IMPACT IN REAL STATE VALUE OF URBAN AND TRANSPORTATION PROJECTS, IN THE METROPOLITAN AREA OF BARCELONA

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ABSTRACT: Often, research has studied the urban impact through: urban development and transport projects. The results suggest that factors from the real estate products (surface useful, number of bedrooms and bathrooms, parking, swimming pools, air conditioning, age) and environmental factors (socioeconomic status of the resident population, the proximity to infrastructure road and rail, the diversity of economic activities) are included in the expectation of real estate value. In this paper we report the results of a study that tries to simulate an integrated manner, the effect produced by large urban interventions on the accessibility, land use and real estate value in the Metropolitan Area of Barcelona. Using integrated transport model (model double bounded distribution and network assignment model) and hedonic models in a specialized GIS platform will try to simulate at census tract scale, direct impacts in the area of implementation of a specific development project, and also the indirect impact that occurs in the system of interaction of the metropolitan area of Barcelona. The analysis suggests that each group of urban development (approximately 30), produce different effects on the dimensions analyzed. The effect of transport projects is significantly lower than the effect of urban interventions as a whole, in the value of supply. This is because urban interventions, in addition to reconfigure the structure of accessibility, change the intensity of the attractions and generations of the system, a fact that no occur with only the transportation projects. There are cases where the magnitude of urban development is significant; however there are no changes in property values.

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1. INTRODUCTION

The large number of projects that are scheduled to be developed in the urban area of Barcelona originated the research question from this paper, referring to estimate the effect or urban impact produced by the realization of large urban interventions and transportation projects in the dimensions of accessibility, land use and real estate value in the metropolitan area of Barcelona. The ability to assess and in some cases simulate multidimensional impact of these urban projects, is increasingly feasible due to the high sophistication of models of specific topics, such as transport models and / or hedonic price models generate a new platform for virtual urban management, multidimensional, with great potential.

The impact of transport projects is part of traditional strategic studies. Strategic level groups of projects are evaluated according to current urban conditions, and future of the areas considered. The methodology traditionally applied in these assessments, is called the classical model of transport. As for the parameters of evaluation of a transportation project, has been the effect on journey times for vehicles and fuel consumption in the whole metropolitan system (ATM, 2007). Other research has incorporated additional variables to evaluate projects such as emission of gaseous pollutants, accident conditions of transport networks, noise pollution, generation of vibration, etc. (IDB, 2006).

Concerning the assessment of the impact on property values, there is an extensive literature which is mainly based on the methodology for the use of hedonic models. This method, belonging to the family of revealed preference assumes that the value of assets implies the marginal value of its attributes. In practice, it uses the property value (rent, buy, soil, etc.) of buildings, to infer, econometrically, the marginal value of externalities, once the rest of locative and manmade attributes have been controlled. The main strength of the method is that infers the implicit price of environmental attributes from the actual behavior of individuals in the market.

According Sirmans et al. (2006), the proper factors of real estate products were similar in the sense of identifying a significant effect of the conditions of surface useful, lot size, number of bedrooms and bathrooms, parking, swimming pools and air conditioning. Another intrinsic characteristic of these products and relevant effects is the age of the building. Increasing age of the construction increases the possibility of a renewal, thereby increasing the property value expectations. The evolution of this situation indicates that up to 27 years the property suffers the effect of the depreciation (reaching 53% of initial value). Then the possibility of renewed increases in value by 32%, bringing the price up to 87% off the original price (Song et al., 2005)

With regard to urban environmental factors were similar in the sense of identifying a value-enhancing effects of some conditions of the urban environment such as socioeconomic status of the resident population (a higher level of income greater value), the proximity to infrastructure road and rail (De Sousa et al., 2009), the diversity of economic activities associated with the home and neighborhood level, as the increased scale of business and services diminish the value of homes (congestion, noise and insecurity.) (Song and Knaap, 2004) In referring to the neighborhood level (Simons et al., 1998) reported two factors, the construction of new homes and delinquency in the payment of property taxes, which affect the sale price of nearby properties. The latter, an indicator is seen as an indicator of disinvestment by the neighboring property, and verifies a negative impact on prices. In contrast, new construction, despite having

a significant and positive effect on prices, the degree of spatial concentration is, make a difference in terms of the importance of this effect. Thus, the effects are magnified near the big new projects, which could have implications for public investment, in the sense to maximize the efficiency of the positive externalities of housing subsidy for larger projects.

Regarding environmental factors, Hiteb (2005) shows a low effect of environmental pollution in the price of housing. But in addition this study constructs a demand curve for environmental conditions from the hedonic model. This demand model is verified that the most demanding environmental quality is the upper class, highly educated, and families with children. Curve is relatively inelastic. They fit (same behavior) the demand for educational quality of the environment with the demand for environmental quality. The size of dwelling and environmental quality, are substitute goods, while the size of the lot turns out to be complementary to the environmental quality.

The social dimensions and economic activities don't have developments so clear, as those mentioned above, in relation to the impact assessment approach. Under a different conceptual approach, have been the transport models that have come over, in this sense, the development of so-called land use models and transportation (LUTM), also known as five-stage models (Hunt, JD et al., 2005). These models predict the location of activities (residential, economic) at the level of an entire urban conglomeration, considering a sequence of effects on soil attributes, and the transport network, dynamically over time. That is, the location depends on the real estate market conditions, which depend in part of the attributes of urban areas, one of which is the level of accessibility, which in turn is affected by the location of activities. In this sense, Gibbons and Machin, (2008), suggests that there is no consensus on the influence of changes in transport prices, which is not surprising, since the utility of new infrastructure or other changes in transport policy depends largely on economic opportunities in terms of accessibility, and the overall urban context.

