

Local Interactions and the Global City Metropolization in Warsaw

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ABSTRACT

A number of the world's large cities are taking on increasing economic importance in the international arenas because they concentrate high-order activities. This metropolization process is a result of the changes occurring in the emerging post-industrial economy, *i.e.* the rise of services and information. It is based on the combination of proximity interactions and global interactions and it is characterized both by a specific internal spatial pattern and by a large outside area of influence.

Since the transition period, services, and particularly high-order services, have grown more rapidly in Poland than in EU countries, as if a catching-up process has been underway. A large part of these services are located in downtown Warsaw, in the district of *Œródniœcie*, as was shown in a previous paper by Bourdeau-Lepage. Combining several Polish data sources, mainly on the geography of employment by sectors, on the location of firms, and on the development of specialized high-order services, we propose to analyze in detail the concentration of metropolitan functions in Warsaw and to determine whether or not a process of metropolization is emerging in the city. Starting from the idea that the internal organization of high-order functions in a metropolis is closely connected to its international attractiveness, we compare the “internal metropolization” of Warsaw with its “external metropolization” *i.e.* its effective world position, evaluated essentially by its position in the transport networks and by its attractiveness in terms of investment and of cultural activities. The results indicate an effective internal metropolization and a narrowing gap between internal and external metropolization.

RESUME

Le rôle économique international d'un certain nombre de grandes villes s'accroît au fur et à mesure qu'elles concentrent des activités supérieures. Ce processus de métropolisation est la conséquence de l'évolution vers l'économie post-industrielle marquée par le développement des services et de l'information. Il résulte de la combinaison d'interactions de proximité et d'interactions globales et il se manifeste par une configuration spatiale interne particulière et par une aire d'influence très étendue.

Depuis la période de transition, la Pologne a connu une croissance des services, et plus particulièrement des services supérieurs, plus rapide que les pays de l'UE, comme par un effet de rattrapage. Une part importante de ces services est localisée dans l'hyper-centre de Varsovie, à *Œródniœcie*, comme l'a montré Bourdeau-Lepage dans un précédent papier. A partir de plusieurs sources de données polonaises, principalement sur la géographie de l'emploi par secteur, sur la localisation des firmes et sur le développement des services supérieurs spécialisés, nous proposons d'analyser de façon détaillée la concentration des fonctions métropolitaines à Varsovie et de déterminer l'éventuelle émergence d'un processus de métropolisation. Sur la base de l'idée que l'organisation interne des fonctions supérieures dans une métropole est étroitement liée à son attractivité mondiale, nous comparons la “métropolisation interne” de Varsovie avec sa “métropolisation externe”, c'est-à-dire son statut international évalué par sa situation dans les réseaux de transport et par son attractivité en termes d'investissements et d'activités culturelles. Les résultats montrent la réalisation d'une véritable métropolisation interne et un retard de la métropolisation externe qui va en diminuant.

Key Words: Urban Centrality, Metropolization, Warsaw.

JEL: P59, R10, R30.

1. INTRODUCTION

In the developed world, a number of large cities are becoming increasingly specialized in high-order activities which are intensive in skilled labor and information. These metropolitan functions relate essentially to creation, decision, and control. They include research & development, high-order producer services, financial activities, large companies' headquarters, along with educational and cultural activities.

Such a metropolization process is a response to the changes occurring in the emerging post-industrial economy, *i.e.* the rise of services and information, and the resulting transformations of the processes of production. Information interactions become the primary input in metropolitan activities such as high-order services.

The process involves an increasingly prominent role for metropolises in their national hinterland and above all in the world economy. In other words, it gives them global power.

Metropolization is also expressed by changes in the spatial organization of cities. Suburbanization takes on new forms with the emergence of multicentric urban structures and the specialization of the city-center in metropolitan functions, especially in Europe.

It follows that the metropolization process is characterized both by a specific spatial pattern and by a large outside area of influence. This results from the combination of proximity interactions and global interactions, and we consider that the organization of proximity within the city affects the role of the city in response to globalization.

Consequently, we assume that this process can be reasonably apprehended through both a sufficient concentration of metropolitan functions and an efficient spatial organization of these functions within the city.

Economic and spatial restructuring impelled by the metropolization process are familiar features in western industrialized countries (Anas *et al.*, 1998). In these countries, even if governments play an important incentive role, individual decisions in a market context remain the main determinants of change. Under these circumstances, the changeover from a planned economy to a market economy in Central and Eastern European Countries (CEEC) might give rise to comparable trends.

Mindful of the specific context of the advent of the market economy, we aim to determine whether Warsaw is following the pattern widely observed in Western Europe and whether this places Warsaw in a significant position in the network of world cities.

CEEC cities have inherited distinctive production and spatial structures from the days of central planning. Warsaw is a typical example. In that era, priority was given to industrial development and location decisions were not constrained by land price considerations. These past choices have determined present-day urban structures and their pattern of change. The return to the market economy, and the opening-up to international relations are all leading to economic and spatial restructuring. Warsaw is profoundly marked by its industrial past, but at the same time it is being drawn increasingly into the services and information economy. Consequently, we wonder about the changes resulting from these two factors. There are few economic studies of urban restructuring in CEEC, even in Poland. An earlier study showed how the rapid rise of new tertiary activities brought about new needs for proximity. This entailed the reorganization of the city, ushering in a standard western pattern of urban development (Bourdeau-Lepage, 2002b). These changes may now redefine the economic role of the city. To show this, this paper examines the development and the location of metropolitan functions in Warsaw and it relates the internal spatial organization to the city's external role.

The literature proposes numerous different definitions of metropolization and the choice is difficult from among a tangle of metropolization criteria. Before conducting any empirical

investigation of Warsaw, we must set out a theoretical framework within which we can apprehend and characterize the phenomenon. With this aim in view, we shall present our conception of metropolises and metropolization (section 2). This analysis leads us to break down the metropolization process schematically into three interacting levels which will be successively illustrated by the case of Warsaw: the capacity for metropolization (section 3), the rise and the location of metropolitan functions (section 4), and the city's attractiveness and influence in the global economy (section 5).

2. METROPOLISES AND METROPOLIZATION

The use of the terms “metropolis” and “metropolization” may be a source of confusion. They are polysemic (Lacour & Puissant, 1999) and may give the impression that they do not correspond to any precise scientific and *a fortiori* to any operational concept. Identifying a metropolization process supposes giving terms a clear meaning on the basis of a simple theoretical framework.

