double shifts were run, and in Andalò, who adopted a different strategy of maximising overall use of the machine even though individual batches remained small in size.

What is innovative about the productive systems described in the case studies is not that they have eliminated the need to achieve economies of scale, but that they have adapted various ways of dealing with diseconomies of scale. In the IMA and Oil Control cases, we saw that the *case madri* were able to charge a premium in the marketplace, passing on costs of diseconomies of scale to final market buyers, and the network firms are also able to recoup these additional costs through charging a premium for small orders to the *casa madre*. Or, the *case madri* are able to force the sub-contractors to absorb the costs of diseconomies of scale, as we saw with Carma.

Technology may therefore be less important in contributing to production flexibility than other factors, such as vertical disintegration within the context of an industrial district. Where the new technology has contributed is to the diversification of the product range, by allowing certain types of designs, especially more complicated designs, to be realised that might not have been technically or economically feasible before. It has also contributed to the quality of the product, by improving precision and replicability of pieces.

1.3.3 Flexibility from organisational structures

What do the case studies suggest with respect to the role of organisational structures in achieving production flexibility? In the case of Carma, the quantity of labour needed fluctuates, both because of the bi-annual production seasons in the knitwear industry, but also even within a given season, in which the unpredictability of demand (which depends on the success in the market of given products) results in fluctuating demand for labour over the short term.

Within the context of an industrial district, vertically disintegrated production allows this problem to be overcome by providing quantitative labour flexibility. Labour requirements are mediated through a simple market transaction (i.e. commissioning piece-work from sub-contractors), not within the firm itself through a labour relationship that is governed by rules, unions, laws, etc.

Vertically disintegrated production within a district also allows the *casa madre* to split batches amongst many producers to save time, and/or gives the artisan firms the opportunity to subcontract to a second tier for the same reason. This can reduce the turnaround time of production.

The vertical disintegration of production, specifically in the context of a specialised, localised, industrial district, provides a significant degree of production flexibility - effectively providing qualitative and quantitative labour flexibility, as well as technological flexibility in the sense that the *casa madre* can choose from a wide variety of firms with differing production technologies.

IMA faced a similar problem to Carma, in the unpredictable timing of the demand for its "lumpy" product. Given the complexity and customisation of the product, it also requires a diverse range of expertise, technology and skills. The vertically disintegrated production structure and the extensive metal-mechanical district were instrumental in accommodating this variability, the concomitant wide fluctuations in labour requirements, and range of inputs required.

The Carma and IMA examples contrast with Oil Control, whose organisational structure is not generally a source of flexibility. Oil Control's joint ownership structure, closed system, and lack of use of typical sub-contracting relations with other firms in the industrial district implies the surrendering of one of the most important elements of flexibility associated with the decentralised production model; that is, the avoidance of long-term commitments regarding labour and the ability to expand or contract productive capability simply by sub-contracting more or less piece work to artisans.

So while the vertically quasi-integrated production structure ensures product quality, it is less a source of flexibility per se. Additional flexibility is provided by the productive system's situation within the industrial district, however. When required, the district can offer qualitative and quantitative flexibility. And more importantly, the district provides a safety net for Oil Control producers, by providing alternative sources of work from outside firms, in the event that Oil Control and Edi-Systems together cannot maintain an adequate volume.

Are the organisational structures of production a source of flexibility? In the cases of Carma and IMA, which had typical sub-contracting relationships with firms in the respective industrial districts, their network structures were the critical source of qualitative and quantitative flexibility, allowing them to expand and contract the capacity and range of the productive system directly in response to their needs at any given time.

In the case of Oil Control, the vertically quasi-integrated productive structure per se did not offer a significant measure of flexibility. Flexibility in this case stems primarily from the production machinery (which to a certain extent is independent of productive organisation), and to a lesser degree from being part of a specialised industrial district which can be called upon for additional qualitative or quantitative flexibility, or as a "backup" source of demand.

1.3.4 The Sources of Flexibility

The evidence of the three case studies suggests that Sayer is only partly right when he says: "...as yet, the new kinds of production that we are seeing, whatever we wish to call them, have more to do with the organisation of work, both in terms of labour processes and industrial organisation, than the hardware of new technology" (Sayer, 1989: 673).

Flexible production technologies can provide some measure of flexibility, depending on how they are managed, and whether price premiums can be charged to recoup costs of diseconomies of scale[36]. In any event, labour processes contributed the least to flexibility, with the occasional exception of extending the hours of work in response to demand. Both the social and technical divisions of labour were extremely deep and constantly deepening, however. There was no evidence of a re-integration of conception and execution; if anything, these two aspects of the labour process were further isolated as the specialisation and complexity of the productive systems evolved.

In the case study districts, evidence suggests that flexibility is mainly a function of organisational structure, that is, vertical disintegration within the context of a district. A vertically disintegrated productive structure can provide qualitative and quantitative flexibility, deal with fluctuations in the amount of labour required over the short term, and provide a wide range of labour skills

36 This in turn depends upon the relative power of the network firm vis-a-vis the *casa madre*, and the position of the *casa madre* in the market.

or technologies. But this is only true of vertical disintegration within the context of a localised, specialised productive agglomeration, namely, the industrial district. The industrial district provided both quantitative and qualitative flexibility, and competition between network firms in the district ensured a deepening specialisation and range of activities. Thus qualitative flexibility exists in two senses: the range of expertise and the high level of expertise in a given phase. Vertical disintegration alone is not enough to provide flexibility, as we saw in the case of Oil Control where under mutual ownership relations, the vertically quasi-disintegrated productive structure itself did not provide qualitative and quantitative flexibility. Flexibility is only achieved through vertical disintegration under certain types of inter-firm relations and within the context of a district where many lead producers share a body of sub-contractors and vice versa.

I.4 Conclusions

In broad outline, we can say that the case study evidence suggests productive systems that are consistent with the post-Fordist model, as described by Moulaert and Swyngedouw (1989), and others, with some qualifications drawn from the above discussion.

Certainly the evidence corresponds to key characteristics of post-Fordist production, including: market fragmentation, product differentiation and range, small batch production, no stocks, quasi-vertical integration or vertical disintegration. The relationship with technology was much more varied, and it was clear that there was evidence of both very advanced production technology as well as very antiquated technology. The weakest part of the picture relates to the characteristics of labour under a post-Fordist regime. There was little evidence of multiple tasks or elimination of job demarcations, for example, and instead clear evidence of a deepening of social and technical divisions of labour. Certainly, the case study evidence is nowhere near Piore and Sabel's (1984) visions of a "worker's utopia". Whether they measure up to an idealised vision of post-Fordist production or not, the systems of production of described clearly have little in common with Fordism (economies of scale, mass production, homogeneous products, standardisation, vertical integration, etc.).

2. THE TERRITORIAL ORGANISATION OF PRODUCTION

In the case studies, the territorial organisation of production of three different productive systems was described. The three cases are very different in several important aspects: product, industry, department, strength in the marketplace, etc. Despite these strong variations, they all share certain fundamental characteristics in their territorial organisation of production:

- vertically disaggregated productive systems, controlled by a lead firm or *casa madre*, which undertakes primarily product design, marketing and sales, and production administration;
- all production functions take place externally in a network of specialised small firms; and
- all systems are highly localised.

Given product, firm and industry differences, how can these strong similarities be explained? This section aims to explain the territorial organisation of production found in the three districts, addressing more systematically the rationale behind the vertically disintegrated, localised organisational structures, and spatial clustering. In broad outline, the line of reasoning suggests that there are certain necessary and characteristic elements associated with post-Fordist accumulation which interact with contingencies to produce the specific territorial organisation of production that we have seen in the case studies. This is in contrast to other schools of thought which hold that, at least under certain conditions, vertical disintegration and spatial clustering are necessary.

Market conditions are characterised first and foremost by intense competition, resulting from globalization, expansion into new markets, competition from newly industrialising countries, free trade agreements, the free movement of financial capital, deregulation etc. Globalization has led to a widening and deepening of the division of labour at the global, national and regional level, and industrial "respecialization"- essentially an increasingly highly articulated and specialised division of labour (Storper and Walker, 1989). It is this respecialization that has created the potential for industrial districts of the kind described in the case studies, specialised not only by industry but by market segment.

Demand conditions have been affected by the saturation of key markets and fragmentation. In particular, three demand qualities emerge again and again in the context of post-Fordist production, not just in the Third Italy but throughout the advanced industrial nations: these are quality, timeliness, and customisation (Gertler, 1994). It might also be said, however, that these demand conditions may themselves have come about as a result of the development of productive forces; in particular, that flexible, computer-controlled production equipment is now seen to permit these characteristics, hence they come to be "demanded".

These demand and market conditions have required significant transformations in the organisation of production and the labour process, elements of which are: organisational and ownership structures, labour, technology, management processes, and the social, technical and territorial divisions of labour. While these are all necessary generic elements in the accumulation process, the specific form they take (e.g. the specific technology, or labour process) is not solely determined by the regime. Different elements can come together in different ways to respond to market and demand conditions, depending in part on interaction with contingencies. For example, productive organisations can rely to greater or lesser degrees on technology, labour, or organisational structures to address the market context. In short, specific organisational forms and labour processes are not the result of necessary forces only, but of the interaction between necessary and contingent factors.

Contingent forces come into play with respect to the market, for example, relating to the basis for the individual firm's insertion into the market and specific firm strategies. Carma had a weak market position in an industry characterised by low entry barriers and high levels of international competition. Carma used the network system in a way so as to devolve costs of diseconomies of scale to network firms, contain its own costs and thereby perpetuate its ability to insert itself successfully in the market. This was a strategic use of local space, and was a determinant in the territorial organisation of Carma's network.

Contingent, industry-specific factors also come into play, for example the seasonality of the knitwear industry, or industries comprised of lumpy investment goods that resist automation and mass production, such as in the automatic packaging machinery sector. These kinds of industry-specific factors can add another layer of "exigencies" to those necessary ones stemming from post-Fordism.

Vertical disintegration has many advantages: it is a way of dealing with certain industry contingencies (seasonality, product lumpiness, unpredictability of demand over time); it allows firms to specialise, responding to the quality imperative; and it is a way of devolving risk (and potential associated costs). However, other organisational options are available, depending in part on the industry and technology available, or other factors, such as local culture. These alternatives might include the substitution of labour with flexible production equipment, the use of part- time or contract employees, etc. In short, there is nothing necessary about vertical disintegration. However, it works very well, especially in certain industries, and in certain places. In other words, its effectiveness relates directly to industry, firm and place-specific factors.

On its own, however, vertical disintegration is insufficient to address the market requirements outlined above. This only occurs when vertical disintegration takes place within the context of an industrial district. That is, without an industrial district, vertical disintegration would not have responded to the range of market exigencies. The district itself is the primary source of qualitative and quantitative flexibility, and allows firms to respond to demands of quality, time-based competition, customisation, or irregular production needs.

