

**The Impact of University Campuses on Disperse Urban Contexts: Case Study of
Brasilia, Brazil**

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Abstract

This article analyses the impacts derived from the presence of university campuses on land and real estate markets in diverse contexts. Using as case studies the campuses of the University of Brasilia and the Catholic University of Brasilia, the article studies externalities mostly related to the wide accessibility of the campuses in terms of travel time. Using the concepts of magnet and enclave to describe the effects produced, the article examines impacts on land prices in areas from which the main flows to the universities come to determine the influence of universities at metropolitan level. Around the campuses, the nature of activities and land prices variation between 1991-2006 is analyzed to understand the effects at local level.

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I. Introduction

Brasilia can be qualified as a city dominated by large properties. The city, planned by the architect Lucio Costa in 1957, according to Modern Movement principles, privileges the parceling of large scale plots, mostly dedicated to institutional activities. The University of Brasília – UnB is one of the largest landowner in town. The Catholic University of Brasília – CUB, although relatively smaller than UnB, represents another important large landowner.

The role of Brazilian Universities as real estate market developers focuses mainly on attending the spatial requirements determined by their educational mission inside their campus areas. In Brazilian culture, faculty and students not often search for universities outside their home towns and students usually continue to live with their parents during university education. Therefore, large dormitories and neighborhoods landscaped to host students or faculties are not a requirement for Brazilian universities such as it can be in other countries.

Brazilian universities, though, affect the surrounding neighborhoods and sometimes the whole metropolitan region. Due to the multifunctional characteristic of this sort of institution and due to their capacity of bringing a great amount of people to an specific point in the city, universities generate many different sorts of impacts on land and real estate markets.

This article analyses the impacts, at the local and metropolitan levels, derived from the presence of two university campuses, on land and real estate markets of the metropolitan area of Brasilia.

The article firstly investigates how the urban development around both studied university campuses happened and how external or internal land use regulations for the universities affect this development as well as the possible role of the university as an urban developer.

Secondly, it is examined how the wide accessibility of the campuses provided by transportation facilities, bringing people from distant areas, impacts over land and real estate markets. The hypothesis of the work is that this impact will reflect on land prices on areas from which the main flows to the university come. So, at the metropolitan level, the preference for areas accessible to the campuses influences the location choice of households which need to commute daily to the university. Since the research deals with a disperse context, the Brasilia's Metropolitan Area¹, lower travel time to the university is analyzed as an element that produces a great impact on the preference of households, impacting on land prices.

Finally, the article investigates, on one hand, the influence of a consumer market formed by the university community on the nature of commercial activities, especially services or commerce that supply faculty, students and staff which spend the day at the universities. On the other hand, the specialized working force or the infrastructure of the university may favor the location of industrial or institutional uses on the surroundings

¹ Alain Bertaud and Stephen Malpezzi in an empirical work considered The Metropolitan area of Brasilia as the most disperse over the set of cities analysed. Bertaud, Alain. & Malpezzi, Stephen. 2003. *The Spatial Distribution of population in 48 World Cities: implications for Economies in transition*, in: <http://alain-bertaud.com>.

of the university. The search of complementarity with the university affects, then, the nature of the surrounding activities. So, it is studied how the high accessibility of the university as well as the special nature of the surrounding activities may influence the demand for plots nearby, thus influencing land prices.

II - Categories to Analyze Impacts Produced by University Campuses: Magnets and Enclaves

Universities may generate different sort of impacts on an urban area. The presence of a campus on a derelict area may initiate the transformation of the entire neighborhood, through the action of the university, as a developer, regenerating houses and urban areas in order to attract students and professors to live nearby (Perry and Wiewel 2005). But the university site can also function completely apart from the surrounding neighborhoods, ignoring social problems.

Other impacts related to the higher accessibility of the area and to the power of attraction of the university, present positive and negative dimensions. This work uses two concepts to analyze the nature of the impacts produced by the presence of a university campus in the city: magnets and enclaves.

The first concept used to describe the impacts of large landowners such as the university is the “magnet”. In urban terms, a magnet represents a concept or metaphor which describes a territory in the metropolitan area which attracts people and economic activity towards it. This desire of proximity reflects in land and real estate prices and rents appreciation (O’Flaherty, 2005). The closer any location is to a magnet, the higher the price or rent tends to be.

University campuses can be qualified as magnets since they have the power of attracting many students, faculties and staff as well as business and institutional activities to a specified region in the city. In the case of disperse metropolitan areas, such as Brasilia, the role played by large landowners as magnets is strengthened because the generation of mechanisms which gathers people is fundamental for economic purposes.

Concentration of people and business activities are necessary to make the economic system efficient. The agglomeration of people makes commerce and services more profitable, because there is a greater possibility of matching consumers and producers interests. Besides, referring to business activities, the proximity to a magnet enhances the possibility of exchanging experiences between different entrepreneurs and increases the availability of production resources.

Large properties have historically played an important role in urban development and in the production of externalities (DiPasquale and Wheaton 1996). The 19th century process of urban expansion was influenced by the construction of new industrial and railway sites on the outskirts of the city. Serving as magnets for urbanization, these large properties attracted new industries that took advantage of the proximity to railway stations to distribute industrial production. New housing areas arose to receive the industrial working force. Other 19th century large properties, usually seen as undesirable, moved to new peripheral areas such as cemeteries, slaughterhouses, as well as hospitals for infected people (Martins 2004).

A university, when acting as a magnet, besides attracting uses that promote urban and economic growth, attracts activities regarded as damaging by particular groups in society. For instance, the concentration of people may be considered, at the same time, positive from the point of view of business and commerce and negative from the point of view of the neighbors who suffer from the traffic congestion generated by this concentration of people. Therefore, a magnet generates simultaneously costs and benefits for its surrounding community.

The second concept used to describe the impacts of large landowners such as the university is the “enclave”. An enclave represents a self-contained place or region of the city, with uses or morphology different from the ones of the surrounding neighborhood. According to Perry and Wiewel (2005), the university has traditionally seen itself as an enclave, “removed enough from the immediacy and demands of modern life to produce the knowledge and information with which to better understand society (...)”. Modern approaches, however, grounded a new vision of the university, in which “the university is seen as a product of its relationship with the city and its urban surroundings, with a strong belief in a university of, and not simply, in a city” (Perry and Wiewel 2005).

Some universities represent relevant enclaves in the city context. They produce breaks in the urban fabric which sometimes cause disconnection between areas located in different sides of the campuses. In that sense, some campuses are not different from other large landowners from the industrial past, such as industrial sites that avoided the connection between the different parts of the city and constrained a large amount of land for undesirable uses (Martins 2004).

This dichotomy of being at the same time magnets and enclaves for urban development characterizes large universities. Depending on the externality, the role of universities as magnets may overcome their features as an enclave and vice versa.

When the analytical interest lies on the impacts produced by the attraction of people and business activities to some part of the city, the concept of magnet is the protagonist. On the other hand, when the main impact examined is the one related to the spatial or morphological structure of universities, the concept of enclave gains importance.

Therefore, the concepts of magnets and enclaves represent an important methodological tool in the analysis of the impacts or externalities produced by universities on land and real state markets.

III - The Universities in the City Context

The process of urban development of Brasilia’s metropolitan area, which is relatively recent when compared to other cities, as well as the almost absence of pre-existing urban settlements in its territory, allows evaluating how long does a large landownership take to impact on the urban landscape.

Since the construction of Brasilia, the public sector has been acting as the main large landowner and developer. The central area of Brasilia, the “Pilot Plan”, was originally planned to receive not more than 500.000 inhabitants. When migration to the city began, motivated by a whole range of jobs offered in the Brazilian Federal Capital, the embryo of a metropolitan area was settled and the construction of new towns were organized, following a “satellite town” model. The capital was the political,

administrative and economical center, and the satellite towns were mainly dormitory areas, organizing a monocentric and unbalanced metropolitan structure. In the last years, though, private sector activities have increased at a considerable rate in some satellite towns.

