

Metropolises and Global Coordination

A Historical perspective

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Résumé

La métropolisation n'est pas née avec le développement des services supérieurs et des technologies de l'information. Il s'agit d'un phénomène très ancien.

Nous définissons une métropole comme une ville qui participe à la coordination des activités économiques à l'échelle mondiale, à travers une organisation réticulaire. Cette fonction coordinatrice a toujours existé, mais elle s'est manifestée différemment selon les périodes. Le passage d'une forme métropolitaine à une autre a été étroitement lié à des progrès technologiques rapides et à des changements dans l'organisation économique. Les continuités et ruptures qui en découlent peuvent se comprendre dans les termes de la théorie économique de l'agglomération.

La période pré-industrielle est celle des *métropoles commerciales*, réalisant une coordination des échanges dans des « économies-mondes ». Les deux révolutions industrielles et les changements économiques qui les ont accompagnées ont suscité de nouveaux besoins de coordination de la production. C'est la période de la *métropole de production*. Enfin, la révolution informationnelle, combinée à de nouveaux changements dans l'organisation des firmes, fait naître la *métropole d'affaires*.

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1. INTRODUCTION: THE METROPOLIS AS AN ENIGMA

In everyday language and even in some scientific work, the term “metropolis” evokes nothing more than a very large city, a focus for all that is good – and bad – about urban life. The vast literature on metropolises and metropolization, especially in Europe over the last 20 years, shows that things are anything but straightforward. Population alone is probably not a necessary condition and obviously not a sufficient condition to characterize a metropolis. So many phenomena are associated with this term that, like Lacour (1999), we may wonder whether this diversity is evidence of just how rich or just how poor the concept is. Producing a meaningful definition is indeed a challenge.

A metropolis is a city, but it is more than a city, and something other than a very large city. Defining a metropolis, and above all understanding what a metropolis is, presupposes that we can determine what makes a metropolis different from an ordinary city. Most of the recent literature, including studies of our own, focuses on the novelty of the phenomenon. Many commentators consider that metropolises have emerged since the 1970s as a consequence of dramatic changes brought about by the recent rise of the service and information economy and by globalization. Global cities, world cities, international cities, informational cities are the most widely used equivalents. But in every urban system, at every period in history, certain cities have stood conspicuously apart from the urban system. Even in the distant past, they were characterized by a series of functions which are often associated exclusively with present-day metropolises. It would be legitimate to suspect that the phenomenon is not entirely new. Resolving an enigma like this entails answering questions such as: are metropolises permanent features? If so, what makes today's metropolises different from those of 50 years, one century or one millennium ago? Has the change been smooth or discontinuous? In the latter case, when do the major discontinuities occur and how do they alter metropolises? Given the extent and the complexity of the problem, we will confine our study to European cities, mainly since the Middle Ages.

In addressing the enigma of the metropolis, we have to make a series of conceptual and methodological choices.

First of all, in order to identify metropolises past and present, we need some criterion that has been relevant throughout the history of cities. In other words, we need a general concept of the metropolis. Such a concept cannot be stated *a priori*. It must be reached by a thorough analysis of the permanence of the main urban functions (section 2). Emphasis will be placed on the coordination function of the leading cities, in economic terms. Of course, the metropolis is not just an economic phenomenon. It has a far-reaching effect on social structures. But economic processes are doubtless at the heart of the emergence and the evolution of metropolises.

Given this conceptual basis, we can determine the concrete features of metropolises at different ages of history and the major changes resulting from the economic and technological transformations of the second millennium (section 3).

This flashback allows us to identify the long-term trends and the most significant changes leading to today's metropolises (section 4).

The main argument of this paper is that metropolises have been around for centuries. We do not deny the importance of recent changes and the originality of today's metropolis. However, we are invited to relativize the widely held idea of a metropolitan revolution occurring in the 1970s as a result of the rise of services and information. The metropolis is an enduring phenomenon, maybe even a natural phenomenon. From a permanent functional basis, its concrete role has evolved with economic and technological advances. The economy, the technology and the metropolis have developed in a cumulative process of interaction punctuated by transformations. Even if we refute purely technological determinism, there is no denying that these transformations are essentially technology-dependent. Mumford (1961) claims that large metropolises multiplied with the development of the technical means to ease overcrowding. Bairoch (1985) shows that for centuries urban growth was limited by means of transportation. Toynbee (1970) argues that for the first 5000 years of cities' history, their geographical extent was necessarily limited by "walking commuting". He establishes a parallel between the curve of urban growth and the curve of technological progress. Ascher (2001) relates urban growth throughout history to the development of means of transport and storage. We believe that technological advances and breakthroughs brought about sudden changes in the metropolis, which had long been in preparation.

