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► **To cite this version:**

Lucia Mejia-Dorantes, Odile Heddebaut. Land value appraisal in an area with a future tramway project in Lille, France. 10th Transport Engineering Conference “Innovative and sustainable Transportation for the 21st Century”, Congreso de Ingenieria del Transporte (CIT), Jun 2012, Spain. 11p. hal-00986000

HAL Id: hal-00986000

<https://hal.science/hal-00986000>

Submitted on 30 Apr 2014

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Land value appraisal in an area with a future tramway project in Lille, France

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ABSTRACT

As it is widely accepted, large scale transportation projects have a significant impact both in the areas around its stations, and in a regional level at different topics of urban environment. For example, a new transport infrastructure may produce changes on the real estate market. Many times, these changes are analyzed using hedonic models. This study measures the actual impact of urban transportation on the real estate market in an area where a future large-scale transportation project -two new tramway lines- will run. In this analysis we evaluate the effects of transportation while accounting for a number of structural, location and neighborhood variables making use of a location-detailed time series dataset. We explore if there are significant land price changes due to the current public/private transportation characteristics of the area and discuss what may have happened due to the so-called "announcement or anticipation effect". As a case study, it is analyzed the region of the *bassin minier* of Nord-Pas-de-Calais in France. It is a deprived region which decades ago, used to be a pole of mining activities. The Transport Authority in the region is the SMT Artois-Gohelle and it has planned to build in the near future two new tramway lines that will improve the accessibility in the region that are not exempt of polemic.

1. INTRODUCTION

A transport station/stop generates a benefit around it, which people living or working close to it take special advantage from. This benefit is noticed in the real estate market, especially in the areas connected by an infrastructure. However, many times it is possible that negative externalities appear where most of the times they are due to noise, barrier and landscape effects or even a rise in criminality (Cohen and Coughlin, 2008).

There are basically two different methods in literature to assess those positive and negative externalities: Repeated sales model and hedonic models. Hybrid models, which are the combination of those methodologies, have also been used. Repeated sales deals with a

regression of the difference in sale prices for the same set of homes and a set of time dummies. It is known also as BMN-model, first presented by Bailey, Muth and Nourse (1963). Its main problem is caused by the small sample data available and the difficulties to collect the data due to the required time frame. Compared to hedonic models, only few studies have been carried out using this method (Sommervoll, 2006).

The hedonic models refer to the implicit characteristics that assemble goods (Rosen, 1974). In the case of land values, the idea is that property prices can be decomposed into its attributes, mainly into its structural, neighborhood and accessibility characteristics. In order to estimate the implicit price for each attribute, they are mathematically modeled as a linear regression model and its parameters are estimated by the Ordinary Least Squares (OLS) method.

It is important to notice that a house unit is fixed in its location and at the same time, it is influenced by the characteristics of the neighborhood, which are basically a set of geographically distributed data. Data members may as well be related to each other, which is known as spatial autocorrelation (Dubin, 1988; Anselin, 1988). Therefore, regression analysis should account for the fact that it may be spatial dependence either in the substantive part of the model or in the residual pattern (Farber et al., 2009). In order to accurately evaluate all these types of relations, Geographical Information Systems (GIS) become an important tool to increase the model's accuracy.

As an empirical analysis, this paper presents the case study of the "Bassin Minier", the coal mining area located at the region of Nord Pas-de-Calais, at the northern part of France. This area is well connected to the metropolis of Lille by the motor way A1 and it is also well connected by many roads and the motorway A21 from east to west. In total, the transport authority deserves 115 communes where seven out of them are the most important towns.

The aim of this paper is to analyze residential land values within these seven most important towns such as: Béthune, Bruay-la-Buissière, Carvin, Hénin-Beaumont, Lens, Liévin, and Noeux-les-Mines. Using a hedonic approach we assess if transport supply has impacted during the last years or not the land market in this area and only for the case of apartments. House prices are divided into three main characteristics: location to public transport, house amenities and neighborhood characteristics. In order to obtain a more accurate model, we use the real network distance to different neighborhood amenities, which has proved to diminish problems of spatial autocorrelation (Mejia-Dorantes et al., 2011).

This paper is divided into 5 main sections. After the introduction, section 2 presents the case study. Section 3 presents the methodology and data used. Section 4 presents the results. Finally, section 5 presents the concluding remarks.

