

TOWARDS A DEFINITION OF URBAN POLYCENTRISM FOR BRAZILIAN METROPOLISES

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ABSTRACT: Polycentricity has a broad and complex meaning that varies depending on the spatial, social, economic and historical perspective of the research. This complexity causes multiple definitions, since the context where a polycentric system is situated influences its profile, providing an unclear explanation of this notion. This paper examines the concept of polycentrism in its broader sense, reviewing the literature of Western authors. This theoretical framework provides a more comprehensive understanding about the theme in order to narrow the general definition down to the context of Brazilian metropolises. It looks into the relevance of polycentrism in the context of Brazil, classifying the Brazilian urban areas into Medium-Sized City Region, Metropolitan Region, and Inter-Metropolitan Region. These typologies are characterised in order to build a useful framework of polycentrism in the context of Brazil.

KEYWORDS: Polycentrism, Brazil, Metropolitan Region, Governance, Urban Dispersion.

1 INTRODUCTION

A polycentric phenomenon occurs in an urban territory which tends to cluster in several centres of activity (Anas et al., 1998, p. 1439). It reflects the dynamism of twenty first century cities characterized by the “*decentralisation of economic activities, increased mobility, complex cross-commuting and fragmented spatial distribution of activities*” (Davoudi, 2003, p.994). In this context, polycentrism comes as a compatible concept that fits within the contemporary socio-economic requirements, which makes it essential to have a clear understanding of this concept.

Despite the consensus related with the occurrence of polycentric phenomenon in the urban areas of the world, there is a diversity of theories of polycentrism. The ‘polycentric idea’ is a concept for which there are different terms to explain it, such as ‘post-industrial cities’ (Hall, 1997), ‘polynucleated metropolitan regions’ (Dieleman and Faludi, 1998), ‘polycentric urban regions’ (Kloosterman and Musterd, 2001), ‘global city-regions’ (Scott, 2001) or ‘mega-city regions’ (Hall, 2004). Aware of this divergence, Bailey and Turok (2001, p.697) stated that despite the “*growing interest in polycentric urban region, literature on this concept is still limited and rather unconsolidated*”. Kloosterman and Musterd (2001, p.623) witnessed this disagreement at a Conference in Amsterdam on Polycentric Urban Regions, in 1999: “[...] *the participants at this conference clearly differ in their points of departure, identifications of crucial issues, approaches, methods and, inevitably, their empirical (and sometimes normative) assessments of polycentricity.*” (Kloosterman and Musterd, 2001, p.623)

The divergent interpretations of polycentrism by different authors derive from the fact that their research focus on different urban contexts and/or urban scales. The only agreement is that polycentrism can be defined as an urban area with a plurality of centres. However, the concept has a broader and more complex meaning which varies depending on the spatial, social, economic and historical perspective of the research. Besides, the scale causes multiple interpretations as well, since the polycentric structures may present some qualitative variations.

In this context, Brazilian urban arrangements are also facing this situation. The requirements of the contemporary society on Brazilian cities reflect the dynamism of its activities, which tends to decentralise in multiple nucleus. Furthermore, Brazil, as other countries in the world, has emergent polycentric structures, which ask for a review of the way to deal with the cities. That is a challenge for the future urban development in Brazilian urban areas.

The main aim of this paper is therefore to provide an analysis of urban polycentrism in the context of Brazilian Metropolitan Regions. In order to achieve these goals, first it is examined the concept of

polycentrism in its broader sense, reviewing the literature of Western authors, because most of the research is drawn on this context. This framework provides a broader overview of opinions about this theme and adds a critical perspective to narrow the general definition down to the context of Brazil. The relevance of polycentrism is then analysed within the Brazilian context, combined with the theoretical framework of polycentrism, in order to obtain a suitable definition of polycentrism for Brazilian Metropolises.

The definition of polycentrism thus should be comprehensive enough to be able to evaluate a whole variety of urban systems that represent the polycentric phenomenon, since cities have different scales, morphological configurations, socio-economic relationships, and structures of governance (Dühr, 2005, p. 235-236). This consciousness to clarify the theoretical framework of polycentrism in a broader sense, in order to make it compatible for any context, leads us to the following question. *What is a suitable definition of polycentrism in the urban context of Brazil?*

This paper is divided into three sections. In the first section some key features of polycentrism are discussed, such as the analytical and normative dimension, the different historical urban backgrounds, the scalable relevance, the gradient way to approach polycentrism, and the dynamism of the borders. The second section presents some aspects of polycentrism separated into three parts: morphological, interrelationships and governance. The third section presents the urban arrangements of Brazil, classifying them into three typologies of emerging polycentric structures.