In the late 1980s, private landowners began to parcel many rural properties into smaller fractions. The housing sprawl, in legal and illegal sites, spread out all over the territory leading to a high degree of dispersion. Commuting from long distances is, then, a reality for most of the population of Brasilia's metropolitan area.

In the first years after the construction of the city, the University of Brasilia (UnB), a state university, occupying 395 ha, with 463.000 m² of built-up areas (in 2003), kept the monopoly of the higher education. In the last 10 years, Brazilian educational policy has experienced the expansion of the higher education private system. This fact increased the number of private university sites in the city. The Campus of the Catholic University of Brasilia – CUB, is the second larger campus of the metropolitan area and the biggest private campus, occupying 60.4 ha, with 106.000m² of built-up area and 408.000m² of open spaces, including large parking lots.

1. University of Brasilia – UnB Campus

The University of Brasilia- UnB is an important element in Brasilia's urban development. The construction of the Brazilian Federal Capital in 1958 began from the symbolic spaces of Brasilia's central area. In 1961, a year after the city was inaugurated, only few residential neighborhood units were constructed in the southern part of the city. The main axes, at north-south and east-west direction, and the local roads to access southern and northern neighborhood units, however, were already set in, assuring the physical support for Lucio Costa's Master Plan.

The University of Brasilia – UnB was also inaugurated that year. Lucio Costa in his 1958 Masterplan for the city, specifies the location of the University of Brasilia composing the central area, which represented the role of the Federal Capital : “Along the Esplanade (...) there must be located the Ministry buildings and the Autarchies (...) being the last one assigned for the Ministry of Education in order to be close to the cultural sector (...) as well as to the wide area assigned to the University Town”.

The Campus was conceived in a central location, about 3 km to the northeast of the Central Business District and the Federal Capital administration center (the Ministerial Esplanade). It was conceived as an open campus in a green atmosphere, following the pastoralist tradition related to the academic mission (Perry & Wiewel, 2005).

The morphology of the Campus defines the ambiguous character of the University of Brasilia: an important element of Brasilia's urban arrangement and at the same time an urban piece relatively self-contained.

In 1964, the occupation of the northern part of the city began around the UnB Campus (fig.1). The university academic expansion between 1964 and 1975 (expansion of 82% in the academic structure) continued to attract new activities, consolidating the neighborhood areas in its surroundings, in such a relation that would make the

University one of the main reasons of Brasilia's northern part urban development (fig.1).

In 1986, Brasilia was almost completely built. From 1986 to 2005, the university constructed several new buildings (fig. 1) to respond to its academic expansion: 21.734 undergraduate students (32% more than 1998 and 53% more than 1961) and 70% more graduate students.

However, the urban landscape where the Campus is placed barely changed since 1986 (fig. 1).

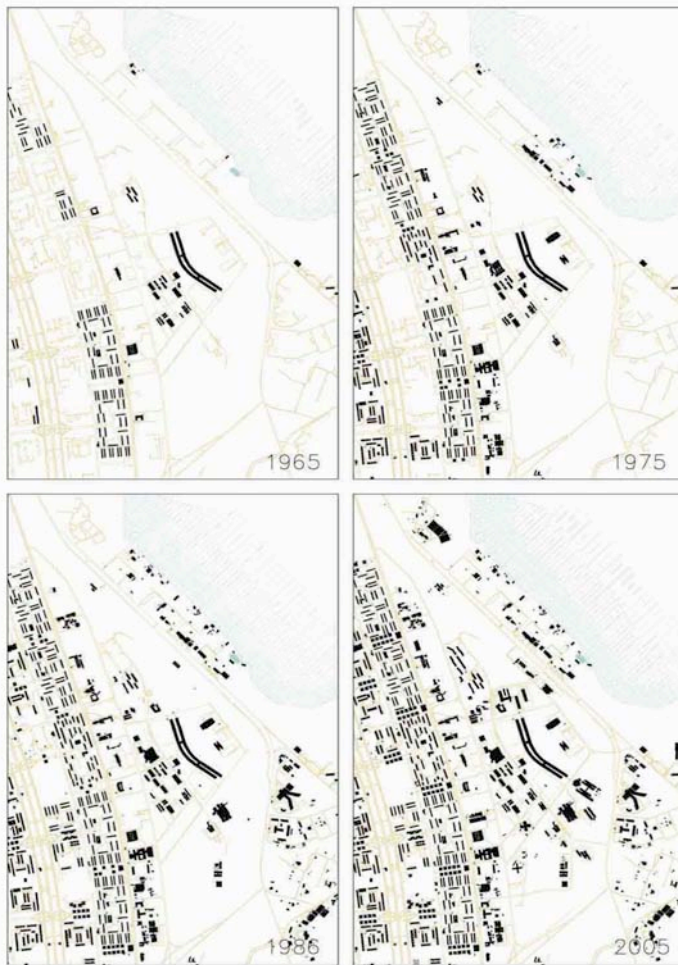


Fig. 1 – Urban growth in the adjacencies of UnB Campus

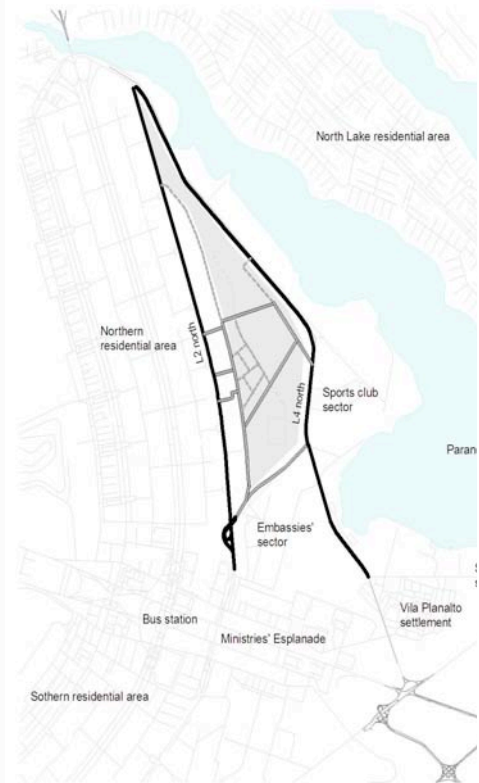


Fig. 2 - UnB Campus urban situation

The Campus is enclosed in the west by a sector mainly formed by institutional plots, which configure a sort of barrier to the residential area nearby, due to the lack of permeability between the Campus and the main road that serves the institutional sector and the residences, the L2 north road. Only 6 transversal streets and few pedestrian passages communicate the Campus to this road. L2 north absorbs most of north-southern flows, as well as those targeting the campus. The Campus occupies 4.2 km of the 6.3 km of extension of this mass transit corridor (fig. 2).

In the east, the campus is surrounded by a sports club sector facing the lake. The main characteristic of this sector is large properties with the predominance of open spaces over built-up areas (fig. 2).

UnB Campus is relatively independent of the local government regarding the managing of land-use. This treatment, though, is not defined by legislation but by the planning practice for the older public institutions established in Brasilia since the 1960s.

There is a commitment between the Campus Master Plan and the preservation of Brasilia's urban atmosphere. The urban area of Brasilia is regulated by guidelines defined to each plot. This legacy from the Modern Movement planning principles intensifies the control over land-use. Since 1987, Brasilia is considered a World Heritage with a strict control over the four "urban scales" - residential, gregarious, bucolic and monumental. These abstract concepts are materialized in some characteristics, such as: the zoning of activities, a hierarchic street system, the existence of neighborhood units as the urban morphological unit for housing areas and the predominance of open spaces over built-up areas. This last characteristic, besides zoning laws, affect directly the area of the UnB Campus, placed in the bucolic scale, where open areas should prevail.

Nevertheless, that doesn't mean that the concern of the University on its real estate will respect rigorously the "bucolic dimension". In terms of available area for academic use, the Master Plan defines that on long term (from 30 to 50 years), 45% of the Campus plot could be taken by built-up areas.