Permanence as well as sudden changes in metropolitan characteristics can be interpreted in terms of urban theory. We focus on the economic theory of agglomeration (Fujita and Thisse, 2002), also known as the microeconomics of cities (Huriot and Thisse, 2000). This theoretical framework provides useful insight because 1/ it models agglomeration processes on the basis of cumulative mechanisms which can be used to understand the stability of metropolises, and 2/ it allows us to determine the consequences of changes in the values of technology-dependent parameters such as transport and communication costs. Technological changes largely affect transport and communication costs and release economic agglomeration forces, which lead to the further development or renewal of metropolises.

Our historical approach seeks to understand present-day phenomena. But our historical view is largely dependent on our knowledge of the present, on our conception of the metropolis at the beginning of this century. This is a general methodological obstacle which there is no getting over. Far from being an impediment, this bias will be used to emphasize the origins of today's metropolises. It is in the past that we seek the seeds of the present-day metropolis.

2. THE PERMANENT METROPOLIS

Defining a generic concept of metropolis involves looking for permanent characteristics. The first step of our study consists in identifying these characteristics by analyzing cities and metropolises both present and past and in synthesizing these characteristics in a simple definition (2.1.). As a second step, we want to show that those cities that share these characteristics are rather stable in the long term (2.2.). Finally, this stability can be understood in the light of the economic theory of agglomeration (2.3.).

2.1. Identification: metropolises and functional permanence

We survey a number of present-day conceptions of the metropolis and compare them with historians' descriptions of major cities of the past. Bairoch (1985), Hall (1997), Hohenberg and Lees (1985), Mumford (1961), and Toynbee (1970) are drawn on, among others. We summarize the findings in a list of the most permanent features characterizing both present-day and past metropolises, before proposing our general conception.

The city coordinates movements of goods, people, and information

Once we have accepted the well-known universal definition of the city as a permanent cluster of populations which does not provide for its own food needs (Bairoch, 1985, Hohenberg and Lees, 1985), we may ask what is the universal function of such a grouping. The coordination function appears to be the most frequently evoked.

Cities are parts of a network organized for exchanging people, goods, and information, or at least they have been since the Middle Ages (Hohenberg and Lees, 1985). Ascher (2001) evokes the permanence of the “gip” system (*goods, information, people*). Cities “provide for the circulation of commodities, money, and information” (Damette, 1994). Metropolises can be defined by their “ability to attract, organize, filter and spread a complex and ever increasing set of goods, people, and information flows” (Gaschet and Lacour, 2002).

The most remarkable point about this is the recurrent reference to information, already in the functions of ancient cities. Historians clearly state that cities were essentially centers of exchange and circulation of information, even at the height of industrial expansion in the 19th century (Hohenberg and Lees, 1985). Information is central because it is necessary to coordinating the movements of goods and people. Therefore, economic coordination is the prime function of the city and information the prime means of coordination.

But coordination is not sufficient to characterize a metropolis. It is a general urban function. The smallest market town is a center for coordinating commodity exchanges. The least regional center is a place of political coordination. Some other criterion is required to grasp the concept of metropolis. Coordination must operate at a certain spatial scale.

The metropolis emerges when the spatial range of coordination extends beyond the local scale, beyond the city's hinterland

Again, this condition lacks precision. We could define the hinterland as the spatial area of influence, *i.e.* by the zone directly dependent on it within a hierarchy of central places. A metropolis invariably develops long-range interactions, mostly with cities of similar standing in other hierarchies of central places. The occurrence of such interactions is enough to destabilize the central place system and to give an advantage to the network system. Hohenberg (2002) and Hohenberg and Lees (1985) show that central place theory and network structure are both necessary and complementary in our understanding of the history of city systems. Focusing on metropolises implies emphasizing network structures, in the past as in the 21st century. Even in the Middle Ages, a system of international cities was established, in which each city was more attuned to the wider world than to its hinterland (Hohenberg and Lees, 1985). Then the long-range network adds to coordination and information to form the core of the metropolis throughout history.

The metropolis is more often than not a large city

Apart from the obvious fact that what counts as a large city differs from one period to another (in 1800 a large city had 50 000 inhabitants, today it has 500 000 – Hohenberg, 2002), size alone is not a requisite feature of a metropolis. However, a large population will probably

facilitate coordination and long-range interactions, because it will more readily concentrate the human and material resources for these functions.

The metropolis is frequently a diversified city

Again this is not a requirement, although it may be a condition for stability, as we shall see later. Moreover, diversity and complexity are generally greater in larger cities, so that this feature is clearly positively linked to the previous one. Besides, diversity is by definition correlated with the rank of the city in a central place hierarchy. Diversity is related to the coordination function for two reasons: first, coordination is a high-level and rare activity concentrated in cities which already provide all other activities, according to central place theory; second, coordination is itself a complex activity which supposes interaction between a number of different specialized and skilled agents, *e.g.* entrepreneurs, merchants, financiers, lawyers, and requires diversified infrastructures, *e.g.* education, transport and communication, and real estate.