2 TOWARDS A COMPREHENSIVE CONCEPT OF POLYCENTRISM

The notion of polycentrism in this paper does not mean that it is different from ‘polynucleated metropolitan regions’, ‘polycentric urban regions’, ‘global city-regions’, ‘mega-city regions’, etc. Actually it has some similarities and some distinctions which should be clarified. The decision for the expression ‘polycentrism’ is a mere choice made by the present author to communicate this phenomenon and this concept, based on the fact that this term is more widespread.

This section first presents the two dimensions of polycentrism in order to make clear that this concept can be understood both in analytical and normative perspective. Then, it also shows different evolutionary paths of polycentric systems and three relevant peculiarities of polycentric urban systems.

2.1 Analytical and Normative Dimensions

Before exploring a conceptual understanding of polycentrism, we first have to take into account the two dimensions of this term: analytical and normative. The analytical dimension uses the concept of polycentricity to explain or analyse an existing or emerging polycentric system, while the normative dimension uses it as a guiding principle to achieve a goal on the level of policy strategies (Davoudi, 2003).

For instance, the normative interpretation was used in the ESDP - European Spatial Development Perspective (EC, 1999, p.20), which proposed the concept of polycentricity as a guiding principle for spatial planning policy, at the European level. On the other hand, the Polynet project (Hall and Pain, 2006) analysed eight European ‘polycentric mega-city regions’ in order to clarify the understanding of “*how these immensely complex spatial systems function in terms of finance and business services*” (Green 2007, p.2080), using a more analytical approach than a normative one. Green (2007, p.2081) therefore explains that “*polycentricity is happening, sometimes as a consequence of policy [normative], sometimes as a consequence of social change [analytical], and that it has both positive and negative aspects*”.

In the context of this research, the analytical dimension of polycentrism takes into account the current reality of an urban system looking for the opportunities of cooperation between areas. In the other hand, the normative dimension uses these existed opportunities as start points to promote a polycentric reality for urban areas through the development of planning concept or policies. Considering these two perspectives, the next sub-sections present features of polycentrism to reinforce its understanding on these two dimensions.

2.2 Different Historical Backgrounds

The comprehension of the historical framework of regions helps to understand the current polycentric morphology, its inner relations, and governance interactions. Champion (2001, p.664) introduces this discussion, presenting three ways in which a polycentric urban region can emerge (**Figure 1**). His intention, with this simplification, was to facilitate the explanation of the morphological process of a polycentric

structure, and its vocation to interact with regional actors. Lambregts (2006, p. 115) corroborates adding that “a polycentric urban region’s (morphological) origin and consequent spatial development trajectory to a large extent determine the nature of the overarching challenges a region faces at a particular stage”.

Champion’s evolutionary ideas thus draw attention to the fact that today’s polycentric structures have indeed developed from different morphological points of departure (Lambregts, 2006, p.116). According to Champion (2001, p.664), polycentrism can come from a former monocentric city developed into a polynuclear urban system, due to its continuous growth (centrifugal mode); or from a former monocentric city which was developed into a polynuclear urban system through the incorporation of smaller centres in the surrounding area (incorporation mode); or even from a union of several previously independent centres of similar size, which were arranged in different shapes (fusion mode) (**Figure 1**). In addition to Champion’s framework, Lambregts (2006) says that different modes of polycentric development can occur at the same time in a region: “In the Randstad, for example, the fusion mode may best describe developments presently taking place at the level of the Randstad as a whole, while simultaneously incorporation and centrifugal modes of polycentric development are affecting the city regions of Amsterdam, Rotterdam, The Hague and Utrecht.” (Lambregts, 2006, p.117)

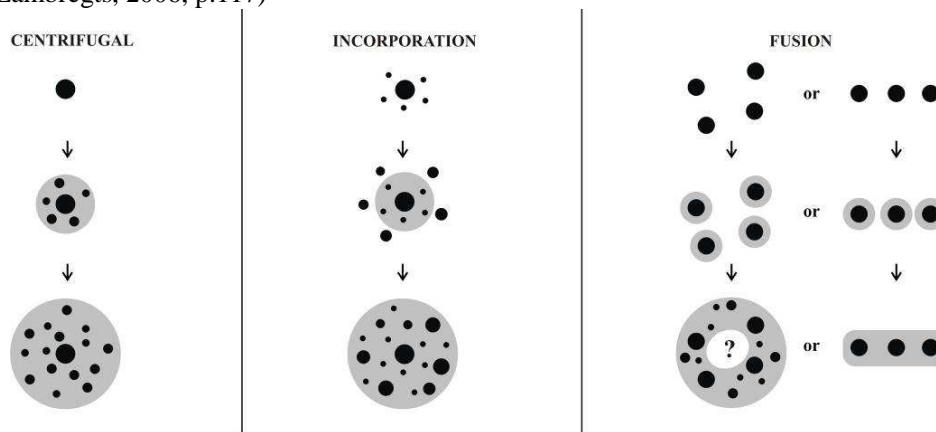


Figure 1 Alternative path for the polycentric urban regions’ evolution. (Source: Champion, 2001, p. 665)