2.1. In search of a definition

The terminology relating to metropolization is very diverse. The most common synonyms include “megalopolis”, “world city”, “global city”, “international city”, “informational city”, and “metapolis”. Like Lacour (1999), we may wonder whether this diversity is evidence of just how rich or just how poor the concept is. If we focus on the term metropolis, we are confronted with a wealth of different phenomena, depending on which period is concerned and even on who is using the expression. The term evokes the regional equilibrium metropolises launched in the 1960s by the DATAR (French regional planning department) as well as the large world financial centers analyzed by Sassen (1991). Descriptive criteria for identifying metropolises are too numerous and not always sufficiently discriminating. The confusion is compounded when we observe that the term “metropolization” is virtually unknown in the United States (Bailly, 1999) and that the term “metropolis” does not necessarily involve international influence as it does in the European literature.

Faced with the difficulty of choosing a significant descriptive definition, we attempt to forge an analytical definition in relation to the economic theory of agglomeration (Fujita & Thisse, 2000). We relate the metropolis to the post-industrial city and to the underlying agglomeration processes. The resulting definition is a working hypothesis favoring the economic dimension and the major present-day features of metropolization. Although partial and provisory, it still provides a key for selecting and classifying empirical indicators of metropolization and for applying them to Warsaw.

2.2 Metropolises and the Post-Industrial Economy

Metropolization generally evokes new forms of urban growth, along with the more recent and dramatic changes in the form and the role of cities in developed countries. But metropolization does not affect all cities. We consider that the term singles out large cities which react more rapidly and intensely to current technical and economic changes, through

their economic and spatial structures and their economic role. This leads to the following definition.

The metropolization process is the efficient adaptation of a city to the changes in the post-industrial economy, i.e. the process by which cities become leading post-industrial cities, in terms of economic power at the national and world levels.

It will be observed that this definition is adapted and therefore restricted to the most recent aspects of metropolization. The phenomenon is not new. But we focus on its new forms resulting from the increasing importance of high-order services and from the development of information exchanges and communication technologies.

To make it clear what a metropolis really is, we must first indicate the nature of these changes and thereafter examine the way in which a city can adapt to them.

The post-industrial economy is characterized first of all by the increasing strategic role of high-order services and information.

Let us put the emergence of the post-industrial city into some historical perspective. The history of western cities can be schematically described by the succession of two well identified models: those of the pre-industrial city and of the industrial city. Today we are entering the era of post-industrial cities (Duranton, 1999; Huriot & Thisse, 2000).

The pre-industrial city is multifunctional: it brings together manufacturing but also commercial, religious, and defensive functions. It relies mainly on non-market interactions, for example as a religious site (Racine, 1993), a defense community, or a social community. This city exchanges its manufactured goods for agricultural goods. It is subjected to the "tyranny of distance" (Bairoch, 1998): its growth is strictly limited by the high transport costs of the agricultural goods it imports and of the manufactured goods it exports to the countryside. It trades more with its near hinterland than with other cities (Duranton, 1999).

The industrial city is the result of the joint effects of the changes in production techniques, the development of the division of labor, and the decline of transport costs allowing market expansion. Market interactions dominate and the city specializes in the productive functions. Large scale production develops and all the conditions prevail for the emergence and the bringing into play of internal increasing returns. The tyranny of distance weakens as a consequence of the rapid decrease in the costs of transporting goods, and urban growth accelerates. However urban growth comes up against commuting costs resulting from the scarcity of urban land: this is the "tyranny of land" (Duranton, 1999).

The emerging post-industrial city is a response to a new pattern of development which we account for by two sets of stylized facts relating to transport and communication costs and to the production system.

First, transport and communication costs exhibit new trends. While the costs of transporting goods continue to decline, direct or opportunity commuting costs are maintained, and the costs of exchanging and processing information collapse because of advances in communication technologies.

Second, production structures and processes are changing. Production is more and more intangible, meaning that services become the main activity. Even in manufacturing activities, information exchange and processing become increasingly significant compared with the direct processing of goods. Production becomes more personalized, in manufacturing with the increasing diversification of products, and even more so in services. The increasing complexity of high-order services favors their externalization and their extreme diversification requires co-production. Finally, production is more and more global, due to the expansion of markets, to the fall in transport and communication costs, to the opening-up of borders, and to deregulation. These trends reinforce the development and the strategic role of creation, decision, and control activities, which are intensive in skilled labor and information.

Informational interactions become the main means of coordination in the post-industrial economy.

The effective response to these changes is given by the metropolization process, which can be characterized by two series of major features, namely the internal concentration of metropolitan functions and the global interactions.

2.3. The concentration of metropolitan functions

Metropolitan economic functions, *i.e.* intangible, personalized, global, and information consuming activities are much more concentrated in metropolises than other functions, so that metropolises contain the major part of the high-order functions of the whole country. Moreover, the metropolises become or remain places concentrating artistic and cultural activities. Thus the metropolization process finds expression in a selective concentration of functions using information and skilled labor, in favor of certain large cities (Cattan *et al.*, 1994).

Whenever it concentrates these specific functions, the metropolis renews its spatial pattern. Even if this restructuring is variable throughout the world, large cities in developed countries display a number of common trends (Anas *et al.*, 1998). Multipolarization and specialization of centers are near-universal features. The metropolitan functions have a key role in this restructuring. These functions are concentrated mostly in cities, and they are also concentrated mostly in privileged districts within those cities. Generally, the hyper-center (the historical center in Europe, the central business district–CBD–in North America) contains most of the metropolitan functions of the city. When these functions decentralize, it is frequently only toward the very near periphery as in the Paris Region (Boiteux-Orain & Huriot, 2001). The 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.

Such concentrations can be understood in terms of proximity externalities. Metropolitan activities are intensive information users. This gives face-to-face contacts a primary role in metropolization process. Face-to-face contacts are informal but strategic as they convey exchanges of complex and personalized information needed by metropolitan activities. Advances in communication technologies do not result in the dispersion of information-dependent activities, but generate a new process of urban concentration (Sassen, 1991; Guillain & Huriot, 2001). It is generally admitted that in information exchange, new communication technologies and face-to-face contacts are complementary rather than substitutable. The new communication technologies do not dispense with the needs for face-to-face contacts, but on the contrary give rise to new needs.

Face-to-face contacts generate strong proximity externalities and we could speak of the “tyranny of proximity” by analogy with the tyrannies of distance and of land (Duranton, 1999). These are non-market externalities with a short spatial range. They act intensely on the metropolitan functions and are the most important determinants of urban agglomeration and of spatial restructuring of cities. They force specialized high-order services, which are closely interdependent and rely on face-to-face interactions, to concentrate so as to gain in efficiency. We could add that high-order services also need centrality for reasons of accessibility or prestige. Their ability to pay allows them to locate in the more central and the more expensive locations.