In this paper, we studied the impact (through an econometric analysis) on accessibility, land use and property values, large urban developments and transport projects planned for the area east and west of the central conurbation Barcelona. The rest of the paper is structured as follows: first define objectives and area of study, then explain the methodology and data used, and finally discuss the results of data analysis.

2. OBJECTIVES OF THE STUDY

In this research the main objective is to analyze the impact on accessibility, land use and property values, of large urban development (with final approval or advanced study in process), and transportation projects listed in Plan for Transport Infrastructure (PDI), planned for the area east and west of the central conurbation of Barcelona. The specific objectives are intended to 1) construct a hedonic price model, to evaluate the effect of current conditions in the area (accessibility, morphology, and socio-professional structures) on the spatial configuration of property values (offers for sale and rental) residences, offices, retail shop, 2) quantify the impact in physical terms (surface land and roof space), economic (employment), demographic (households and individuals), and transport (accessibility), of new development from planning , potential project without a development plan and the projects considered in the master plan for transport infrastructure, 3) evaluate the effect of the new urban configuration (resulting from implementation of new development, and transport) in real estate values in the project area, and

the rest of the territory, and 4) make a territorial hierarchy based on the differential effect (with and without projects) in urban and real estate value attributes.

3. DATA AND METHODOLOGY

The overall objective of the study focuses on the central conurbation of the city of Barcelona, with an area of 370 km2, and consists of 23 municipalities, 2382 census areas, 351 areas of transport, and 5 protosystem. Figure 1, shows the study area arising from the overlap of functional protosystem (areas grouping several municipalities in terms of its structure interaction of travel) municipal boundaries, census tracts, and the continuous urbanized (obtained by the semi-assisted processing of satellite images SPOT). Solid black color shows the large urban developments that are considered in the analysis.

Figure 1 Area of study
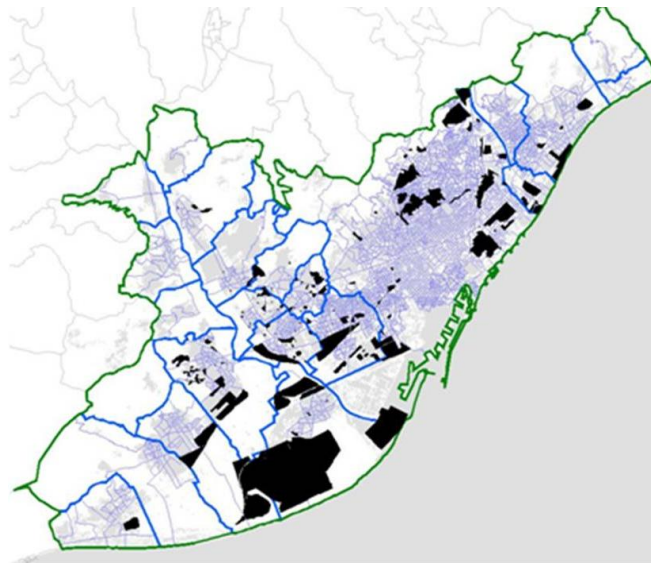
Source: Own CPSV

With regard to the Metropolitan Region of Barcelona (hereafter RMB), the chosen area of study represents 60% of the population, 59% of jobs, 33% of the buildings (where a higher proportion of buildings in poor condition) and 66% of retail shop. From the above we can see the significant weight that has defined the area of study, being the area of greatest density, diversity and concentration of both economic and demographic activity.

The impact of large urban development and transport infrastructure projects are studied at two scales. The scale of urban developments is census tracts and transport projects to scale transport areas. For information on population and housing and buildings used 2001 data from the National Statistical Institute of Spain. As information relating to travel, we use the survey of daily travel (EMQ) 2001 of the RMB, and travel times of travel by public transport and private transport comes from the Autoridad Metropolitana del Transporte (ATM). For its part, the urbanized area is the set of artificial land uses derived from analysis of remote sensing from satellite images of the Corine Land Cover 1990 and 2000. For the analysis of the road network with its various hierarchies of pathways (associated with service levels, capacity, etc.), in the RMB has used the information available for Teleatlas 2004. Finally information on property values (residential, office and retail) comes from assessments and offer prices generated and analyzed by studies of the Center for Land Policy and valuations (hereafter CPSV).

3.1 Urban projects to consider

For the selection of large urban developments, we used the information obtained by the study "El Potencial Urbanístic de la Regió Metropolitana de Barcelona, una visió des del 2007 ", conducted by the CPSV in 2007. According to the study area, 169 projects were selected from a total of 1,262 projects that considers the Urban Potential Study of the RMB.

In terms of roof space, the area of study includes projects for a total of 24.66 million m2, representing 27.5 % of the total planned for the RMB (91.08 million m2 of roof space). Most are intended for economic activity, followed by residency, underground parking, and finally equipments. In terms of spatial distribution, this area is located mainly in the municipalities of: Barcelona to 12.13 million m2 roof space, El Prat de Llobregat to 4.06 million m2 roof space and L'Hospitalet de Llobregat 1.89 m2 million roof space.

The overall roof space in the area of study has the capacity to serve 324.201 workplaces, corresponding to 47% of the total planned for the RMB. This percentage is significant, because in terms of roof space, the area of study focus only 27% of the RMB, which is symptomatic of the greater density and tertiary level of economic activity that is expected to be installed in this area.

Of a total of 169 projects planned for the study area were grouped based on their location in the area of study, forming 30 groups presented in Table 1.