Being aware of the variety of evolutionary contexts helps to understand “why in some regions the concept of polycentric spatial development is welcomed as a possible answer to such problems as urban congestion, regional imbalances and unbridled sprawl while in other regions polycentricity is rather seen as a barrier to interaction and (economic) efficiency” (Lambregts, 2006, p.117). The comprehension of the evolution urban process can facilitate the identification of potentialities and limitations of a region in order to promote a polycentric development. Subsequently, three inherent features of polycentric structures are explained in order to add knowledge for a broader understanding of the polycentric concept.

2.3 Scale, Gradient and Borderless Matters

According to Green (2007, p.2082), the formal definition of polycentrism should be scalable. Peter Hall (2003) observed that “polycentricity can occur at multiple levels or spatial scales, and what is monocentric at one level can be polycentric at another-and vice versa”. However, some authors do not consider this element, excluding from their analysis some urban system due to its dimension, despite of the similarity to its spatial topography and interconnectedness characteristics.

Champion (2001, p.663-664) identified scales of polycentric configuration, ‘individual metropolitan area’ and ‘polynucleated metropolitan region’, and foresaw another one, called ‘polynucleated urban field’ (**Figure 2**). The first one, ‘individual metropolitan area’, is an urban field together with its suburbs, commuting hinterland, or peripheral vicinity, which “has been most fully articulated in the North American context, with wide-spread observations of employment sub-centres rivalling the CBD in size” (Champion, 2001, p.663-664). The ‘polynucleated metropolitan region’ is an urban territory which contains a number of cities, none of which is dominant. The main origin of this approach was Europe, especially in the Netherlands with the planning concept of the Randstad (Champion, 2001, p.664). The ‘polynucleated urban field’ would be an inter-region approach, which could be exemplified with “the Rhine-Ruhr Metropolitan Region, the Randstad, the Flemish Diamond and the less urbanized areas now interspersed between them” (Dieleman and Faludi, 1998, p. 374, in

Champion, 2001, p.664). On this last scale of polycentric configuration, we can introduce the concept of transnationality, if the regions would be located in different countries.

The ESPON 1.1.1 project (EC, 1999, in Dühr, 2005, p.235) also categorize three polycentric scale varieties in Europe, naming them ‘micro’, ‘meso’ and ‘macro’ (Figure 2). The ‘micro’ scale corresponds to city clusters at intra-regional scale; the ‘meso’ scale is related to the development of urban complementarities within regional scale; and the ‘macro’ level is about the development of urban complementarities at inter-regional scale. According to Kloosterman and Musterd (2001, pp.626-628), this scalable characteristic of polycentrism presents some qualitative differences between them. These variations are in the level of physical form, political entity, functional relationships, cultural identity and representation, which have to be taken into account when doing the empirical analysis.

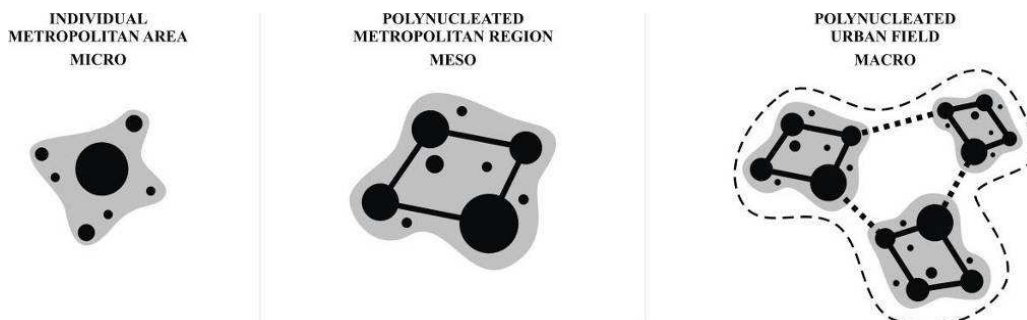


Figure 2 Spatial scales of polycentric urban system. (Source: drawn based on Champion, 2001, p. 665)