Thus the metropolization process depends essentially on specific agglomeration processes. But it 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, the city's size favors the concentration of metropolitan functions. More specifically, the concentration of economic activities promotes the rise and the externalization of high-level activities because they find a large market there. As a consequence, a large city is able to generate new rare activities which in turn favors diversity and thus new Jacobs-type agglomeration economies. Furthermore, a minimum size is required for the appearance of specialized public services involving high fixed costs, which generate new agglomeration economies.

In these agglomeration processes, human capital externalities, play a key role. As metropolitan functions develop, the need for skilled labor increases and human capital externalities appear. City size, the level of human capital, and information exchanges are mutually reinforcing. Because it facilitates the diffusion of information, the agglomeration of agents favors the formation of human capital. In return, human capital is a factor of agglomeration, insofar as a high level of education attracts migrants and especially those who possess a high level of human capital. Thus human capital attracts human capital. Moreover, the size of the agglomeration, the diversity of activities, and the human capital externalities combine to generate “technological infrastructures” (Feldman, 1994; Guillain & Huriot, 2001) which favor innovation, and consequently the concentration of new metropolitan functions.

2.4. Global interactions

It might be thought that proximity and global interactions operate in opposite directions. In fact, both are powerful factors of agglomeration and metropolization.

A global interaction network interconnects large cities. These connections are formal and are based on material exchanges, or immaterial exchanges using communication technologies. Through these interactions, the city is subjected to a “global tyranny” such that cities interact more with one another than they do 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 of these two types of interactions is an original feature of metropolises. In a sense, this dualism is the rebirth of what characterized the “ville-monde” described by the historian Braudel (1979) in the pre-industrial world. This city attracted and diffused. It operated as a true business center and interacted with a vast geographical area. However, its role was restricted to the luxury goods trade, it dominated a small part of economic activity and failed to generate any significant cumulative process of agglomeration.

Moreover, these interactions are closely complementary. The metropolis stands at the interface between proximity and the global economy. It organizes proximity and concentrates face-to-face interactions thereby providing greater efficiency in long range interactions. Consequently, the external role and the internal organization of the metropolis are closely interdependent. Beyond a certain level, these two dimensions of the metropolis are mutually reinforcing, so that metropolization implies metropolization. Greater efficiency in the internal organization of the metropolitan functions facilitates global interactions, and more intense global interactions favor the concentration of metropolitan functions.

From the preceding statements, it follows that the metropolization process can be analyzed in the following three stages.

First, the metropolization process operates only if initial conditions are satisfied, giving a city the capacity to become a metropolis, *i.e.*, to generate and reinforce the economies of proximity and the global interactions favoring metropolization (section 3).

Second, when these conditions are fulfilled, a restructuring of the city takes place and affects its functional, social, cultural, and spatial composition. This restructuring represents the internal dimension of metropolization. It is reflected by a marked specialization in metropolitan functions and an intra-urban polarization of these functions (section 4).

Third, this internal restructuring can result in greater attractiveness and more economic power, at the national and world level. This is the external or global dimension of metropolization (section 5).

These three stages are only a mode of exposition. The phenomenon is more complex. It is not only sequential but also circular and cumulative: each stage reinforces the others. The restructuring of the city changes the initial conditions, and the rise of international power affects the internal organization and the initial conditions.

We associate a series of indicators with each of these stages. We are subjected to the constraints of Polish data. Urban data are difficult to obtain, and when they are available, they are often non-homogenous and not very reliable. Many different sources have been combined, from statistical yearbooks to online data bases. Our sources are listed in the appendix.

3. THE CAPACITY FOR METROPOLIZATION

Every agglomeration depends closely on initial conditions, which may be comparative advantages or historical accidents: in spatial processes, history matters, as Krugman (1991) asserts. These conditions are necessary but not sufficient. An agglomeration process must follow. At a later stage of agglomeration, the metropolization process also depends on necessary conditions. It takes place only if the agglomeration is able to generate or strengthen the concentration of metropolitan functions.

In this application, the criteria selected are the size of the city and its position in the Polish and European city system, its productive potential approximated by the GDP per head, which favors the rise of the metropolitan functions, and the educational and cultural structures, which are at the source of human capital externalities and enhance the development of metropolitan functions.

3.1 The Size of a Metropolis

The metropolitan functions will develop only if externalities exceed a minimum level. Even if it is not absolutely decisive, the size of the city is a relevant criterion. The relative city size may also be significant. Given the absolute size, a city will more probably emerge as a metropolis if it is well placed within the national hierarchy of cities. This is so if the city is a capital or if there is a high primacy rate¹ (Cattan *et al.*, 1994).

In 1999, the population of Warsaw was more than 1.6 million, that is to say 4.2% of the Polish population, and twice the population of the second city, Lodz (800 000 inhabitants). This is a common situation since the primacy rate is more than two in most countries of the world (Moriconi-Ebrard, 1993). The third city, Krakow, has 740 000 inhabitants. The next

seven cities have between 350 000 and 600 000 inhabitants. Thus the second rank cities form a large and relatively homogenous lattice clearly dominated by the capital.

Warsaw ranks far behind the large European cities. However it has improved its position. In 1950 it was Europe's 32nd city with one tenth of the population of London (Hohenberg & Lees, 1985). By 1996, the city had risen to 11th place among European cities², well behind Paris and London, but up with Hamburg and Vienna, and ahead of Prague. The migration balance is slightly positive while it is negative in other CEEC cities such as Budapest, Bratislava, or Prague.

3.2. Productive Advantages for Metropolization

In 1999, the Warsaw region (Mazowieckie) represented 13.1% of the Polish population but 19.6% of the national GDP. Product per head was 24 000 zlotys³, 50% higher than in Poland as a whole and the highest of all Polish regions. GDP per head in Warsaw is twice that in the Warsaw region, and three times the national level. Other Polish cities have a lower GDP (table 1). By way of comparison, the Paris Region, with 18.8% of the French population, generates 29% of the national GDP. In the Paris Region, the GDP per head is also 50% more than in France as a whole, but it is twice the GDP of the Warsaw Region.

Still in 1999, the unemployment rate was very low in Warsaw: 3.2%, versus 15.1% for the whole of Poland. It was lower than in all the large Polish cities. In the same year, the unemployment rate was 10.1% in Paris and 4.6% in Dublin. We can say very guardedly that this could be an indication that the city is adapting well and could be a sign of good matching of supply and demand on the labor market.

These results confirm those of an earlier study of the differing capacities of Polish regions to adapt to the new economic situation. With its high urbanization rate and high GDP, the Warsaw region was clearly identified as the most dynamic region (Bourdeau-Lepage, 2002a). It displayed the most extensive restructuring movement and a very active labor market.

