Polycentric Metropolitan Form: Application of a 'Northern' Concept in Latin America

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1. Introduction

Until the early 1980s, the monocentric model was the standard approach to study the spatial structure of cities in countries of advanced economies. This model 'postulated a concentration of employment in the central business district (CBD) with the rest of the metropolitan area devoted to residential use'.[1] But not all employment was concentrated in the CBD: manufacturing was generally located outside it, in areas with lower densities and land values.[2] Gradually, more employment started to move outside the CBD, following and anticipating residential suburbanisation. After 1950, 'Fordism simultaneously accentuated centrality, with the concentration of financial, government, and corporate headquarters in and around the downtown core; and accelerated decentralization, primarily through the suburbanization of the bourgeoning middle class, manufacturing jobs and the sprawling infrastructure of mass consumption that was required to maintain a suburban mode of life'.[3]

Since the 1980s, however, we see a more fundamental change. The city centre ceased to be the single focal point for productive activities and jobs. Metropolitan areas have stretched out into discontinuous, borderless and centreless urban forms with a growing number of economic subcentres. These subcentres have functional interrelations with the city centre and other urban nodes located in the same city and in other cities, at national or international level.

These trends made clear that the monocentric CBD-dominated city was no longer valid. The polycentric model emerged - and gained popularity - to denote the new spatial reality of metropolitan areas. The concept of polycentricity, however, does not have a clear and undisputed meaning. On the contrary: to paraphrase Davoudi, the concept has now different meanings for different people with regard to different urban configurations at different geographical scales.[4] These different configurations correspond with different manners of spatial development of polycentric urban systems: the centrifugal, the incorporation and the fusion mode.[5]

Due to the spatial origins of their urban systems - a number of small and medium-sized cities at close proximity - European studies pay attention to 'polynucleated metropolitan regions' and 'polycentric urban regions' that have evolved by an incorporation or fusion mode.[6] On the other hand, United States' literature generally addresses a centrifugal mode[5] of outward expansion of single metropolitan areas with new subcentres of employment.

A variety of forms and sizes of employment clusters in subcentres have been observed in the U.S. Some even 'look remarkably similar to a traditional CBD, with thousands of workers employed in a wide variety of industries'.[7] The CBD may still be the largest employment cluster, but decentralisation has had significant effects on its overall spatial distribution across the metropolitan area.

Further, the discourse in North America observes, often in 'abstractions of postmodernism',[8] a changing 'big picture' of metropolitan areas within the context of the globalising post-industrial economy. An evermore expanding patchwork-type of spatial distribution of economic subcentres is being emphasised, connected with their increasing functional diversity and diverging geographical patterns of functional interrelations.

Several scholars have suggested that metropolises of the developing world also show trends towards polycentricity.[9] Some of them commented on emerging subcentres in large metropolitan areas in Latin America. Harris e.g. already mapped 'the subcentres' of Caracas, Lima, Sao Paulo and Buenos Aires. In his 'model of the Latin American city', Bähr distinguished a few subcentres, a phenomenon which became almost generally accepted as of the 1980s.[10] But these subcentres were generally mentioned in descriptive terms, without clear definitions, and hardly operationalised in quantitative terms (as it eventually happened in North America). Their (spatial) evolution was neither systematically tracked through time and/or placed in comparative perspectives.

This paper attempts to broaden our knowledge on the concept of polycentricity by exploring the dynamics of subcentre formation in large metropolitan areas in Latin America according to the spatial distribution of employment. It focuses on large metropolitan areas, for, if sizeable subcentres of employment have developed in Latin America, they are expected to occur there. In essence, this contribution reviews the international and local literature on the (Latin American) polycentricity debate related to issues of the metropolitan form and its transformation through time, but not from the perspective of planning or governance.

In the absence of explicit criteria to answer the main questions, an indirect methodology will be used, consisting of three steps. The first starts with a brief historical review of polycentricity in North America, resulting in a few key-elements that typify the polycentric development of its metropolitan areas. In the second step, the paper gives a bird's-eye view of the debate on possible subcentre formation in large metropolitan areas of Latin America. Since the local literature on polycentricity is mostly of a qualitative and descriptive nature, this part finishes by presenting the results of a breakthrough study of the metropolitan area of Mexico City (*Area Metropolitana de la Ciudad de México* or AMCM) by Aguilar and Alvarado,[11] assuming that similar types of spatial development may also be encountered in other large metropolises of the region. In the last step we present the findings and recommend some elements for a research agenda on polycentricity in metropolitan areas of Latin-America.