Where production is vertically disintegrated, competition then plays a decisive role. It acts to promote constant product differentiation and propel the social division of labour, increasing specialisation, encouraging the adoption of new technologies, moderating prices of intermediate products, and so on. It is clear that the effects of competition are not just experienced in the realm of the global or national market for the final product, which tends to be at the national or international scale, but also at the local scale. Local competition occurs within a district both among *case madri*, and between sub-contractors in intermediate product markets created as a result of a vertical disintegration.

At the local level, there are a number of important contingencies which came into play. The most important of these was probably the fact that the industrial districts pre-dated the era of change that began in the 1970s. An extensive, specialised metal-mechanical industrial district existed in and around Bologna even in the 1920s, and the Carpi district can be dated back to the 1500s.

Another set of local contingencies relates to patterns of local uneven development. As noted in Chapter Three, significant local variations exist within Emilia-Romagna. It is essentially comprised of several distinct regions with different characteristics and degrees of economic development and accessibility (the mountains, the *pedemontana*, the plain, and the neighbouring regions of Veneto and Mantua). The uneven territorial distribution of work force characteristics (skills, unionisation, wage rates, unemployment levels, malleability, female labour, etc.) is particularly important.

The pre-existing territorial distribution of productive capacity (i.e. labour force and firms) is also important. Carma was able to construct a spatially separated system because appropriate labour capability was scattered across the regional territory. If all sub-contractors and labour were aggregated in one urban centre this would not have been possible.

Uneven development thus also relates to the urban system. For example, a polycentric urban system such as that which exists in Emilia-Romagna acts to effectively separate the working class into many small communities, towns and cities. Disaggregated production systems, particularly those distributed over a polycentric urban system rather than aggregated in a single urban centre, can impede the consolidation of a working class and efforts toward unionisation.[37] The presence of many small to medium-sized cities, where the urban land market permitted central city clustering, was also found to be conducive to industrial districts.

And while obviously not the result of a deliberate strategy because it would imply coordination amongst all producers, the distribution of industrial activities over a polycentric urban structure avoids or at least delays the onset of agglomeration and urbanisation diseconomies. Indeed, many of the Italian academics' explanations for the success of the Emilian system of production have cited as a factor the absence of geographical concentration of production in one or even a few urban locales (Fuà, 1985; Arcangeli et.al., 1980).

It is clear that particular characteristics of local territory have shaped the organisation of production and the adoption of a vertically disintegrated structure. A disaggregated productive structure is only effective in the context

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[37] Drucker (1994), for example, has described how the original organisation of blue collar workers came about because for the first time a working class was spatially clustered within large workplaces, located within single urban areas and residing in homogeneous neighbourhoods.

of an industrial district. If no such district existed locally, such an organisational structure could not be pursued. In other words, local territory is as integral a factor determining productive structures as labour, technology, ownership, etc. This suggests a different approach than that proposed by the transactions costs school, in which the evolution of a particular productive structure is seen more as a sequence: first a firm decides to externalize certain functions, then producer firms gravitate toward the lead firm in order to minimize transaction costs.

Given the integral nature of the production and territorial decision, it is not surprising that agglomeration occurs, as the clustered patterns of many of these districts were already established. Moreover, as the industrial district is the primary source of competitiveness, spatial clustering can be seen as a direct response to the need on the part of both lead firms and sub-contractors for access to the district. It is the primary source of quality, timeliness, customisation, qualitative and quantitative flexibility.

Also, in the in cases examined, the process of production includes not only firms, but extends to local institutions, associations, etc. These elements can be thought of as integral to the production process. Industrial production is not the undertaking of private enterprise, but could be seen in this case more as civic process - the city as factory. As has been noted many times, there is a particularly rich and industry-specific infrastructure in direct support of industry, including technical schools, industry and firm associations, unions, chambers of commerce, and a particularly strong local government (Capecchi, 1990; Nanetti, 1988; Putnam, 1993).

Is spatial clustering a necessary outcome, as the transactions costs approach suggests or can it be solely attributed to local contingencies? As with vertical disintegration, we have seen that there are many good reasons why spatial clustering occurs: it reduces risk and inventory, promotes timeliness, provides access to other firms in the district and the civic capital that supports production. However, there is evidence that flexible, fast production can occur without such clustering[38].

The key factor which causes spatial clustering is the constant product innovation that is underway within the districts, and the resulting inability to standardize or routinize production and hence transactions. This is why just-in-time suppliers to the auto industry - to take one example - need not cluster spatially even though their products also increasingly emphasize diversity, timeliness and quality. Though broader than in the past, the range of intermediate products in the car industry (say the varieties of car seat) is nonetheless restricted, finite, rigid, essentially unchanged over a period of years, and consistent specifications must be met. Everyone involved understands very clearly what the product inputs are, and there is no need for discussion - a simple faxed order form to a supplier will suffice. Just-in-time suppliers need not deliver *quickly* so much as *reliably*. So long as they can guarantee predictable, on-time delivery, production can take place in any location - close or distant. A major factor is overall high and predictable product volumes. The volumes of car seats produced are not likely to vary, as auto production on the assembly line is extremely regular.

Contrast this with the situation in the case studies described above. The products are constantly being changed or customised (APM and oleodynamics), redesigned (knitwear), or new products being developed to respond to particular problems (oleodynamics). The range of potential intermediate and final products is infinite and constantly changing, and batch sizes are small. As a result of constant change to the product, volumes of any single item are relatively low - about 100 automatic packaging machines might be produced by IMA in a year, compared to thousands of a given type of

[38] At Ford's Oakville, Ontario minivan plant for example, all inputs are sourced just-in-time, from all over the world. Their local seat supplier in turn sources all of their own inputs just-in-time, from as far away as Mexico. A highly evolved production administration system is able to respond to demands for timeliness, flexibility and quality without geographical clustering.

automobile. In such a situation it is impossible to standardize intermediate products and routinize transactions. Where there is ongoing product innovation and inability to standardize the product, spatial clustering allows these obstacles to be overcome.

In the absence of an ability to standardize products and routinize transactions, and in the face of competitive pressure and market demand for quality, timeliness and customisation, the role of a shared local culture, norms of behaviour, and mutual trust become critical elements in the ability of the district to function smoothly and competitively. In the three case studies, virtually all inter-firm transactions were extremely informal in nature, did not involve written contracts, and were able to be dealt with very efficiently and securely, allowing production to proceed quickly.

In general, inter-firm relations did not involve a lot of consultation and input from the network firms into product design or the production process. The transactions between firms tended to be primarily to contract specified (though unstandardized) piece work rather than to discuss its content. Quick, secure business transactions allow the effective re-integration of a vertically disintegrated productive structure, and they are greatly facilitated by shared culture, norms, and mutual trust. In effect, cultural standardization replaces the corporate and product standardization that takes place in other sectors, where networks may straddle different national or international cultures (e.g. the auto industry). This gives credence to Becattini's (1990) notion of industrial districts as social organisms, in which geographical boundedness is an expression of the limits of shared culture and social norms. However, Becattini's explanation on its own is insufficient; the role of local culture must be placed within the context of a broader dynamic of capital accumulation.

In brief, there is a fundamental difference between industries or segments which are characterised by ongoing and frequent product innovation, irregular and unpredictable demand, infinite product range, and short production runs, and those which are characterised by the ability to standardize, bounded flexibility, and high and predictable volumes. All of the case study districts shared the characteristic of ongoing product innovation, and the associated inability to routinize. This, and the shared culture, norms and trust which permit efficient, fast transactions, are key factors which account for spatial clustering.

Storper (1993, 1992) began to address this distinction with the concept of "technology district", which was characterised by evolution, dynamism, unstandardized knowledge, and relatively open developmental paths. According to Storper, what binds firms together in technology districts, even in the absence of direct inter-firm linkages, is technological learning and an infrastructure of rules and institutions - the untraded interdependencies. His concept, however, seems to apply more to cases of young, emerging industries, especially computer and other hi-tech industry districts. It does not accurately describe the Emilian examples, where there is constant innovation but in relatively mature industries, the technological content can be quite low, and development paths are not particularly open. Rather, innovation is simply the day-to-day business. As constant innovation is the singlemost important characteristic of the case study districts, they could be more accurately be described as "innovation districts".

Additional Conclusions

Several further conclusions can be drawn from this analysis. First, the specific territorial organisations of production are the result of the interaction of necessary forces relating to post-Fordism with contingent factors relating to industry characteristics, firm characteristics, and local territory. Despite the fact that the case study districts appeared in different sectors, with different market positions, etc., the similarities in their productive organisation can be attributed to the fact that they shared the characteristics of the "innovation district" - constant innovation and re-invention of the product, short production runs, infinite product types, etc., that render standardisation and routinization of transactions impossible.

Second, local territorial conditions and space play an important role in determining the organisational structures of production. Local territory is as integral a determinant of productive structure and labour process as technology, skills, or other factors. In the case studies, local characteristics shaped the dominant, vertically disintegrated productive structure.

Third, the territorial organisation of production is not the result of a uni-dimensional tendency to geographical clustering. Rather, it is the result of a more complex balancing of the need for proximity with a tendency toward dispersion. This latter tendency can result from the need for production systems to take advantage of conditions of local uneven development, or from the use of spatial separation as a mode of control of elements of the productive system.

In Carma's case, the successful insertion of the product in the market relied upon this spatial separation of sub-contractors, as an instrument of cost control. The spatially disaggregated production system, which is not confined to a single urban centre but extends over many towns and villages, impedes the organisation of the network firms. In Oil Control's case, the specific territorial organisation of production is a result not just of a tendency to clustering, but the result of a local spatial balancing between the need for clustering on one hand and the tendency toward dispersion on the other, especially the search for localised pools of labour with specific characteristics.

In short, the tendency toward spatial separation and dispersion has been overlooked, particularly in the context of industrial districts, where the emphasis has been on geographical clustering. Centrifugal tendencies are important in the functioning of the productive organisation and in its underlying rationale, though they are ultimately constrained to the local level by opposing forces of clustering.

Fourth, the use of local territory in innovation districts relates especially to a particular firm's market, market position, and strategy. Space was used by Carma as a regulating mechanism which ultimately helped control cost, and the polycentric nature of the urban system played a role in this regard. On the other hand IMA, which was able to charge a premium in the market because of its strong position, did not appear to use space either as a network control mechanism nor to exploit local uneven development.

Finally, in none of these cases was transactions costs a major determinant of the territorial organisation of production. In all cases except Carma, the firms did not identify competition in their sector to be based on price. Other factors, especially product quality, customisation, and timeliness were always more important. It is difficult to defend transactions costs as the major determinant of the territorial organisation of production, and geographical clustering in particular, when price is not a major competitive factor. Certainly transactions costs cannot be seen as a *necessary* factor leading from externalisation of certain production functions to spatial agglomeration, as Scott seems to suggest it is, nor a sole factor explaining localisation.

3. INNOVATION DISTRICTS AND POST-FORDISM

In this section, certain themes that emerged from the literature relating to post-Fordism are rejoined, and re-evaluated in light of the case study evidence. It is argued that the districts described hereto are post-Fordist in nature, and that a transition to post-Fordism is clearly underway.