2. THE BASSIN-MINIER

2.1 Characteristics of the region

This study focuses on the region the ex-coal mining area (ex-bassin minier), which is a deprived area of Nord-Pas-de-Calais, at the northern part of France, next to Belgium. Figures 1 and 2 show the location of the territory under study. It is known as an area which has different socio-economic problems, such as: unemployment, the highest rate of mortality in France and poorly academic performances and failures, which have taken place after the conclusion of the coal mining activity era at the end of the 80's.



Figure 1 – Location of the city of Lille and the region of Pas-de-Calais

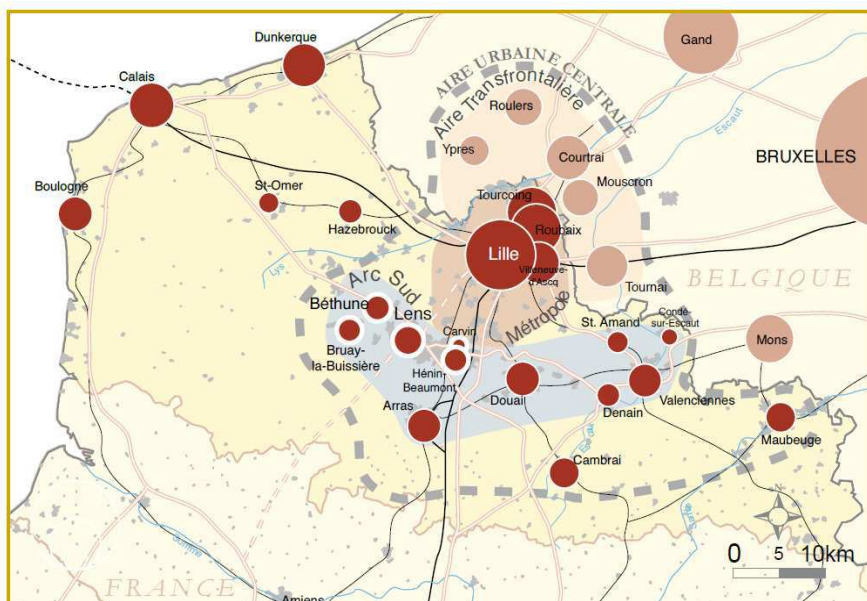


Figure 2 – Lille metropolitan area (Source: SCOT Lens Liévin Hénin Carvin)

Different socioeconomic conditions of this area are shown in the following graphs (figure 3 to 6). They were obtained from the French Institute of Statistics and Economic Studies (INSEE) (Institut National de la Statistique et des Études Économiques, 2011). For the territories under study (known as "Communes") we present different facts. For example, how population has evolved during the last years from 1968 to 2008 for each main Commune, and the type of population (men/women) per age (figure 3). It is interesting to note that the difference among the percentage of women and men is higher for the people older than 65 years. This is related to the fact that men used to work in the mines, which was a very tough job and had a direct repercussion on men mortality.

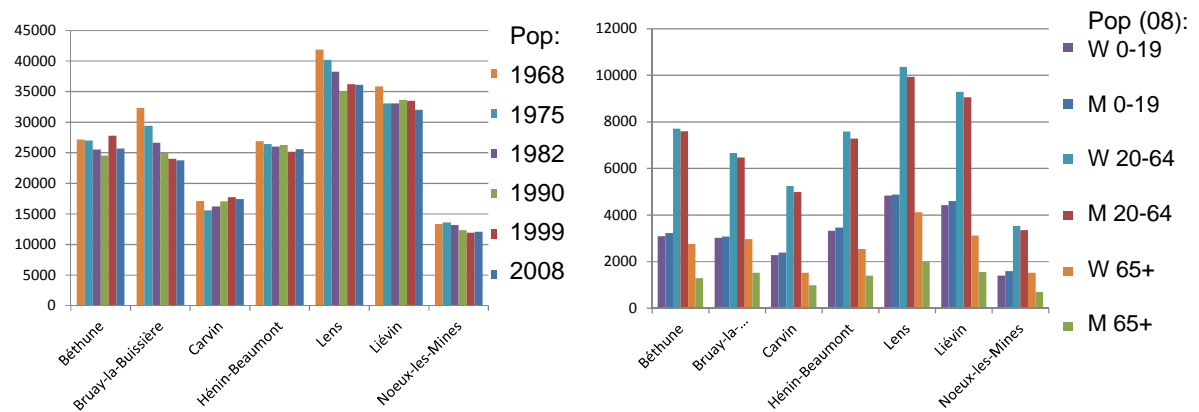


Figure 3 – Population in the study area (INSEE)

Figure 4 shows the jobs' qualifications in the region. Most of the people are non-skilled workers, and jobs are focused on commerce and services (see figure 5). Moreover, figure 6 shows that the rate of unemployment in the area has not importantly diminished in a decade, although according to the INSEE (2011) more firms have localized in the area over the last years.