Table 1 List of groups.

|	Cluster	N° of projects by cluster	Major projects	Predominant use
1	Poblenou 22@	2	22@	Tertiary
2	Can Alemany	1	Can Alemany	Offices
3	Cluster Centre Direccional del Prat	1	Centre Direccional del Prat	Residential
4	Ciudad Aeroportuaria	6	Aeroportuaria Centre, Sector Riera Roja-Casa Club	logistic activities and equipment
5	Sports equipment La Ribera-Eix	6	Equipment Ribera New Project, Parc Tecnològic WTC	Residential and equipment
6	Esplugues de Llobregat	17	Finestrellas, St. Llorenç y Can Vidalat	Residential
7	Estació Sants-Modelo-Castells	4	Estació Sants-Modelo-Castells	Technological-tertiary
8	Forum - Campus Universitario	1	Forum - Campus Universitario	Tertiary
9	Front Marítim Badalona	1	Front Marítim Badalona	Residential
10	Gabrielistes	1	Gabrielistes	Residential
11	Molins de Rei	7	Vallpineda, Can Iborra	Residential
12	Parc d'Activitats	1	Parc d'Activitats	Offices
13	PRAIH	1	PRAIH	Residential-tertiary
14	Prologis-Alcampo	2	Prologis, Centre comercial Alcampo	Tertiary
15	Rest of Badalona	1	-	Residential
16	Rest of Cornellá	15	Mas Millas, Siemens	Residential
17	Rest of L'Hospitalet de Llobregat	6	Barri Collblanc-Torrasa	Residential
18	Rest of Prat	5	El Prat Nord-La Seda, Barrí de Sant Cosme	Residential
19	Rest of Sant Boi de Llobregat	20	Torre de la Vila, Centro Assistencial Benviure	Residential and equipment
20	Sagrera-Bon Pastor	2	Sant Andreu-Sagrera, Bon Pastor	Residential
21	GV-Districte d'Activitat	12	Gran Via-Quimica, Passeig de la Zona Franca	Offices
22	La Marina-Zona Franca	1	La Marina-Zona Franca	Residential-tertiary
23	La Mina – La Catalana	6	La Mina - Consorci, La Catalana	Residential
24	Sant Feliu de Llobregat	6	Can Dot, L'àmbit del polígon Balmes i General Manso	Residential
25	Sant Joan Despí	15	Bellavista, Jardí Urbà Pont Reixat	Residential
26	Sant Just Desvern	4	Bellavista, Pep Ventura	Equipment
27	Torre Baró	3	Torre Baró, Trinitat Nova	Residential
28	Tres Turons-Vall d'Hebron-Vore	5	Tres Turons-Vall d'Hebron-Vore	Residential
29	Zona d'Activitats Logístiques	2	ZAL y ZAL II	Logistic activities
30	Pla de Ponent	1	Pla de Ponent	Residential

Source: Own CPSV

3.2 Transport projects to consider

For the selection of transportation projects use the information derived from the Master Plan for Transport Infrastructure (PDI) 2001-2010 finally approved on April 25, 2002 by board of ATM. The PDI 2001-2010, considered a total of 19 projects to expand the rail network, 16 projects of modernization and improvement of networks (Metro and FGC), 11 projects of heat exchangers, 19 projects of expansion, modernization and improvement of the rail network state, and 12 feasibility studies and design of new projects. The year 2007 is held the fourth annual monitoring report of the PDI, which makes known the status of implementation of each of the projects approved, and the state of feasibility studies.

Figure 2 shows the location of the projects considered in 2026 and the network base (2007).

Figure 2 Transport network baseline, scenario 2007, and projects PDI considered in 2026.
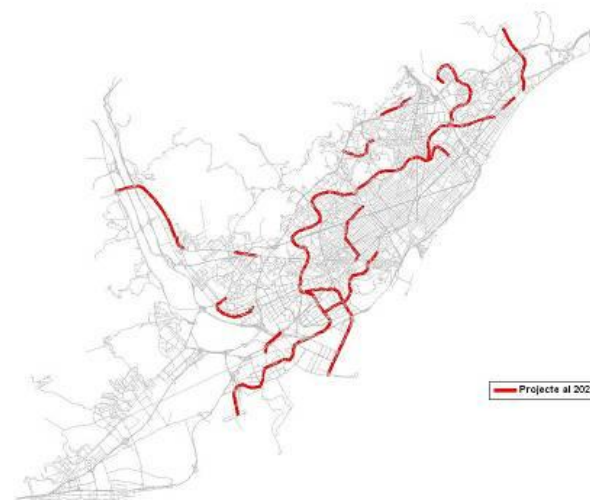
Source: Own CPSV
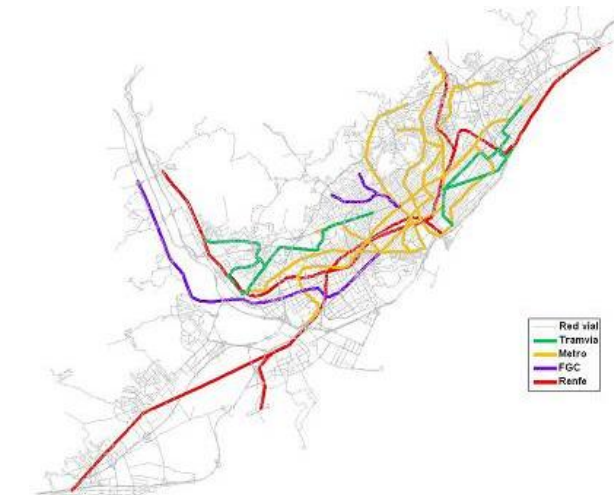
Source: Own CPSV

Subway projects are most important because it means an increase of 70% of the original network (79.757 Km). These projects include the new line 9 which connects the Zona Franca La Sagrera, creating a corridor orbital public transport, non-existent to date, in the city of Barcelona. Next in importance are the Tram projects, which increase the original network in

31% (9.173 km), and finally the FFGC projects (train) which increase in 15% (3.338 Km.) the original network.