The Centrality of Flexibility

The case studies suggest that an emphasis on flexibility only as the defining feature of post-Fordism is too simplistic. There is a range of new market demands that are related to post-Fordism, only some of which can be addressed through flexibility. The new market realities suggested other exigencies, and approaches to competitiveness that relied on factors other than flexibility. Certainly high product quality and time-based competition are not necessarily linked to flexibility. Price was a decisive factor only in the case of Carma; the other firms were able to charge premiums in the marketplace because of their high quality product and customisation. These market demands must be addressed through means other than the attainment of flexibility, such as through higher skill levels, better technology, or increasing social and/or technical divisions of labour. To take Oil Control as an example, the firm's particular organisational structure was established not because of a need for flexibility, but because of the overriding requirement for high product quality.

In short, it is misleading to reduce post-Fordism to flexibility. As has been detailed above, other factors come into play and are equally important determinants of territorial productive structures.

Pre-Fordist and Fordist industrial agglomerations

Certain critiques of post-Fordism have charged that some systems of production that have been dubbed "post-Fordist" cannot truly be said to be so, because they existed before or during Fordism; or they have always existed outside the Fordist mainstream and cannot now therefore be called *post*-Fordist. The Fordist/post-Fordist distinctions are not so clear cut, however. IMA, which existed throughout the Fordist period, produced a standardised product according to the logic of maximising economies of scale until the 1980s, even though volumes were still relatively low compared to many mass production industries. Carma's production system was previously organised according to Fordist principles, and was subsequently re-organised. And while Oil Control developed its productive system only in the 1970s, and it was from the outset a decentralised one, long series, standardised oleodynamic products are produced within the same network firms alongside highly customised ones.

Does the fact that allegedly similar productive forms existed before and during

Fordism mean that all industrial districts must be rejected as evidence of a potential new regime of accumulation? Such an approach is somewhat rash. First, the industrial districts that exist today are not the same as earlier incarnations, given computer-controlled production technologies, or market conditions, for example. Many significant transformations were observed in the case study districts, particularly since the 1970s. Second, the economic context in which modern-day industrial districts exist is completely unlike that which existed at the time of its predecessors. Current industrial districts are inserted into a qualitatively different logic of advanced capitalism, which is characterized by the respecialization of production upon which the new type of territorial organisation is premised.

In short, the fact that forms similar to industrial districts existed during or before Fordism should not blind us to the fact that there is a particular logic at work in the dynamic of advanced capitalism that underpins their current resurgence.

Species and Genus

The "innovation district" has been identified herein as a species of industrial agglomeration which exhibits certain characteristics, in particular, constant product innovation and a concomitant inability to routinize or standardize production. The three case studies examined each fell into this classification, and could all be considered examples of fundamentally the same entity. Other examples of the same species occur elsewhere, and might for example, include metropolitan garment districts such as those in New York or London.

The basis for defining the district type relates to unique, functional characteristics of the district, its particular territorial/organisational dynamic and its position within the broader global division of labour. This is also the approach taken by Storper (1993,1992), in his proposition for a "technology district" type, which operates according to a different dynamic. These approaches lead to a more meaningful typology than the industry-based typology proposed by Scott (1988b), which consisted of the three categories of advanced craft production; hi-tech, and office-based districts.

Necessary vs contingent origins

Critics of the new orthodoxy have argued that industrial districts are the result of contingent factors only, such as place-specific factors, and cannot therefore be cited as evidence of a new phase of post-Fordist accumulation (Amin and Robins, 1990a, 1990b). As argued above, the territorial organisation of production that exists in Emilia-Romagna, as depicted in the case studies, is the result of the interaction of necessary forces associated with globalisation of competition and markets, demand, the labour process, and accumulation with contingent factors associated with specific industries, firm strategies, or local conditions.

Nevertheless, the so-called rise of the industrial district must be situated in the broader (necessary) context of expanding markets, the deepening global division of labour, and the respecialization that have created the *potential* for the existence of highly specialized production complexes like (but not limited to) industrial districts. To the extent that globalizing forces and competition continue, and the pace of change continues to quicken, so too will the opportunities for increasingly specialised production complexes expand.

The particular, *realised* territorial organisation of that complex - be it localised or not - is the result of a more interactive process of necessary and contingent factors. It is overly rigid to say that a particular production complex can only be attributed to either necessary or contingent factors; they cannot be isolated one from the other. All production must take place in territory; production always involves place-specific factors whether it is Fordist or post-Fordist.

Indeed, it was suggested above that global forces and local factors are not necessarily in opposition, and the conclusions from the case studies further suggest that in fact globalising forces may render local factors more important. When production is vertically disaggregated and externalised, there is greater scope for local factors to come into play and firms can be more closely tied with their local context. Many of the elements of competitive advantage that comprise Porter's (1991) "diamond", for example, are indeed local in nature. Certainly in the case of the rise of the Third Italy districts studied herein, the existence of *local* demand, *local* related industries, *local* competition, and other factor inputs such as labour and embedded skills contributed to the emergence of the industrial districts.

This suggests, however, that it is appropriate to be less deterministic about specific organisational forms associated with post-Fordism, however, given the role of industry, firm and local contingencies. These factors will interact with necessary factors to produce different production organisation outcomes in different places. In other words, the kind of approach espoused by Scott, which explains industrial districts on the basis of vertical disintegration and transactions costs necessitating spatial clustering, is less powerful than that put forward by the Regulation School, for example, which entertains much more open-ended outcomes in terms of the configurations of territorial production complexes.

There is, however, little doubt that the advanced industrial nations are entering a qualitatively different era that shares little with Fordism, and parallels the scale of transformation that took place with the introduction of technological innovations that brought about the evolution from rural manufacture to machinofacture in the late 18th century. Transformative changes are under way which have major implications for cities and regions, which is the subject of the following section.

4. POST-FORDIST CITIES AND REGIONS

As we saw in Chapter Two, although placing spatial elements at the centre in proclaiming the resurgence of the region and industrial districts, the post-Fordist literature has paid scant attention to the actual spatial processes unfolding, the role of territory, or the implications of post-Fordism for cities and regions. On the rare occasions when the regional or urban implications of post-Fordism are addressed, they frequently result in contradictory allegations, for example: industrial districts could not exist in a metropolis (Becattini, 1990) - industrial districts are often found in metropolises (Scott, 1988a).

With very few exceptions (Lebornge and Lipietz, Scott, etc.), a post-Fordist regime of accumulation has not been related in any systematic way to spatial outcomes. What follows is an initial attempt to address this lacunae, by drawing on the case studies to point to the most important of the implications of post-Fordism for regions and cities. This requires some abstraction from complexity for a moment, in order to isolate the theoretical implications of post-Fordist production of the type described in the case studies. It is by no means to suggest that other forces will not also act upon the evolution of regions and cities, such as neo-Fordist manufacturing, office-based industries, etc.

Regions, cities and industrial districts

It has been claimed that post-Fordism implies a renewed emphasis on the regional scale and the re-emergence of regions (Sabel, 1988, 1989). This begs the issue, which is highly confused in the literature, of the relationship of industrial districts to regions. In the literature, industrial districts and regions are taken to mean the same thing, which seems to be the primary basis upon which claims of the re-emergence of regions are laid. Are regions indeed synonymous with industrial districts? Or is a region a place where a collection of industrial districts emerges?

The equating of industrial districts with regions is inaccurate. While there are some instances where several industrial districts seem to emerge within a given region (e.g. the Third Italy, Baden-Wurttemburg. etc.), there are also many instances in which single industrial districts emerge in relative isolation (e.g. the Valenza Po jewelry district, the ski boot district in Montebelluna etc.). Generally, there is little in the way of direct linkages amongst industrial districts located within the same region. The Carpi knitwear district and the Sassuolo ceramics district, for example, are highly self-contained. There are some instances, however, in which districts share a common pool of sub-contracting firms that are related to a number of different industries. This was the case with the Bologna metal-mechanical district, which provided inputs into a range of related industries, including automatic packaging machinery, motorcycles, production equipment, transportation, agricultural equipment or instrumentation. In many cases though, simply because of the specialised nature of the given sector or industry, this ability for sub-producers to supply a range of client industries is not possible (eg knitwear), and there is little overlap.

Industrial districts are, however, almost without exception, clearly associated with an urban centre: the Carpi knitwear district, the Modena oleodynamics district, the Bologna automatic packaging district, the Sassuolo ceramics district, and so on. The urban centre of a district is demarcated by the close clustering of the *case madri*, as we saw in the case studies. Some larger districts can extend across urban centres, such as the Bologna automatic packaging district. But in every case, the territorial division of labour by industry sub-sector is extremely pronounced at the city or sub-regional scale.

In other words, the respecialization associated with increased global competition propels a division of labour that extends beyond the global, national or regional to the intra-regional and city level. In the Fordist and new international division of labour phases, the spatial division of labour tended to stop at the regional level. In the post-Fordist era, the division of labour proceeds beyond this level to the local scale. The basic territorial unit is not the Region in the sense that the Third Italy, the Italian industrial triangle, the Mezzogiorno, the Northeastern U.S., or Atlantic Canada are Regions, created by Fordist and pre-Fordist industrial capitalism, but smaller scale regions associated with a particular industry or more usually, market segment.

Relations between regions

Under the new international division of labour model, multi-national enterprises are disaggregated into various separate establishments according to function - headquarters, administration or R&D - can be established separately while various production functions can be broken apart by product line or sub-component. Different functions are located in different areas of the globe, in order to take advantage of international variations in conditions, especially cheap labour or resources. Regions thus become defined on the basis of particular functions, and a core-periphery relationship develops. In the core are located the control functions, and those functions which require highly skilled labour. Headquarters functions tend to be located in the major world cities. R&D functions are also located in the advanced capitalist countries, but can often be found outside the major metropolises but in the core regions, in their own science parks and high-tech agglomerations. Routine production takes place in less developed, low wage and low cost economies wherever these may be found - either on the European or global periphery. The core region exerts control over and exploits the peripheral regions under this scenario, extending and deepening uneven development at a global scale.

The industrial district productive structure implies a global spatial division of labour that is entirely opposed to and distinct from that associated with the new international division of labour. Three unique characteristics of the post-Fordist industrial districts examined in detail in the case studies are critical:

- The industrial districts were defined on the basis of an industry or subindustry.

- The industrial districts represent production systems that are virtually entirely integrated and self-contained. All functions necessary to the production of a particular good were performed within the district, including not just those directly associated with production, but also services and support. Despite participation in international product markets, ownership was maintained at the local level. Where there were interlocking corporate ownerships, these almost never extended beyond the district, and certainly not to foreign capitals. The only extra-district linkages were for raw material inputs and production machinery, and of course linkages with the final market.
- The industrial districts were clearly geographically delimited and contained at a local level.