3.3. The Sources of Educational and Cultural Externalities

Warsaw dominates the Polish educational structure. With 4.2% of the population, Warsaw counts 8.5% of the secondary schools and 18.5% of higher education institutions⁴. Warsaw is the leading Polish city in terms of student numbers, ahead of Kraków. It has the largest concentration of students in Poland. However, the number of students per 1 000 inhabitants puts Warsaw behind Lublin, Wrocław, and Kraków (table 1). Warsaw is in a better position for the highest education levels, since in 1998 it awarded 29% of Polish masters degrees (five years of higher education) for day studies⁵ and 20% of the doctorate diplomas (15% were awarded in Kraków).

Warsaw does not display a marked concentration of cultural infrastructures. It accounts for only 4.8% of movies (which are uniformly distributed throughout Poland) and 7.5% of Polish museums, but the city is home to 19% of Poland's theaters. The concentration is clearer in terms of cultural activity since Warsaw takes the first place for the number of seats in movies and it stages 23% of the total number of film shows, *i.e.* three times more than in Wrocław and five times more than in Kraków. Warsaw receives one eighth of the total number of Poland's museum visitors, with 2.3 million visitors to its 50 museums in 1998. This figure puts Warsaw ahead of Prague (2 million visitors), but behind Vienna (7 million), and far behind Berlin (13 million) and St Petersburg (22 million; 1992 data).

The performance in terms of libraries is also disappointing. Despite its 177 public libraries (markedly more than in Prague, Budapest, or even in Vienna), the rate of lending per head was 4.2 in 1999, below the average of 4.6 for the 58 largest European cities (for 1996, EUROSTAT data excluding Paris and London).

Table 1 – The Capacity for Metropolization: Warsaw and the Large Polish Cities in 1999

	Population (in thousands)	GDP/inhab. (zł/inhab.)	Number of higher education institutions	Students per 1000 pop.*	Public libraries	Seating in cinemas per 1000 pop.
Kraków	738.2	26330	15	89.8	69	6.2
Bydgoszcz	386.3	-	-	36.2	37	5.9
Gdańsk	457.9	24376**	-	69.7	40	5.2
Katowice	343.2	-	9	65.9	38	5.0
Lublin	356	-	-	111.0	31	7.3
Łódź	800.1	20645	-	88.0	84	6.0
Poznań	576.9	32796	-	89.6	65	10.0
Szczecin	416.6	-	-	65.3	46	5.9
Warsaw	1615.4	48217	53	62.3	177	10.8
Wrocław	636.8	25285	-	85.7	67	9.4
POLAND	38654	15914	287	37.0	9100	5.5

Sources: Calculated from GUS (2002a), tab. 85; GUS (2002b); USK (2001), tab. 18 & 27 and USKr (2000), tab. III.

* in higher education institutions for 1999/2000; ** Gdańsk, Gdynia, Sopot.

Finally, these elements give Warsaw a relative advantage derived essentially from its role as capital in a regular hierarchy of cities. However, Warsaw is in competition with a series of secondary cities. Its superiority derives more from its position in the Polish production structure than from the educational or cultural infrastructures which are evenly distributed throughout Poland. Moreover, Warsaw suffers from intense rivalry with Kraków in terms of image and historical prestige. Warsaw can thus rely more on its comparative advantages in terms of production concentration and productivity. Its economic size and performances may push Warsaw to take off as a metropolis.

We shall now examine how Warsaw has been able to adapt its structure to the new economic situation.

4. PROXIMITY AND THE ORGANIZATION OF METROPOLITAN FUNCTIONS

The city of Warsaw is divided into 17 administrative units, of which 10 are peripheral communes (“gminas”) and 7 are central districts forming the central commune called the city-center (see the maps in the appendix). The analysis is conducted in three phases, corresponding respectively to three spatial geographical scales. First we show that Warsaw as a whole specializes significantly in metropolitan functions. Second, we examine the center-periphery structure of the city and show how metropolitan functions concentrate mainly in the city-center. Third, we observe in detail the structure of this city-center and the concentration of metropolitan functions in three central districts, principally in the city-core, Śródmieście.

The new urban patterns of Warsaw are captured by data on employment and on economic units by sector, as well as in terms of the importance of a number of selected metropolitan

functions, which are very sensitive to proximity externalities, such as specialized producer services or decision functions represented by corporate headquarters.

4.1. The Rise of Services in Warsaw

The city is adapting rapidly to the new requirements of the market economy. Its economic structure is becoming more diversified. The de-industrialization process engaged at the beginning of the 1970s is continuing and service activities are expanding as part of a catching-up process..

The rise of services is much more marked in Warsaw than on average in Poland. At the end of 1999, 73.4% of the work force were employed in services in Warsaw compared with only 46.1% in Poland as a whole, which corresponds to a location quotient (LQ) of services of 1.64 in Warsaw (Bourdeau-Lepage, 2002b). In Paris, London, and Brussels, the rate of service employment is close to 80%. The Warsaw structure is similar to that of Dublin whose corresponding rate is 73.8% (IAURIF, 2001b).

The tertiary structure of Warsaw results from a relative decrease in non-market services and a large increase in market services. From 1994 to 1999, employment in market services increased by 27.3% with extreme growth rates of 83% for financial activities and 44.4% for business services. In the same time, the location quotient in Warsaw rose from 1.67 to 1.81 for market services and fell from 1.56 to 1.38 for non-market services (Bourdeau-Lepage, 2002b).

This evolution is the consequence of the opening to the market and is a sign of the metropolization of the city. Market services like financial activities or producer services were virtually absent before 1989 and have developed very rapidly since. The specialization of Warsaw in market services results from the operation of intensive agglomeration processes. These services are closely related to one another and their development can determine the development of other service activities by cumulative processes.

The capital has adapted more rapidly than the other large Polish cities. De-industrialization has occurred on a larger scale and Warsaw was the only Polish city of more than 300 000 inhabitants to be specialized in market services in 1999, with a location quotient of 1.24 (table 2).

The opening-up to the market economy and tertiarization have led to a dramatic expansion in high-order services which were virtually absent during the central planning era. For example, in 1989, nine consulting companies were established in Warsaw. There were 317 in 1996 and 432 in 1999 (Wilk, 2001). Law firms, notarial firms, and banks have followed the same pattern. In 2000, more than one third of the headquarters of Poland's 500 largest firms were located in Warsaw.

It seems that Warsaw has adapted rapidly to the new situation, mainly by a large increase in market services and especially in high-order services. This adaptation has gone along with a spatial restructuring of the city.