Another polycentric characteristic is the gradient which is a sliding scale way to measure the degree of polycentricity in an urban system. Green (2007, p.2082) corroborates saying that “any group of reasonably closely spaced settlements is likely to be polycentric to some extent and any formal definition of polycentricity should reflect that”. This means that an urban system should be assessed in terms of levels of polycentrism, and not in terms of ‘black and white’ definitions, since these urban structures have a great variety of conditions which rate their polycentric stage. Taking into account the gradient element of polycentricity to rate the level of urban relations, Champion (2001, p.666) presents 3 degrees of interaction and interdependences within urban areas. The lower level is an urban situation without any relations between settlements, just distribution of the population. Then, the next level requires a minimum degree of interaction to identify which centres form part of the system and which are independent of it. The most synergetic level presumes that each centre has a city or regional scale function. This means that each centre function supports more requests than it is necessary for its own demand, and its function provides supplies for whole urban system (Champion, 2001, p.666). (Figure 3)

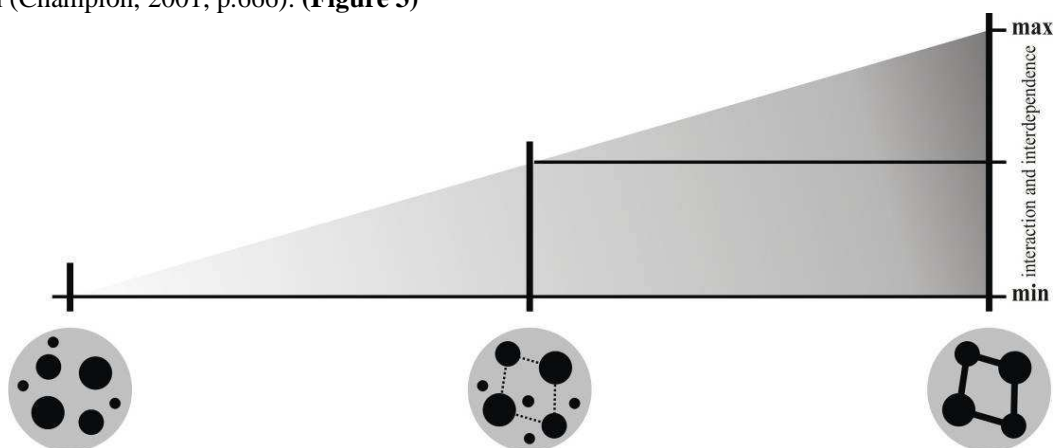


Figure 3. Degree of interaction and interdependence (Source: drawn based on Champion, 2001)

In the same line of reasoning, the polycentric urban agglomeration has a dynamic border, since its limits are not fixed anymore with predefined administrative edges. Castells (1996) describes the spatial transformation of the modern metropolis as an “increasingly discontinuous, fragmented, polycentric, and

almost kaleidoscopic socio-spatial structure” with a *“difficulty of delineating its outer boundaries and hence of accurately estimating its population size”* (Soja, 2000, p.235). The border transition is unclear, which is defined by a gradient of borders, and not anymore by a line. This complex urban form defines a complex network of governance. The interrelationships and unclear boundaries create opportunities of cooperation in local, regional, national, and also global level, reflecting therefore dimensions that transcend urban scales. (Moura, 2005, p.89) **(Figure 4)**

2.4 Are there Weak Points in Polycentricism?

Some authors believe that polycentric model is a trend to promote sustainable (balanced) development, economic competitiveness and social cohesion (EC, 1999). However, every model has indeed benefits and problems, which should be considered in order to take advantages of the opportunities and be prepared for the inconveniences. An analysis of the balance between benefits and problems is therefore prudent before taking the polycentricism concept for granted, since there are some research that identify inconsistencies. For example, there is a study in a French context which alerts that polycentric system tends to increase the average of commuting distance (Aguilera, 2005). On the other hand, the polycentric development will improve the distribution of commuting pattern temporally and spatially, changing from pendulum to cross-commuting model. Champion (2001, p.666) also consider that *“this shift from an urban region with a single centre to one with multiple centres will be accompanied by changes in the geography of land prices and, thus, of residential areas”*, which could bring some problems, but also some benefits.