This suggests an entirely different basis for the spatial division of labour. The division of labour between districts occurs along lines defined by industries and sectors (i.e. vertically) not by functional strata within a given industry or industries (or horizontally). Post-Fordist regions become defined on the basis of a social division of labour based on industry sectors, not on the basis of particular functions within industry as under the new international division of labour model. All functions related to production in that industry are performed and contained locally: R&D, administration, all production functions, marketing, services, etc. Linked to the international division of labour and respecialization, we are also witnessing a new local division of labour.

The pattern of uneven development between local areas becomes one of variations not between various horizontal strata in the occupational structure (as under the new international division of labour model), but a pattern of variation between the entire occupational structures and industry sectors. Uneven development at the regional scale is defined by the variation between the occupational and other characteristics of a particular industry or industries; e.g. the differences between a region dominated by the clothing industry versus a region dominated by the computer industry. This also suggests that local regions become more diverse occupationally, and socially, with a full range of social strata localized.

This post-Fordist spatial division of labour does not imply a global core-periphery relationship. Instead, each localised production complex has a direct relationship with the global market. This relationship is not mediated or controlled by external command centres in core regions or metropolises; it is mediated only by (ever-diminishing) national policies. A core/periphery control/dependence relationship between regions is replaced by an international, competitive relationship.

Post-Fordist core, periphery or in-between?

Some have noted that post-Fordist development occurs systematically outside the areas of Fordist accumulation (Moulaert and Swyngedouw, 1989; Scott, 1988; Arcangeli, et. al., 1980). It is certainly true in the case of the Third Italy that flexible accumulation has occurred outside the major locus of Fordist accumulation (in Italy's case, the north-western industrial triangle).

We can only speculate on the reasons for this; it could be attributed to a number of factors, many of which have been referred to in the literature, in particular agglomeration and urban diseconomies (e.g. in the organisation of labour, high cost of labour, high land costs, etc.). However, the existence of production complexes in some very high land cost, metropolitan locations, such as the Midtown Manhattan garment district, challenges this view. Based on the evidence of the case studies, it can be proposed that a key factor relates to the importance of a high degree of integration of producers with the marketplace under post-Fordism. Boyer (quoted in Morgan, 1992), for example, notes that while the Fordist practice was to have more mediated, less direct links with consumers, post-Fordism is accompanied by close producer-user interaction in response to accelerating technological change, shorter product life cycles and less predictable, more segmented markets. This he claims, is characteristic of the Japanese, German and Swedish economies. It was certainly characteristic of each of the case studies.

In this respect it is easy to see that the Third Italy is ideally situated vis-a-vis its European market, while also avoiding the diseconomies associated with the major urban/industrial agglomerations of the northwest; it is as close as one can get (within Italy) to the centre of Europe. The importance of such a location is further reinforced by the centrality of time-based competition and the requirement of being able to deliver the final goods to market faster than competitors. In other words, post-Fordist production is likely to take place not only outside areas of Fordist accumulation, but also near to markets for manufactured goods and not in the distant periphery; a return of production to the core or regions highly accessible to core markets.

This focuses new attention on local uneven development in and near the core regions. Under the new international division of labour, conditions of local uneven development were overlooked in favour of much larger differences associated with uneven development at the global scale. But under post-Fordism, the need for close market integration implies a return of production activities to the "core" or at least areas highly accessible to the core, and a new emphasis then on conditions of local uneven development that can be exploited. Capital then turns its attention to the potential associated with exploiting uneven development in its own back yard. Exploiting conditions of local uneven development is an important factor in explaining local patterns of post-Fordist territorial organisation of production.

The Urban Hierarchy

A further implication of the post-Fordist division of labour relates to traditional concepts of urban hierarchy. Urban hierarchy often implies relationships of control, of larger, more central cities or places over smaller urban centres. This is certainly an implication of central place theory, and of the new international division of labour model, under which economic control becomes centralised in a few "world cities", with London, New York, and Tokyo being the most frequently cited. The metropolitan command centres exert control over the peripheral, backward regions through their headquarters and other knowledge-intensive functions.

As we have already seen, the post-Fordist division of labour contains the command and control functions at the same locus as production, and places regions in a competitive relationship with one another, rather than in a relationship of dominance and dependence. The core-periphery relationship is replaced with a competitive relationship between local production complexes, in which cities compete with one another in the global marketplace. Control functions are not necessarily contained in major international or national urban centres, but are dispersed throughout the productive regions. At the global or national scale, there is no longer a hierarchical relationship of control of larger, central cities over smaller or more peripheral ones. Urban centres of any size can find their international market position independently of other centres, as we saw in the cases of Bologna (population 455,000), Modena (population 180,000) and Carpi (population 60,000).

The Urban System

Given that post-Fordist industrial districts and their urban centres are directly integrated into the international marketplace, irrespective of their size, the evidence of the case studies presented herein suggests an equalisation amongst urban places, allowing small places to compete on equal footing with large places in a global economy. Flexible production complexes are not associated directly with cities of a certain size, as was the case in pre-Fordist and Fordist industrial phases, where large production facilities were associated with the creation of the metropolis and the "great cities" (Weber, 1899).

Indeed, industrial districts can be found in towns of a few thousand inhabitants, or metropolises of ten million. As suggested earlier, in each case, they operate according to the logic of post-Fordism, as well as the contingencies of particular industries, firms and places. Scott (1988), for example, has suggested that the presence of industrial districts in metropolises such as New York City or London has much to do with the availability of a particular type of labour typically found in the large cities; cheap, immigrant, often female labour. Certainly, there is little evidence to support claims such as Becattini's (1990) that industrial districts could never function in a large metropolis because of a lack of shared values or beliefs; though these may exist within communities within the metropolis rather than across the metropolis.

However, there are more specific relationships between production scale and city size. In Chapter One, I described how in the latter 1800s, increasing market sizes for standardized products, achieved in part through the introduction of the railroad, allowed production scales to be increased and efficiencies to be achieved, causing industrial production to be primarily a large-city phenomenon (Pred, 1977). The scale of production exceeded the dimensions of small towns, auguring their "doom" (Weber, 1899).

In general, increasing urbanisation and large city growth were observed right up until about 1970 in the advanced industrial economies. There are two changes in particular associated with the post-Fordist era that suggest a potential reversal of this trend. First, as noted above, the globalization of trade, competition and the economy in general has brought about increasing global, national and regional divisions of labour, and the respecialization of production (Storper and Walker, 1989). This more highly articulated division of labour has opened up opportunities for specialised production, which occurs at a scale compatible with smaller and medium-sized urban centres. Indeed, this explains to a great degree the existence of the three industrial districts profiled in this thesis.

Second, changes in the forces of production have also brought about reductions in minimum efficient scales of production. This is primarily as a result of the flexibility achieved through the introduction of computers into the production process, which has dramatically reduced the cost associated with downtime, and increased the potential for product variations (Kaplinsky, 1984). Theoretically, the reduction of minimum efficient scale has the potential to reduce the size of operation, and permit smaller urban centres to take on a new role in production.

Indeed, this seems to be true both for innovation industries such as those of the Third Italy and routinized industries, though the underlying rationale for this outcome is extremely different in each case. In the Third Italy cases, product volumes, minimum scales, batch sizes, and routinization are all very low, while the product range is infinite. Products aimed at very specific market segments are compatible with small towns and cities, as the case studies clearly indicate, where the constant irregularity leads to geographical clustering of related firms. The urban land market in towns and smaller cities in particular also supported clustering in the central areas, whereas they would be forced to peripheral locations in larger cities.

This is in contrast with more routinized industries, such as the automobile sector, in which there is some product variation, but product options are standardised and limited. Minimum efficient scales remain very high, as do production volumes. Outsourcing is used extensively, which creates a larger number of smaller firms. But geographical clustering with related firms is not necessary because transactions are routinized, hence networks can extend over regions, nations, continents or the world. The more limited range of functions performed internally means that the final assembly plant is smaller, but volumes remain high.

So even large volume, routinized production becomes possible in smaller urban centres, where a single assembly or component plant may be located in relative spatial isolation from its suppliers. There is evidence that this has been the pattern in new auto plant investment. Recent investments by Japanese automobile companies in Ontario, for example, have favoured smaller urban centres, like Alliston or Cambridge.

Of course, the internal dynamic in these two cases is extremely different. In innovation districts such as the Third Italy, there are strong local inter-firm linkages, connections with the surrounding infrastructure, and the potential for local development through small-scale business start-ups. In the case of the routinized operation, the individual production establishment sits in relative isolation from its local context.

Within the non-routinized industries described in the case studies, there appear to be further relationships between certain industry or product characteristics and city size, in particular in terms of product value and complexity. The lower cost, more simple products tend to be manufactured in the smaller urban centres, while more costly and complex products are made in larger cities. In the three case studies presented, there is a clear continuum: the most simple and least expensive product (knitwear) was manufactured in the smallest city; a more expensive, technologically sophisticated product (oleodynamic components) was manufactured in the medium-sized city; and the most expensive, complex product (automatic packaging machinery) was fabricated in the largest city. The more complex the product and production process, the greater the number of firms involved and extent of the network, and the larger the urban centre. It is difficult to imagine that Carpi could accommodate the automatic packaging machinery industry, for example.

One of the potential outcomes of this trend is the upsetting of the rank-size stability rule, as smaller urban centres compete on equal footing (in some industries) with larger urban centres. Indeed, this may be a factor behind the "clean break" and reversal of the pattern of ongoing urbanisation that is said to have occurred around 1970 (Hall and Hay, 1980). There is a certain amount of evidence that this reversal is underway, particularly the growth of medium and smaller urban centres, as outlined in Chapter One.

Re-agglomeration in urban centres

If the crisis of Fordism was associated with the de-industrialisation of the cores of major urban centres (Fothergill et.al., 1988), does post-Fordism suggest the re-capitalisation of these areas? The possibility of this outcome has been proposed, and the motion picture industry in the Los Angeles area cited as an example of urban re-agglomeration resulting from a number of changes in that industry (Christopherson and Storper, 1986; Scott, 1988a).

More specifically, it has been suggested that there is a rough direct correlation between plant characteristics such as size and routinization and distance from the core of the city. This implies that organisational or technological changes up or down the scale of plant size and routinization will be associated with decentralization and recentralization respectively, raising the possibility that the reorganisation of an industry or the introduction of new technologies could bring about reagglomeration in urban centres (Scott, 1988a). This would be a reversal of trends toward the dispersion of industry observed since the late 1800s, starting with suburbanisation and leading to internationalisation of production.

It is not plant size per se that is correlated with location within the city, but routinization. Location is related to plant size only insofar as plant size is related to standardization (the more standardized is production, the greater plant size, as shown in Scott, 1988a). Certainly, the overwhelming tendency in production is toward routinization wherever possible, even in cases where there is greater apparent flexibility in the form of widening product range or product options.

Again it is important to differentiate between industries which are characterised by ongoing innovation, irregular and unpredictable demand, infinite product ranges, short production runs, and those which are characterised by a degree of standardization, bounded flexibility, and predictable volumes. Re-agglomeration in urban centres is more likely in the former case than in the latter. Urban re-agglomeration in the Los Angeles motion picture industry, for example, had to do with the introduction of legislation that broke up a monopolistic market. The motion picture would fall into the category of "innovation industry", in the sense that every product (every film) is by definition different and requires reorganising a new production process from scratch.