UnB Campus Master Plan proposes a zoning of activities and building standards that should not be understood as a proposal for parceling, but rather as a way of organizing the large property. The document defends two principles: the prevailing urban use (referring to both academic and scientific purposes) and the integrity of large property (meaning that no parceling outs are accepted). The Master plan defines eight zones:

1. Natural areas for strict preservation;
2. Sectors strictly designated to academic uses;
3. Sectors of public or private institutions with academic interests;
4. Sectors of multifamily housing for the University community;
5. Sectors of supporting facilities and community environment (commerce, leisure and services oriented towards the University community and other campus users);
6. Sectors of recreational and leisure parks
7. Sectors of convention parks and hotels (oriented to institutional events and new courses in tourism and management of hotels).
8. Sectors of technical support and maintenance.

UnB has defined in its Master plan limits for the real estate market concerning vacant areas: 36% of vacant areas are still available for construction. A large percentage of the vacant areas in the campus is protected by environmental preservation (natural areas for academic research or urban parks). Only sectors (3) and (5) are not designed to the University structure.

So, 13,5% of the remaining areas could be considered to other uses. The areas assigned for institutional uses would be probably priced in the market in the same way as those of the surroundings. Although they would represent a new supply, their influence on prices should be low since the existing stock of this sort of land use in the surroundings is already very large.

The real estate interests of the University of Brasilia focus on 3 aspects:

- firstly, to build inside the campus improving the space for existing academic units, providing new facilities for the city (such as a science museum) and attracting important scientific related activities to the campus;
- secondly, to retain some properties of its ownership in central Brasilia as part of their patrimony;
- thirdly, to decentralize the University by creating new campuses on strategic points of the Metropolitan area, relying on its power to attract new dynamics for less-favored urban areas.

2. Catholic University of Brasilia – CUB Campus

The CUB campus is 4 km distant from the second regional business center of the metropolitan area – the towns of *Ceilandia* and *Taguatinga*. *Taguatinga* was one of the first satellite towns built in Brasilia's metropolitan area. Since 1964, *Taguatinga*'s grid has almost not changed. The urban limits in 1964, though, didn't comprise the future area of the Catholic University (fig. 3).

With the inauguration of the Campus of the Catholic University of Brasília in 1985, the urban limits of *Taguatinga* begin to expand towards south. The CUB campus was set along the EPCT highway, an important mass transit corridor that distributes important flows towards this second center. The EPCT also distributes, towards the central area of Brasilia, the flows coming from the urban areas in the southwest, where more than 52% of the population live. The Campus occupies 585 m of the 5.2 km in length of the EPCT (fig. 4).

In its beginning, the structure of the CUB campus was very small compared to the one of 2005. From 1995 on, two elements contributed to Southern *Taguatinga* urban development: on one hand, *Taguatinga*'s Master Plan approved in 1998 turned more flexible the land-use regulation for the eastern border along EPCT highway, the exact area around the Campus; on the other hand, in 1995, the Catholic institution suffered an upgrade, improving enormously the physical structure of the Campus (fig.3).

Presently, the CUB campus built-up area is almost six times larger than it was in 1995 (jumping from a former structure of 3 buildings to 17 buildings and 3 others planned for the next 2 years).

The surroundings followed the same level of growth. In the east, rural areas surrounding the campus experienced a process of urbanization. In the southeast, *Areal*, the existing low-income area, was consolidated due to its recognition as a regular urban area by the 1998 City of *Taguatinga* Master Plan. Industrial areas were planned and began to be constructed both in the south and in the southeast. In the north, a new neighborhood for both medium and high income classes begins to consolidate: *Aguas Claras*, where about

80.000 inhabitants live today. In the north-west, along the EPCT highway, shopping centers, hypermarkets and a large number of car dealers surround the campus. (fig.3 and 4)



Fig. 3 - Urban growth in the adjacencies of CUB Campus

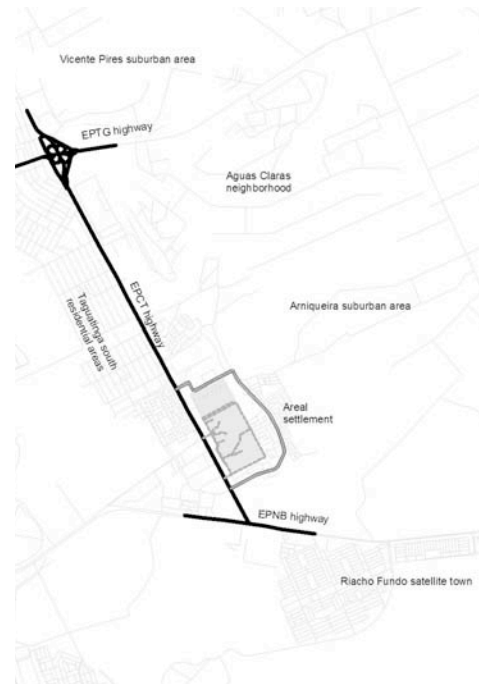


Fig. 4 - CUB Campus urban situation

The growth of the CUB Campus is not the only explanation why this area faced such a considerable urban growth. It is also remarkable the creation of 3 satellite towns – *Samambaia, Riacho Fundo I & II* and *Recanto das Emas* – in the south-western part of Brasilia’s metropolitan area in the last 15 years. Due to the shortage in the supply of services and commerce in those low and medium income areas, the population uses the nearest center, *Taguatinga*. The EPCT highway is the route through which this center can be reached, especially by bus. Few restrictions regarding the use of areas along the road offered many advantages for new activities searching for large plots in less expensive land with great accessibility, stimulating a sub-center to be located in southern *Taguatinga*.

After some years, the catholic university’s directory decided to put fences along the campus perimeter. This feature prevents the campus from being a possible element of connection between important housing areas since the fences configure a barrier in the urban space. From the EPCT highway the campus is accessible only through one entrance. A second entrance will be opened in the next couple of years, in order to facilitate the flows coming from the northern neighborhood of *Aguas Claras* and the close settlement of *Areal*. At present, drivers have to make a detour of about 2 km to reach the campus main entrance. A street which surrounds the campus, acting as an urban beltway, is being improved through the duplication of its lanes.

The Catholic University Campus is regulated by the 1998 *Taguatinga City Master Plan*, constraining the role of the University as an urban developer. The *Taguatinga City Master Plan* presents a less detailed zoning of activities. The urban areas are grouped

according to three major concepts: areas of major, medium and lower restriction. This feature makes this Master Plan different from Brasilia's land-use regulations, where built-up parameters and a more detailed range of activities are defined for each plot.

CUB Campus is placed in a plot of low restriction, following the tendency of the neighborhood. This means that this plot can be used for other purposes rather than educational. Nothing prevents the area from being transformed into a shopping centre or a hypermarket, such as other properties nearby.

The urban area inside the plot is organized according to short term needs without making use of a planned strategy. University official plans for the next years encompass the construction of four new buildings, including a new library, a Forum and a commercial area. The Campus Authority is studying the size of a commercial building, since the area around CUB Campus already has a large shopping center and two hypermarkets located about 2,5 km away from the campus. This commercial area inside the campus is then expected to be a local facility oriented mainly towards the university community, the immediate surrounding housing and the automobile dealers shopping areas. Regardless of these buildings, more than 35 ha will remain available for future constructions.

Considering that it is not clear which will be the future non-academic activities of the campus, real estate developers could still speculate about the redevelopment of part of the plot. The real estate market around CUB is much more dynamic, because the area is still under consolidation when compared to the area around UnB, much older and already consolidated. Moreover, considering the flexibility of land uses, the massive presence of commercial activities followed by some important new universities and schools, reveals the preference to use this location for institutional purposes.

IV. Accessibility to Universities Campuses Generating Impacts on Land Markets

Because students, faculties and staff from Brasilia's universities do not necessarily live close to the Campus, their demand for transportation services is strong. So, if the university community lives in distinct points of the metropolitan area, the analysis of the accessibility to the campus is relevant in understanding the impacts on land and real estate markets associated with the movement through the territory related to the university community.