The metropolis is a powerful and prestigious city

Its renown derives from its coordination function. Coordination of long-range activities secures economic or political power. Coordination supposes the agglomeration of decision-makers and of skilled workers. Therefore it entails the concentration of wealth, prestigious buildings, and cultural activities. Coordination relies on strategic activities. For example, it always involves finance, even if its effective role has changed greatly over the course of history.

The metropolis refers to the dynamic process of metropolization

The metropolis is not a static phenomenon. It is fundamentally the result of an ongoing process. Change and capacity to adapt play a major part in this. In an earlier paper, we defined the contemporary metropolis as the result of an efficient process of adaptation to the economic and technological changes of the post-industrial economy (Bourdeau-Lepage and Huriot, 2002). Separated from its historical context, this process is almost general. It applies to every period of important change, as we shall see later. This adaptive capacity is the basis of the stability and permanence of metropolises. Hall (1966) confirms this by emphasizing the sustained economic vitality of metropolises. Again, the capacity to adapt is correlated with the size and diversity of cities.

This analysis leads to a very simple identification of the permanence of the metropolis. The main stable characters of the metropolis derive from or are closely connected with one major feature which is the function of coordination of economic activities operating at a broad spatial scale, national or international. In other words, *the metropolis coordinates long-range economic interactions*. This means:

1/ that *the most permanent strategic activity of the metropolis concerns the capture, the processing and the diffusion of information*, which is the prime input of coordination activities;

2/ that there is a *connection between the external role of the metropolis and the nature and structure of metropolitan economic activities*.

This is a simple form of local-global dualism. External activities involve specific coordination needs. The resulting internal interactions between high-level activities

1/ determine a concentration of these activities in metropolises, and

2/ can affect the spatial organization of metropolises when they become strong enough.

The first trend is near permanent and will be explained in paragraph 2.3. The second trend is probably more pronounced, and at any rate better known, in the recent period.

2.2. Application: the long-term relative stability of the metropolitan system

Bairoch (1985) considers that the stability of the urban system is a constant of urban history, strongly marked in a given geographical area and in a civilization system, but often observed at a still larger spatial scale. The large size and the diversity of cities are important factors of their permanence. Hohenberg and Lees (1985) clearly show that cities with one dominant activity have been less stable metropolises than more diversified cities. The latter were very often cities with significant coordination functions. However, the dominant long-range commercial centers of the pre-industrial era were rather unstable. Throughout this long period, cities at the top of central place hierarchies were more durable than the nodes of large networks (Hohenberg, 2002), because the latter were relatively specialized. This is the case of the commercial metropolises of the pre-industrial era as well as of the first industrial cities. From the 15th to the 18th centuries, the center of gravity of the international commercial network shifted from Southern Europe (Italy) to North-Eastern Europe (Netherlands and then England). Generally, large cities were also more stable than smaller ones. Hohenberg and Lees (1985) propose a comparison of the ranks of the main European cities in 1750, 1850 and 1950. They remark on the relative stability of the ranks of the large cities, despite the major breaks of two industrial revolutions that mark this period. However, we observe that only eight cities keep their place in the top twenty of the hierarchy over the entire period. Still more importantly, changes affect smaller cities. But with few exceptions, the main capitals and multifunctional cities invariably dominate the hierarchy: London, Paris, Naples, Vienna, Moscow, Madrid, Berlin, and Hamburg. The most enduring metropolises combine political, industrial and service activities. Agulhon *et al.* (1998) confirm this phenomenon in 19th century France: the largest cities are still the most stable and the city is a stronger structure than industry. However, the phenomenon is much more pronounced in France than in either England or Germany.

2.3. Interpretation: aspects of agglomeration theory

The concentration of coordination activities in metropolises and the relative stability of large diversified cities can be understood in the light of the economic theory of agglomeration. Always and necessarily, the development of long-range activities goes along with the rise in long distance and more or less dispersed tangible or intangible interactions. This leads to an increasing complexity of economic operations which demand more accurate decision processes, more aid to decision and more control. In the remote past, even if commercial interactions were relatively simple, the rudimentary means of transport took a great deal of time and implied high risks, which made foreign trade rather complex. Under these circumstances, the need for coordination increased, entailing the development of a series of high-level, skilled, and information-based activities. As reported above, these activities naturally tended to concentrate and to reinforce the metropolitan character of the cities where they developed.

Such concentrations can be understood in terms of proximity externalities

Coordination activities make intensive use of information. This bestows a leading role on face-to-face contacts. They are strategic as they convey exchanges of the complex and personalized information required by coordination activities. Face-to-face contacts generate strong proximity externalities and we might speak of the “tyranny of proximity” by analogy

with the tyranny of distance (Bairoch, 1985) and of land (Duranton, 1999). These are non-market externalities with a short spatial range. They generate an agglomeration process affecting coordination activities. This is probably the single most important factor in the formation of a metropolis.