2. From monocentric cities to polycentric metropolitan areas in North America: a brief historical review

U.S. studies on urban polycentricity date back to the beginning of the 20th century. In 1937 Proudfoot observed the existence of nucleated business districts outside the CBDs of larger American cities that were bound to intra-urban highway intersections.[12] Evidence of multiple peaks in land value functions in the early 20th century brought McMillen to comment that 'the assumption of monocentricity was *always* [our italics] more of a mathematical convenience than an accurate depiction of reality'.[13] Three decades later, the 'circus tent' by Berry also dealt with the intra-city level.[14] Already at that time however, some consumer-oriented services had started to decentralise to locations outside central cities, following - or anticipating - residential suburbanisation: 'communication agencies, financial and legal services, the administrative offices of political, recreational, religious and other services as well as industry concentrated in subcentres in metropolitan areas'.[15] Schnore distinguished already in the late 1950s between 'housing or dormitory suburbs and

manufacturing or industrial suburbs'.[16]

In the 1950s, however, most urban employment was still - and by far - concentrated in and around CBDs. '[T]he typical American city' at that time 'still had a high density core where most people worked', with 'a majority of these workers actually living in suburbs and commuting by car'.[17] Atkinson used the metaphor of the hub-and-spoke metropolis to represent this predominant commuting flow from different 'bedroom suburbs' towards the single urban core.[18] In the 1960s, jobs started to follow the ever-larger share of metropolitan residents that suburbanised on a bigger scale; the 'second wave of suburbanisation'.[19]

The role of centrality - i.e. proximity to consumers and workers as well as to business and service providers - as an explanation for the concentration of productive activities and their jobs in the CBD greatly diminished after 1960. Manufacturing plants were among the first to relocate, followed by retail, professional consumer services (e.g. doctors, lawyers, schools etc.) and business services.[20] Calculations by Gordon et al. of private sector growth rates in fourteen of the largest US metropolitan areas over the time span 1969-1994 show that these rates were by far the lowest in their central counties and much higher in surrounding rings of adjacent counties.[21]

These relocation trends, and the consequent change of the spatial distribution of employment, are usually explained by the dichotomies of (1) economies versus diseconomies of agglomeration and (2) decentralisation versus clustering. Decentralisation, i.e. the moving out of firms and jobs from the CBD of central cities, accelerated because increasing diseconomies - rising land and congestion costs, fiscal instability, and social and physical decline - started to undo the advantages of clustering in the CBD.

The car, and later information and communication technologies (ICTs), have lowered transport and communication costs and facilitated distant locations. Nevertheless, accessibility for employees, suppliers and customers remains a valid consideration in firms' location decisions. This has resulted in polycentric structures insofar these decisions have taken place in concert with clustering in new subcentres.[22] Subcentres as building blocks of polycentric structures have particularly emerged at intersections of the expanding automobile system across suburban zones.

After three decades of job decentralisation, the North American downtown, including its CBD, has lost its status of the single centre of gravity of metropolitan employment, which has shifted away to new subcentres. Employment in the subcentres is almost without exception larger than CBD employment. Based on data of the Economic Census 1982, Gleaser et al. classified the 100 largest U.S. metropolitan areas into four types according to the spatial distribution of employment. The outward shift of the metropolitan employment balance is most clear in the decentralised and extremely decentralised types [table 1]. On the other hand however, 31 of these 100 metropolitan areas still belonged to the dense type with a concentration of minimally 25% of employment in the 3-mile radius around the heart of the CBD.[23] Possibly, the CBD is still the single largest cluster of employment in these metropolitan areas.

More recently, downtowns have experienced a remarkable process of revitalisation due to the growth of new key-sectors. These include both command and control functions in operational headquarters of transnational corporations and small-scale firms in creative industries, both to meet their need for face-to-face communication. Furthermore, downtowns are being transformed to places of consumption of culture, leisure and entertainment industries.[24] These new functions are much

less prevalent in peripheral subcentres. Hence, the metaphor of the 'donut city', i.e. 'a city with an empty centre drained by parasitical new subcentres',[25] is not any more valid for U.S. metropolitan areas.

Some authors emphasise that this changing metropolitan organisation of employment is more fundamental than just a changing spatial balance of employment.[26] According to Soja, North American suburbia has transformed into ' a seemingly new form, […] arising from a process involving the urbanisation of the suburbs'.[27] The 'flight' from the city centre is no longer the primary source of employment in suburbs; this centre is no longer the exclusive 'point of first entry' for firms to a metropolitan system.[28]

Polycentric development in North America has evidently taken a great part of the twentieth century, from which we can distinguish three stages:
- A gradual but slow evolution in the first half of the past century;
- An accelerated evolution during the three post-war decades; and
- A transformation towards 'a post-industrial form of urban agglomeration since the end of the 1970s.[29]

In this last stage, we see a more fundamental change of the polycentric form and organisation of metropolitan areas due to several processes, including the ever-expanding suburbanisation, car-dependency, the expanding road system, the widespread use of ICTs, and the emergence of the global service economy and consumer society. In the following section, the morphological and functional dimensions of current polycentric development of North America metropolitan areas are typified by four key characteristics.

3. Key elements of North American polycentric development

3.1 The number of subcentres increases, spreading out over larger territories

U.S. literature on polycentric development does not cast any doubt on the foundation and growth of subcentres of employment. But there is no standard methodology to identify subcentres. Interesting work on formal quantitative procedures is being done,[30] but it is nevertheless the early, and relatively little sophisticated model of Giuliano and Small[31] that has been repeatedly applied in comparative research,[32] and is therefore useful to observe the evolution of subcentres. This model defines employment centres by a minimum of 10,000 jobs and a minimum density of 5,000 jobs per square mile.