Accessibility refers to the number of opportunities to reach a site (Pacione 2001), either by public transportation systems or through private automobile. Moreover, accessibility has a dimension connected with the time spent by individuals to reach interesting places in the territory. Both aspects of accessibility were analyzed in the research.

Accessibility interferes in the location decision of firms and households. While firms search for accessibility due to factors of production, such as labor force, households seek accessibility due to work opportunities, shops, schools and recreational facilities (Harvey 1996). The location decisions described above have a powerful role in the determination of location rents in both land and real estate markets (Wheaton and DiPasquale, 2006).

The price of land, like the price of other goods, is determined by the interaction of supply and demand in the market. However, considering that the supply of urbanized

land is restricted (unless the undesirable unlimited urban expansion is adopted by the local Government) the demand influences land prices much more than the supply (Harvey 1996). This means that the value of a site will increase and will remain at high levels, for a long time, following a positive demand shock, since the supply side adjusts relatively slowly.

So, the more the opportunities of a site raise, because of its wide accessibility, the more attractive it becomes. Land prices tend to be higher, everything else is kept constant if the site has a great accessibility and the demand for the site is high.

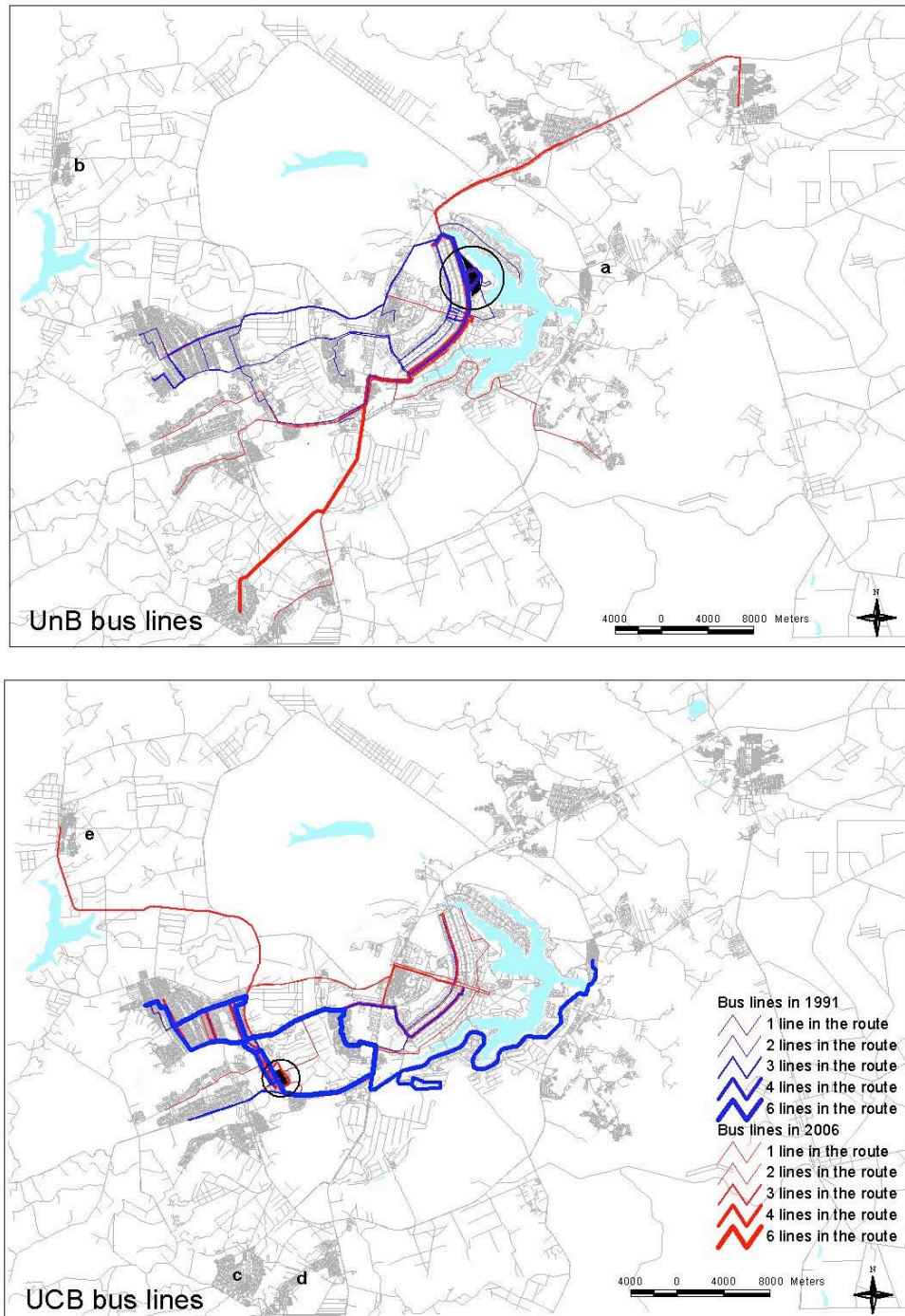


Fig. 5 - Representation of the public transportation system growth: 1991-2006

The improvement of accessibility levels experienced by the campuses is illustrated initially by the growth in the availability of public transportation lines (buses), coming from different points of the territory which crosses or reaches the campuses. The purpose of performing this analysis is to demonstrate how the opportunities to get to the university areas have increased in the last 15 years, as a consequence of the physical expansion of both institutions and of the consolidation of many urban areas from where the university community comes from (fig. 5).

In the case of the UnB Campus, fig. 12 shows that, in 1991, the existing bus lines connected the university with the south-western urban areas. The expansion of public transportation system allowed eastern, northern and southern cities of the metropolitan area to be directly connected to the university. Those journeys in the past had to be done by changing buses in the central bus station, reflecting the high cost of transportation back then. Except for the urban areas of *Paranoá* (fig. 5, a) and *Brazlândia* (fig. 5, b), the inhabitants of the urban nucleus of Brasília can now reach directly the UnB Campus.

In the case of the CUB Campus, fig. 12 shows that in 1991 bus lines passing through the Campus served only a southern arch in the Federal District, excluding though southern cities close to the administrative limits of the Federal District (fig. 5, c&d). The growth of the urban transportation system in the area of the university expresses a wide connection of the Campus with the central area of Brasília, as well as the new flow to the northwest (fig. 5, e). The urban relationship between the CUB Campus with the city of *Taguatinga* was intensified with the consolidation of that city as a second regional business center.

As for the private automobile, the road system that reaches both universities was improved in the last decade, by means of creating new roads, introducing round-points, widening roads, etc.

These improvements show that the accessibility, in terms of number of opportunities to reach the universities, rose dramatically in the last decade.

A second analysis, regarding another feature of accessibility, refers to the importance of travel time in favouring accessibility.

In compact areas, proximity plays a major role in the determination of values in land and real estate markets. Properties pertaining to the same neighbourhood share a positive correlation over their values and rents (Le Sage 1999).