Another important factor in the motion picture industry was the introduction of computer technology into production processes, such as sound and video editing, animation, etc. This substantially reduced the minimum efficient scale of operation required in these sectors, fragmenting the industry and creating a competitive situation amongst multiple firms in the same production phase, much the same as has been seen in the case studies of the Third Italy. The reduction in minimum production scale and fragmentation of the production process also contributed to the urban re-agglomeration. Small firms are more dependent upon geographical clustering, and the access to information, external support services, etc. that is associated with clustering in urban areas. They are also likely willing to pay higher central city unit land costs for this reason.

This relates to the point made earlier about the effect of declining production scale in the urban hierarchy, that is that it allows smaller urban centres to accommodate industry. There is a relationship between the urban hierarchy level and the intra-urban level, to the extent that at a certain point, volumes or routinization become so high that they quit the urban area altogether, and move to a distant, low cost location.

Of course the potential for urban re-agglomeration relates to other contingent factors too, such as the availability of labour with appropriate characteristics in a particular urban areas, or the local urban land market and urban/suburban price differentials, and so on. Certainly, the point made earlier regarding the new emphasis on local uneven development would support the idea that there is a potential for such urban re-agglomeration especially, perhaps, given that it is often within larger urban areas and metropolises that the most extreme cases of uneven development exist, including devaluation of central city land and availability of cheap immigrant labour.

Intra-district patterns

The dynamics of intra-district spatial patterns are almost completely ignored in the literature. Scott (1988a) is one of the few to have examined the internal spatial structure of the industrial district or "complex". Two specific aspects of intra-regional district organisation have been noted: 1) that there are systematic technological differences between core locations and fringe locations, and 2) that there are different patterns based on firm size.

Based on evidence from the New York City garment district, Scott (1988a) notes that high quality, highly skilled, flexible forms of manufacturing took place in the central core, while more routinized, low-skilled, lower-quality manufacturing functions occurred in the urban periphery. There is evidence of a similar tendency in the Third Italy case studies, where knitwear networks would extend into more distant, lower cost locations for more standardized, lower-cost functions. This would also support the general claim that clustering is related to lack of routinization. In other words, inability to routinize explains the need for clustering, while the *degree* of routinization can help to explain spatial patterns *within* clusters.

Within the Orange County high technology complex, spatial patterns related to firm size were also observed. Small plants had an especially strong tendency to cluster together compared to large plants. This was attributed to the higher unit transactions costs faced by small plants compared to large (i.e. small firms do not benefit from bulk transportation rates). Also, small firms were seen as more labour-intensive, so there was an inducement to gravitate toward the spatial centre of their main areas of labour supply. Large plants enjoyed economies of scale as a result of their higher levels of transactional activity, thus they were less locationally restrained than small plants. Also, large plants often required larger premises, which suggested lower-cost, peripheral locations. Scott suggests that "...any large industrial complex will almost certainly exhibit distinctive patterns of internal locational differentiation. These patterns will be likely at a minimum to consist of (a) a spatially dominant network of small plants in selected central areas of the complex, overlain by (b) a more dispersed distribution of large plants, the latter becoming dominant in peripheral zones" (1988a: 197).

Scott is attempting to draw generalised or necessary relations from the Orange County case, both in terms of the intra-district patterns observed, and in the explanation for them. He calls upon a transactions costs explanation, to ascribe necessary relations to intra-district spatial patterns. The evidence of the case studies presented herein challenges both of these aspects.

First, the intra-district patterns observed are opposite from those described by Scott for Orange County. The *case madri* (which tend to be the large firms) generally exhibited a pattern of centralisation in the major urban centre, while the smaller, network firms, although they were present within the core city, tended also to be scattered throughout the surrounding areas. Especially in the knitwear and oleodynamics districts did the *case madri* cluster very closely together. Aside from the fact that these lead firms share use of the network firms which are scattered around, the clustering of large firms may also be related to their competitive relationship. Proximity allows them to monitor each others products, innovations and advancements through informal mechanisms. The lead firms also have very close connections with service firms (graphics support, advertising, marketing, etc.), which are more likely to be found in the urban locations.

Extending the earlier analysis of this chapter, it can be suggested that this pattern is not the result of any necessary dynamic relating to transaction costs or access to labour markets. As we saw above, intra-district patterns are better explained in terms of factors such as:

- degrees of routinization in production;
- variations in value-added by production phase or product line;
- competition between firms within the district;
- the competitive strategies of lead firms within the district, their competitive position and the particular basis of their insertion into the marketplace, which affects their use of space and territory;[39]
- the exploitation of aspects of local uneven development toward the firm's competitive ends or to meet industry contingencies.

In the case of Emilia-Romagna, elements of local uneven development included spatial variations in labour force characteristics; a polycentric urban system; or the relatively even distribution of sub-contractor/artisan firms over regional space (which permits lead firms the ability to select firms that are localised but spatially disaggregated).

Based on this evidence, it could also be proposed that the major dimension of the core-periphery relationship no longer occurs at the international scale, between regions, but instead at the local level, between city and urban periphery or hinterland. There is a dominance/dependence relationship associated with the patterns of territorial industrial organisation described above, in which urban centres control their surrounding regions.

39 For example, Carma's weak market position caused it to construct a network which segregated sub-contractors, allowing it to price so as to pass on costs of diseconomies of scale.

A Territorial Reversal

In the advanced industrial nations, the so-called "clean break", a dramatic reversal of territorial patterns, has been noted to have been underway since about 1970. As noted in Chapter One, the emerging pattern of urbanisation is observed to be moving downwards, from larger to smaller urban centres; outwards, from metropolitan cores to rings, and from metropolitan areas to non-metropolitan areas; and across, from older industrialised areas to new industrial spaces (Hall and Hay, 1980).

These patterns are most pronounced in the U.S., and Great Britain, while the rest of Europe is seen to be still tending toward overall toward metropolitan concentration, but less strongly than prior to 1970. The explanation offered for the clean break was the inevitable evolution as city-systems mature from a primate structure to a rank-size distribution. The lag experienced in parts of Europe was attributed to the fact that industrialisation and urbanisation proceed together in predictable, sequential phases, and that as parts of Europe were late industrialisers, they are also late urbanisers (Hall and Hay, 1980).

By and large, the evidence presented herein corroborates a clean break and patterns such as the downwards shift in the urban hierarchy, and the potential for movements outwards and across. Also noted above, however, is the potential for counter-movements, e.g. inwards, as a result of urban re-agglomeration, depending on the logic of post-Fordist accumulation in particular industries and places. However, the framework presented in this thesis suggests a different interpretation to the clean break; that it is associated with the transition from Fordism to post-Fordism, and that the continuous path along which industrialisation and urbanisation are together proceeding may well be pre-empted, as transformations in the organisation of industrial capitalism bring about a dramatic restructuring of urban and regional territory.

5. THE REORGANISATION TO POST-FORDIST TERRITORY

This thesis has attempted address the question of the relationship between post-Fordism and uneven development, in particular its impacts on cities and regions. This is an area that has been unexplored in the literature, despite the centrality of geography and agglomeration to arguments about post-Fordism.

In a nutshell, it has been argued that the pattern of cities and regions that has been evolving relatively smoothly since the beginning of the industrial era is currently undergoing a dramatic reorganisation, as a result of a new logic of post-Fordist capital accumulation. New patterns of uneven development are being forged.

Patterns of urban and regional development have been persuasively tied to industrial capitalism throughout the course of its evolution. It is generally acknowledged that industrialisation was the dominant force shaping the rise of the "great cities" and the metropolis, and the ongoing process of urbanisation (Mumford, 1961; Weber, 1899).

The dramatic economic upheavals that have been witnessed in the advanced industrial nations are associated with a transition from the Fordist regime of accumulation to a post-Fordist regime. The characteristics of this regime are still being debated and refined, but in general one can say that post-Fordism is the anti-thesis of Fordism - product range replaces product standardization, flexible production machinery replaces dedicated equipment, etc. - though in reality neither form is as pure as the textbook case. In the case of post-Fordism this is particularly true with respect to allegations of a worker's utopia, and the centrality of flexibility. Industrial districts are further evidence of post-Fordism. Their recent "resurgence" can be explained by the interaction of necessary forces of post-Fordist accumulation (in particular that globalisation of trade, capital, and competition have brought about an increasingly articulated global division of labour which results in respecialisation) and contingent factors (especially those related to specific industry, firm or local conditions). Indeed, local geography is shown to play an integral role in determining the organisation of production.

The three case study districts (Carpi knitwear, Modena oleodynamics, and Bologna automatic packaging machinery) are all fundamentally of the same type. The key characteristic is the constant and frequent invention and reinvention of the product, resulting in a literally infinite product range, small batch sizes, and an inability to routinize production functions or transactions between firms. It is this characteristic that accounts for spatial clustering that is exhibited by the localised "innovation district". Clustering is further reinforced by a shared local culture, norms, practices and trust, which serve to "standardise" otherwise irregular transactions, allow them to take place quickly and easily.

The innovation district may be distinguished from other species of district (e.g. the technology district) as well as from other "flexible" forms of post-Fordism such as flexible mass production. Routinization of products, components and transactions is still possible (and indeed necessary) in mass production industries, and as such, they tend to have different spatial patterns than those exhibited by the innovation district. Their spatial patterns are nonetheless also the result of interaction with industry, firm, and local contingencies.

From this analysis, certain specific implications can be drawn with respect to uneven development at a variety of scales including regions, the urban system, and intra-district space. Regions in the Fordist or new international division of labour sense are not the key economic units. The division of labour extends from the global to beyond the regional level to the sub-regional or city level. Core-periphery inter-regional relationships are replaced with relationships of direct competition in the global marketplace between different local regions and cities. Uneven development occurs at this lower geographic scale (i.e. between regions, not Regions) and on the basis of industry sectors, not functions. Integration with the market becomes a key locational factor for production.

At the same time, as a result of respecialization and declining minimum efficient scales of production, a whole new realm of productive possibilities is opened up for smaller cities and towns, and even a potential reagglomeration in central cities. At this point this is a seemingly unimaginable possibility, given the universal entrenchment of the vision of central city decline and deindustrialisation that we have been living in for the last two decades or so. Uneven development is further expressed in intra-district differentiation, which proceeds based on a number of factors, chief amongst them competitive strategies of lead firms, and degrees of routinization in production.

In short, extrapolating from the case studies leads one to suggest that post-Fordism is associated with a potential reversal of most key urbanization patterns seen in the last 150 years or so. This contributes to an explanation of the "clean break" in urbanization patterns observed since 1970 in the US and European countries.