Making a minor adjustment - a minimum density of 15 employees per acre - McMillen identified the subcentres in Chicago's metropolitan area: 9 in 1970, 13 in 1980, 15 in 1990 and 32 in 2000. Data from 1990 in 62 U.S. metropolitan areas showed that the number of subcentres rises with metropolitan areas' population size.[33]

The new subcentres have been established further away from their traditional downtowns. 'The Interstate System has enabled metropolitan regions to sprawl to a radius to […] even 60 miles across'.[34] In the early 1990s it was already observed that U.S. metropolitan areas had extended over territories as large as the '100-mile city' or the '100-mile corridor'.[35] This extension is not primarily a matter of 'more centres need more space', which theoretically would have resulted in an extending but still rather compact landscape of continuous medium- to high-density subcentres of employment. Instead, the big picture is a patchwork of subcentres located at nodal points of high bid-rent values, interspersed with open land and residential suburbs with low built-up densities, and interconnected by extending networks of freeways and beltways.

3.2 Subcentre development reflects the rise of the service economy

The development of large concentrations of corporate office complexes in edge cities is generally related to the emergence of the U.S. as a service economy.[36] This general trend has changed the composition of employment in subcentres of North American metropolitan areas.[37] According to Frey, 'nonmanufacturing jobs have suburbanized faster than manufacturing jobs already since about 1970'.[38] These latter jobs had already suburbanised, or had started to move to 'other parts of the world that offered more malleable environments and lower costs'.[39]

The development of subcentres towards clusters of services has rarely been tested with quantitative data, however. A notable exception is McMillen's study, whose data show, for 1980, that the 'single largest' shares of jobs were manufacturing in eight subcentres, 'services' in four subcentres, and 'transport, communications and utilities' (TCU) in the remaining three subcentres.[40] The picture had slightly changed in 1990: manufacturing was the largest single employer in seven, services in six and TCU in two subcentres. In 2000 however, the picture had more drastically changed in the direction of a growing importance of the service economy. Manufacturing was still the single largest employer in only five subcentres. Services, on the other hand, was the largest one in twelve subcentres, and if we include retail and FIRE industries even in seventeen. In the remaining ten subcentres, TCU (6) and government (4) were the largest employers.

3.3 Subcentres have grown bigger and more autonomous vis-à-vis the CBD

The deconcentration of employment in the first half of the past century was limited in size and generally created small clusters. Most workers still had a job in or near the central business district, which was still 'a large nucleus and the rest of the employment centres small and dependent satellites'.[41] The transformation of urban agglomerations since the early 1980s has changed the employment balance of metropolitan areas from the CBD to subcentres that are no longer small and dependent.

Garreau emphasised subcentre development around the most visible landmarks of the metropolitan areas: shopping mall and office-centres. His Edge Cities were defined by minimum quantities of 0.6 million square feet of retail and five million square feet of office space.[42] McKee and McKee argue that the office component is far more significant than retail in Edge Cities because it represents growing concentrations of corporate offices and research facilities that are components of production chains of major corporations which operate in many nations.[43]

A major explanation of the increasing size of subcentres of employment is the addition of evermore new economic activities and specialisations, tied to markets and production chains outside their metropolitan areas, to services and production for the local market. Bogart and Ferry, and Anderson and Bogart explain the specialisations of subcentres in terms of exports to national or international markets.[44]

Contemporary subcentres develop indeed more autonomously from central cities than a few decades ago, but their corporate offices are still part of 'metropolitan business complexes': they 'export' to the CBD and other subcentres in their metropolitan area and require access to both their suburban labour supply and to the advanced business services in their CBD.

Despite these common elements, the 'big picture' of polycentricity across the U.S. includes considerable differences between cities. Based on data of decentralisation *cum* concentration in subcentres - of 1980, 1990 and 2000 - Lee distinguished three

types of metropolitan areas:

(1) Those with great decentralisation and low concentration (Philadelphia and Portland);
(2) Where a significant proportion of decentralising jobs has reconcentrated in suburban centres (Los Angeles and San Francisco); and
(3) Where urban cores (still) perform better than suburban centres and have remained strong employment agglomerations (Boston and New York).

Type 2 represents the most polycentric metropolitan areas. The other two types are less polycentric, but fundamentally different. Type 1 shows a much more dispersed spatial organisation of employment and type 3 has progressed less than type 2 in the shift from monocentric to polycentric.[45]

The following question is whether these key-elements are also visible in metropolitan Latin America. Do we find similar phenomena in the Latin American metropolitan structures? Does Latin American polycentricity - if developing anyway - differ from the North American in its spatial and temporal manifestations, and to what extent? To answer these questions we continue with step two of our methodology.