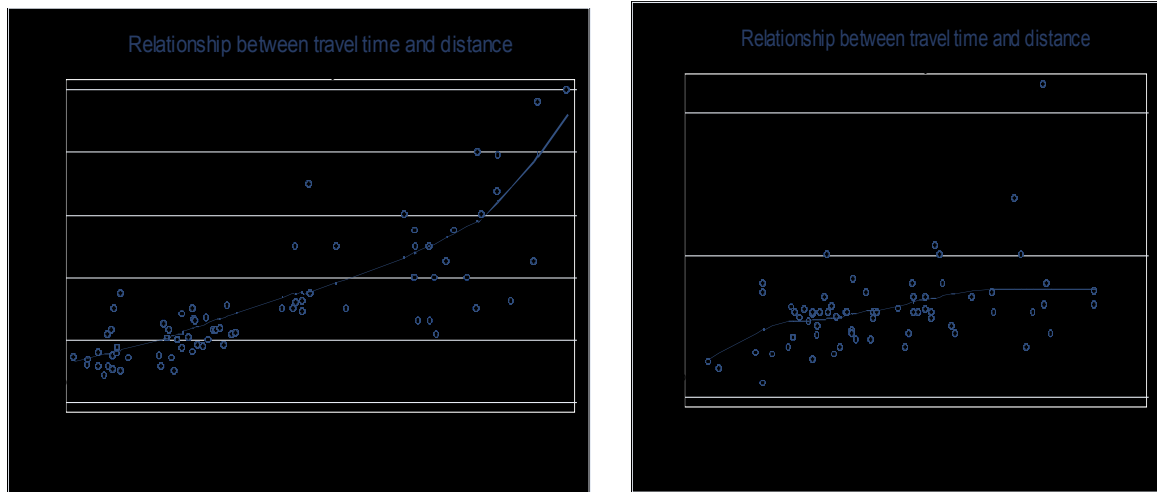
However, in disperse contexts such as the metropolitan area of Brasília, as the distances between sites become longer, the importance of time spent on journeys become a significant variable to measure the accessibility to a certain point of the territory. So, accessibility is not only a question of having public transportation or a good road system to reach the university site but it is also a matter of how long people take to reach this site.

Travel time will be considered as an important location decision variable. For people commuting daily to the universities, the research works on the hypothesis that their preference would be to live in places accessible to the campuses in order to spend less time on the journeys. Therefore, the demand for those accessible sites would reflect on land values.

By making use of a micro-data base of patterns of transportation with regard to journeys in the Brasilia metropolitan area (Codeplan 2000), the research measured travel time for places near and far from the university.

The research selected as the data to be analyzed the trips, having either as origin or destination both University campuses, of any modal and with a variety of purposes, such as: studying, working, living or accompanying someone.

Graphic 1 presents, for the CUB and UnB campuses, the aggregate relationship between travel time and distance to the Campuses, without making distinction between the two main modes of transportation: private automobiles and buses/micro-buses.



Graphic 1- relationship between travel time and distance to the Campuses

By looking at the regression lines in graphic 1, for the CUB case, it can be noticed that the time wasted to arrive at the campus only increases slightly, as distance traveled increases. In the UnB case, however, longer spatial distances are also translated into longer travel time. This means that somehow CUB campus is more accessible than UnB campus for more distant areas.

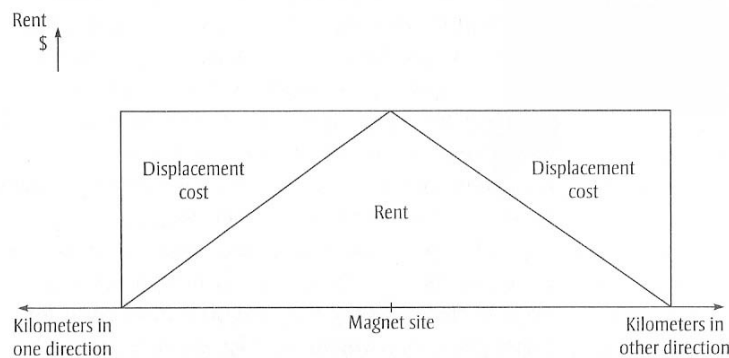
The inflection point is located between 5 to 10 km, in which the behavior of the regression line representing the average accessibility for both campuses follows a distinct pattern: for the UnB the line goes up and, for the CUB, it goes down.

So, the level of accessibility of each Campus – CUB as having a higher accessibility for distant places than UnB - seems to indicate a different extent of the impacts produced by each campus.

The next sections evaluate the influence of both campuses at the territorial and local levels.

V. Impacts of large campuses on land and real state markets

Some large landowners, due to their size and capacity to attract people, are able to produce impacts on land and real state markets not only in their neighborhood but also in the whole metropolitan area. In this research we worked with the hypothesis, tested subsequently, that both case studies, the UnB and CUB, work as magnets, by the fact that they represent huge urban areas which attracts thousands of people daily.



Graphic 2 – Land rents around a magnet site
Source: (O’Flaherty, 2005)

Graphic 2 (O’Flaherty, 2005) illustrates well the reason why large University Campuses act as magnets. Magnets are places that, due to their characteristics (economical, environmental, cultural etc) of centrality, command a high value in the market. The further apart the localities are situated from the magnet site, the more their values shrink.

Therefore, universities produce impacts on land and real state markets depending on the proximity of the locality in relation to the Campus. In disperse contexts, though, those impacts may reach more distant areas since accessibility can be more important than proximity, especially when the time spent on the trips towards the magnet doesn’t vary too much for areas close or far from the magnet. That is the case of the CUB campus.

Considering these theoretical approaches, at the metropolitan level, the article examines the impacts produced by the mobility of people in the territory attracted by the magnet site. The magnitudes of these impacts are a function of the power of attraction of the magnet site and the accessibility of the various localities in relation to this site.

At the local level, the article analyses the impacts related to land use and price changes, in order to accommodate external economies of concentration and complementarity in relation to the dominant activity.

1. Metropolitan Impacts

To observe the territorial extent of University campuses impacts, the research firstly tried to identify the area of influence of each university. However, as mentioned before,

in disperse areas, where mobility of people and accessibility of sites become important features in the location choice of households, the area of influence of a certain activity may reach more distant areas. The research, by analyzing the trips to and from the university, computed in the transportation survey data base (Codeplan 2000), worked on the hypothesis that the magnitude of the influence of both university campuses is stronger for regions in the metropolitan area that concentrate the major number of journeys towards the university.