But this process appears only above a minimum level of agglomeration forces. Now the intensity of these forces depends on the size and composition of the city. Even if it is not the only determinant of metropolization, city size favors the concentration of coordination functions. More specifically, the concentration of economic activities promotes the rise of high-level activities because they find an extended market there. As a consequence, a large city is able to create new rare activities which in turn increases diversity and thus produces new Jacobs-type agglomeration economies. Furthermore, a minimum size is required for the appearance of specialized public services involving scale economies, which generate new agglomeration economies.

In these agglomeration processes, human capital externalities play a key role. As coordination functions develop, the need for skilled labor increases and human capital externalities arise. City size, human capital, and information processing are mutually reinforcing. Because it facilitates the diffusion of information, the agglomeration of agents benefits the formation of human capital, *i.e.* development and learning, knowledge and innovation. In return, human capital is a factor of agglomeration, insofar as it attracts new activities with a marked need for coordination.

Proximity interactions and long-range exchanges are mutually reinforcing

Proximity and global interactions operate in the same direction and in combination are powerful factors in agglomeration and metropolization. Through long-range interactions, metropolises are subjected to a “global tyranny” such that they interact more with one another than with their respective hinterlands. “Global tyranny” is also a factor of agglomeration, because large cities are the best points of entry into the networks of long-range interaction between metropolises. The coexistence and interplay of these two types of interaction is a novel feature of metropolises. Above a certain level, these two dimensions of the metropolis are mutually reinforcing, so that metropolization entails metropolization and old-established metropolises have a definitive advantage over others. The cumulative processes leads to a lock-in mechanism promoting the stability of the metropolis.

3. FROM THE MARKET METROPOLIS TO THE PRODUCTION METROPOLIS

Coordination functions are a permanent feature of the metropolis. But, depending on the period, they apply in diverse contexts and relate to different activities, being implemented in various ways. They vary with the prevailing modes of production and the technical regimes, specially the means of transportation. Three main stages are classically distinguished, punctuated by radical technical changes: the pre-industrial period, the industrial period (including the two industrial revolutions), and the post-industrial period.

From one period to another, the metropolis adapts to changes in technico-economic organization. But the movement is irregular. During each change, the form and the characters of the metropolis vary with the new economic context – mainly the new structures and organization of production, and with new technological conditions – especially advances in means of transport and communication. We consider that two significant breaks affecting metropolitan transformations, namely 1870 and 1970, were the most decisive steps towards the contemporary metropolis. The first one occurred a couple of decades after the decrease in

inter-urban transport costs and related to the sizeable fall in intra-urban transport costs. The second one related to the considerable fall in information diffusion costs. These two changes in costs acted a major part in the agglomeration processes. In particular they helped modify the internal organization of the metropolis, giving weight to services and extending their external influence. In this way, they gave metropolises more important and more extended coordination functions, in particular in the organization of production. They paved the way for the metropolis in its present-day form.

These adaptations of the metropolis as well as the metropolization process can be explained by the interactions between changing costs and agglomeration forces.

We deal here only with the pre-industrial period (3.1.) and the industrial period (3.2.), and with their role in the emergence of production metropolises. The final transformation – the informational one – and the resulting contemporary metropolises are the subject of the following section (4.)

3.1. The pre-industrial period: from the Middle Ages to the 18th century

This stage is characterized by the high costs of carrying people and goods and by the high costs of communication. It is also distinguished by very scattered production in small individual and domestic units with little in the way of capital assets. Small-scale production entails no or only low increasing returns. Even so a spatial division of labor arose between the city and its surroundings which became more marked during the proto-industrial period. The city became increasingly specialized in activities which were intensive in skilled labor (Hohenberg and Lees, 1985). So, the city produced craft goods such as clothes and silk products which required know-how, while its hinterland supplied it with food and raw materials and produced less elaborate goods.

But the predominant urban activity was commerce on local or distant markets. At the beginning of the industrial revolution, the most characteristic feature of the city was trade (Toynbee, 1970). Long distance trade involved luxury goods mostly, and then only in small amounts. However, they were of strategic importance and were significant in shaping the metropolization process as we shall see. Several features are worthy of note.

First, this trading activity generated long distance interactions during this stage. Thus, it produced large-scale networks. Second, movement by traders allowed information to spread around the world. Third, trade was risky and stimulated the emergence of finance and insurance. The city became the cradle of financial, accounting, commercial, and administrative services.

The city also had an ecclesiastic function (Toynbee, 1970). For some of the period, pilgrims, who were also merchants, initiated or enhanced the commercial role of the city.