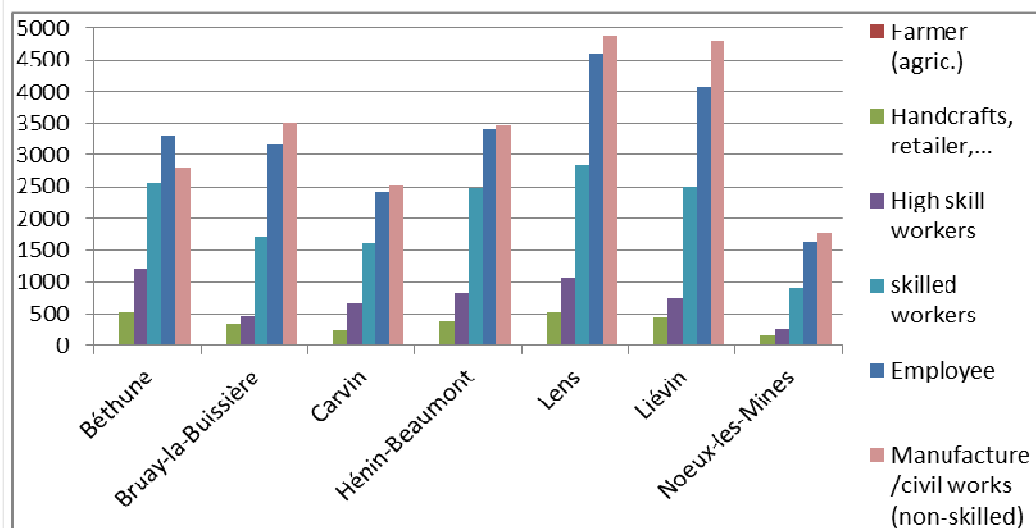


Figure 4 – Job qualification in the region (INSEE)

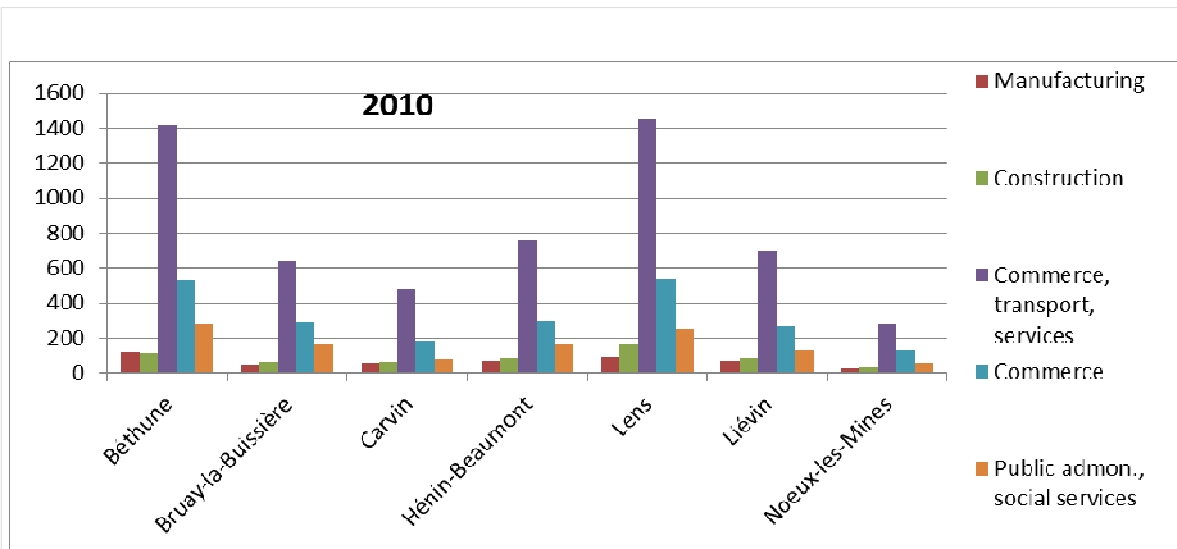


Figure 5 – Comparison of economic activities from 1999-2008 (INSEE)