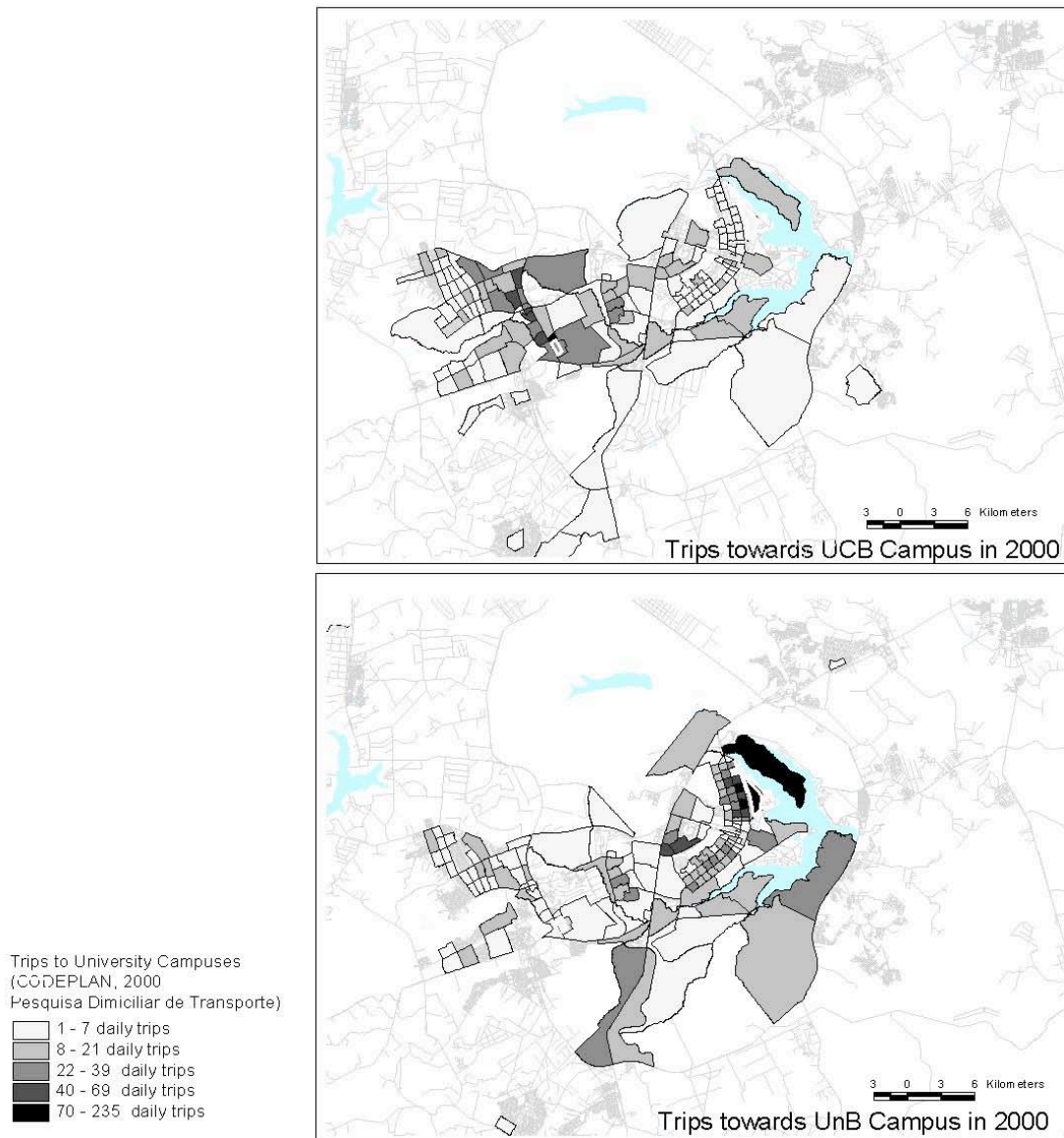


Fig. 6- Areas of Influence of both University campuses and their relationship with income in the metropolitan area.

Over these wide areas of influence it was analyzed how the accessibility to the universities may affect land prices. The research worked on the hypothesis that the University Campus represents a magnet which impacts on location rents of areas where people interested in reaching the university live. The underlie reason which triggers the impact of Universities on land and real estate markets is the monetary and temporal cost saved or expended on daily journeys to the campus. So the accessibility to the university seems to interfere in land prices of these areas of influence.

From the analysis of a sample data drawn from the transportation survey data base, it can be concluded that the major flows of people going to each university coincide with their close neighborhoods (5 to 10 km), decreasing as the localities are placed faraway from the Campuses (fig. 6). So, the trips *from* and *to* UnB Campus have as their main origin or destination the traffic zones adjacent to Brasilia's primary center: the residential areas of *Asa Norte, Asa Sul, Lago Norte, Lago Sul, Cruzeiro/Sudoeste and Guar*. As well, the main trips *from* and *to* CUB Campus have as their origin or destination the traffic zones adjacent to the second center of Brasilia's metropolitan area: the cities of *Guar, Taguatinga, Aguas Claras, Vicente Pires/Arniqueira, Ceilandia and Samambaia* (fig. 6).

In order to measure this influence, the research performed an econometric analysis using housing market data due to its connection to the land market. By studying housing market we may infer the value of location which represents a significant part of the value of land. The econometric analysis used the Budgetary Household Survey jointly with the transportation survey data base to generate the variable "housing rents" which represents the variable to be explained.

What the econometric analysis does, in intuitive terms, is to simulate an experiment which cannot be seen in real life. The experiment consists in moving a typical dwelling into various points of the metropolitan area, some of them close to the university campuses and others placed faraway, checking how the value of the dwelling has changed. The parameter of interest in each equation was the one designed to track the impact of distance, measured as travel time from the campus, over the value of housing rents. The remaining parameters were just used as controls. Those parameters were chosen after performing a series of tests in which the main criterion was the preservation of the consistency of the estimate of the parameter of interest: the one related to the accessibility to the university.

The power of the econometric analysis relies on the capacity of disentangling impacts of an exogenous variable (distance from a magnet site) over an endogenous variable (housing rents) while keeping the remaining factors that may influence the endogenous variable constant.

The specification chosen was the Log-Log: logarithms were taken in both sides of the equation in all the continuous variables employed. The dummy variables were kept into their original forms. The Log-Log econometric model is a version of the following hedonic rent model, expressing the results in terms of elasticity:

$$HRENT = f(\textit{accessibility}, \textit{neighbourquality}, \textit{dwellingcharacteristics}) \quad (0.1)$$

The specifications for the UnB and CUB campuses have the following estimates to measure the relation between travel time and prices:

Hedonic Equation UnB

$$\begin{aligned}
 \ln(HRENT) = & 4.993052 - .1225373*\ln(TIMEUNB) - .2035028*\ln(WORK) + .3298709*\ln(SCHOOL) \\
 & (26.36) \quad (-4.72) \quad \quad \quad (-4.21) \quad \quad \quad (6.00) \\
 + & .408351*\ln(AUTOS) + .1082266*LEVELSTUD - .0779912*FEMALE + .079284*MULTIFAM \\
 & (18.99) \quad \quad \quad (20.01) \quad \quad \quad (-3.93) \quad \quad \quad (3.21) \\
 + & .3451977*\ln(ROOM) + .0777985*OWNER - .1441428*DOUBLING + .0211163*FAR \\
 & (13.87) \quad \quad \quad (4.55) \quad \quad \quad (-5.19) \quad \quad \quad (2.93)
 \end{aligned}$$

Number of obs = 3799; R-squared = 0.3036; Heteroskedastic robust t-values in parenthesis

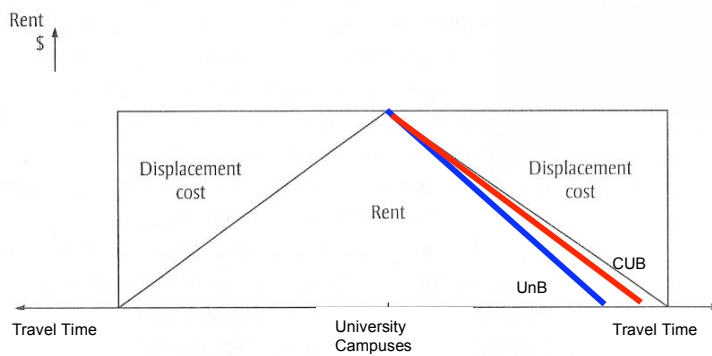
Hedonic Equation CUB

$$\begin{aligned}
 \ln(HRENT) = & 6.73522 - .0528794*\ln(TIMEUCB) - .9985769*\ln(WORK) \\
 & (30.21) \quad (-2.16) \quad \quad \quad (-26.93) \\
 + & .7067544*\ln(SCHOOL) + .4553633*\ln(AUTOS) + .3836786*\ln(ROOM) \\
 & (11.69) \quad \quad \quad (18.40) \quad \quad \quad (14.24) \\
 + & .0311813*OWNER + .0007343*TIMEDWEL + .0289011*FAR \\
 & (1.56) \quad \quad \quad (0.91) \quad \quad \quad (3.58)
 \end{aligned}$$

Number of obs = 3568; R-squared = 0.4859;

Heteroskedastic robust t-values in parenthesis

The time equation for the UnB case allows the interpretation of the elasticity: a 1% increase in the time to reach the UnB campus from home (TIMEUnB) leads to a decrease in housing rents of 0,1225%. For the CUB specification the impact is milder: a 1% increase in the time to reach the CUB campus from home (TIMECUB) leads to a decrease in housing rents of 0,0528%.



Graphic 3 – Behaviour of UnB and CUB referring to land rents around a magnet site
Source: (Adaptation of a graphic introduced by O'Flaherty, 2005)

The stronger impact produced by travel time on rents in the UnB's specification in relation to the CUB one, was probably caused by the greater centrality of the UnB campus in relation to the CUB campus, and because of the greater accessibility of the CUB campus to travelers coming from distant localities.

2. Local impacts on land markets

Local impacts on Brasilia's university campuses are mainly associated with the effects produced by the presence of an important consumer market formed by the university community that stay a long period inside the campus and not necessarily live nearby.

Local impacts are expected to reflect, firstly, on the nature of activities placed on the surroundings, influenced by students, teachers and workers when acting as consumers; by the university's research projects and human capital assets that may be used by enterprises; and by the university's infra-structure (library, labs and hospital) that may be employed by the whole community.