4. Metropolitan Latin America: a different socio-economic context

Between 1950 and 2000 Latin America's urbanisation rate jumped from about 40 percent to over 70 percent, while the number of cities with more than a million inhabitants went up from seven in the early 1950s to almost fifty in 2000. At the beginning of this century, Mexico City, Sao Paulo, Buenos Aires and Rio de Janeiro amply exceeded the ten million mark.[46] Latin America's urbanisation process is clearly linked to economic and demographic processes since the end of the 19th century, in which immigration and internal migration played a very important role.[47] During the 1950s, rural-urban migration still accounted for some 50 percent of urban growth. Despite a gradual decrease over time, these rural-urban population transferences still made up for more than 35 percent of Latin American's urban growth during 1990-2000, despite huge country-to-country variations.[48] Besides, the decrease of the rural-urban transferences to the metropolitan areas was (more than) compensated by increases in urban-urban transferences, i.e. from small and medium-sized towns to large metropolises.

Ongoing rural-urban migration in Latin America goes together with growing urban poverty. The continuous increase of the labour force outpaces job-growth in the formal economy. Large segments of the low-income groups find alternatives outside the regulated market, through self-employment. This has resulted in the dramatic growth of the informal economy, currently a salient element of Latin America's metropolitan structures. This is characterised by a network of small- and micro-scale oriented, unregulated and unprotected production, repair and service activities, which yield low and unstable incomes. The proportion of informal economic activities in urban employment roughly varies from a relatively low 30 percent in Chile to 60 percent in Peru.[49]

The population distribution in metropolitan areas has experienced large movements, generally from the centres to the peripheries, which now also accommodate gated communities, housing projects for the middle classes and social-housing projects for lower-income groups. These peripheries, once almost paramount areas of self-help housing, are increasingly 'mixing' with other residential developments. As a result, the polarised city with its clear-cut spatial differentiation between the rich (city centre) and poor (urban periphery) is gradually turning into the fragmented city with complex patchworks of highly different socio-economic groups living apart together.[50]

Metropolitan Area	Total employment within 35 miles from CBD	Type of Metropolitan Area	Shares of metropolitan employment within zones around heart of CBD		
			< 3 miles	3 – 10 miles	10 – 35 miles
LosAngeles – Long Beach	3,229,154	Extremely decentralised	6.9	31.2	61.9
New York	3,078,507	Dense	45.3	32.1	22.6
Chicago	2,814,162	Decentralised	18.7	17.7	63.6
Philadelphia	1,869,688	Decentralised	16.6	23.8	59.6
Detroit	1,604, 527	Extremely decentralised	5.2	16.7	78.1
Boston	1,536,970	Dense	25.7	29.4	44.9
Washington DC	1,515,563	Decentralised	18.9	33.8	47.3
Atlanta,	1,457,958	Decentralised	11.3	26.8	61.9
Houston,	1,419,485	Decentralised	12.0	37.7	50.3
Dallas,	1,399,951	Decentralised	11.4	30.7	57.9

Table 1: The spatial distribution of employment in the 10 largest North American metropolises according to size of employment (Source: Glaeser *et al*. (2001))

Important segments of economic activities and employment have also moved outwards.[51] Clusters of economic activities have emerged outside the central areas, oriented to highly different population groups.[52] Shopping malls have been built for the higher-income groups, while 'traditional' open-air markets came about for the lower-income groups. Industrial estates sprang up on new manufacturing locations in the outskirts, while clusters of informal production- and repair-units appeared elsewhere. In such way, the formal and informal activities of the city-centres were 'replicated' in the expanding peripheries.

All these changes produced an increasing demand for transportation. Private car ownership and its associated auto-mobility - which in the U.S. have strongly determined the formation of subcentres of employment - have also increased impressively over the past years in Latin America. Nevertheless, both are still much smaller in size because only a small proportion of the population can afford car ownership. Hence, most people use collective systems for their (daily) mobility: suburban railways, subways, large and small buses, taxis etc. In Mexico City, approximately 80% of the 30 million daily trips in 2000 was performed by collective transportation modes, with private cars (including taxis) making up for the remaining 20%[53]. In Lima, 77.3% of the 12.1 million daily trips was made using public transportation in 2004; 7.4% by taxi and 15.3% by private cars.[54]

Based on all these recent types of changes in the spatial metropolitan structure in Greater Buenos Aires, Janoschka proposed a new model for the Latin American city [fig. 1], which illustrates the notion of fragmented city that prevails in Latin American urban studies.

At first glance, Janoschka's model suggests some degree of polycentricity of Latin American metropolitan areas. However, the purpose of the model was more to show the heterogeneity and territorial extension of the new developments than the very formation of subcentres. Neither did it concern questions such as to what degree or why that may have resulted in polycentric developments. In the next section we will attempt to tackle those issues, using data from a study on Metropolitan Mexico City.