3.3 Methodology

This research is important to achieve the integration of data from the base situation and the data delivered by the projects. To achieve integration, it is necessary to conduct an analysis of thematic and spatial coherence, namely it tries to find the variables of impact of projects that are similar to those of the territorial baseline information, for this to be able to add them (if the project's increase), or subtract if the reduced project. The projects provide information concerning: economic activities, housing, and workplaces located. This requires classifying the land base information in three dimensions: characteristics of the park built, socioeconomic structure of the residents, and structure of economic activities.

In the case of buildings, land base variables are: the age expressed by the weighted average year of construction and conservation status, classified into good, poor, bad and dilapidated. Projects will integrate these variables with the total number of homes converted to number of buildings by means of an index of buildings. Thus, the number of buildings from projects is introduced to calculate the year of construction for the 2007 and in a good condition.

To integrate data from the socioeconomic structure of the residents use the housing from projects which are divided into three groups: HPO, concerted and free, and Resident Employed Population (POR), separated in the 10 categories.

To integrate data from the structure of economic activities are used LTL (jobs) disaggregated data in the same 10 categories that were grouped the POR. These categories are re-grouped in a first group corresponding to the tables high (managers, technicians and professionals, technicians and support professionals and administrative staff), a second group corresponding to the middle management (services and sellers) and a third group tables corresponding low (skilled workers, operators and unskilled workers. Finally the last group corresponds to the armed forces and qualified agricultural workers. These groups capture the information that determines the potential LTL as urban activities. Whereupon, the number of LTL offices, technology park and equipment are added to the high tables, those derived from tertiary uses, commercial, hotels, equipment, technical services and parking are added to the middle and finally the LTL from the uses of Industry and logistics add to the low tables.

To characterize the socioeconomic structure of the residents used the information from the resident employed population (hereafter POR), according to occupational category (executives, professionals, technicians, salesmen, skilled workers, unskilled, etc.). In order to synthesize this information applies the statistical technique of principal factor extraction where we get two components. The first with a variance of 53%, has a positive value when grouping the occupations of low income level (workers, skilled and unskilled workers), and a negative value when grouping the occupations of high income level (managers, professionals, and technicians). This new variable is called "low- high level socioeconomic factors ", because on the one hand polarized high income groups, and other low-income. With a variance of 13%, the second component comprises administrative, and a smaller percentage of the technicians and salesmen. The positive value factor is associated to predominance of administration and the

negative value when those are not dominant. This new variable is called "mid-level socioeconomic factors".

To characterize the externalities of economic activities, it uses information from the LTL under the same occupational categories used in the socioeconomic analysis of the residents. But in this case, different categories were grouped to achieve consistency with information from urban development projects. LTL groups are: 1) managers, professionals, and administrative, 2) Service and sales workers and 3) Operators skilled and unskilled. In order to synthesize this information is made a factor analysis of the located workplace (using the varimax rotation method) where you get two components. With a 66.5% variance, the first component comprises professional and managers overall with skilled and unskilled operators. This new variable is called "industrial activity factor." The positive value of this variable indicates a predominance skilled and unskilled operator, while a negative value indicates a predominance of managers and professionals.

The functional interaction is defined as the level of attractiveness of the territory and the standard of accessibility that characterizes it, depending on the service levels of different transport networks. To characterize each territory construct two indicators, which are also directly altered with the implementation of both urban projects, like transportation projects. The first indicator corresponds to the attractiveness of travel to shop and reflects the travel density of arriving in a territory with the purpose of shopping. The second indicator is accessibility, for which we must consider that the implementation of a development project will affect, first, the structure of mobility needs in origin (residential), and secondly, the supply of workplace and commercial activities in the destinations.

In this context, what matters is how it will benefit the travel time of employees to their workplaces, and the travel time of residents to shopping areas. As the travel time is a variable that has a probability distribution is calculated the expected value, or rather, the most likely time of travel. That is, each territory was estimated the most likely time to access a workplace (Weighted Time in origin, hereafter TPO), and also the most likely time to get to that territory (Weighted Time in destination, hereafter TPD). The same applies to travel shop, being in this case the TPO the most likely time to access a shopping center, and the TPD the most likely time to reach a shopping center.

$$TPOi = \frac{\sum_j Tij * Vij}{\sum_j Vij} \quad ; \quad TPDj = \frac{\sum_i Tij * Vij}{\sum_i Vij} \qquad (1)$$

To calculate the time weighted (Eq. 1) of each territory requires a matrix of travel (Vij), and a travel time matrix (Tij) between each pair of zones i and j.

To analyzed real estate exogenous and endogenous factors. Among the exogenous factors are considered variables that account for the morphology of the built environment. The variables

considered are: 1) average year of construction in the census tract, and 2) the number and density of dwellings, surface range, considering three ranges three ranges from 0 to 75 m2, from 76 to 90 m2, and over 91 m2. Endogenous factors refer to the characteristics of real estate product analyzed. 1) The variables considered for residence (sale and rental) are: number of bedrooms, number of bathrooms, floor area, holding a lift, quality bathrooms, quality kitchen, old, and year of reform. 2) The variables considered for office (rental): total quality, which is variable in the study itself that causes the database, and integrates a number of qualities evaluated for different elements (roofs, walls, floor, etc.). And finally, 3) the variables for retail (sales and rentals) are: axis shopping type nearest, distance from the center of the nearest axis shopping, total floor area, floor area at the level of access, front and bottom lengths of retail shop.