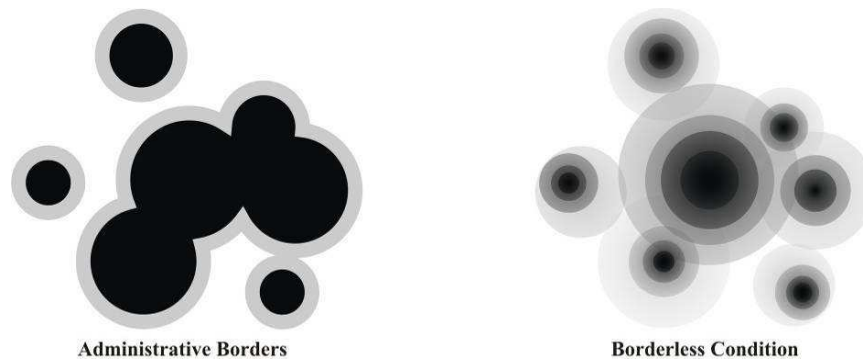


Figure 4. Administrative Borders X Borderless Condition

This paper does not intend to present all possible disadvantages of polycentricism. The intention of this subsection is just to keep on mind the possible adverse consequences of polycentric development. On the following section it is presented three aspects of polycentricism, which are complementary with each other: morphology, relations between urban areas, and governance.

3 COMPLEMENTARY ASPECTS OF POLYCENTRICITY

In order to support the analysis of the level of polycentricity and the potential for polycentric development in Europe, the ESPON project (Dühr, 2005, p.235-236) identified three interrelated but distinctive aspects of analysis. In this paper, these three aspects are used to group the elements presented by the literature, arranging therefore the information in a clearer way **(Figure 5)**.

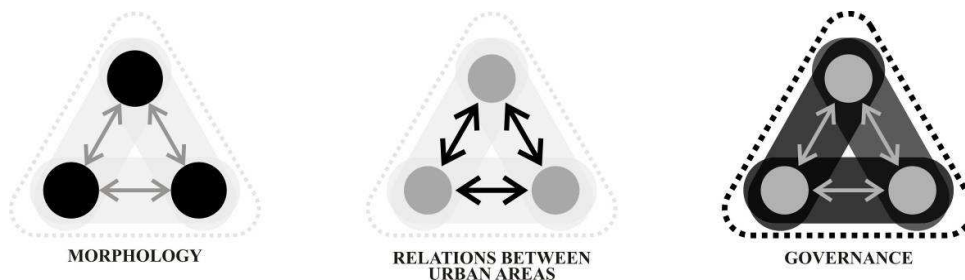


Figure 5. Three aspects of polycentricity by ESPON project (Source: drawn based on Dühr, 2005)

3.1 Morphology

The morphological aspect is related with the physical organisation of urban activities in a territory. That is the most obvious difference between monocentric and polycentric model. Soja (2000) presents the morphology of cities through the term 'exopolis', which is one of the six key features of his 'postmetropolis' idea. 'Exopolis', according to this author, is a reference to the growth of 'outer' city, and also suggest the continuous process of decentralisation and centralisation, instead of centrifugal and centripetal force of the monocentric model (Soja, 2000, p.239).

Some authors tried to define objective criteria to recognize the spatial patterning of a polycentric development, such as the employment and services distribution across a number of centres. The decentralization of jobs directly impacts in spatial and temporal pattern of live-work commuting, and consequently on the spatial organisation (Cervero, 1998, p.1059). Giuliano and Small (1991), one of the pioneers in defining that sub-centres makes a polycentric urban system, says that the criteria to identify potential nucleus should have a minimum density of 5,000 jobs per square mile and a minimum total number of 10,000 jobs. Despite of this discussion being very strong in North American context, Dieleman and Faludi (1998) note that this phenomenon can be found in other contexts: "*The historic core of Amsterdam now provides fewer jobs than the burgeoning employment centre in Amsterdam South East and the scattered office parks around Schiphol airport*" (Dieleman and Faludi, 1998, p. 365).

The criteria to analyse sub-centres therefore can not be restricted to clusters of jobs. Gordon and Richardson (1996, p.290) indicate that different activity centres with the same number of jobs may generate different levels of traffic, because "*if metropolitan spatial structure is largely the result of the interaction between transportation and land use, a sub-centre anchored on a suburban mall may have more significance than one based on an industrial park, even if the latter generates more jobs*" (Gordon & Richardson, 1996, p. 290). Kloosterman and Musterd (2001, p.626) add that "*commuting from home to work has, in addition, lost its monopoly as being the sole reason for people to take public transport or get in their car. Shopping, taking the children to school and especially leisure have become very important reasons for making a journey.*"

Other criteria are presented by Kloosterman and Musterd (2001, p.628) who define a list of morphological characteristics for a polycentric urban configuration. These features are: a number of historically distinct cities; no obvious leading city; a small number of larger cities, together with a greater number of smaller cities; cities located relatively close to one another; cities spatially and politically distinct from one another. However, this description focuses on just one type of polycentric structure, for instance Randstad, contradicting the authors who say that "polycentricity can, in principle, refer to any clustering of human activity" (Kloosterman and Musterd, 2001, p. 623).