5. Subcentres in metropolitan Latin America?

The literature on the changing structures of Latin American cities has grown impressively.[55] In addition to the concentration of economic activities in their CBDs, the (largest) Latin American cities boasted outlying economic subcentres in the early 1970s.[56] Consequently, polycentricity-related ideas began to surface in the local urban literature. Nevertheless, a proper, comparative discourse on metropolitan subcentre formation and the emergence of polycentric structures in metropolitan Latin America is still in its infancy. The literature generally links up the emergence of subcentres in metro Latin America with a) the (spatial) expansion of the metropolitan areas, b) the dynamics of metropolitan populations and their spatial outcomes, and c) the changes that took place in manufacturing, commerce and services. Building on the observations of section 4, it is useful to add a few words about the spatial developments of the latter activity-groups.

Manufacturing. Although several metropolises had some industries in the late 19th century, manufacturing growth is mainly associated with the import-substituting industrialisation policies launched from the 1930s onwards. Consequently, industrial activities were seldom located in or near the city centres, but fanned outwards from the edge of the inner cities, following the road or rail arteries.[57] As of the late 1950s, industrial clusters were created in the expanding metropolitan fringes. Later, promoted by neo-liberal trends, newer industrial parks developed even further out, also as Export Processing Zones,[58] leading to the conceptualisation of 'industrial subcentres' in Latin America's

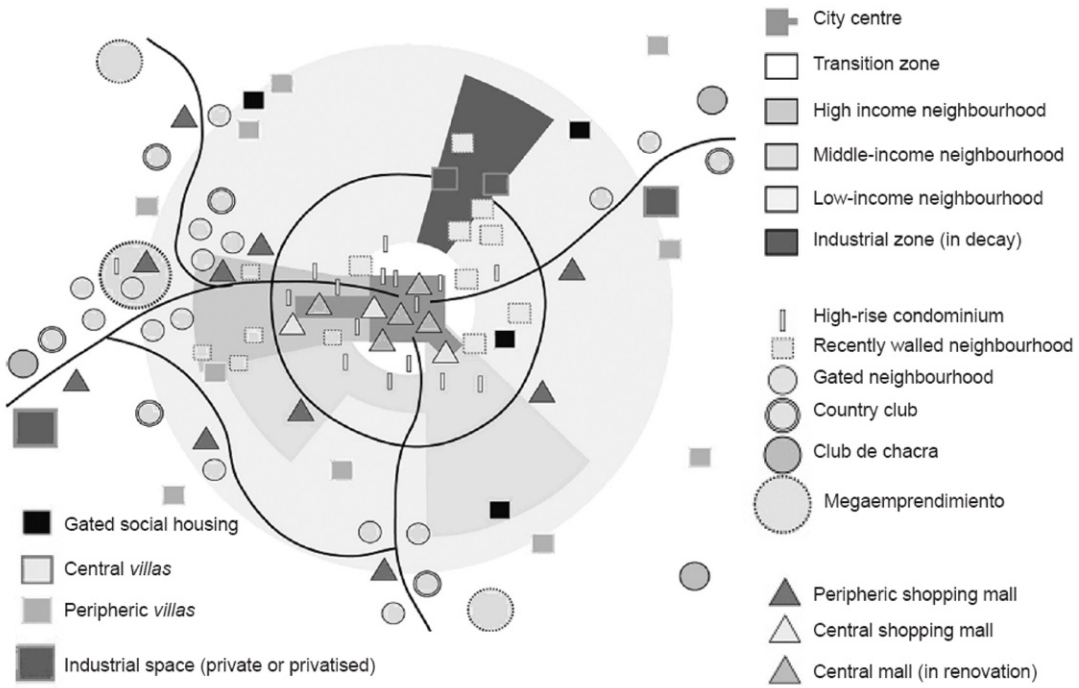

Fig. 1: Janoschka's model of the Latin American city.

metropolitan areas.[59]

On the other hand, large numbers of small and often informally organised manufacturing and repair activities emerged in the poorer areas of the metropolis. They were generally fairly ubiquitous and neighbourhood-based, but some of them were also organised in (sizeable) clustered forms, in spaces in and around the (covered) market-areas.

Retail-trade. For a very long time retailing activities were tied to the inner-city areas, which between the 1930s and 1950s also became the strongholds for convenience stores, shopping centres, large department stores, etc. Gradually, the outward expansions of the metropolitan populations were followed by the retail sector.[60] Tied to the purchasing power (and automobilisation) of the upper and middle classes, super- and hypermarkets, shopping-malls etc. appeared in the expanding peripheries, often with clear clusters near major transport arteries.[61]

Today, the modern retail sector is rapidly expanding in the outskirts of many Latin American metropolises, combined with leisure and entertainment facilities or/and with office and residential complexes.[62] Commercial and service apparatuses have also grown impressively in self-help housing districts at the peripheries. Apart from the almost ubiquitous small, neighbourhood-based shops, large and small supermarkets, convenience and specialty stores have entered the scene.

Under the current socio-economic conditions both the formal *and* the informal segments of the retail sector are rapidly growing.[63] The 'formal' retail clusters are strongly oriented toward the groups with higher purchasing power levels *and* largely depending on private automobility. On their turn, the 'informal' retail clusters are geared to those with little purchasing power, have a neighbourhood-based orientation and are dependent on public transport.