Over this period, a number of cities acquired specific features corresponding to our criteria and could be considered as metropolises. We can briefly distinguish two groups of such cities: “capital cities” and “specialized cities”.

The former were at the top of the hierarchies of central places. They fulfilled mainly political, administrative, religious, defensive and coordination functions, but they were also market-oriented. Thus, their activities were diversified and services ever present. A large population was not a sufficient condition for a city to be a “capital”. Such a city was distinguished functionally by its position in the system of central places. (Hohenberg, 2002). Although small, cities grew in size over the period. The “capital city” exerted its influence over its near hinterland and at the national level. This differentiated it from the “specialized city” which had an international influence.

The economic functions and specially long-distance trade characterized this second kind of metropolis, which Braudel (1979) termed “*ville-monde*” (world-cities).

These cities both attracted and diffused. They operated as true business centers and interacted with a vast geographical area. They were the coordination centers of international trade and were organized in a reticular network system. They share a feature with the contemporary metropolis in that they traded more with other cities than with their immediate vicinity (Hohenberg and Lees, 1985). In addition to commercial activities, these cities were the focus for financial activities such as exchange transactions, bank lending, financial consultancy and other service activities such as legal consultations, which were essential in coordinating commercial activities. However, their role was essentially restricted to the luxury goods trade, it dominated a small part of economic activity and failed to generate any sustainable agglomeration process, which was probably one cause of its long term instability.

3.2. The industrial period of the 18th-20th centuries (1770-1870-1970)

This period was preceded by the agricultural revolution. Until then the spread of intensive farming practices and the commercialization of agricultural products were slow. Progress led to an increase in agricultural productivity, which subsequently enabled food to be provided for the growing urban population, releasing the work force for industry and promoting the formation of capital. It was also characterized by profound changes in the form of two industrial revolutions.

The first stage (1770-1870) coincided with the first industrial revolution

This was the era of coal and the steam engine. Successive innovations altered the manufacturing structure: large-scale production emerged and not only because of the rise of “royal manufactures”. So, large factories developed during this time and their organization changed with the use of machinery. The need for capital assets was considerable and with the resulting high fixed costs, increasing returns develop. Because of the high costs of transport, factories were located near to the source of energy and mining and/or industrial cities like Manchester in England grew. Industry expanded in highly specialized cities near to the sources of energy. Nevertheless, an industrialization movement in the old urban centers arose but was less marked.

With the building of the railroads around 1850, depending on the country in question, transport costs decreased especially between cities, leading to the more rapid spread of innovation and economic growth. Industry returned to the cities and factories could be located away from sources of coal. Industry became reconciled with the city and big, new factories were set up on the outskirts of large cities. In France, from 1850 to 1911, the fastest urban growth was in coal mining cities and industrial suburbs (Agulhon *et al.*, 1998). Urban industry became more diversified. Greater needs for coordination related to the production and sale of products resulted in the rise of service activities. These activities were naturally located in the large cities or more exactly in cities which already had metropolitan features, because of a skilled labor force, diversified activities, and the presence of financial, consulting, and commercial activities. Industry and administrative services drew population to these places.

So, during this transitional stage, metropolises grew in particular by migration toward the cities but also thanks to population growth (Hall, 1966). Metropolises covered small areas (Paris, 34 km²; London, 50 km²) and population densities were high and getting higher (Paris: 316 inh./km² ; London 288 inh/km²). Metropolises were still “walking cities” (Pinol, 1991). Land use was not specialized although, for example, finance was concentrated in one small

district in New-York. The high costs of transport within the city and the low-rise buildings were two essential elements in understanding the spatial structure of the metropolis. The change in the metropolis was also reflected in the diversification of its activities.

With the development of commercial bureaucracy, which is clearly a feature of the 19th century (Mumford, 1961) and consequently with the increasing needs for information, many tertiary occupations developed such as clerical work, accountancy, and consultancy. Such office employment was on the increase in metropolises, which had a skilled work force, and it in turn fostered the development of the metropolis.

The second stage (1870-1970): a new economic organization, a new technical regime

Two major features characterized this period. The first was the substantial change in the firm as an organization, mainly because of new capital requirements. The second was the discovery and development of electricity, the internal combustion engine, gasoline, *i.e.* the second industrial revolution.

Production and trade had long been carried out by individual firms for the most part. In the 1860s, *i.e.* before the second industrial revolution, the first limited liability companies were formed. Owners of capital and managers were no longer necessarily the same people. Responsibilities were shared between two groups. Strategic choices about the method and the level of production and commercialization were in the hands of the new capitalists, who were in general financiers, whereas manufacturing was in the hands of the manufacturers.

These changes gave rise to new interactions between production, commerce, and finance making coordination more complex. This implied further expansion of services and mainly of bureaucracy and finance. The strategic role of finance in economic activities resulted in a new development of the coordination function of metropolises. From the second part of the 19th century, the center of gravity of industry was no longer to be found in workshops but in offices (Hall, 1966).