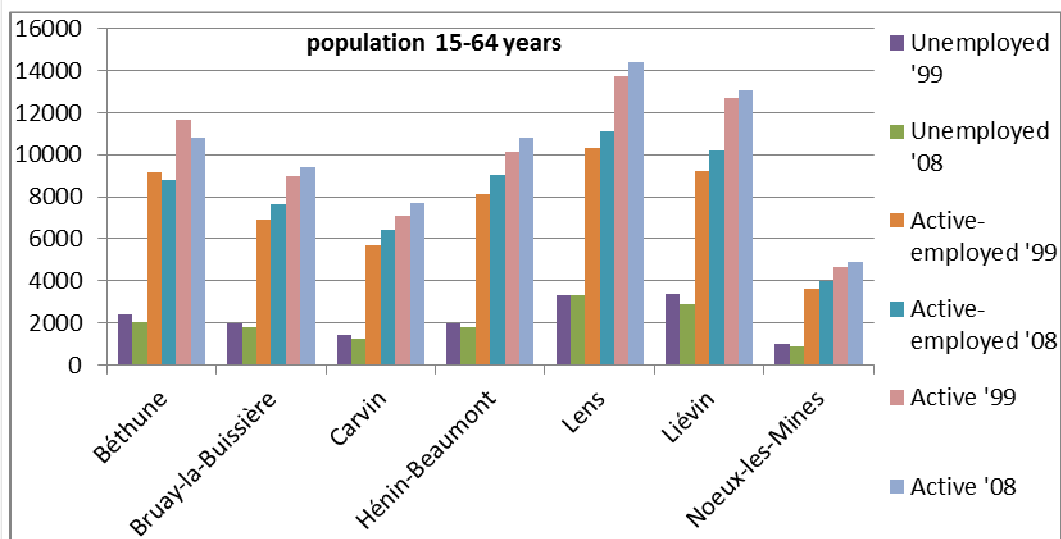


Figure 6 – Comparison on employment from 1999-2008 (INSEE)

2.2 Transportation

To ameliorate the socioeconomic situation of this area, different policies are being implemented aimed at regenerating the socioeconomic activities of these towns. For example the case of the new Museum of Louvre in Lens, and the improvement of public transportation, which intend to improve the economic, social and environmental situation of the zone. The Transport Authority (SMT Artois-Gohelle) planned to build two new tramway lines (see figure 7 and 8). The project was announced at the end of 2008. There are still some areas where there may be changes in the final route of the tramways.