Other (office-based) services. The central areas of Latin America's metropolises were (and still are) important locations for government functions, the headquarters of para-statals and foreign enterprises, as well as offices of professionals and practitioners (like e.g. medical doctors, dentists, lawyers, notaries, real-estate agents, surveyors, underwriters, or travel agents). Many of these activities were located in the historic centres, but eventually they expanded to the adjacent - and frequently better accessible - zones along the major arteries.

Many services would later 'follow' the decentralising metropolitan populations into the expanding peripheries. By the 1970s, fair concentrations of service-oriented activities had emerged on the metropolitan fringes, catering to the various income groups.[64]

The growth of the public and the (national and foreign) private sector boosted a demand for medium- and large-size offices spaces in the metropolitan areas. Multi-storey office blocks were developed in the inner-cities, generally outside the historic centres, along major roads, alternating with international hotel chains, luxurious apartment towers and shopping complexes. Eventually, this resulted in the emergence of 'central spines': linear-shaped, medium- to high-rise commercial and residential corridors.[65] Typical examples of such spines are the well-known *Paseo de la Reforma* and *Avenida Insurgentes* in Mexico City and *Avenida Paulista and Avenida Faria Lima* in Sao Paulo.

The continuing demand for office space made the spines too expensive and problematical for automobile-access. This triggered the development of new high-rise office complexes further away from the metropolitan centres, located near major highways (to ensure accessibility by car) or/and close to metro stations or important bus nodes (to enable workers to commute by public transportation). Over time, such complexes even merged with residential,

shopping, entertainment and office functions, which also came into being in the context of metropolitan redevelopment plans. The medium height skyscrapers of the Santa Fe Area, located to the west of the core of Mexico City, and Vila Olímpia at the South West of São Paulo are interesting examples of this trend.

Over time, manufacturing-, shopping- and or office-based subcentres emerged away from the metropolitan cores, which in due course became quite conspicuous elements of the Latin American spatial structures.[66] Remarkably though, the discussion on subcentres and polycentricity on metropolitan areas of Latin America has a rather descriptive nature, while it generally lacks empirically-based quantifications. Moreover, the debate was (still is) hardly related to the changing economic structures of Latin American metropolises.

6. Subcentres and polycentricity in metropolitan Mexico City

Aguilar and Alvarado's recent study of Mexico City is one of the few in which the formation of subcentres is supported with empirical (census-)evidence.[67] This study processed a set of metropolitan-wide data from the Mexican 1999 Economic Census, broken down to the so-called AGEB-level (*Areas Geo-Económicas Básicas*). AGEBs are small statistical units similar to the U.S. census tracts.

The Mexico City Metropolitan Area (AMCM) as depicted in Figure 2 consists of 16 administrative divisions (*Delegaciones*) of the Federal District (DF); 24 adjacent municipalities of the State of Mexico (*Municipios Conurbados*), and 17 municipalities of the State of Mexico located further away (*Municipios Periféricos*). Applying a minimum of 5,000 localised jobs as cut-off point, the authors identified 35 subcentres in this very large area. Most of these subcentres are located in or near the core of the metropolis, in the northern *delegaciones* of DF. When we apply Aguilar and Alvarado's data to the distance categories of Glaeser et al. (see table 1), it appears that almost 70 percent of AMCM's employment is located in the first and second rings. In Glaeser's terminology, AMCM would be labelled a Dense Employment Metro. Outside these rings, the number of subcentres is rapidly diminishing in importance. While AMCM's employment structure is indeed clearly polycentric, the metropolitan core still plays a very important role. Using Lee's typology (2007), AMCM might be considered a Type 3 metropolis in which the urban core has the upper hand over the subcentres.

Breaking down the employment-data according to major economic sectors, it turned out that manufacturing was the single largest employer in 5 of the 35 subcentres. Unlike U.S. metropolises, manufacturing employment is not yet on the decline in Latin America where the post-industrial economy is only in its infancy. Figure 3 shows that manufacturing subcentres are still very much present within AMCM's core area. Nevertheless, manufacturing had begun to move outwards, in the late 1960s, into the adjacent areas of the State of Mexico, by accommodating relocations from the core and foreign newcomers.[68]

Figure 2 presents a picture at a given moment in time. Aguilar and Alvarado also tried to portray changes over time by comparing, as good as it gets, AMCM's Economic Census data of 1999 and 1989. Cutting through the hedges, the authors argue that the number of subcentres has grown. For 1999, they identified 10 (relatively small) subcentres more than for 1989. Although the urban core still has the upper hand over the subcentres in 1999, most of the new subcentres in the preceding decade had sprung up away from that core, in the outer 'Gleaserian' ring. Hence, apart from a clear-cut growth in numbers, AMCM's subcentres were also spreading out over a larger territory over time. These observations comply with one of the trends mentioned in section 3.

This model cannot be considered as a generalisable model for the process of subcentre formation in metropolitan areas across Latin-America, because a single case-study is a too fragile basis. But the Mexico City case shows that subcentre development does appear in Latin America, be it in a different form than in the U.S. It is likely that Mexico City shows a type of spatial development that may also be encountered in other large metropolises of the region.