Hedonic Pricing Model
Using the hedonic pricing method attempts to deduce the effect of different variables on a decision or observed attribute. The effects of each variable are represented by the coefficients of the econometric model that relates variables with attributes, or elections.

Regarding the real estate value, the method assumes that the value can be decomposed into the marginal value provided by each one of the elements that characterize it. Thus, the property value or offer price (P) is the integration of the value of each covariate (explanatory variable multiplied by its shadow price, or price hidden).

$$Pi = \exp^{\left(\beta o + \sum_i \beta_i X_i\right)} \iff \ln(Pi) = \beta o + \sum_i \beta i X i \qquad (2)$$

Where: Pi: i bid price, exp: exponential function, βo, βi: regression coefficients of each of the variables (Xi) considered, Xi: exogenous and endogenous variables supply.

The functional expression used (Eq. 2) in this case is a semilog structure, where the conventional calibration method, mostly used in the literature, goes through the application of the natural logarithm function, then a linear regression calibration. Besides this functional structure has the advantage of determining (in the regression coefficient) directly the semi-elasticity, namely the impact on property values in percentage terms of unit changes in the covariates.

In this way calibrated models to explain the total value and unit value (per m2 roof space) of the property analyzed.

The strategy for calibration of the models are not focused to get the best adjust (highest level of explanation) the real estate value, but rather the calibration coefficients that were correct (with attention to basic assumptions of econometric techniques, which ensure efficient coefficients). In order to eliminate the error of the econometric model, we performed a differential analysis with and without project situations, thus providing the isolated effect of the implementation of the project, in the property value structure and the basic conditions of the territory.

Future status of the transport system
To assess the impact of different urban development in the territory, was necessary first to isolate the effect of their actions or projects planned transportation system. The configuration of the transport system directly affects the time-weighted calculations in origin and destination (for work and shopping), variables that ultimately are incorporated into the hedonic model.

Finally, keeping the matrix of travel from the base year are calculated new values of the indicators of accessibility, incorporating the impact on travel times of planned projects (PDI).

The result of this procedure shows that the greatest benefits will be generated in the superior orbital corridor of the city of Barcelona, between the area of L'Hospitalet and Prat, mainly due to commissioning of the new metro line 9. The greatest benefit means reductions of approximately 1 to 2 minutes of TPO to work (home work). In this sense, we must clarify that the rest of travel for purposes other than work; they also experience reductions in time, but have not been quantified in this work.

Territorial impact of a development project
Finally, for each project group will do the following impact assessment: 1) changes the data sections that are directly affected by the group. 2) Recalculate indicators (and its variation percentage) of residents' socio-professional structure, activity structure, morphology. 3) Apply the double-dimensional gravity model to determine the new matrix of travel, resulting from the modification of both origins (residents) and destinations (jobs). 4) Calculated the new indicators of accessibility (and percentage change) product of the modification of the matrix of travel, considering the matrix of travel times from the stage of evaluation. 5) Calculated the new values of supply usage (and percentage change), using the hedonic model with the explanatory variables changed in the preceding paragraphs.

The spatial hierarchy of values
The analysis of the variation in spatial hierarchies downplayed the results of the implementation of the hedonic model (and especially its error) for the all territory as a whole. For this 10 scales were defined in property values, which represent hierarchies.

The effect was evaluated is the change that produces the materialization of all transportation projects considered for the future scenario (PDI) in relation to the effect of the materialization of all urban developments.

Each territory is affected by a project, change the property value, which can lead to a change in a hierarchy to another (up or down), or to remain in the same hierarchy, despite the change in value. While in the previous paragraphs explained the change in value in percentage terms (relative to the same value) is evaluated at this point the absolute change in value, but relativizing its position to the territory. In this sense the situation may be a small percentage change generates a change of hierarchy, or that a large percentage change does not generate hierarchy.

4. MAIN RESULTS.
The results refer to the reports and calibration analysis of hedonic models, and the impacts evaluated by projects in the different dimensions analyzed.

4.1 Calibration of hedonic models

Table 5 shows the econometric report has been simplified so as to indicate, for each real estate product, the variables included in the final model (which were statistically significant at 95%), the sign of the coefficient, and finally model adjust (percentage of explanation of the real estate value by the model-R^2-).

Table 2 Final report of the calibrated model

		Model			
		Habitatge Venda Valor total (euros)	Locals comercials Venda Valor total (euros)	Locals comercials Lloguer Valor unitari (euros/m2)	Oficines Lloguer Valor unitari (euros/m2)
	Variable inclosa	Beta	Beta	Beta	Beta
	Constant	10,57800	11,78000	6,67700	1,58800
Característiques de l´oferta	Superfície total construïda (habitatge)	0,01000			
	Indicador de qualitat integral (oficines)				0,06240
	Superfície del local a nivell d'accés (comerç)		0,00390	0,00400	
	Localització entre 100 i 200 m de l´eix comercial principal		0,24550	0,39280	
Resident	Factor socioeconòmic de nivell sota-alt	-0,07778	-0,18910		-0,08430
	Factor socioeconòmic de nivell mig	-0,01074	-0,06700		
Activitats econòmiques	Factor d´activitat industrial-no terciàri cualificat	-0,03266			
	Factor d´activitat terciàri banal	0,00144			-0,01412
Característiques del parc edificat	Densitat d'habitatges 76 - 90 m2 (Concertat)		-0,00002		-0,00002
	Densitat d'habitatges < 75 m2 (HPO)			-0,00002	
Atractivitat i accesibilitat	Temps ponderat des d'origen al treball (TPO treball)	-0,00294			
	Densitat de viatges atrets de compres				0,00001
Dependència espacial		0,09252	0,02600	0,36340	0,18100
	Ajustament del model (R2 adj)	0,78	0,59	0,50	0,41