A second local impact, expected from the presence of the campus on the surrounding properties, is some influence on land prices of those properties.

Economic land value is constituted by three aspects: utility, scarcity and desirability (Gwartney 1999). A land that lacks one of these elements has no economic value. So, the fact the university attracts some activities, may lead to a strong competition for the lots surrounding the university, increasing the demand (desirability) and therefore increasing prices. However, as far as land regulation for these surrounding plots may constrain the sort of development allowed, land prices instead of increasing may fall.

The research firstly analyzed the nature of the activities placed around the campus. The research cataloged activities that could reflect educational purposes of the Universities or could subsidize the daily needs of the university community.

The work then, analyzed the impact of the campuses on land prices by comparing land prices of the areas around the university campuses of three different years – 1991, 1998 and 2006. In the period, 1991-2006, both universities faced an important expansion of their academic and physical structure. Estimated sale values, obtained from the urban property taxes cadastre, were used in the analysis. The influence of land-use regulation was considered as an important element that could influence land prices.

2.1. The Nature of Activities

Four groups of activities that could benefit either from the consumer market or from the educational facilities of the universities were catalogued:

1. Supporting uses for daily consumers: restaurants, bars, supermarkets and entertainment;
2. Activities that benefit from the proximity to the University: educational and scientific institutions, international organizations, public agencies, hospitals, laboratories.
3. Related commerce: such as book and CD stores, computer supply stores, office supply stores and hotels;
4. Other commercial activities, reflecting specifically the metropolitan atmosphere, such as hypermarkets or supermarkets, shopping centers, outlets;
5. University central libraries and hospitals that could attract users from the community.

In the context of the UnB Campus, on one hand, the location of residential neighborhoods nearby interferes in the nature of the products sold, mostly goods of high frequency purchase, focusing the consumer that lives in that area and complementing

the daily needs of the university community. So, small retail around UnB is represented, for instance, by bakeries, hair dressing and drug stores, while large retail facilities are mostly supermarkets or malls. A local concentration of small shops dedicated to culture or technology is observed along a street of access to the campus.

On the other hand, in the context of the CUB Campus, an important mass transit corridor influences the nature of commerce. Ribbon developments of unplanned retail (Jones 1991) appear as response to suburban growth in contexts like the one of the CUB campus. This commerce offers less frequently purchased products or goods which can be purchased together in a single trip (the usual monthly shopping trip) trying to reach the consumer that passes through the area (DiPasquale and Wheaton 1996). Therefore, large scale activities are observed around the CUB campus. Two hypermarkets, a shopping center, automobile dealers in outlets and shopping strips are distributed along EPCT highway. In this area no specific relation to cultural commerce or computers supply was observed.

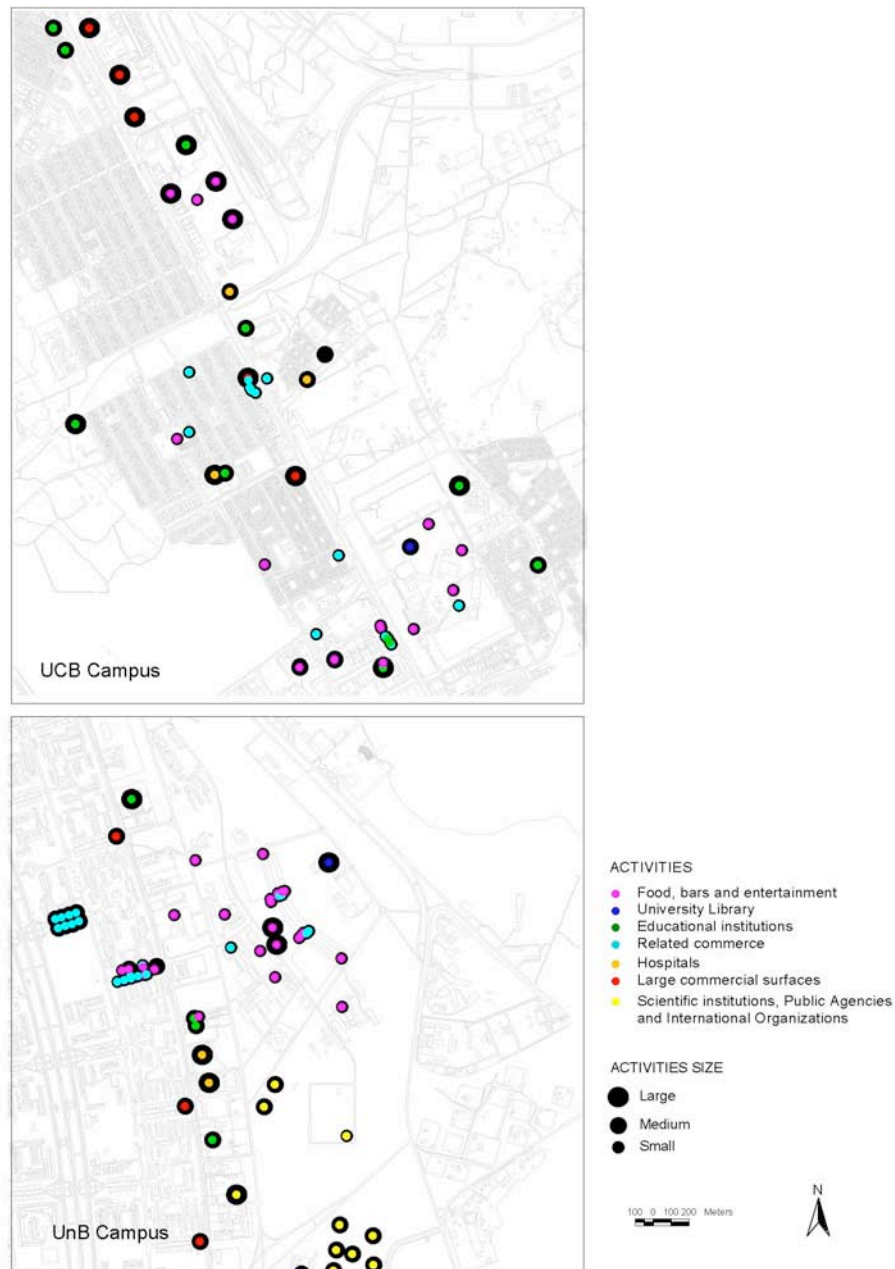


Fig. 7 – Activities distribution around CUB and UnB Campuses

Referring to the location of institutional uses, however, it was observed the influence of the university campuses. Educational institutions may share supporting activities such as libraries, common services and public transportation system. So, the presence of the university may influence the location of other schools nearby. In both cases studied this hypothesis is true.

Around UnB Campus, it is observed the presence of another university and a language school. The UnB Central library, the possibility of sharing teachers, academic technicians and even students searching for complementary courses and a possible congress held by one university establish the relationship of co-operation between these uses.

Other university units and schools are located near the CUB campus. Facilities provided by CUB, such as the central library and sports installations, stimulate the location of these activities.

The relationship of complementarity of the university with other institutions is represented by a ready supply of a skilled labor that is able to make personal contact with other specialist during working days. The system of sharing activities and facilities is observed in the areas influenced by both University campuses.

2.2. Land prices around the university campuses

In the immediate area of influence (a radio of 1km from the campus) of both campuses, land prices are expected to be impacted by the proximity of the universities. The large accessibility provided, as well as the daily attraction of a large amount of people to the sites, tends to influence prices.

Regarding the CUB Campus, the higher land prices around the campus occur in lots lately parceled. It could be argued that, over the years, accumulated flows of new urbanized land have affected the size of stocks. From 1998 to 2006, a large amount of plots were launched in the market. This flow could have decreased prices at first (when urban development began) because the supply was higher than the demand.