7. Concluding remarks

Returning to the frame of reference, i.e. to the key-elements of polycentricity derived from the North American context, there is little doubt that many Latin American metropolises also faced growth in the number/sizes of their subcentres, while moving towards polycentric metropolitan structures. Further, it also seems logical to assume that these subcentres are now scattered over a larger territory than they were before. Unfortunately, we do not have much hard-core information about the growth and spatial distribution of Latin America's metropolitan subcentres. Certainly, quite a few authors mapped 'their subcentres'. For some metropolitan areas we have even cartographic images of subcentres at different periods. But an attempt to bring these different images together to track down subcentre evolution brought disappointing results, due to the very different definitions. Still, based on the findings of Aguilar and Alvarado, one might hypothesise that the spatial distribution of subcentres of employment in Latin American metropolises is of a more centralised nature than in North America, due to the lower levels of private-car mobility and the less developed intra-metropolitan road infrastructures.

Next, the process of subcentre development in the U.S. reflects the rise of the post-industrial economy, with its declining manufacturing base. Latin America, however, is still catching up with industrialisation, and its metropolises are important accommodators of (new) industrial investments. Contrary to North America, manufacturing still is important in Latin America's metropolitan subcentre development, and it will continue to do so in the near future. Decentralisation tendencies might even lead to the emergence of new manufacturing-based subcentres in the metropolitan peripheries.

Knowledge and insight about the current vicissitudes of Latin American inner-city areas are rather limited, certainly as to investment, economic development and employment-related issues. Despite growth of subcentres and associated erosion of the monocentric city model that also take place in Latin America, the core areas of its metropolises may still be considered the dominant, economic strongholds. The processes that determined the impressive revitalisation of U.S. downtowns over the last few decades are not likely to operate in comparable ways in Latin America.

In a time-space perspective, the metropolitan subcentres show differential growth tendencies. Some decline in size (and importance?), others rapidly grow. Aguilar and Alvarado's study even hint at interesting centre-periphery differences in this respect. Much more difficult, however, is the question whether (some of) the subcentres in metropolitan Latin America are becoming more autonomous vis-à-vis the downtowns, a topic hardly addressed.

As Aguilar and Alvarado have clearly shown, the use of spatially disaggregated employment data from the Economic Census data brings rewarding results. It is to be expected that the future availability of more detailed primary statistical data and more refined methods of disaggregation will improve our insight in the formation of subcentres and polycentric structures in metropolitan Latin America. We believe, though, that larger and more detailed sets of such data alone will not be enough. In our view, there is an unimpeded need for meticulous and comparative case-studies of spatial-sectoral development processes in the metropolitan areas.