Source: Own CPSV

The model homes sales (total value) achieved a 77% adjustment. The variables that make up this model, in order to participate in the adjustment are: 1) total built area that adds value (positive sign), 2) socioeconomic factor low-high, whose negative sign indicates that the variable sum value (predominance high income levels), and subtracts value when the factor is positive (prevalence of low income levels), 3) TPO to work, which have a negative sign subtracts, with increasing travel time to work, home loses value. 4) Factor middle-and tertiary activity factor banal, as value added activity predominates tertiary banal, and when there devalue residential administrative dominance, respectively.

The model of retail shop sales (total value) reached a 59% adjustment. The variables that make up this model are: 1) the local surface level of access adds value, 2) socioeconomic factor low-high, value added or subtracted as described in previous models, 3) the location within 100 meters a axis shopping that adds value, 4) socioeconomic factors mid-level, which subtracts predominance, 5) Housing density between 76-90 m2 subtracts, 6) and the spatial dependence of the values that provides the value.

The model of retail shop rental (total value) achieved a 50% adjustment. The variables that make up this set are: 1) the local surface level of access that adds value, 2) the spatial dependence of the values that add value, 3) be located within 100 meters of a axis shopping that adds value , 4) and housing density of less than 75m2 which subtracts the value.

The model of office rental (unit value) reached a regular adjustment of 41%. The variables are structured model be: 1) integral quality indicator of the office offered that adds value (positive sign), 2) spatial dependence of the value, this means that the values of other bids environment influence its value unit, a positive (if the environment is high, the value is high, and vice versa), 3) socioeconomic factor low-high and density housing between 76-90 m2. The socioeconomic factor low-high add / subtract value according to the predominance of high / low level of income. The density of houses between 76-90 m2 subtracts office space.

4.2 Impact of urban development

The impact evaluated of each group of urban developments concerning five major dimensions: social and occupational structure of residents (POR), the structure of economic activities (LTL), the residential types (type of housing density), accessibility of territory, and the value of potential real estate deals. The results show that the groups of projects of higher percentage impact on the social and occupational structure of the residents are La Marina - Zona Franca, the Directional Centre Prat, and El Pla de Ponent, with values above 200% of the base situation. They are the largest projects in terms of residential and generate the greatest impact in the receiving area (industrial or depopulated). Of these projects, only La Marina - Zona Franca affects the structure in the mid-level factor, since it reduces the predominance of middle-income class product of the inclusion of a large proportion of public housing, while El Pla de Ponent changes predominant structure by the high level by the fact that basically fits in the city of Gava, historically working class. The group of 22 @ and Molins de Rei, change the structure of their territories, the first by predominant low levels because it only considers public housing and lofts that are discretionary in some heritage buildings, and the second produces the predominance of upper classes as well as El Pla de Ponent transforms a little labor profile of the municipality to include open-rate housing. The result also suggests that there is no direct relationship between the absolute increase in population and the percentage increase and between the percentage increase and change in social and occupational structure. This change denotes territorial inertia of the population, namely the change in magnitude is not necessarily significant percentage change, nor change the social and occupational structure.

The results indicate, the impact on the structure of economic activity, approximately 50% of the project groups generate job increases over 100% of the base situation, and three of these increases over 1000% over of the base situation (Centre Directional Prat, Ca n 'Alemany, and Ciutat airport). It is important to clarify, in the case of 22 @, the change of structure refers to the realization of 100% of the projects in relation to the 2006 situation in which some part of projects already completed, and therefore already had changed the original structure (prior to 2000) industrial markedly. The same remark applies to the other projects that by 2006 they were already partially completed. Regarding the change in the structure of activities, the frequent changes are to the predominance of activities banal office and tertiary (commerce and services). One can see that there are projects that increase the existing specializatión in the basic situation of affected territories. This mixed-use projects, for example, the Ciutat Airport which not only includes personal services and logistics activities, but also office space. Finally one can argue that in this dimension, the impact of projects is significantly higher, generating most of them significant structural changes of economic activities in the territory.

Regarding the impact on the residential types, the results show that few projects that provide percentage increases over 100% (El Prat Directional Centre, La Marina - Zona Franca, and El

Pla de Ponent). Most groups have a lower percentage increase of 100%. The densities that are most affected, with significant percentage increases (over 100%) correspond to free housing. The density of public housing (VPO) has lower percentage increases (less than 100%), of which highest percentages coincide with the largest total contributions from private homes.

The results on the impact of accessibility show that all the projects reduce travel time weighted residence to work. This is very significant, and suggests that urban sprawl in the metropolitan area of Barcelona, follows a pattern characterized by a polycentric, in which the old industrial areas renewing with higher density levels in new businesses semi-peripheral as those at El Prat, L'Hospitalet, Vilamoura, or the area Besos. These centers are generated the most significant impacts on the overall reduction in travel time home-work. Finally the groups at greatest impact on accessibility are those that generate new centers of activity in the west entrance of the central area of Barcelona. This occurs because of the good connectivity of these points (concentration of transport services), and the high rate of generation of work travel purposes, from the western zone, which are captured centralities above.