APPENDIX I

QUESTIONNAIRE OUTLINE

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1. BACKGROUND

a. When was this establishment/firm founded? How did it come about? How did the founders develop expertise in this industry?

b. How many employees are there in this establishment/firm?

c. What is your main product(s) or main stages of production? Please describe.

d. Is this a single, independent, owner-operated establishment? If branch plants or other locations, where are they located and what functions do they perform?

e. What were your last annual revenues?

f. What are your main markets and/or clients? What share of sales is regional, national and exported?

g. How did this establishment come to be located in this particular location?

2. THE PRODUCT AND CLIENTS

a. Are products produced speculatively or by special order (or both)?

b. Who do your produce for (e.g. directly for the final market, other manufacturing companies, wholesalers)? What types of firms are they (e.g. what industry)? Where are they located (% local, % regional, % national, % international)?

c. How many clients do you produce for in a year? Last year?

d. What share of sales is accounted for by the top three clients?

e. Do you tend to work consistently for the same clients, or do they change frequently?

3. FLEXIBILITY

a. How many different products do you produce on average, in a year, e.g. last year? Is this an increase or decrease over previous years?

b. What is the average lot size? The range of lot sizes?

c. How frequently does the production process change? Is there much variability in the type of work undertaken in this establishment?

d. Does the unit cost vary with lot size? How?

4. PRODUCTION IN THE NETWORK

For case madri:

a. What are the main stages of production for your most typical product (including any R&D, design, marketing, etc.)?

b. Which stages are undertaken within this establishment and which externally?

c. How many establishments in total are involved in production? How many of these do you deal with directly in the coordination of production?

d. How many other establishments would be involved in the production of a single, typical product?

e. Are these firms specialised by phase? If not, how are the different stages of production distributed amongst the other firms, i.e. how many firms per stage, and how many stages per firm?

f. Where are these firms located? Local vs. regional (Third Italy) vs. national vs. abroad.

g. Within this firm, who coordinates production? How is it coordinated? Are computers used? In what ways?

h. What kinds of arrangements or agreements exist between this establishment and other firms involved in production (e.g. direct ownership, short or long term contracts, or is each piece of work negotiated separately)?

i. Do other establishments in the network have direct links with each other or only through a central coordinator (e.g. with respect to transfer of materials, information, intermediate goods, etc.)?

j. How often does the production process change? Does each different product or order require organising a new network for production? Does the process inside the establishment change with each new order or product?

k. How do you decide which firms to use for any given piece of work?

l. Do any firms in the network work exclusively for you?

For network firms:

m. Do you work only for other firms, or do you also have your own products? If own products, are they produced entirely internally? If not, what other firms are used and for what functions?

n. How many firms do you work for in a year? What type of firms are they? What industries do they represent? Where are they located (% local, regional, national and international)? What share of annual revenues are attributable to the biggest client? To the second biggest client? To the third biggest client?

o. Do you tend to work consistently for the same firms, or do they change frequently?

p. What kinds of arrangements or agreements exist between this establishment and your clients?

q. Do you ever sub-contract work out to other firms? To homeworkers? If so, where are they located? What phases of production do these firms perform? What types of agreements do you have with them?

r. Who in this firm is responsible for co-ordinating production internally and externally?

s. Do you ever have direct links with other sub-contracting firms in the production of a given order?

t. Is there ever a flow of information from this establishment to the *casa madre* (e.g. regarding production processes, design suggestions, etc.)?

5. TECHNOLOGY

a. What kinds of production machinery do you have within this establishment (i.e. dedicated or multi-purpose equipment)? How many of each type of machine? Are any machines computer-controlled or programmable? When did you acquire the equipment?

b. If there is computer-controlled equipment, has it changed the production process? How? (e.g. further division or recomposition of tasks, number or type of workers required, sequence of tasks, etc.)

c. Who is involved in making decisions about the types of machinery used in this establishment?

d. Are computers used in R&D? Production? Management? Administration? Are there direct computer linkages between these areas? Are there any direct computer linkages between firms in the production network?

6. LABOUR PROCESS

a. What are the different types of workers in this establishment and what are their main tasks?

b. What skills does each type of worker require?

c. How many pay-scales are there in this establishment?

d. Is each worker assigned a specific, narrowly-defined task or is there fluidity or movement between tasks? Would, for example, a production worker also have input into design, development, or decisions about the production process?

e. What is the level of unionisation?

f. What is the supervisory structure?

7. MANAGEMENT

a. What is the management structure of this firm (i.e. how many managers, division of responsibilities, reporting structure, etc.)?

b. Is this firm managed entirely internally or do management directives and decisions also come from outside the firm (e.g. from a parent company or *casa madre*)?

c. *For network firms:* Is there any consultation with clients on the production process, techniques, materials, etc.? If so, how does it take place and on what subjects?

d. Does this firm have any management control over other firms in the network? Over what things and how? Over what kinds of firms?

e. Who in this establishment makes decisions about what specific products will be produced and how they will be produced, which orders to accept, (i.e. process of production, technology, labour requirements, internal vs. external production, etc.)?

f. Who takes part in decisions about investment?

g. Do the firms in the network have any input into these decisions about what is produced and how (i.e. what products, process, labour, technology)? If so, on what specific matters and through what mechanisms (e.g. informal talks, regularly scheduled meetings, etc.)?

h. Is the productive process supervised? What is the supervisory structure?

i. Is all administration undertaken internally? If not, which functions are undertaken elsewhere and by whom or what agencies? Where are they located?

j. Are outside sources used for advice, information, financial assistance, etc.? If so, for what purposes and what types of assistance?

8. GENERAL

a. Has the product or production process changed over the past 20 years? What were the major changes and why did they come about (e.g. with respect to division of labour, technology, internal vs. external production, number and types of workers, skills required, etc.)?

b. Are you able to keep the level of production relatively stable on a daily, seasonal, or annual basis? If not, how do you cope with fluctuations?

c. What are the major problems faced by this establishment today?

d. Why has the firm succeeded so far?

e. What would you like this establishment to be like in ten years' time?

APPENDIX 2

LIST OF INTERVIEWS

CARMA CASE STUDY

- Carma S.p.a.
  Dott. Morelli - Director of Administration
  May 5 and May 30, 1988

- Corazzari e Bruschi
  Sig. Bruschi - owner
  May 30, 1988

- Confezione Fanny
  - co-managers
  May 20, 1988

- Luciana Ricami
  - owners
  May 23, 1988

- Tosatti e Bacci
  Sig.ri Tosatti e Bacci - owners
  May 23, 1988

- Union - Camera del Lavoro di Carpi - FILTEA
  Sig. Artioli
  June 2, 1988

- Dott. Pagliani
  Associazione Imprese Abbigliamento, Carpi
  April 20, 1988

OIL CONTROL CASE STUDY

- Oil Control
  Sig. Storci, owner and Ing. Ferrari, Director of Production
  July 1, 1988

- Edi-Systems
  Sig.ra Acerbi - manager/partner
  July 11, 1988

- TARP
  Sig.ri Venturelli - owners
  July 8, 1988

- RGP
  Sig. Benedetti - owner/manager
  July 13, 1988

- Union Representatives- FLM
  Sig. Girotti and Sig. A. Scarmani (Oil Control union delegate)
  Camera del Lavoro di Nonantola
  July 13, 1988

IMA CASE STUDY

- IMA S.p.a.
  Sig. Leoncourti, VP, Director-General , July 13, 1988
  Sig. Miselli, Director of Production and Technical Office, June 15, 1988

- Andalò
  Sig. Andalò- owner
  June 27, 1988

- Ramazza
  Sig. Ramazza - owner
  June 30, 1988

- Meccanica Sarti
  Sig. Sarti - owner/manager
  June 27, 1988

- Vignoli-Roda
  Sig. Vignoli - owner
  July 5, 1988

BIBLIOGRAPHY

Aglietta, M., 1992, "The regulation approach and capitalist crisis: an alternative compromise for the 1990s", in Dunford, M. and G. Kafkalas, eds., Cities and Regions in the New Europe: Global-Local Interplay, London: Bellhaven Press.

Aglietta, M., 1982, "World capitalism in the eighties", New Left Review, 136, 5-42.

Aglietta, M., 1979, A Theory of Capitalist Regulation, London: Croom Helm.

Albrechts, L., F. Moulaert et al, eds., 1989, Regional Policy at the Crossroads: European Perspectives, London: Jessica Kingsley Publishers.

Amin, A., 1992, "Big firms versus the regions in the Single European Market", in Dunford, M. and G. Kafkalas, eds., Cities and Regions in the New Europe: Global-Local Interplay, London: Bellhaven Press.

Amin, A., 1989, "Flexible specialisation and small firms in Italy: myths and realities", Antipode, 21, 13-34.

Amin, A., and K. Robins, 1990a, "Industrial districts and regional development: limits and possibilities", in Pyke, F., G. Becattini, and W. Sengenberger (eds.), Industrial Districts and Inter-firm Cooperation in Italy, International Labour Organisation (International Institute for Labour Studies), Geneva.

Amin, A. and K. Robins., 1990b, "The re-emergence of regional economies? The mythical geography of flexible accumulation", Environment and Planning D: Society and Space, 8(1), 7-34.

Arcangeli, F., et al, 1980, "Patterns of peripheral development in Italian regions, 1964-1977, Papers of the Regional Science Association, 44, 19-34.

Avellini, L., and M. Palazzi, 1980, L'Emilia-Romagna, una regione, Bologna: Zanichelli Editore.

Bagnasco, A., 1977, Tre Italie, Bologna: Il Mulino.

Bagnasco, A., 1983, "The social construction of the market: business strategies and experiments of scale in Italy", paper presented at the Social Sciences Research Council, Joint Committee on Western Europe, Lisbon.

Becattini, G., 1990, "The Marshallian industrial district as a socio-economic notion", in Pyke, F., G. Becattini, and W. Sengenberger (eds.), Industrial Districts and Inter-firm Cooperation in Italy, International Labour Organisation (International Institute for Labour Studies), Geneva.

Becattini, G., 1987, Mercato e Forze Locali: Il Distretto Industriale, Bologna: Il Mulino.

Bellandi, M., 1989, "The Industrial District in Marshall", Small Firms and Industrial Districts in Italy, Goodman, E.F. W.(ed.), New York: Routledge.

Berry, B., H.G. Barnum, R.J. Tennant, 1962, "Retail Locations and Consumer Behaviour", Papers of the Regional Science Association, 9, 65-106.

Berry, B. and W. Garrison, 1958, "Functional Bases of the Central Place Hierarchy", Economic Geography, 34 (April), 145-154.

Best, M. H., 1990, The New Competition: Institutions of Industrial Restructuring. Cambridge: Polity Press.

Bianchi, P. and G. Gualtieri, 1990, "Emilia-Romagna and its districts: the evolution of a model", in Leonardi, R. and R. Nanetti, eds., The Regions and European Integration: The case of Emilia-Romagna, London and New York: Pinter Publishers.

Brusco, S., 1992, "Small firms and the provision of real services", In F. Pyke and W. Sengenberger (eds.) Industrial Districts and Local Economic Development, Geneva, International Institute for Labour Studies.