Table 2 – The Specialization of Polish Cities with over 300 000 Inhabitants in 1999 (LQ)

	Industry & construction	Market services	Non-market services
Warsaw	0.81	1.24	0.85
Kraków	1.12	0.86	1.08
Bydgoszcz	1.29	0.80	0.97
Gdańsk	1.02	0.92	1.09
Katowice	1.18	0.98	0.83
Lublin	0.96	0.78	1.39
Łódź	1.14	0.79	1.17
Poznań	1.03	0.98	1.01
Szczecin	1.07	0.93	0.99
Wrocław	1.03	0.91	1.13
All ten cities	1.00	1.00	1.00

Source: Calculated from USKr (2000) tab. III.

4.2. Metropolitan Functions: the City-Center *versus* the Periphery

The emerging metropolitan functions seek to be located centrally. They modify the spatial organization of the city where they develop, by their own location and by their effects on the location of related activities. This spatial recomposition is both the result of and a necessary condition for sector restructuring, through the operation of agglomeration economies and cumulative processes.

The diversification of economic activity implies a tendency toward a new specialization of the periphery and of the city-center, in terms of employment as well as of economic units. Retailing is more and more suburbanized and the center accommodates the activities which are the most sensitive to agglomeration economies (Bourdeau-Lepage, 2002b).

As usual, the periphery specializes in activities demanding space such as manufacturing, and in those which follow population such as retailing and education. An important zone specialized in retailing and high-order services is emerging. It is made up of the contiguous communes of Ursynów and Wilanów (see the appended map), which differ from the other peripheral communes by the large proportion of their economic units in real estate, renting, and business services (this proportion is 25% more than the city's average, *i.e.* the location quotient is 1.25). This is evidence that agglomeration economies play a significant role, alongside transport costs, in the suburbanization of economic activities (Bourdeau-Lepage, 2002b).

The city-center is clearly dominant in terms of both employment (Bourdeau-Lepage, 2002b) and number of economic units. In 2000, 62% of economic units in Warsaw were localized in the city-center⁶ and mainly in the central districts of Śródmieście (15%), Mokotów (14%), Praga-Południe (11%) and Wola (9%). This concentration is still more marked for the 5% of Warsaw's economic units which count more than nine employees. These units employ 760 000 people 77% of whom are based in the city-center (28% in Śródmieście, 16% in Mokotów, 7% in Praga-Południe, and 12% in Wola).

This concentration in the city-center is differentiated by sector. The central districts are clearly specialized in tertiary activities, mainly in metropolitan functions. In 1996, 86% of the 432 consulting firms were in the city-center (Wilk, 2001). More than 90% of law firms, notarial firms, and banks were located in the city-center (table 3). The city-center is also the privileged place for the firms' decision functions. In 2000, more than three-quarters of the 165 Warsaw headquarters were located in the city-center (table 3). These new activities are very

sensitive to information externalities and therefore to proximity. The central district also concentrates activities associated with metropolitan functions, such as printing or reprography.

Table 3 – The Location of Metropolitan Functions in Warsaw.

	Consulting Cies in 1999	Law firms in 2000	Notarial firms in 1999	Banks*	Commercial banking agencies*	Headquarters in 2000
CENTRUM	86.3	91.9	91.5	84.5	90.7	77.0
Mokotów	14.1	8.5	6.4	13.6	13.4	13.3
Sródmięcie	44.9	63.3	67	41.7	46.4	26.1
Wola	9.3	7.7	7.4	13.6	17.5	17
Rest of Warsaw	31.7	20.4	19.1	31.1	22.7	33
WARSAW	100	100	100	100	100	100
Number of units	432	714	94	206	97	165

Sources: calculated from Wilk (2001) and Rzeczpospolita (2002).

* on June 30, 2000.

4.3. Metropolitan Functions: the Leading Central Districts

Within the city-center, the concentration of metropolitan functions is even more apparent. Metropolitan functions are concentrated in only three of the seven central districts, essentially in the city-core Sródmięcie, and to a lesser extent in Wola and Mokotów. Sródmięcie is by far the most attractive district and is emerging as a true business center like those of western metropolises (Bourdeau-Lepage, 2002b). Externalities, and mainly information externalities, are doubtless high enough to generate a pronounced concentration of high-order services and of associated activities. Sródmięcie and Mokotów together group 67% of economic units in a set including metropolitan functions and associated activities⁷.

The specialization of Sródmięcie is marked in high-order services which require close proximity: public administration (LQ⁸: 3.5), real estate (LQ: 1.3), science, and research & development (LQ: 1.2), as well as in associated activities: the district features the main concentration of restaurants and hotels in the city.

In the domain of our selected metropolitan functions, Sródmięcie is clearly predominant, since it concentrates more than 40% of the consulting companies, banks, and commercial banking agencies, and more than 63% of the law firms and notarial offices. The district is also home to 26% of Warsaw's corporate head offices, that is to say 9% of the headquarters of Poland's 500 largest firms. Most of them are in financial activities: the business center concentrates half of the financial headquarters of Warsaw. It also concentrates all the hotel headquarters and one-third of the real estate and business services headquarters in Warsaw (table 4).

Wola and Mokotów are both distinguished by the presence of consulting companies, banks, and finance company headquarters. Wola attracts headquarters, mainly in transport and communication and is more specialized in finance than Mokotów. Mokotów is specialized in science and research & development (LQ: 1.2), real estate, renting and business services (LQ: 1.15) and computing (LQ: 1.1). It also has a significant share of commercial headquarters. This district displays an original structure. It is a rich residential area with few economic activities, but it accommodates a significant proportion of Warsaw's high-order functions. This district did not appear as an "employment zone" in the analysis of Warsaw's

suburbanization (Bourdeau-Lepage 2002b), and its hidden strategic role is revealed only by examining the metropolitan functions in detail.

Table 4– The headquarters, by sector, in three central districts

	CENTRUM	Mokotów	Sródmięcie	Wola	Rest of Warsaw	WARSAW*
Primary sector (A, B)	1.6	0	2.3	0	1.4	1.2 (2)
Industry (C, D, E)	16.5	22.7	18.7	7.1	30.6	22.4 (37)
Construction (F)	4.7	4.5	4.7	3.6	4.2	4.2 (7)
Trade and repair (G)	29.9	40.9	11.6	32.1	38.9	30.9 (51)
Hotels and restaurants (H)	1.6	0	4.7	0	0	1.2 (2)
Transport, storage and communication (I)	7.1	0	4.7	14.3	9.7	7.9 (13)
Financial intermediation (J)	27.6	18.2	41.9	35.7	5.6	21.8 (36)
Real estate and business activities (K)	7.1	9.1	9.3	3.6	6.9	7.3 (12)
Other services (O)	3.9	4.5	2.3	3.6	2.8	3 (5)
TOTAL	100	100	100	100	100	100 (165)

Sources: calculated from Rzeczpospolita (2002).