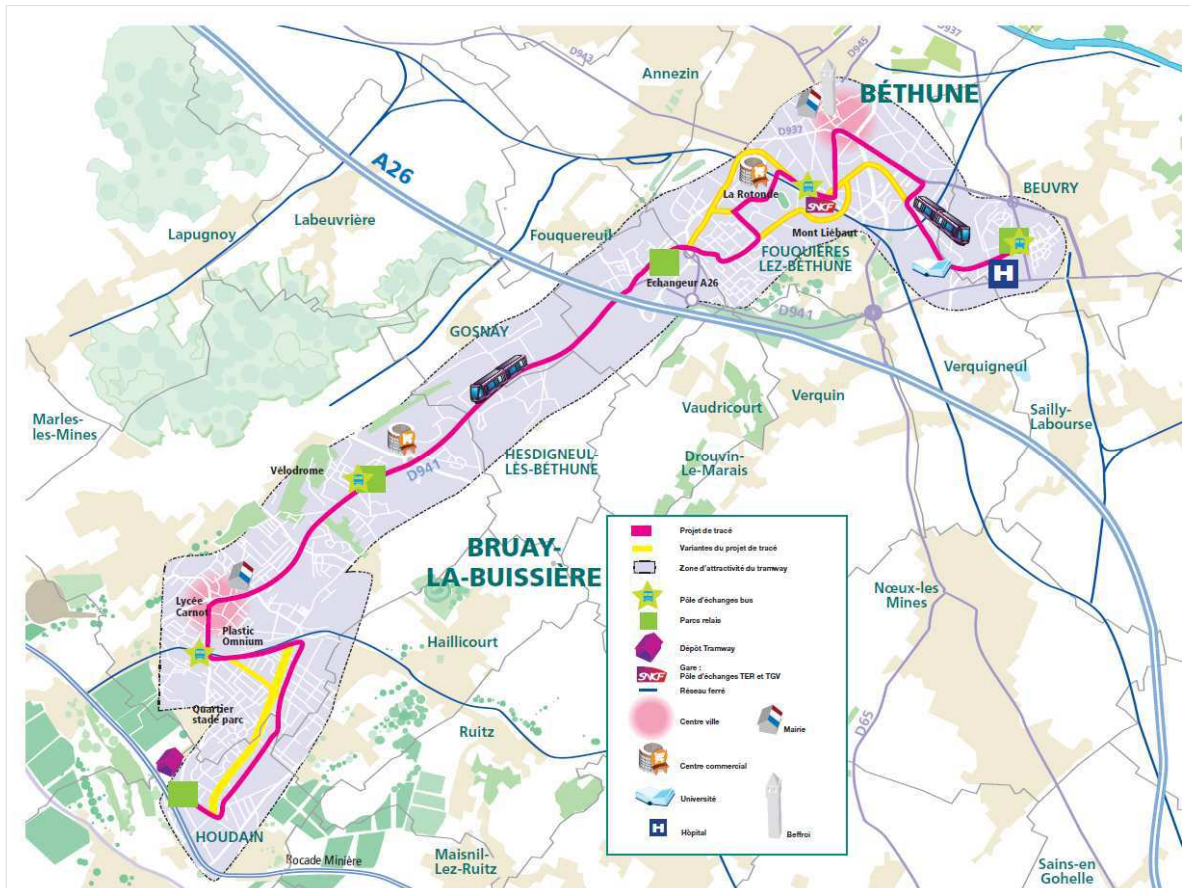


Figure 7 – Tramway project from Béthune to Bruay-la-Buissière (Source: SMT)

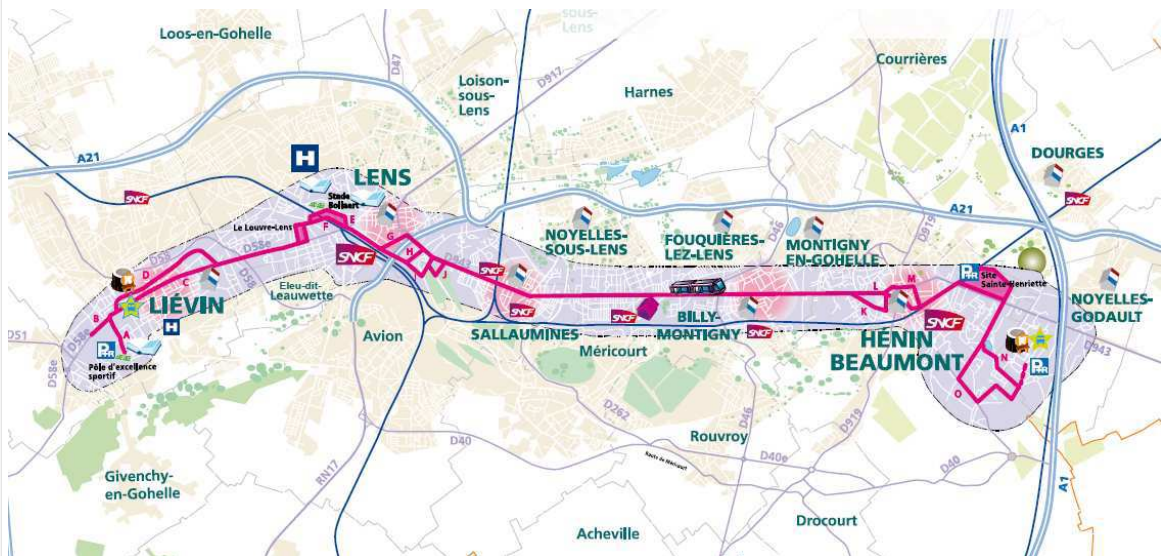


Figure 8 – Tramway project from Liévin to Hénin-Beaumont (Source: SMT)

However, different publications on the media show that people living or working in the area are afraid of the negative effects of these new lines. For example, recently Caratini (2012) reported that the owners of retail stores believe that due to the new tramway their customers will go away more easily to other areas for shopping, that in other towns, such as Bruay, the downtown will be even less crowded than nowadays.