These changes reinforced the role of the metropolis in the economy and determined the new spatial form of the metropolis.

One obvious effect of the second revolution for the metropolis was the fall in intra-urban transport costs. Thanks to continuous progress in transportation – electric tramway, rail, subway and automobile – the population could move more quickly and at less expense. Mass transport came into being. Thus, it became feasible to separate the place of residence and place of work. The metropolis expanded and its spatial pattern changed. The suburbs grew with the new migrants coming principally from rural areas (Pinol, 1961) and the central district gradually specialized in services. The specialization of land use emerged with the residential zone and the central business district.

The modification of the spatial structure of the metropolis also resulted in increased needs for information. During this stage, with innovations in printing and reproduction processes, the advertising business developed. The diffusion of information became essential and the new investment trusts were set up naturally enough near the finance and insurance companies. Consequently, service activities became more concentrated in the metropolis. The metropolis brought together and produced the service activities necessary for the new organization of production. Many innovations and inventions like stenography, the lift, the telephone and the typewriter contributed to the creation of the present-day office but the progress in building and the invention of the lift and the telephone were two key factors allowing coordination functions to be concentrated in the skyscrapers of the metropolitan central district (Moss, 1987).

Transport costs and agglomeration

Directly or indirectly, the rapid decline in transport costs was beneficial to agglomeration and to the power of metropolises. Basic results in economic geography tell us that, all things being equal, a sufficient fall in transport costs can stimulate the agglomeration of economic activities. Even if recent theoretical developments sometimes argue to the contrary, this is limited to a very low level of transport costs. Now, it seems that in the 19th century the decrease began from a high level of transport costs. Therefore it is not unreasonable to suppose that the effect was beneficial to agglomeration. We know that this *a priori* curious effect is explained by the fact that low transport costs release agglomeration forces. People, consumers or producers, can more readily take advantage of increasing returns and proximity externalities of different kinds because their localization is less restrained by transport (Fujita and Thisse, 2002).

In the light of these theoretical points, we can say that two changes combined to promote the development of metropolises in the period of the industrial revolutions. The increase in the scale of production and the new organization of the firm generated new agglomeration forces. The fall in transport costs, both within and between cities, allowed these agglomeration forces to work.

4. THE BUSINESS METROPOLIS

Many commentators report a new form of metropolization since the 1970s, brought about both by the transformation of production structures affecting the emerging post-industrial economy, especially the rise of high-order services, and by rapid and dramatic changes in communication technologies.

Contemporary metropolises generally involve new forms of urban growth, along with more recent and striking changes in the form and the role of cities in developed countries. Again, metropolization does not affect all cities. We consider that the term singles out today's large cities which react more rapidly and intensely to current technical and economic changes in the post-industrial economy, and succeed in developing efficient and leading coordination functions (Bourdeau-Lepage and Huriot, 2002). This adaptation implies large changes in the spatial structure and the economic role of metropolises. But these changes were prepared by the two industrial revolutions and were made possible largely by the new communication technologies.

We shall first identify the major technical and economic changes resulting in the post-industrial economy, by focusing on what seem to be definitive breaks with the past (4.1.). Then we shall try to characterize what is really new in the post-industrial metropolis, in terms of its coordination role and of its internal spatial restructuring (4.2.). Finally, we relate these trends to some tentative models inspired by the economics of agglomeration (4.3.).

4.1. The emerging post-industrial economy

Industry remains an important sector in all economies, even if it is no longer dominant in cities. The post-industrial economy emerges and is most visible in metropolises, in relation to their coordination function.

The revolution in information technologies

While the costs of transporting goods continue to decline, direct or opportunity commuting costs remain high, and the costs of exchanging and processing information have collapsed because of advances in communication technologies. The progress in information and communication technologies is a transformation comparable to the industrial revolution of the 18th century (Castells, 1996). It has even been compared with the invention of writing. It gives information a dominant, strategic role across the entire range of economic activities. It contributes to radical change in the structures and workings of the economy, of cities, and especially metropolises.

The strategic role of information is not new, as we have seen. But its extension and its primacy are new. We have moved on from an industrial economy where the strategic role was played by energy and raw materials, to an economy where the capacity to process information becomes the main productive force (Castells, 1996). Moreover, information itself is part of a cumulative process where information influences technologies and technologies influence information. It has been shown elsewhere (Guillain and Huriot, 2001) that the close complementarity between tacit information (exchanged by face-to-face contacts) and codified information (diffused by information technologies) gives rise to new behaviors, new interactions, and new needs for information. Information is no longer only in the service of economic activities, but also in the service of information. More generally, the information society is distinctive in that knowledge acts upon knowledge itself (Castells, 1996).