3.2 Relations between Urban Areas

The relations between urban areas concern the synergies and flows of the spatial structure (structural) and the voluntary cooperation (institutional) within an urban system (Dühr, 2005, p.235-236). Green (2007, p.2082) named this aspect as functional polycentricity, considering the relations between actors in a polycentric system. According to him, the relations between urban areas should follow two rules in order to exist in any physical space of any scale. First, "*the space in question must contain more than one node*", and second "*those nodes must be functionally linked to one another, so that if no functional connections exist between nodes, then functional polycentricity cannot be said to exist*" (Green, 2007, p.2084).

Adding to these authors, Meijers (2005, p.768) introduces the term synergies to explain this network of nodes, linkages, flows and meshes within a polycentric urban system. Those synergies are "*achieved through the mechanism of co-operation, complementarity and externalities linked to them*" (Meijers, 2005, p.767). According to this author, 'co-operation' is the common interest shared by the actor's network; 'complementarity' is the different actors' activities which well-match with each other; and 'externalities' are results of the two previous ones. The author adds that "*the presence of one of these three synergy releasing mechanisms (co-operation, complementarity or externality) combined with network behaviour generates synergy and hence economic benefits for the actors*" (Meijers, 2005, p.767). Furthermore, two or three types of these synergies can occur in one polycentric urban system at same time, overlapping the mechanism of co-operation, complementarity or externality to achieve synergy.

Identity is another characteristic that strengthen the relations within polycentric structures, since it acts as magnet for the parts of the region. Meijers (2003, p.21), based on Houtum and Lagendijk (2001), says that there are three types of identity: strategic, cultural and functional. The strategic identity "*is important*

because the will and intention to create an interdependent polycentric urban region is often ahead of the actual reality". The cultural dimension "concerns the shaping of a feeling of belonging together and the creation of cultural element that help to perceive the polycentric urban region as an entity". The functional identity "focus[ed] on the tenability of the notion of the polycentric urban region as a coherent functional entity". According to the authors, the functional factor is just one of the three relevant aspects which determine the strength of the existing relationships.

3.3 Governance

The governance of polycentric structures is one of the most complex issues, since it deals with multi-level of actors in different levels and competences. Considering the fact that polycentric urban system is a borderless structure (**Figure 04**), the governance aspect becomes a challenge in every scale. The politics and administrative limits of governances are not compatible with the emerging polycentric context. According to Salet *et al* (2003, p.389, in Healey, 2007) "*the metropolitan arena is filled with public and private actors at manifold levels of spatial scale and they are active in all sectors of urban policy. In this multi-dimensional game many different coalitions and many conflicts may occur*".

In this way, Meijers *et al* (2003, p.18) consider a polycentric urban region as an 'actor' rather than 'space', since it "*has to deal with a large number of public and private actors, all having their own goals and preferences and often having differences in procedures, culture and power, perceived and real*". For instance, the cross-boundary cooperation is one of the big efforts of European Union. They recognize the difficult of implementing such cooperation, particularly in regions with fragile economies and weak institutional structures, which are unlike to emerge voluntarily and without a long-term external assistance (Davoudi, 2003, p.993).

3.4 Summary

As presented above, the concept of polycentrism has many variables and characteristics that make its profile quite complex, which causes some divergences among authors. It is very simplistic to explain the polycentric urban area just about its morphologic perspective, for instance multiple centres, especially if we do not take into account the scale of such territory. Despite the morphological aspect of polycentrism being quite consensual, the scale sometimes causes disagreement among theories, since some researchers focus on just one urban scale to explain their perspective about the broader concept of polycentrism. Another relevant comment is about the three complementary aspects of polycentrism - morphology, interrelations and governance. Some studies do not consider all of these three dimensions, when of their explanation, missing the comprehensibility of the term.

The occurrence of polycentric phenomenon in the urban areas of the world is quite consensual, although this sense of disagreement about the theories of polycentrism. The next section, presents an overview of the emerging polycentrism in Brazilian cities and then they are classified in three typologies of polycentric arrangements.