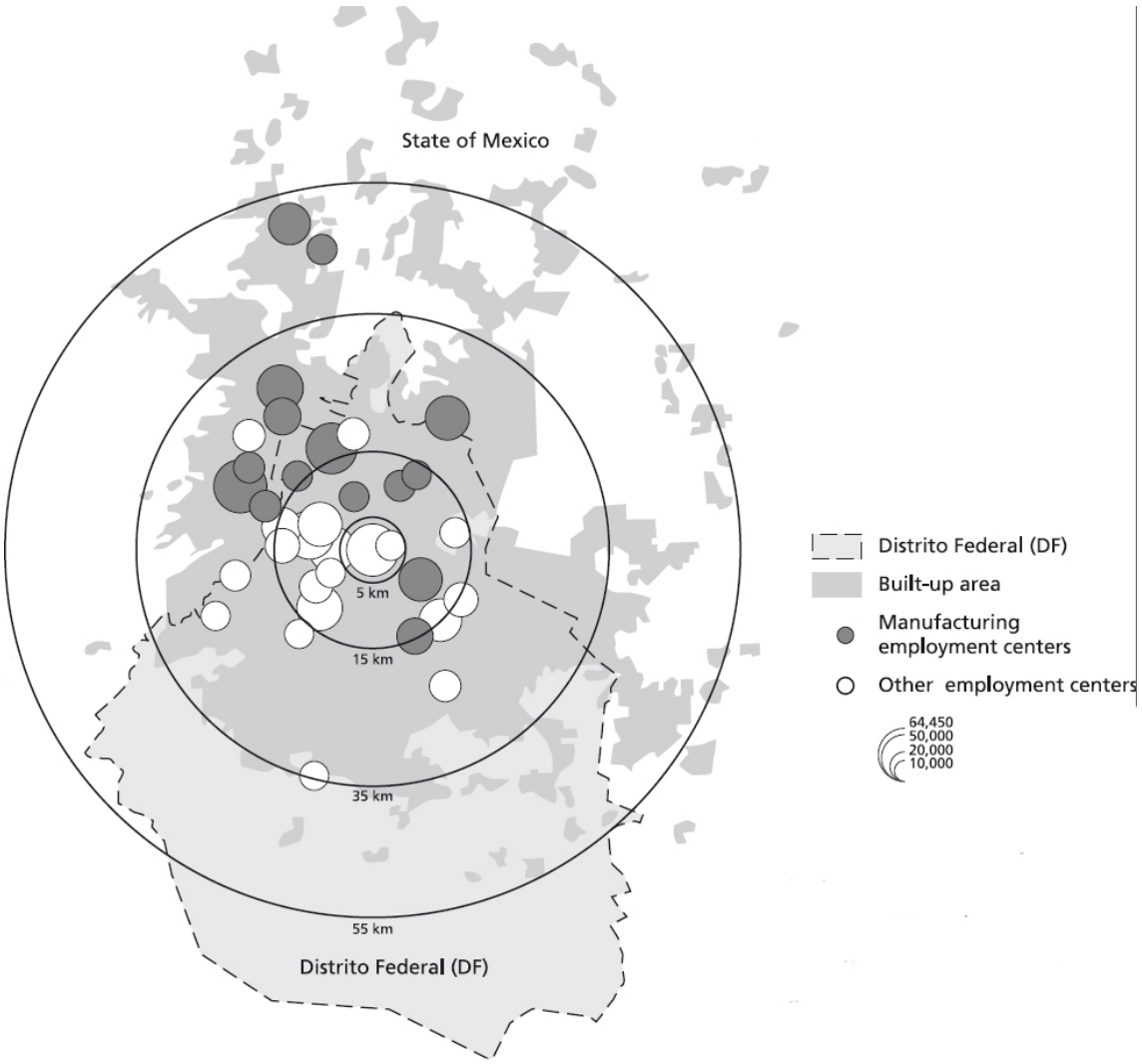

Fig. 2: Subcentres of employment in Mexico City's Metropolitan Area. INEGI, *Cuaderno Estadístico de la Zona Metropolitana de la Ciudad de México, Edición 2002* (Mexico DF, INEGI, 2002).

A research agenda to understand subcentre formation better should prioritise a few topics. First, there is an urgent need for more detailed information on the spatial and temporal development of the metropolitan manufacturing clusters (as e.g. embodied in the *parques industriales*), quantitatively as well as qualitatively. Studies of the unfolding retail structures taking into account (a fair part of) the broad retail gamut is also needed, including locational decision-making and accessibility issues.

Further, research on the commercial real-estate sectors in metropolitan Latin America would be more than welcome. From the subcentre perspective, a special focus on the spatial and temporal changes in the metropolitan office sector and its clusters would be very useful. Furthermore, the study of ongoing processes of territorial densification and functional change would be helpful to understand the interplay between social and economic processes. And finally, our research agenda grants a very important role to studies of the changing downtowns that focus on spatial and sectoral changes.

The North American literature uses high thresholds to define meaningful 'employment-centres'. In their study, Aguilar and Alvarado lowered the threshold to a minimum of 5,000 registered employees, to fit better the Mexican economic reality. Fixed thresholds are attractive for simplicity's sake, but the different socio-economic conditions across Latin America call for more flexible methodologies to accommodate for smaller metropolitan areas and/or less favourable urban living and income conditions. Formal quantitative procedures that are 'in the making' open up good perspectives because they identify subcentres by the size of deviations from the density of employment functions of the city or parts of it, rather than by absolute numerical values for size and density of employment.

Aguilar and Alvarado's 1999 data-set of 35 subcentres relates to some 675,000 employees out of a total of almost 2.9 million for the whole metropolitan area. However, according to the 2000 Mexican Population Census the labour force of AMCM exceeded 6 million workers.[68] Apparently, the Economic Census focuses on formal sector activities only, without taking the informal sector into account. In societies of advanced economies where most of the labour force is employed in the formal sector it may be logical to discard those who operating outside of it. But what about societies where informal economic activities do make up for a very sizeable part of metropolitan employment? Would it be possible that unregistered, informal activities appear in clustered forms? And if so, would it be possible that some of these clusters would meet the threshold to be considered a subcentre of employment?

Even though informal economic activities are almost ubiquitously present in the poorer areas of the Latin American metropolises, impressive informal clusters also exist. The large, 'traditional' metropolitan market sites may be a case in point. Here, the concentrations of formal, semi-formal and informal activities may easily add up to large numbers of traders, brokers, carriers, caterers and the like. Consequently, many of these market sites and their surroundings may well qualify as commercial subcentres, or seriously enlarge the employment base of a subcentre that was already noted from a 'formal perspective.' (Pilot-) studies of metropolitan areas which are known for their concentrations of informal activities will show whether the number (and/or the size) of the metropolitan subcentres might change or not, once informal activity clusters are also taken into account.

The literature on Latin American metropolitan development assumes that this development is characterised by polycentric configurations, as do their North-American peers. That assumption may be true, but we still lack much hard-core evidence to prove so. Simultaneously, we need taking our

departure from the idea that possible Latin American polycentric patterns of spatial urban development necessarily follow the North American example. For that, the demographic, socioeconomic and spatial conditions, as well as the developmental contexts of both continents are simply incomparable. To fill in the major gaps in knowledge and understanding of Latin American polycentricity, a more systematic research agenda is needed.

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