It should be recalled that the fall in the cost of exchanging information by the new technologies relates only to marginal cost. Communication infrastructures are rather large and expensive and they yield increasing returns. This greatly affects the form of the new metropolises. Besides, direct face-to-face contacts, far from declining, develop as a result of the new technologies (Guillain and Huriot, 2001).

The changes in production structures and processes

Production is increasingly *intangible*, meaning that services are becoming the main activity. Also in manufacturing activities, even in agricultural production, information exchange and processing are increasingly significant compared with the direct processing of goods. Services were present in cities for centuries. What is new is the rapid rise in high-order producer services.

Production becomes more *personalized*, not only in manufacturing with the increasing diversification of products but even more so in services. This contrasts radically with the preceding Fordist period. Diversification involves more complex production and enhances the need for coordination, *i.e.* the rise of high-order services. These services are increasingly specialized and therefore tend to be externalized. The extreme diversification and specialization of these services requires co-production and new needs for coordination.

Last but not least, production is increasingly *global*, owing to the expansion of markets, to the fall in transport and communication costs, to the opening-up of borders, and to deregulation, and in close connection with the new global division of labor. Globalization is made possible by new technologies, and in return it requires specific coordination means which make intensive use of information. Actually, globalization implies world-wide dispersion of production. This is another factor of complexity then and another source of the increasing need for coordination. Headquarters controlling plants or other establishments operating in a number of distant countries, with different cultures and different laws, need more information and specialized producer services.

The global economy differs from the world economy. This is not simply a generalization of the “*économies mondes*” defined by Braudel in the pre-industrial economy, or of the

international economy of the first half of the 20th century. Thanks to information technologies, the global economy operates in real time at a planetary scale (Castells, 1996).

All these trends reinforce the development and the strategic role of coordination activities, which are intensive in skilled labor and information and will renew and reshape metropolises.

4.2. The business metropolis

The new organization of production and the increasing needs for coordination entail new forms of metropolitan concentration. Once more, technological progress and the related change in communication costs have brought about new forms of spatial organization. Three features characterize this transformation: the metropolitan concentration of high-order activities, the modifications of the internal metropolitan structures and their global domination in a network system.

The metropolitan concentration of coordination activities

Coordination activities are intangible, personalized, global, and information-intensive. They are concentrated more in metropolises than are other functions, so that metropolises contain the major part of the high-order functions of the whole country. What is new is not so much this concentration, but rather the nature of what is concentrated and the actual concentration process.

The nature of coordination activities results from what has been said of the post-industrial economy and the information revolution. If finance is a permanent component of metropolitan activities, its role has changed. Since the 1970s, financial and business sectors have changed radically (Ansidei, 2001; Gehrig, 2000; Sassen, 2001). They significantly increased their weight in the global economy and still more markedly in the economy of metropolises. Even financial services are subject to high increasing returns. Compounded by the substantial need for tacit information exchanges, this results in a huge concentration of world finance in a small number of cities. Alongside this, we also observe a certain dispersion of secondary financial centers, due to the need for localized tacit information (Gehrig, 2000). However, agreements between financial centers periodically reinforce concentration.

The process of concentration results from the new organization of information exchanges. Recall the distinction between tacit and codified information. Only the latter can be transferred using the new technologies. The former necessarily requires face-to-face contacts. This creates an informational dualism and thus an organizational and spatial dualism between coordination functions and execution functions. The result is that the need for centrality of the latter vanishes while the concentration of the former becomes even more intense. This boosts the concentration of coordination functions in metropolises. If we add that the intensive use of information technologies requires high fixed costs, we can claim that new information technologies stimulate the concentration of coordination activities in metropolises.

The new spatial composition of metropolises

Whenever it concentrates very specific functions, the metropolis renews its spatial pattern. For the same reasons as before, the internal composition of metropolises is itself more and more selective.

Despite substantial differences, metropolises in developed countries share a number of common trends including multipolarization and specialization of centers (Anas *et al.*, 1998). Coordination functions have a key role in this restructuring. These functions are not only

concentrated mostly in metropolises, they are also concentrated mostly in privileged districts within those cities.

Improvements in informational and communications technologies allow and even encourage this functional split in office activities. This promotes the progressive relocation of the less complex functions of office activities (back offices) in the suburbs. These functions do not generally require frequent and direct face-to-face contacts, so that lower suburban land costs and better accessibility become major location criteria. This new office suburbanization has two consequences. First it facilitates the maintenance of the most specialized parts of high-order services (front offices) in the center. Second, it creates new specialized clusters in the metropolitan periphery. These new clusters differ from the main center. Most empirical studies in Europe confirm this claim. Central and peripheral poles of activities are not substitutes but rather complements. When these new centers generate sufficient and appropriate externalities, they can attract front offices. When these functions decentralize, it is frequently only toward the very near periphery as in the Paris Region. This decentralization of high-order activities is more significant in the United States and in a number of Canadian cities. Nevertheless, the CBD generally remains the most important center, at least in relative terms, for these activities. In any case, the CBD retains economic power and most coordination functions in developing specific competence in a limited number of activities requiring high skills, like FIRE (Finance, Insurance and Real Estate) services or legal services. Finally, these processes increase the concentration of the coordination functions and the specialization of urban activity clusters.