4 THE CHALLENGE OF BRAZILIAN POLYCENTRISM

As in other urban areas of the world, Brazilian cities are also facing changes in their spatial arrangements, in order to attend the dynamism of urban society. These changes have often resulted in fragmented and unbalanced urban structure, unfair distribution of opportunities and life conditions. This situation was built along of a historical process of fast urban growth together with an ineffective implementation of the urban planning. In this context, this section shows an overview of the spatial arrangements of Brazilian cities and their current urban trends. Then it presents the analysis of these Brazilian urban systems in the theoretical framework of polycentrism, grouping the Brazilian metropolises into three typologies in order to describe them based on the polycentric features.

4.1 Brazilian Urban Arrangements

Due to its scale, Brazil has a great variety and disparities along the country, which should be taken into account when making an urban analysis. The urban areas have different morphological characteristics, specific socio-economic relationships, and varieties of governance actions. In this context to have an

impression of the Brazilian urban features, examples of urban areas in different macro-regions of Brazil it will be presented (**Map 1**).

The complex urban-regional phenomenon has emerged in Brazil since some decades (Moura, 2005, p.78). Group of urban agglomerations, articulated by a network of transportation and communication and linked by socio-economic relationships, have been appearing along the Brazilian territory in different shapes. The metropolitan area of São Paulo, in the southeast macro-region of Brazil, incorporates in its surrounding Campinas, Santos and some smaller municipalities (**Map 1-a**). That urban concentration is the most populous area in the country with 13 % of the Brazilian population, and 20% of national wealth. Similar urban structure as São Paulo occurs in other areas of the country, but in smaller scales. This typology of urban area grows in a radial structure, polarised by a main metropolis and conforming a polynuclear network

of centres linked by infrastructure of flows (Moura, 2005, p.83). According Champion (2001, p.665), these arrangements can be classified with an overlap of centrifugal and incorporation evolution paths.

The regional axis between São Paulo and Rio de Janeiro regions is an example of interregional synergy which transcends the municipal and state governance (Moura, 2005, p.88) (**Map 1-b**). Another example of interstate relationships is the axis of Brasília-Goiânia, incorporating Anápolis, in the centre-west macro-region (**Map 1-c**). This region has a great flow of relationships, putting together different entities of governance: two states and many municipalities. This region concentrates specific functions in some nuclei, whose relevance go beyond state and also regional level (Moura, 2005, p.88).

The south macro-region has interesting examples of polycentric fusion model (Champion, 2001, p.665), except for Curitiba (**Map 1-d**) and Porto Alegre (**Map 1-e**) being similar to radial structure of São Paulo region. The urban agglomeration of Caxias do Sul, Santa Cruz do Sul, Lajeado/Estrela, Gramado/Canela, in Rio Grande do Sul State (**Map 1-f**); the regions conformed by Joinville, Itajaí, Blumenau e Florianópolis, in Santa Catarina (**Map 1-g**); and, the agglomeration of Londrina e Maringá, in Paraná (**Map 1-h**), all are emerging fusion examples of urban configurations that differ morphologically with the centrifugal regions, which are most common in Brazil (Moura, 2005, p.86).

The urban fusion (Champion, 2001, p.665) is not the most common morphological development in Brazilian cities. Actually this phenomenon is more appropriately addressed to the medium-sized cities (100-500 thousand inhabitants), which tend to arrange themselves in clusters. In the northeast macro-region, both types of urban regions can also be identified, the centrifugal and incorporation kind are mainly related to the state capitals: Fortaleza, Recife, Salvador, etc. (**Map 1-i**); and the regions of Crato-Juazeiro do Norte-Barbalha, and Juazeiro e Petrolina (**Map 1-j**) are examples of fusion typology.

Based on what was exposed, we identify some polycentric urban structures emerging in Brazil. Some demographic trends reinforce this information. For instance, despite of the fact that most of the metropolises in Brazil are still growing more than the country, the medium-sized cities are also presenting higher rates of demographic enlargement (+4,8%) (Serra, 1998). The other tendencies are the higher growth of the metropolitan peripheral areas if compared with their central nuclei, which represents that the main centre is dividing its economic power with other sub-centres on its vicinities (Maricato, 2000).

4.2 Brazilian Polycentrism

In order to build a useful definition of urban polycentrism to be used in the context of Brazil, the Brazilian urban arrangements were grouped in three typologies: *Medium-Sized City Region*, *Metropolitan Region*, and *Inter-Metropolitan Region*. These categories are described in the **Table 1**, based on the Brazilian context (Moura, 2005), the historical backgrounds (Champion, 2001), and the spatial scales (Champion,



Map 1. Brazilian's examples of emerging polycentric structures.