* The figures in brackets are the number of headquarters.

Notice that the district of Ochota is specialized in real estate (LQ: 1.6).

Finally, analysis of the spatial distribution of the metropolitan functions within Warsaw strengthens the analysis of the concentration of these functions in Warsaw. The dominant role of the city-center is consolidated by its cultural potential. It is the primary location for museums, cinemas, and theaters (Bourdeau-Lepage, 2002b).

5. WARSAW IN THE GLOBAL ECONOMY

The internal structure of Warsaw reveals a number of winning cards in the metropolization process. Our central hypothesis states that the efficiency of the internal organization in Warsaw should affect the external role of the city. The metropolitan functions concentrated in Warsaw endow it with a power for creating, deciding, and controlling. The high concentration of these functions in the business district facilitates external contacts at the national and international levels. In order to determine whether Warsaw is effectively able to fulfill this external role, we propose to examine how the city fits into transport networks and try to evaluate its rank in the hierarchy of world cities based on economic and cultural criteria.

5.1. A Second-Rate Position for International Accessibility

Warsaw airport accounted for 75% of Poland's passenger traffic in 2000 with more than 4.3 million passengers. Nearly 90% of them took international flights. This traffic corresponds to two passengers per inhabitant, which is less than the average rate of 9.7 calculated for the 58 largest European cities excluding Paris and London. Warsaw's traffic is therefore relatively low. The traffic in Paris, for both Orly and Roissy airports, totals nearly 70 million passengers (IAURIF, 2001a). Warsaw's traffic in 2000 was equivalent to that of Paris in 1960. In 1998,

total traffic was 34.4 million passengers in Amsterdam, 18.5 in Brussels, 17.4 in Manchester, 11.6 in Dublin, and 10.6 in Vienna.

The insertion of Warsaw in the air network can be assessed in terms of accessibility. For example, an evaluation of the potential accessibility was conducted for 55 European cities in terms of time⁹ (Delvin, 1993). Cities in the CEEC have generally low accessibility. Other evaluations confirm this pessimistic result, and even show a worsening of the situation (from 1977 to 1997, Timberlake *et al.*, 2001).

The attraction of Warsaw relies also on perceptions of its accessibility by the transport networks. Interviews of senior executives of European firms (Healey & Baker, 2001) show that this image is rather poor. Of 30 cities surveyed, Warsaw ranks last with Prague.

5.2. Expected Economic Attractiveness

Economic decisions preparing Warsaw's future rely on the city's image and its appeal for business and investment. The same report by the consulting firm Healey & Baker shows Warsaw in 27th position among the 30 cities with significant appeal in 2001. This survey gives detailed results about the rank of each city for many criteria.

One fifth of the firms surveyed planned to have offices, manufacturing, distribution, or sales outlets in Warsaw (ranked 12th in Europe). On current expectations, more than one quarter of the firms will be in that situation in 2006, putting Warsaw in 9th position. However, only one fifth of the executives surveyed knew Warsaw well and a lot of them would like more information about the city and thought that Warsaw did not promote itself well enough. Detailed results by attractiveness criteria¹⁰ reveal that Warsaw is not very attractive in terms of the availability of skilled labor, the quality of telecommunications, the quality of life, the ease of intra-urban transport, the quality of the environment (pollution), and the language. Conversely, it is clearly attractive for labor costs (despite the fact that the average wage is higher than in most CEEC: see DREE, 2002), the price and availability of office floor space, and less so for government incentives and market access.

Consequently, Warsaw is attractive in terms of low costs of factors and access to markets rather than in terms of the quality of its living and working environment, and of its infrastructures. Its attractiveness is more prospective than actual.

More objective evaluations of attractiveness tend to confirm these results.

Warsaw receives proportionally more foreign capital than other Polish cities. Almost one quarter of the commercial companies with foreign capital are located in Warsaw. Only 4.6% are in Wrocław, 4.5% in Poznań, and 3.3% in Kraków¹¹.

Based on the criterion of the presence of high-order producer services, an inventory of European cities has been drawn up by the research network Globalization and World Cities (GaWC; Beaverstock *et al.*, 1999). Services surveyed include accounting, advertising, law, and banking services. For each type of service, cities are classified and weighted in three groups: primary centers (3 points), major centers (2 points), and minor centers (1 point), depending on the degree of presence of the largest international firms in this activity. The four classifications are combined by giving each city a grade from 1 to 12, equal to the sum of the points obtained. This evaluation puts Warsaw in the third class of world cities (gamma world cities), with a grade of 5, immediately behind Amsterdam, Dusseldorf, Geneva, and Prague and on the same footing as Rome and Stockholm in Europe. Only 21 cities obtained 5 points or more. Warsaw scores well (major center) for legal and banking services.

5.3. Increasing Cultural Attractiveness

Despite wartime destruction, Warsaw still has a potentially attractive cultural heritage. The city ranks 16th in Europe after Prague and Budapest but curiously ahead of Kraków, Athens, and Amsterdam¹² (Vandermotten, 2000).

This potential is probably related to the increasing role played by Warsaw as a venue for international congresses. The International Associations Union records congresses of at least 300 people, 40% foreigners, and five nationalities, and lasting at least three days. Of 9 400 congresses recorded in 1999 around the world, 57% were held in Europe. Poland's share was barely more than 1%, just behind Korea, India, Portugal, Hungary, and Greece (which have very similar shares). Poland comes far behind the two leading countries, the United States (13%) and France (7%).

However, Warsaw has a significant position in the hierarchy of cities participating in international congresses. It features in the second group, which follows that of the world's 25 leading cities such as Paris, Brussels, and Berlin. This second group contains cities like Lisbon, Munich, Montreal, Lyon, Chicago, and Warsaw, ahead of Toronto, Atlanta, Dublin, and Florence. Warsaw has made more progress during recent years than most other cities in Europe and indeed the world. In the same group, Warsaw is behind Paris, Brussels, Vienna, London, Strasbourg, Rome, or Barcelona and Lyon, but is ahead of Dublin, Birmingham, Florence, Moscow, Milan, Cambridge, Bonn, and Bordeaux.

Judging from these various economic and cultural criteria, it seems that the external role of Warsaw is still not at the level we might expect from its internal economic restructuring.

6. CONCLUSION

Is Warsaw a city in the process of metropolization? The answer cannot be clear-cut, but we can propose a reasonable interpretation of the results.