At the basis of these processes, new combinations of agglomeration and dispersion forces operate.

Metropolises and global networks

Contemporary metropolises are organized on a network basis. What is new is not the existence, and even the prevalence of the network system. What is new results from the character of the global informational economy. Networks are global and connect the nodes together instantly. Coordination itself becomes global and instantaneous. On the part of metropolises, the divorce with the central place system, which began long ago, is now largely completed. The network of metropolises relies on networks of firms, financial networks, even cultural networks. The metropolis is the node of a large number of more or less specialized networks. It plays a coordinating role within each of these functional networks and between these networks. The nodes interact mainly by means of the new information technologies and brief business trips. Communication infrastructures and rapid transport nodes (high speed train stations and airports) are the privileged points of entry into the global economy. Their high fixed costs entail their metropolitan localization. Their presence in a city reinforces the concentration of high-level functions, especially of coordination functions.

4.3. The underlying agglomeration forces

We shall only recall the main lines of analyses which are largely developed elsewhere (among an abundant literature: Huriot and Thisse, 2000; Fujita and Thisse, 2002; Boiteux-Orain and Huriot, 2002).

The elements of agglomeration theory proposed in paragraph 2.3. apply at present as in the past. So we shall point out just two analyses which seem particularly relevant in explaining the new division of labor within and between cities.

Inter-urban functional specialization

Suppose that the coordination functions of firms consume producer services and therefore generate urbanization economies, or Jacobs' type externalities. Their execution functions consume sector-specific inputs, which produce localization economies, or MAR externalities. A simple model (Duranton and Puga, 2001) shows that if each firm's internal communication costs are low enough, 1/ firms localize their high-level functions in large cities, with a functional specialization in producer services and headquarters of diverse sectors, 2/ they localize their execution functions in smaller secondary cities specialized by sector. Although simple, this model is one of the most convincing attempts to get to the roots of the contemporary metropolization process.

Intra-urban functional specialization and interaction costs

Suppose the firm can be divided into a front office and a back office. While the front office and the back office exchange information at low cost via the new technologies, the front offices of different firms have frequent face-to-face, high-cost contacts. Back offices of different firms do not interact. It is well known that, in this case, front offices cluster in the city center and the back offices set up on the periphery (Ota and Fujita, 1993). Thus the new information technologies appear as a major cause of the concentration of the highest level functions, and of the deconcentration of the most routine services. This model contributes to the understanding of the selective suburbanization of functions but it fails to explain the formation of peripheral clusters and the deconcentration of front offices.

In these models communication costs are decisive in explaining the new forms of metropolises. This is consistent with the role we have ascribed to technological change in the major transformations of metropolises.

5. CONCLUSIONS: PERMANENCE AND CHANGE

As Bairoch (1985) said, every interruption in a process of evolution is in practice only an acceleration of a continuous movement.

The continuous movement consists in 1/ the slow growth and diversification and 2/ the ever increasing spatial influence of leading cities. This movement preserves what we have defined as the permanent character of the metropolis, namely its coordination role. It is itself progressively diversified and spatially extended. The breaks are caused by sudden variations in production and transportation costs induced by technical breakthroughs, which accelerate the mechanisms of agglomeration and diversification, and enhance the strategic role of coordination.

In consequence, our historical detour allows us to refine the widely held idea that the contemporary metropolis is an entirely new phenomenon. The structure and organization of this metropolis are new. They are essentially the consequences of the informational revolution and the related globalization. But the foundations of the metropolis are ancient. Even before the first industrial revolution, a number of cities exercised important coordination functions involving high-level activities. Technical revolutions have only brought about 1/ the extension of these functions to new sectors of activity, 2/ the complete renewal of their structure and organization and 3/ their spatial expansion.

Even the spatial structure of large cities is not entirely new. Multipolarization is recent, but not suburbanization, which began at a small scale back in the pre-industrial period and is a near permanent feature of urban growth.

However this historical detour presents a number of limits. First, our vision of historical development is over-simplified. There is not just one kind of pre-industrial city, not just one sort of industrial city. Furthermore, the post-industrial metropolis is an over general concept. But we do not want to set ourselves up as historians. We are only interested in the overall pattern. Second, we cannot say anything about metropolises if we have no *a priori* idea of what a metropolis is. So, our definition of a metropolis is not only the end-product of a historical investigation, but also the consequence of such an idea *a priori*.

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