2001; Dühr, 2005). The borderless (Soja, 2000; Moura, 2005) and gradient (Champion, 2001) features are not mentioned, since these characteristics happen in those three typologies. This categorisation of polycentric urban systems in Brazil comes from the necessity of understanding the intrinsic characteristics of them, since the morphological, functional (inter-relation), and governance aspects change according to each typology.

Table 1 Characterisation of the three urban system typologies

	Brazilian Context	Background	Scales
Medium-Size City Region	<p><u>Morphological</u>: Group of centres developed by a network of medium-sized cities and interconnected by road, which integrate them to the big urban centres of Brazil (Moura, 2005, p.86). They have different origins and developed from small nucleuses which were located close to each other.</p> <p><u>Relations between Urban Areas</u>: These nucleuses are interrelated by functional activities.</p> <p><u>Governance</u>: The cooperation between actors is weaker in terms of political level, since this typology deals with different municipalities, and sometimes in different states. Besides, this urban structure is not officially recognized by the government, such as a Metropolitan Region.</p>	Fusion Mode and/or Incorporation Mode (Champion, 2001)	Polynucleated Metropolitan Region (Champion, 2001); Meso Scale (EC, 1999)
Metropolitan Region	<p><u>Morphological</u>: This urban typology is the most common in Brazil. It is originated by a main centre which enlarged concentrically, generating new sub-centres and/or incorporating others smaller cities.</p> <p><u>Relations between Urban Areas</u>: The relationship between areas is more about commuters (residence-work). The functional activities occur, but are not as relevant as in the Medium-Size City Region, regarding scale.</p> <p><u>Governance</u>: The relation between actors is stronger than Medium-Size City Region, since it is officially recognized by the government. However the cooperation is not ideal, despite the existence of integrated plans and policies.</p>	Centrifugal Mode and/or Incorporation Mode (Champion, 2001)	Individual Metropolitan Area (Champion, 2001); Micro Scale (EC, 1999)
Inter-Metropolitan Region	<p><u>Morphological</u>: That urban system is a composition of two or more metropolitan regions or medium-size city regions.</p> <p><u>Relations between Urban Areas</u>: These nucleuses are interrelated by functional activities.</p> <p><u>Governance</u>: The cooperation between actors is weaker in terms of political level, since this typology deals with different municipalities, and sometimes in different states. Besides, this urban structure is not officially recognized by the government, such as a Metropolitan Region.</p>	Fusion Mode and/or Incorporation Mode (Champion, 2001)	Polynucleated Urban Field (Champion, 2001); Macro Scale (EC, 1999)

5 CONCLUSIONS

This paper sought to provide a better understanding of polycentrism to be used on the context of Brazilian metropolises. This paper reviewed authors from different contexts in order to assemble the divergences and overlaps of ideas from this urban phenomenon. Then, the paper compiled these ideas trying to build a more structured and useful definition to be applied for analysis (analytical) and for proposal (normative) of polycentric development in Brazil.

In order to conceptualise polycentrism, first the two dimension of polycentrism were presented, the analytical and the normative, which are related to the way to approach this phenomenon in urban structures. The analytical considers polycentrism as a consequence of the social changes, and the normative understands

it as an outcome of policies. Subsequently, it was discussed the importance of knowing the historical spatial development of polycentric arrangements in order to understand the future challenges, presenting three alternative paths: centrifugal, incorporation and fusion modes. Then, three intrinsic characteristics that are relevant in these urban structures were emphasized: scale, gradient, and borderless.

After the explanation of the main features of polycentrism, it was explained its three basic aspects: morphology, relations between urban areas, and governance, which are complementary with each other. Those characteristics are relevant aspects to support the analysis of the level of polycentric development as well as the potential to achieve it. Then, the reviewed literature was structured according to these three aspects, filling some authors' gaps and clarifying some divergences between them. Afterwards, the Brazilian urban arrangements were presented and then classified in three emerging polycentric structures in Brazil: *Medium-Size City Region*, *Metropolitan Region*, and *Inter-Metropolitan Region*. These urban typologies were characterised, crossing ideas with literature review of polycentrism and their Brazilian context. Hence, all these steps went toward to answer the main question which is: *what is a useful definition of urban polycentrism in the context of Brazil?* This conclusion was presented on the **Table 1** according to the three aspects of polycentrism (morphology, inter- and intra-relations, and governance).

The main outcome of the paper is the understanding of polycentricity in the context of Brazil. The amount of polycentric structures emerging in different regions of Brazil reflects the great challenge for the future urban development in such cities. These urban systems ask for compatible strategies to take advantages of the opportunities and to be prepared for the inconveniences that may come together with the polycentric development.

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