The effect of different groups of projects in the territorial baseline information, and accessibility on the property value is a combination of all effects presented above, weighted by their hedonic coefficients. To evaluate the effects of projects must be considered a "product property" specific and assume that this product is offered in each of the studied census tracts (a situation that is not real, but to appreciate the potential bid that would exist in all the territory of this product, and its comparative hierarchy.) For the above products are considered the following types (average values of the samples used in the calibration stage): 1) residence: area of 82.36 m2, 2) office: endnote quality 6.4 (scale 1 to 7) and 3) retail shop: area of 138.6 m2, with 98% of the surface at the entrance floor, and located within 100 meters of a main axis shopping. From each of these products was evaluated bid value (predicted by the hedonic model) in the situation without project, and after the implementation of the project. Ultimately not analyze the absolute value of the offer (which is slanting by the model error), but rather the difference in value (in percentage change) caused by the project, namely, the changes produced by the project on accessibility, the resident social structure, the structure of activities, and morphology constructive.

The results suggest that the sales value of residence, 23 groups (77%) increase the value, the 3 groups (10%) have no effect (variation between -1 and 1% of value) and 4 groups (13%) decrease the value. The two groups most increase the value they do on a scale beyond 20%, and correspond to the Directional Centre Prat, and La Mina - La Catalana. The group that makes the value decreases by about 10%, and corresponds to Zona d'Activitats Logistiques. The decrease in value produced by some groups of projects should be preferably the change in economic activity rates, though they do not succeed in changing the structure (change in the principal factor), significantly increase the industrial activity, which by its sign, directly affects the residential value. To this is added the increase in housing density concerted and HPO, as in the case of projects and Molise Cornella de Rei, which also decrease the value. Regarding the sales value of retail shop, shows that 18 groups (60%) increase value, 11 groups (37%) have no effect, and only one group (3%) decreases the value. The groups do most increase in value with a magnitude above 20%, and correspond to the Pla de Ponent, and La Marina - Zona Franca. The only group to decrease the value (1.4%) is Tres Turrons - Vall'd Hebron. In general we can say that development projects increases the value of sales of both residential and retail

shop. It is also necessary to remember that hedonic models sales value is those that show a better position to specify parameters, and adjust the calibration sample. Therefore they are the most reliable.

The results of the rental value of office only two groups of projects (7%) increase value, 4 groups (14%) have no effect, and 24 groups (79%) decrease value. The group further increases value, it is in a magnitude of 4%, and corresponds to Can Alemany. The group that decreases value, it does at a rate higher than 20%, and corresponds to Prologis - Alcampo. As for the rental value of retail shop, do not appear to increase the value groups, 20 groups (37%) have no effect, and 10 groups (3%) decrease value. The group further increases value, it is in a magnitude of 7.5%, and corresponds to La Marina - Zona Franca. In general we can say that the effect of the groups of urban projects in the rental value, both in offices and retail shop, is not to alter the value, or decrease in low magnitude. At this point it should be noted that the rental hedonic models are those that are least able to specify parameters, and adjustment. Therefore the results presented must be considered with great caution.

Finally, it presents findings of the Impact on the hierarchical structure of sales value. In this analysis, values are considered more appropriate adjustment determined by the hedonic models (higher rates) and are: 1) the sale of residences and 2) the sale of retail shop. The hierarchies considered correspond to calculate the deciles of sales values predicted by the hedonic models for the base situation (2007). Figure 3 shows the spatial structure of the hierarchies of the sale price of homes in the base year.

Figure 3 Hierarchy and effect on the sales value residential
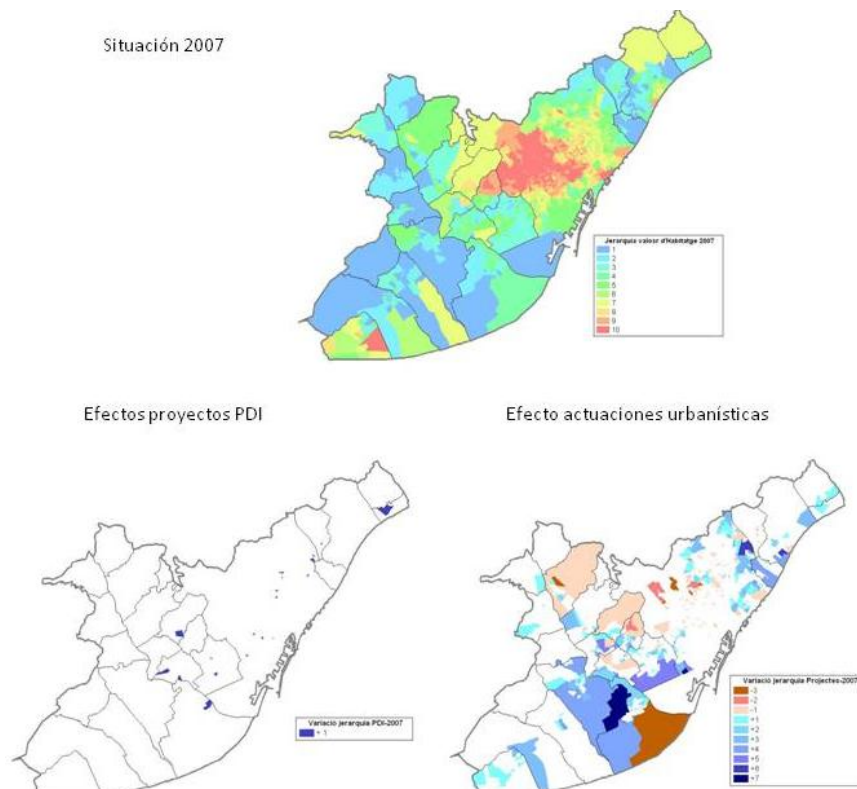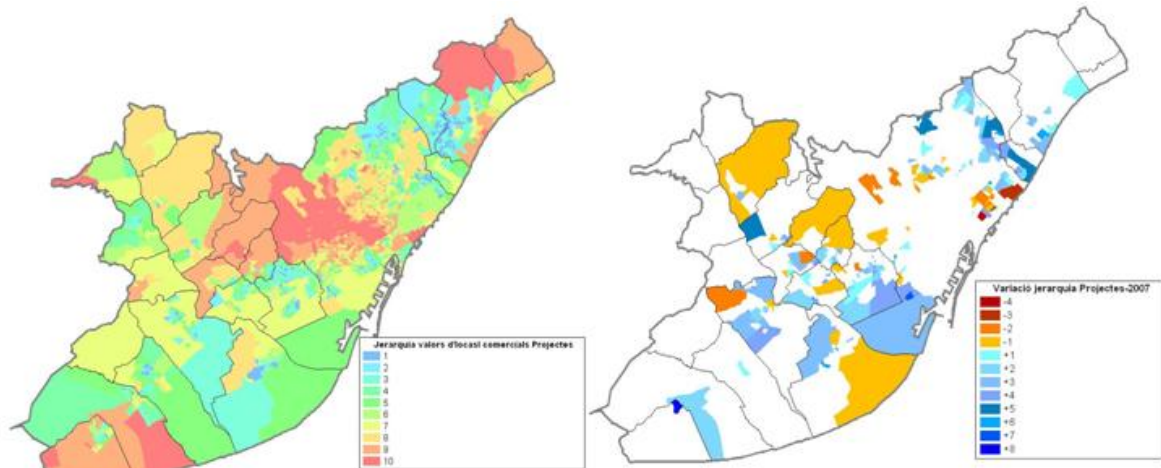