But as far as the development was consolidated, from 2000 to 2006, the success of most activities called the attention of investors in real estate market opportunities. This period coincides with the academic and physical expansion of the CUB Campus. With a restricted land supply in comparison to demand and with the synergy of urban improvement in the campus, land prices increased for the plots that were still available.

In the case of the UnB campus, an inflexible land-use regulation seems to be responsible for the price decrease of the areas surrounding the campus, as shown in fig. 9. Although from the theoretical point of view, land-use regulation could increase prices because the supply is restricted for a certain type of land, if the use assigned for this land has low or no demand, prices, on the contrary, could fall, because one of the three aspects (scarcity, utility and desirability) responsible for the economic value of the land is absent: desirability.

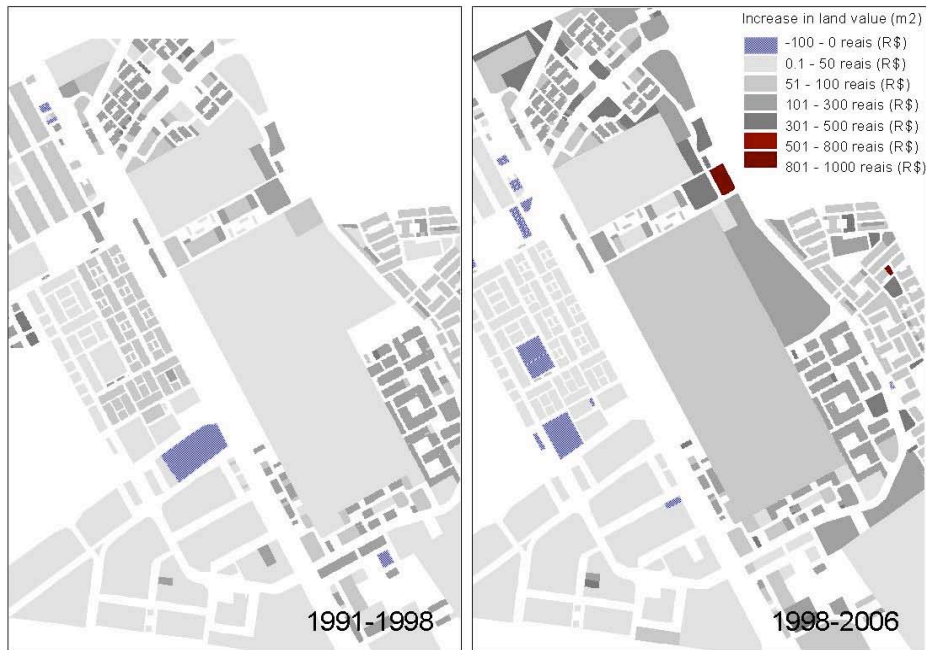


Fig. 8- Changes in land prices around CUB campus from 1991-1998 and 1998-2006

This is the case of the area around UnB Campus. As almost all plots immediately around UnB Campus are assigned for institutions, the supply for a single activity tends to be higher than the demand for this same use. Neither scarcity nor desirability seems to define the local market for institutional plots. The same occurs in the Embassy sector around UnB Campus. Although the area is very central and very accessible, no uses other than Embassies are allowed. Considering the large land supply for those uses, and the lack of demand for these plots, it was observed a decrease in land prices in this sector. The proximity to UnB Campus seems to have no relationship with this decrease in land prices.



Fig. 9 - Changes in land prices around UnB campus for 1991-1998 and 1998-2006

Considering the housing market, however, UnB Campus seems to have been related to the increase of land prices, especially between 1998 and 2006. The areas where land values mostly increased correspond, as shown in Figure 15, to the areas along the main accesses to the university from *Lago Norte* neighborhood and from the central area of Brasilia. Therefore, in terms of location decision, being in the area served by flows towards the university tends to reflect higher land values.

This contrast between a rigid land-use regulation around UnB Campus and a flexible regulation around CUB Campus demonstrates how local impacts tend to fade when the land use of an area is constrained, not allowing the market to locate the most profitable activities in the neighborhood.

VI. Conclusion

The article analysed impacts produced by the presence of universities campuses on land and real estate markets. Since universities represent major large landowners in many cities, they are expected to impact at both local and metropolitan scale.

The work focused on two university campuses in the city of Brasília: The University of Brasilia, UnB, a huge site present in the city from its beginnings, and the Catholic University of Brasilia, CUB, created in the 1980s.

Two concerns oriented the research: firstly, the description of the main sources of impacts produced by universities on land and real estate markets and, secondly, the explanation of how the impacts disseminated into the territory.

In terms of the sources of impacts produced, the research employed the concepts of magnets and enclaves. Rather than opposed concepts, they complement each other in describing the nature of impacts produced. Universities act like a magnet by their power to attract people and economic activities to their surroundings and at the same time they represent enclaves due to their large dimension which causes discontinuities in the urban fabric.

In analysing the dissemination of impacts, the work observed that, due to their size and their multifunctional activities, universities are able to produce impacts at the metropolitan level. Those impacts are a consequence of the high accessibility levels of the campuses, acquired along the years with the physical and academic expansion of the universities, as well as a result of the pattern of mobility enjoyed by the university community.

The characteristics of the metropolitan area where the university campuses are located, in terms of level of dispersion of the urban areas and of quality of transportation services and road system, also influence the way impacts and externalities are disseminated.

The high level of accessibility of both cases studied and the pattern of mobility of households in the metropolitan area of Brasilia confirm the previous hypothesis. Travel time turns out to be a concept more powerful than distance in explaining the accessibility to the university campus, since the research dealt with a case with high level of dispersion of the urban areas. Besides, the fact that the university community do not necessarily live near to the campus contribute to the importance of travel time over

distance. The inflection point is located between 5 to 10 km, where the accessibility for both campuses follows a distinct pattern: CUB campus as having a higher accessibility to distant places than UnB campus.

As a result of good accessibility levels, one impact expected to happen at the metropolitan level is the choice of the university community to live in areas with good accessibility to the campus, specially related to travel time. In those accessible areas, housing prices, thus land prices, are expected to be influenced by this choice.

Having as a sample areas where important flows to and from the universities are observed, the work tested if more accessible areas to the campuses in terms of travel time present higher land prices. The work observed that a 1% increase in the time to reach the UnB campus from home leads to a decrease in housing rents of 0,1225%. While, for the CUB campus the impact is milder: a 1% increase in the time to reach the CUB campus from home leads to a decrease in housing rents of 0,0528%.

On a different zoom, university impacts at the local level are associated with the so-called spill over effects in which complementary activities, such as those related to education, research and technological enterprises. These activities search places nearby the universities in order to grasp the benefits of being closer to high quality physical and human capital. Moreover, other activities such as restaurants, hypermarkets or book stores benefit from the large number of people attracted daily by the universities. This demand and competition for sites near to the university are expected to influence land prices of the surroundings of universities. Therefore, the nature of activities and land prices around the campuses are affected by universities at the local level.

The research observed that commerce around universities is actually much more influenced by the environment in which the campuses are placed than by the presence of the university's large properties themselves. Around UnB Campus, a housing neighborhood, it is observed commerce of goods of high frequency purchase, focusing the consumer that lives in the area, while around CUB Campus, a commercial area along a mass transit corridor, retail is represented by large scale activities.

Institutional uses, however, are observed around both campuses, showing that relations of complementarity is relevant in their location choice. The areas around campuses, especially CUB campus, are turning out to be important educational areas, independently from the urban regulation.

However, the land-use regulations represent a relevant factor in the determination of the strength of the impacts at the local level, particularly related to land prices around the campuses. The area around UnB Campus is the example of how the zoning of activities not demanded by the market and low building intensity led land prices to decrease in the period 1991-2006. In the case of CUB Campus, however, more flexible land-use regulation allowing the market to choose the most profitable use seems to stimulate the competition for plots around the university, reflecting in greater land values for the same period.

Differently from other works that study university real estate projects as the main type of impact of university on land markets, the research analysed impacts derived from the

presence of university campuses as major large landowners in a large city,
independently from a direct action from the universities as urban developers.

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