The answer cannot be clear-cut, for a series of reasons, related to the concepts, to the data, and to the results.

Despite our search for an analytic definition of metropolis and metropolization, this concept remains multidimensional and qualitative. The recent work by Lacour & Puissant (1999) emphasizes both the agreements and the disagreements between experts in urban economics or geography. Consequently, even the best quantitative indicators would reflect the phenomenon only partially and subjectively.

We have tried to push back these limits by gathering a wide variety of information, by comparing diverse sources, by combining data on employment and economic units, by including educational and cultural aspects, and by adding the results of opinion interviews to more objective measures. The points presented in this paper are mutually consolidating and converge toward the same interpretation.

The central argument of this paper is that the metropolization process is characterized by the conjunction and the interplay between two levels of urban organization, the internal level governed by close proximity externalities and the external level depending on global and long-distance interactions between cities. The results show significant and rapid growth of metropolitan functions in Warsaw, and an efficient organization of these functions in the main business center and in two minor centers, with the aim of maximizing agglomeration economies. In its internal composition and structure, it seems that Warsaw is well placed to

join the circle of European metropolises. However, the external situation of Warsaw is not so good and its role in the world is still a minor one. This reveals a gap between internal and external metropolization in Warsaw.

This gap could be explained by history and by the specific case of Poland. The opening to the market has led to a rapid change in the production structure. In Poland, Warsaw is clearly the leading city for the adaptation to the new economic situation, essentially through the marked specialization in high-order services. However, like other CEEC cities, Warsaw suffers from the inheritance of long years of at least partial closure to interaction with the West, which has still not been offset by the expectations of future membership of the European Union. The inertia of practices and of perceptions may explain this gap.

However, we think that this gap could be made up. The first reason stems from the central idea of the paper. If the efficiency of the internal structure of a city really does affect its external influence, the success of the former should entail, in the not too distant future, the success of the latter. Moreover, the internal and external phenomena can react with one another and generate a cumulative process of metropolization. The second reason is based on evidence which seems to herald metropolization, such as the presence in Warsaw of foreign capital, the rise of the city as a place for international congresses, and the positive expectations of European executives about the attractiveness of Warsaw for business and investment. Finally, the leading role of Warsaw within Poland may give it a role as an interface between the European Union and Poland and maybe between the European Union and Russia.

BIBLIOGRAPHY

- Anas A., Arnott R. and Small K.A. (1998), Urban Spatial Structures, *Journal of Economic Literature*, XXXVI, 1426-1464.
- Bailly A. (1999), Regards croisés sur un concept, in : Lacour C. and Puissant S., *La métropolisation. Croissance, diversité, fractures*, Paris : Anthropos, 153-164.
- Bairoch P. (1998), *Cities and Economic Development: From the Dawn of History to the Present*, Chicago: University of Chicago Press.
- Beaverstock J.V., Smith R.G. and Taylor P.J. (1999), A Roster of World Cities, *Cities*, 16, 6, 445-458.
- Boiteux-Orain C., Huriot J.-M. (2001), L'économie des nouvelles structures urbaines. L'Ile-de-France en perspective, communication au 50^e congrès de l'AFSE, Paris, 20-21 septembre.
- Bourdeau-Lepage L. (2002a), Marchés du travail et disparités régionales en Pologne, *Région et Développement*, 15/2002.
- Bourdeau-Lepage L. (2002b), Varsovie entre agglomération et dispersion, *Revue d'Economie Régionale et Urbaine*, 3.
- Braudel F. (1979), *Civilisation matérielle, économie et capitalisme, XV^eme-XVIII^eme siècle*, Paris : Armand Colin, tome 3.
- Cattan N., Pumain D., Rozenblat C. and Saint-Julien T. (1994), *Le système des villes européennes*, Paris : Anthropos (Coll. Villes).
- Delvin G. (1993), L'accessibilité aérienne des villes européennes, *Revue Belge de Géographie*, 117, 23-37.

- Duranton G. (1999), Distance, sol et proximité. Analyse économique et évolution urbaine, *in* : Bailly A. et Huriot J.-M. édés, *Villes et croissance. Théories, modèles, perspectives*, Paris : Anthropos, 91-131.
- Feldman M. (1994), *The Geography of Innovation*, Dordrecht: Kluwer.
- Fujita M. and Thisse J.-F. (2000), The Formation of Economic Agglomerations: Old Problems and New Perspectives, *in* Huriot J.-M. and Thisse J.-F. eds, *Economics of Cities, Theoretical Perspectives*, Cambridge: Cambridge University Press, 3-73.
- Guillain R. and Huriot J.-M. (2001), The Local Dimension of Information Spillovers. A Critical Review of Empirical Evidence in the Case of Innovation, *Canadian Journal of Regional Science*, forthcoming.
- Hohenberg P.M. and Lees L.H. (1985), *The Making of Urban Europe, 1000-1950*, Cambridge: Harvard University Press. French translation (1992), *La formation de l'Europe Urbaine 1000-1950*, Paris : PUF.
- Huriot J.-M. and Thisse J.-F. (2000), Introduction to *Economics of Cities, Theoretical Perspectives*, Cambridge, Mass.: Cambridge University Press, ix-xv.
- Krugman P. (1991), *Geography and Trade*, Cambridge, Mass: MIT Press.
- Lacour C. (1999), Méthodologie de recherche et théorisation des villes, *in* : Lacour C. and Puissant S. édés, *La métropolisation. Croissance, diversité, fractures*, Paris : Anthropos, 63-113.
- Lacour C. and Puissant S., coordinated by (1999), *La métropolisation. Croissance, diversité, fractures*, Paris : Anthropos.
- Moriconi-Ebrard F. (1993), *L'urbanisation dans le monde*, Paris : Anthropos.
- Racine J.-B. (1993), *La ville entre Dieu et les hommes*, Paris : Anthropos.
- Sassen S. (1991), *The Global City*, Princeton: Princeton University Press.
- Timberlake M., Smith D.A. with Shin K.H. (2001), The Relative Centrality of Cities Based upon Air Passenger Travel. GaWC Data set 10, available on-line.
- Vandermotten G. (2000), Structuration de l'espace et grandes métropoles européennes, *in* : Wackermann G. éd., *Les métropoles dans le monde*, Paris : Ellipses, 71-86.
- Wilk W. (2001), Czynniki lokalizacji i rozmieszczenie wybranych usług w Warszawie (Location Factors and Spatial Distribution of Selected Services in Warsaw), Warsaw: University of Warsaw, Department of Geography and Regional Studies.