Brusco, S., 1990, "The idea of the industrial district: its genesis", in Pyke, F., G. Becattini, and W. Sengenberger (eds.), Industrial Districts and Inter-firm Cooperation in Italy, International Labour Organisation (International Institute for Labour Studies), Geneva.

Brusco, S., 1986, "Small firms and industrial districts: the experience of Italy", in Keeble, D., and E. Wever (eds.), New Firms and Regional Development in Europe, London: Croom Helm, 184-202.

Brusco, S., 1985, "Local government, industrial policy and social consensus", OECD Italy Seminar, Opportunities for urban economic development, Venice, June 25-27, 1985.

Brusco, S., 1983, "Flessibilità e solidità del sistema: l'esperienza emiliana", in Industrializzazione senza fratture, G. Fuà and C. Zacchia, eds., Bologna: Il mulino.

Brusco, S., 1982, "The Emilian model: productive decentralisation and social integration", Cambridge Journal of Economics, 6, 167-184.

Brusco, S. and C. Sabel, 1981, "Artisan Production and Economic Growth", in Wilkison, F. (ed.), The Dynamics of Labour Market Segmentation, London: Academic Press.

Brush, J., 1953, "The hierarchy of central places in Southwestern Wisconsin", Geographical Review, 43, 380-402.

Bursi, T., A. Morello, R. Gaeta, 1983, Tessile/Abbigliamento: quali prospettive a Carpi per gli anni '80, Comune di Carpi, Assessorate agli interventi economici.

Campos Vcnuti, G., 1986, "Bologna: From expansion to transformation", Built Environment, 12 (3), 138-144.

Capecchi, V., 1990, "A history of flexible specialisation and industrial districts in Emilia-Romagna", in Pyke, F., G. Bećattini, and W. Sengenberger (eds.), Industrial Districts and Inter-firm Cooperation in Italy, International Labour Organisation (International Institute for Labour Studies), Geneva.

Capitani, G. et al, 1986, "Interdipendenze spaziali e industriali nella Padania, 1971-1981, Politica ed Economia, 4, 33-44.

Cavallini, R. (1988), "Il sistema oleodinamico a Modena", unpublished paper.

Cazzola, C. and A. Perrucci, 1986, "Il modello di specializzazione flessibile", in Il check-up dell'industria Italiana, Roma: Ediesse.

CGIL, 1988, Le Aree Distrettuali e Sistemiche in Italia, Vol. 2, National Convention, Rome, March 9, 1988.

Christaller, W., 1935, Central Places in Southern Germany, English edition 1966, Englewood Cliffs: Prentice-Hall.

Christopherson, S., and M. Storper, 1986, "The city as studio, the world as back lot: The impact of vertical disintegration on the location of the motion picture industry", Environment and Planning D, 4, 305-320.

Comune di Modena, (undated), Il Settore dell'Oleodinamica a Modena, Riccardo Cavallini (ed.), studi e richerche 5.

Comune di Modena, (undated), "The Municipality of Modena's policy for the organisation of areas for industrial firms, artisan firms, commercial centres".

Comune di Modena, 1987, Piano Regolatore Generale: Modena nel 2000.

Comune di Modena, (undated), "Municipal Initiatives for Artisan, Commercial and Wholesale Business Parks".

Cooke, P., 1994, "The cooperative advantage of regions", paper prepared for the Harold Innis Centenary Celebration Conference, "Regions, Institutions and Technology: Reorganising Economic Geography in Canada and the Anglo-American World", University of Toronto, September 23-25, 1994.

Cooke, P., 1988, "Flexible integration, scope economics, and strategic alliances", Environment and Planning D: Society and Space, 6(3), 281-300.

Cooke, P. and K. Morgan, 1993, "The Network Paradigm: New Departures in Corporate and Regional Development", Society and Space, 11, 543-564.

Cooke, P., and A. de Rosa Pires, 1985, "Productive decentralisation in three European Regions", Environment and Planning A, 17, 527-554.

Coulet, L., 1978, "La fabrique diffuse en Emilie-Romagne", Méditerranée, 4, 13-25.

Databank, 1987, Dati e Analisi: Componenti ed Apparecchiature Oleodinamiche, November.

Dematteis, G., 1988, "The Weak Metropolis", in World Cities and the Future of the Metropoles, L. Mazza (ed.), Electa, Triennale di Milano.

Dicken, P., 1994, "Global-local tensions: firms and states in the global space-economy", The Roepke Lecture in Economic Geography, Economic Geography, 70(2), 101-128.

Dicken, P., 1992, Global Shift: the internationalisation of business activity, London: Paul Chapman.

Drucker, P., 1994, "The age of social transformation", The Atlantic Monthly, November.

Dunford, M., 1989, "Technopoles, politics and markets: the dvelopment of electronics in Grenoble and Silicon Glen", in M. Sharp and P. Holmes, (eds.) Strategies for New Technologies, Hemel Hempstead: Philip Allan.

Dunford, M., and G. Kafkalas, 1992, "The global-local interplay, corporate geographies and spatial development strategies in Europe", in Dunford, M. and G. Kafkalis, eds., 1992, Cities and Regions in the New Europe: Global-Local Interplay, London: Bellhaven Press.

ERVET, 1987, L'Industria delle macchine automatiche per dosatura, confezionamento e imballagio, Bologna: Editrice Compositori.

ERVET, 1986, Il Comparto Oleodinamico in Emilia-Romagna, Bologna: Editrice Compositori.

Elger, T., 1991, "Task Flexibility and the Intensification of Labour in U.K. Manufacturing in the 1980s", Farewell to Flexibility?, A. Pollert, (ed.), Oxford: Basil Blackwell.

Ettlinger, N., 1994, "The localization of development in comparative perspective", Economic Geography, 70 (2), 144-166.

Florence, P.S., 1948, Investment, Location and Size of Plant, Cambridge: Cambridge University Press.

Fothergill, S., G. Gudgin, M. Kitson, S. Monk, 1988, "The de-industrialization of the city", Uneven Redevelopment: Cities and Regions in Transition, London: Hodder and Stoughton.

Fregna, R., 1985, "Crescita urbana e modernizzazione delle città dell'Emilia", in Niccoli, O. et al, (eds.), Per una storia dell'Emilia Romagna, Istituto Gramsci Emilia-Romagna, Ancona: Il Lavoro Editoriale.

Fuà, G., 1985, "Rural industrialization in later developed countries: the case of northeast central Italy", Banca Nazionale del Lavoro, 351-377.

Garofoli, G., 1994, "New firm formation and regional development: the Italian case", Regional Studies, 28 (4), 381-393.

Garofoli, G., 1984, "Uneven regional development and industrial restructuring: the Italian pattern in the 70s", City and Region, 9, 47-76.

Garofoli, G., 1983, "Le aree-sistema in Italia", Politica ed Economia, XIV, 11, 37-40.

Garofoli, G., 1983, "Areas of specialised production and small firms in Europe", Economia Marche, II, 1.

Garofoli, G., 1981, "Lo sviluppo delle "aree periferiche" nell'economia Italiana degli anni settanta", L'industria, 3, 391-404.

Gertler, M., 1994, "The nature of contemporary industrial change: implications for land use in Southcentral Ontario", paper presented at "Towards an Industrial Land Strategy: A forum on the future of industrial land", Metro Hall, Toronto, December 13, 1994.

Gertler, M., 1992, "Flexibility revisited: districts, nation-states, and the forces of production", Trans. Inst. Br. Geogr., N.S. 17, 259-278.

Gertler, M., 1988, "The limits to flexibility: comments on the post-Fordist vision of production and its geography", University of Toronto.

Goodman, E., J. Bamford and P. Saynor (eds.), Small firms and industrial districts in Italy, London: Routledge.

Gordon, D.M., 1978, "Capitalist Development and the History of American Cities", in Marxism and the Metropolis, W.K. Tabb and L. Sawers, eds., New York: Oxford University Press.

Granovetter, M. and R. Swedberg, 1992, The sociology of economic life. Boulder, Colorado: Westview Press.

Haig, R.M., 1927, Major Economic Factors in Metropolitan Growth and Arrangement, New York: Regional Plan Association of New York and its Environs.

Hall, P., 1962, "The East London footwear industry: an industrial quarter in decline", East London Papers, 5, 3-21.

Harrison, B., 1994, "The Italian districts and the crisis of cooperative form: Part I:, European Planning Studies, 2, 3-22.

Harrison, B., 1994, "The Italian districts and the crisis of cooperative form: Part II:, European Planning Studies, 2, 139-174.

Harrison, B., 1992, "Industrial districts: old wine in new bottles"?, Reg. Stud., 26 (5), 469-483.

Harvey, D., 1989, The Condition of Post-Modernity, Oxford: Basil Blackwell.

Harvey, D., 1987, "Flexible accumulation through urbanization: reflections on "post-modernism in the American city", Antipode, 19, 3, 260-286.

Harvey, D., 1985, "The urban process under capitalism: a framework for analysis", International Journal of Urban and Regional Research, 9, 101-131.

Harvey, D., and A. Scott, 1988, "The practice of human geography: theory and empirical specificity in the transition from Fordism to flexible accumulation", in Macmillan, W.D. (ed.), Re-modelling Geography, Basil Blackwell.

Hilpert, U. ed., 1991, Regional Innovation and Decentralization, London: Routledge.

Hudson, R., 1989, "Labour-market changes and new forms of work in old industrial regions: maybe flexibility for some but not flexible accumulation", Environment and Planning D: Society and Space, 7, 5-30.

Kaplinsky, R., 1984, Automation: The Technology and Society, Harlow, Essex: Longman.

Kenney, M. and R. Florida, 1992, "The Japanese Transplants: Production Organization and Regional Development", Journal of the American Planning Association, 58: 21-38.

King, R., 1987, Italy, London: Harper & Row.

Knudsen, D. et al, 1991, "Flexible Manufacturing in the American Midwest", Indiana University Ameritech Fellowship Program, Institute for Development Strategies.

Lazerson, M.H., 1991, "Subcontracting in the Modena knitwear industry", in Pyke, F., G. Becattini and W. Sengenberger (eds.), Industrial Districts and Inter-firm Co-operation in Italy, International Labour Organisation (International Institute for Labour Studies), Geneva.

Leborgne, D., and A. Lipietz, 1988, "New technologies, new modes of regulation: some spatial implications", Environment and Planning D, Society and Space, 6,3, 263-280.

Leonardi, R. and R. Nanetti, (eds.), 1990, The Regions and European Integration: the case of Emilia-Romagna, London: Pinter.

Lipietz, A., 1992a, "The regulation approach and capitalist crisis: an alternative compromise for the 1990s", in Dunford, M. and G. Kafkalas (eds.), Cities and Regions in the New Europe: the global-local interplay and spatial development strategies, London: Bellhaven Press, 309-335.

Lipietz, A., 1992b, Toward a New Economic Order, Oxford: Blackwell.

Lipietz, A., 1986, "New tendencies in the international division of labour: regimes of accumulation and modes of regulation", in Storper, M., and A.J. Scott (eds.), Production, Work and Territory, Boston: Allen and Unwin.