Source: Own CPSV

Transport projects (PDI) only increases of hierarchy in a single category (namely moving from one category to the next), but in a marginal amount (only 0.8% of the census tracts). The urban development changes occur in approximately 13% of the sections analyzed, of which about 5% of them decreases the hierarchy (mainly low one category), and 8% up the hierarchy (preferably up to a higher category). While on the stage of urban development, 87% of the census tracts are not affected in the values of residential offer for sale, you can suggest a slight tendency for emergence of new centers of high value, which is not generate a significant difference in the structure of the base year.

In the case of the sales value of retail shop, the hedonic model does not include accessibility variable, so that transportation projects do not generate effects on these values. Figure 4 shows the territorial hierarchy of values of retail shop sales.

Figure 4 Hierarchy and effect on the sales value of retail shop.

Hierarchy 2007   Effect urban developments

Source: Own CPSV

The urban development changes occur in approximately 7% of the census tracts studied, of which about 2% of them decrease their hierarchy and a 5% increase in hierarchy, also achieved significant increases. The scenario of urban developments in respect of the sales value of retail shop, does not suggest a clear trend of emergence of new centers of high value, as in the case of residential sales value.

5. CONCLUSIONS

This research attempts to understand what is the impact of large urban development and transport infrastructure projects planned for the area east and west of the central conurbation of Barcelona, on accessibility, land uses, and values property.

Through the integrated use of transport models and hedonic pricing models we attempt to simulate the direct impacts in the area of implementation of a specific development project, and also the indirect impact that occurs in the system of interaction of the metropolitan area Barcelona.

The different projects grouped based on their location and logic of design, produce different effects on the dimensions analyzed. There are situations in which the contribution of the project is significantly different from the territory which it hosts, so the property value does not vary significantly, or vice versa, that is, small changes in the base situation creates significant changes in property values. Thus we can conclude that there are situations territorial "buffer" or "amplifying" the effect on property values and that these characteristics depend on the initial situation of the territory for the key variables identified in the hedonic models.

Impacts on accessibility dimension beyond the territories receiving the different urban development, creating areas of affectation that depend on network configuration, the current system of transportation services, and its future shape. It is for this reason that the urban development located at points of entry to the central area of Barcelona (Sagrera, Santa Adrià, Badalona, L'Hospitalet de Llobregat, etc.) generate effects of highest catch of potential commute, and therefore, reduced travel times.

As for the groups of projects that reduce property value offer, it is concluded to be mainly to changes in social and occupational structure of residents and the activities (jobs), which mainly affects the value of home sales , and secondly the sales value of retail shop. So can you conclude about the great importance which holds, the social structure dimension of the territory in the spatial structure of property values.

The spatial structures of hierarchies of value of residential and commercial sales, suggest that the effect of urban development as a whole, is more significant than the effect produced by the implementation of transport projects (PDI) planned for the study area. Moreover, the effect generated by urban development, in the spatial structure of hierarchies of sales value, shows a slight tendency of new centers emerging high value (preferably in nursing), which does not stand out significantly from the hierarchies the base situation. Finally the impact of urban development in the reduction in travel times although not large in size, generated greater equity in access conditions.

The methodology used in the area assigned to it, opens up new possible line of analysis, despite its deficiency and limits of application. The possible lines are: 1) determine the level of damping or reactivity in property values, in different areas within the study area, 2) determine a profile "optimum" of urban development, on the types of activity and intensity thereof, so as to generate desired effects of appreciation in different areas and environments, 3) Identify strategic partnerships of transport projects and urban development, to revalue depressed areas, 4) identify variables territorial "control" of speculative processes real estate value and territorial factors that hinder the emergence of real estate supply in different territories, and 5) validate the model results with observed data.

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