APPENDIX

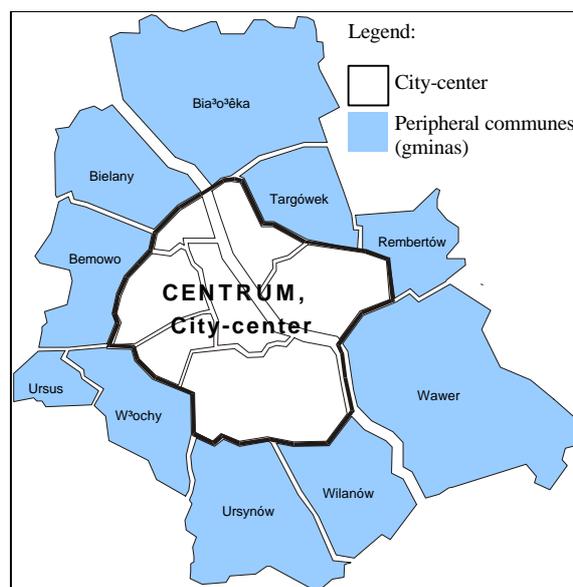
1. List of Data Sources

- Biuro Zarz¹du Miasta Sto³ecznego Warszawy : BZMSW (2002), Ocena zmian w zagospodarowaniu przestrzennym M. st. Warszawy w latach 1998-2001, Warszawa: Miejska pracownia planowania przestrzennego i strategii rozwoju, forthcoming.
- EUROSTAT (2000), *L'audit urbain*, Luxembourg: Communautés européennes.
- G³owny Inspektorat Lotnictwa Cywilnego : GILC (2001), report n^o2 (128), available on-line: www.gilc.gov.pl.
- G³owny Urz¹d Statystyczny : GUS (2001a), *Rocznik Statystyczny Rzeczypospolitej Polskiej 2001*, Warszawa.
- G³owny Urz¹d Statystyczny : GUS (2001b), *Powiaty w Polsce*, Warszawa.
- G³owny Urz¹d Statystyczny : GUS (2002a), *Województwa w latach 1995-2000*, available on-line: stat.gov.pl.

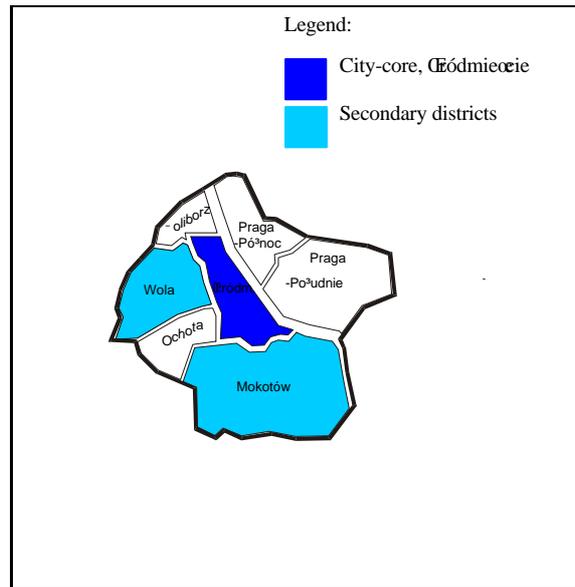
- Główny Urząd Statystyczny : GUS (2002b), *Mały Rocznik Statystyczny (człowiek) 2000*, available on-line: stat.gov.pl.
- Główny Urząd Statystyczny : GUS (2002c), *Main Indicators of the National Economy*, available on-line: stat.gov.pl.
- Healey & Baker (2001), *European Cities Monitor*, London: Healey & Baker, Marketing Department.
- IAURIF (2001a), *40 ans en Ile-de-France. Rétrospective 1960-2000*, Paris: IAURIF, Etudes et Documents.
- IAURIF (2001b), *Les métropoles du Nord-Ouest de l'Europe en chiffres*, PROJET INTERREG II GEMACA II, Paris.
- DREE (2002), *Revue Elargissement* n°26, 29 avril 2002, available on-line: www.dree.org.
- Rzeczpospolita (2002), *Lista 500* (The list of the 500 largest Polish firms), available on-line: www.rp.pl/dodatki/lista500_2001_010508/index.html.
- United Nations (1994), *World Urbanization Prospects: the 1994 Revision*, New-York: United Nations, Population Division.
- Union of International Associations (2002), *International Meetings in 1999*, available on-line: www.uia.org/uiapubs/pubcalen.htm.
- Urząd Statystyczny w Warszawie : USW (1996), *Rocznik Statystyczny Warszawy 1996*, Warszawa.
- Urząd Statystyczny w Warszawie : USW (2000), *Rocznik Statystyczny Warszawy 1999*, Warszawa.
- Urząd Statystyczny w Warszawie : USW (2001a), *Rocznik Statystyczny Warszawy 2000*, Warszawa.
- Urząd Statystyczny w Warszawie : USW (2001b), *Panorama gmin Warszawy 1999 rok*, Warszawa.
- Urząd Statystyczny w Krakowie : USKr (2000), *Rocznik Statystyczny Krakowa 2000*, Krakow.
- Urząd Statystyczny w Katowicach : USK (2001), *Statystyka powiatów województwa slaskiego 2000*, Katowice.

2. Maps: Administrative Division of Warsaw from 1994 to 2002

Map 1: Communes (Gminas) of Warsaw



Map 2: The city-core and secondary districts in 1999



Notes

¹ Ratio of the population of the capital to the population of the second city.

² The 58 largest European cities of EUROSTAT data base to which we add Paris, London, Bucharest, Budapest, Warsaw, Prague, Sofia and Bratislava (EUROSTAT 2000 and USW 1996 p. 290).

³ One zloty is approximately 0.30 Euro.

⁴ Poland has 287 higher education institutions including 15 universities.

⁵ Polish data distinguish day studies, evening studies, weekend studies and extramural studies. Day studies represent only 43.3% of diplomas awarded.

⁶ The city-center corresponds to the "Centrum" commune (gminas) of Warsaw.

⁷ This group includes real estate, computing, science, research & development, printing, reprography, and hotel business.

⁸ This quotient and the following ones are based on the number of economic units ; quotients based on employment data lead to similar results (Bourdeau-Lepage, 2002b).

⁹ This measurement is made for each city on the basis of the average access time to the 54 other cities, taking account of the flight time, the access time to the airport, and half the average interval between two flights.

¹⁰ The questions are "which city do you think is best in terms of the criterion X? Which is second best and which is the third?" The 30 cities are ranked according to their scores. The scores are based on the responses and weighted according to the best, second best, and third best.

¹¹ Calculated from GUS, 2001a and USW, 2001a.

¹² This classification of European cities is derived from a quantitative analysis of the contents of the Michelin Guide to Europe.