Lipietz, A., 1986, Mirages and Miracles, London: Verso.

Lorenzoni, G., 1987, Constellazione di imprese e processi di sviluppo", Sviluppo e Organizzazione, n. 102, July-August, 41-57.

Losch, A., 1944, The Economics of Location, English edition, 1967, New Haven: Yale University Press.

Lovering, J., 1990, "Fordism's unknown successor", International Journal of Urban and Regional Reserach, 14 (1), 159-174.

Marginson, P., 1991, "Change and Continuity in the Employment Structure of Large Companies", Farewell to Flexibility?, A. Pollert, (ed.), Oxford: Basil Blackwell.

Mariotti, S. and G.C. Cainarca, 1983, "Hierarchies and intermediate structures in the textile-clothing industry", Paper prepared for the 10th EARIE (European Association for Research in Industrial Economics) Conference, August 23-25, 1983, Bergen, Norway.

Massey, D., 1984, Spatial Divisions of Labour, Houndmills: Macmillan Education.

Menghini, F., 1983, "Appendice Bibliografica", in Fuà, G., and C. Zacchia, Industrializzazione Senza Fratture, Bologna: Editrice Il Mulino.

Morgan, K., 1992, "Innovating by networking: new models of corporate and regional development", in Dunford, M. and G. Kafkalas (eds.), Cities and Regions in the New Europe: Global-Local Interplay, London: Bellhaven Press.

Moulaert, F., and Swyngedouw, 1989, "A regulation approach to the geography of flexible production systems", Environment and Planning D, Society and Space, 7, 327-345.

Mumford, L., 1961, The City in History, New York/London: Harcourt Brace Jovanovich.

Murray, F., 1987, "Flexible specialisation in the Third Italy", Capital and Class, 33, 84-95.

Murray, R., 1991, Local Space: Europe and the new regionalism, (CLES/SEEDS, Manchester/Stevenage).

Nanetti, R., 1988, Growth and Territorial Politics, London: Pinter.

Ohmae, K., 1993, "The rise of the region state", Foreign Affairs, 78-87.

Peck, J.A. and A. Tickell, 1992, "Local modes of social regulation? Regulation theory, Thatcherism and uneven development', Spatial Policy Analysis Working Paper 14, School of Geography, University of Manchester.

Peck, J.A. and A. Tickell, 1991, "Regulation theory and the geographies of flexible accumulation: transitions in capitalism, transitions in theory", Spatial Policy Analysis Working Paper 12, School of Geography, University of Manchester.

Perulli, P., 1987, "Strategie di Flessibilità: direzioni aziendali, sindacati e governi locali" - Il distretto industriale di Modena", draft paper.

Perrons, D.C., 1981, "The role of Ireland in the New International Division of Labour: a proposed framework for regional analysis", Regional Studies, 15 (2), 81-100.

Phelps, Nicholas A., 1992, "External economies, agglomeration and flexible accumulation", Trans. Inst. Br. Geogr., 17, 35-46.

Piore, M., 1990, "Work, labour and action: work experience in a system of flexible production", in Pyke, F., G. Becattini, and W. Sengenberger (eds.), Industrial Districts and Inter-firm Cooperation in Italy, International Labour Organisation (International Institute for Labour Studies), Geneva.

Piore, M. and C. Sabel, 1984, The Second Industrial Divide, New York: Basic Books.

Pollert, A., 1991, Farewell to Flexibility?, Oxford: Basil Blackwell.

Pollert, A., 1988, "Dismantling Flexibility", Capital and Class, 34, 42-75.

Porter, M.E., 1990, The Competitive Advantage of Nations, New York: The Free Press.

Pratt, A.C., 1991, "Industrial districts and the flexible local economy", Planning Practice and Research, 6(1), 4-8.

Pred, A., 1977, City-Systems in Advanced Economies, London: Hutchison.

Putnam, R. (1993), Making Democracy Work: Civic Traditions in Modern Italy, Princeton, N.J.: Princeton University Press.

Pyke, F., G. Becattini, and W. Sengenberger (eds.), 1990, Industrial Districts and Inter-firm Cooperation in Italy, International Labour Organisation (International Institute for Labour Studies), Geneva.

Righi, E., 1987, "Municipality's land and private money for housing and renewal", paper presented at the International Housing Conference, Glasgow, July 7-10, 1987.

Sabel, C., 1989, "Flexible specialisation and the re-emergence of regional economies", in Hirst, P. and Zeitlin, J. (eds.), Reversing Industrial Decline, Oxford: Berg.

Sabel, C., 1988, "The reemergence of regional economies", paper presented at the conference "L'impresa rete: riconpremscerla, proggetarla, gestirla", Camogli, 2-4 June.

Sabel, C., 1982, Work and Politics: The division of labour in industry, Cambridge: Cambridge University Press.

Sayer, A., 1992b, "Ownership, division of labour and economic power", in Dunford, M. and G. Kafkalas (eds.), Cities and Regions in the New Europe: the global-local interplay and spatial development strategies, London: Bellhaven Press.

Sayer, A., 1989, "Post-Fordism in question", International Journal of Urban and Regional Research, 13(4), 666-695.

Sayer, A. and R. Walker, 1992a, The New Social Economy, Oxford: Blackwell.

Schoenberger, E., 1988, "From Fordism to flexible accumulation: technology, competitive strategies, and international location", Environment and Planning D: Society and Space, 6, 245-262.

Scott, A.J., 1992a, "The Collective Order of Flexible Production Agglomerations: Lessons for local economic development policy and strategic choice", Roepke Lecture in Economic Geography, Economic Geography, Vol. 68, (3), 219-233.

Scott, A.J., 1992b, "The role of large producers in industrial districts: a case study of high-technology systems houses in Southern California", Regional Studies, 26 (3), 265-275.

Scott, A. J., 1988a, Metropolis: from the division of labour to urban form, Univeristy of California Press.

Scott, A. J., 1988b, New Industrial Spaces: Flexible Production Organization and Regional Development in North America and Western Europe, London: Pion.

Scott, A. J., 1988c, "Flexible production systems and regional development", International Journal of Urban and Regional Research, 12, 171-86.

Scott, A.J., 1986, "Industrialization and Urbanization: a geographical agenda", Annals of the Association of American Geographers, 76 (1), 25-37.

Scott, A.J. and M. Storper, 1992, "Regional development reconsidered", in Ernste, H. and V. Meier, (eds.) Regional Development and Contemporary Industrial Response: Extending Flexible Specialisation, London: Bellhaven Press.

Sforzi, F, 1989, "The Geography of industrial districts in Italy", in Goodman, E.F. W.(ed.), Small Firms and Industrial Districts in Italy, New York: Routledge.

Sforzi, F., 1990, "The quantitative importance of Marshallian districts in the Italian economy", in Pyke, F., G. Becattini, and W. Sengenberger (eds.), Industrial Districts and Inter-firm Cooperation in Italy, International Labour Organisation (International Institute for Labour Studies), Geneva.

Sharp, M., and P. Holmes, 1989, Strategies for New Technologies, Hemel Hempstead: Philip Allan.

Sistema, s.n.c., 1983, Le Trasformazioni dell-economia e della società carpigiana negli anni '70: tendenze e problematiche dello sviluppo, Carpi.

Smith, C., 1991, "From 1960s automation to flexible specialization: a *déjà vu* of technological panaceas", in A. Pollert (ed.). Farewell to Flexibility, Oxford: Basil Blackwell.

Smith, N., 1986, "On the necessity of uneven development", Int. Jrl. of Urb. Regl. Res., 10 (1), 87-103.

Smith, N., 1984, Uneven Development, Oxford: Basil Blackwell.

Storper, M., 1994, "The resurgence of regional economies, ten years later: the region as a nexus of untraded interdependencies", paper presented at the conference on "Cities, Enterprises and Society at the Eve of the XXIst Century", Lille, March 16-18, 1994.

Storper, M., 1993, "Regional 'worlds' of production: learning and innovation in the technology districts of France, Italy, and the USA", Regional Studies, 27 (5), 433-455.

Storper, M., 1992, "The limits to globalization: technology districts and international trade", Economic Geography, 68 (1), 60-93.

Storper, M., 1990, "Response to Ash Amin and Kevin Robins", in Pyke, F., G. Becattini, and W. Sengenberger (eds.), Industrial Districts and Inter-firm Cooperation in Italy, International Labour Organisation (International Institute for Labour Studies), Geneva.

Storper, M. and B. Harrison, 1991, "Flexibility, hierarchy and regional development: the changing structure of industrial production systems and their forms of governance in the 1990's", Res. Policy, 20, 407-422.

Storper, M., and A. Scott, 1989, "The geographical foundations and social regulation of flexible production complexes", in Wolch, J, and Dear, M. (eds.), The Power of Geography, London: Unwin Hyman.

Storper, M., and R. Walker, 1989, The Capitalist Imperative, New York: Basil Blackwell.

Swyngedouw, E. A., 1992, "The mammon quest. Glocalisation, interspatial competition and the monetary order: the construction of new scales", in Dunford, M. and G. Kafkalis, eds., 1992, Cities and Regions in the New Europe: Global-Local Interplay, London: Bellhaven Press.

Swyngedouw, E.A., 1989, "The heart of the place: the resurrection of locality in an age of hyperspace", Geographiska Annaler B, 71B (1), 31-42.

Swyngedouw, E.A. and C. Kestloot, 1990, "Le passage socio-spatiale du Fordisme à la flexibilité: une interpretation des aspects spatiaux de la creise et de son issue", Espaces et Societés, 54-55, 243-262.

Trufelli, C., 1983, "Gli indicatori delle differenze territoriali dello sviluppo: esame comparativo di alcuni studi sull-Emilia-Romagna", in AGEI, Le Aree Emergenti, Vol. II, L'Italia Emergente, C. Cencini, G. DeMatteis et. al., eds., Milano: F. Angeli.

Utili, G., 1987, "Mutamenti organizzative nei distretti industriali: ossevazaioni su due casi", Progetto finalizzato CNR "Struttura ed evoluzione dell'economia italiana", Sottoprogetto 2, Sistema delle imprese, Centro di Economia e Politica Industriale, Dipartimento di Scienze Economiche, Università di Bologna.

Utili, G., 1988, "Italian leadership and Comparative Advantages", Centro di Economia e Politica Industriale, Dipartimento di Scienze Economiche, Università di Bologna (preliminary draft).

Walker, R., 1988, "The geographical organisation of production-systems", Environment and Planning D: Society and Space, 6, 377-408.

Weber, A.F., 1899, The Growth of Cities in the Nineteenth Century, 1965 edition, Ithaca, N.Y., Cornell University Press.

Williams, K. et al., 1987, "The end of mass production?", Economy and Society, 16 (3), 405-439.

Wise, M.J., 1949, "On the evolution of the jewellery and gun quarters in Birmingham", Transactions of the Institute of British Geographers, 15, 57-72.

Zangheri, R.(ed.), 1986, Bologna, Roma-Bari: Editori Laterza.