3. METHODOLOGY AND DATA

Hedonic regression analysis are very popular for land market studies. Literature using this technique is extremely extensive. Different examples include the assessment property values due to commuter rail proximity in California (Cervero and Duncan, 2002), the land market value-added due to accessibility to a Bus Rapid Transit (Rodriguez and Targa, 2004), the benefits of air quality in house prices (Won Kim et al., 2003), the impact in house prices due to high-speed rail accessibility (Andersson et al., 2008) or the benefits of proximity to the beach (Parsons and Noailly, 2004), among others. The model presented herein is based in the following equation:

$$P_i = X_i \beta_i + \varepsilon \quad (1)$$

P_i	(N x 1) vector of registered prices at Notary
X_i	(N x K) matrix with observations on structural or neighborhood characteristics
β_i	(K x 1) vector of unknown regression coefficients
ε_i	is assumed to be a vector of independent and identically distribute (i.i.d.) error terms

As noticed by different authors, many times hedonic models exclude locational variables (for example, distance to relevant points such as CBD) (Paez et al., 2001) which have proven to increase the probability of spatial error autocorrelation or heterogeneity (Mejia-Dorantes et al., 2011). Therefore, in order to minimize those problems, we analyzed several variables, as shown in table 1.

The dataset used was obtained through the Conseil Régional Nord-Pas de Calais which provided us with all the facilities to work at their place to treat the information they have. We are using a time-series dataset, from 2005 to 2010. This dataset has all the selling prices registered at notary from the entire region and for all types of buildings and terrains. In this case, we are analyzing only apartments for the seven different towns involved in the future project of the tramway lines.

We realized that the datasets needs to be deeply analyzed and has many problems such as lack of information or wrong data. In this paper we present a preliminary analysis taking into account that each apartment unit had the following characteristics:

- 20 < Real surface < 120
- 50000 € < Registered value < 250,000 €

A Geographic Information System (GIS) was used to calculate the real distance through the street network to the closest transport station or other amenity (itinerary). Many hedonic models are based on Euclidean distance, however, this approach overestimates the real distance (and the population served) to get to the closest station through the street network

(Gutiérrez and García-Palomares, 2008). Moreover, an analysis by Mejia-Dorantes et al. (2011) proves that this approach may be an alternative to a spatial econometric approach.

As we said before, it is a time-series dataset, in order to analyze it we are using dummy variables accounting for the year of registered sale. We also use dummy variables to account for the location of the apartment by different *Communes*.

Variable	Obs	Mean	Std.Dev.	Min	Max
year registered					
2006	1507	0.171201	0.37681	0	1
2007	1507	0.173855	0.379111	0	1
2008	1507	0.155275	0.362287	0	1
2009	1507	0.163238	0.369706	0	1
2010	1507	0.078301	0.268734	0	1
RealEstateValue	1507	130607.8	49628.35	50500	245000
Commune (base outcome= Bethune)					
Bruay la Buisserie	1507	0.084273	0.27789	0	1
Carvin	1507	0.048441	0.214767	0	1
Henin Beaumont	1507	0.095554	0.294076	0	1
Lens	1507	0.352356	0.477863	0	1
Lievin	1507	0.050431	0.218906	0	1
Nouex les Mines	1507	0.047777	0.213365	0	1
Realsurface	1507	54.61181	20.88656	21	119
Rooms	1507	2.339748	1.001343	0	7
it_sante	1507	1110.031	622.9978	27.12043	4797.618
it_science	1507	340.4016	199.8037	18.35634	1475.432
it_culture	1507	467.2102	378.3164	3.251444	2111.612
it_spacena	1507	2017.884	592.6364	389.4961	4004.452
it_industr	1507	1377.863	503.2491	91.11511	2903.628
id_sports	1507	805.5978	380.3213	40.38059	2986.229
it_bus	1507	168.3819	106.5183	1.714499	741.5867
it_aerop	1507	6849.708	3778.152	409.6963	18912.86
it_parking	1507	559.9523	515.9897	1.35194	5259.967
it_gares	1507	2684.221	1267.941	0.993151	6685.238

Table 1 – Descriptive statistics of the variables tested for the different analyses

4. PRELIMINARY RESULTS

The results indicate that the entire dataset needs to be further analyzed. Probably it is necessary to analyze detached or semi-detached housing instead of apartments. Years ago, in the mining

area, detached and semi-detached dwellings were built for engineers and mine workers (its location and type of house depended on their working status). Therefore, more centrally lodgments areas have an important amount of this type of construction. These houses are not in the private market (where our database comes from) because they belong to a public society "SOGINORPA" that manages this patrimony.

Number of obs = 1507	
R-squared = 0.1073	
RealEstateValue	Coef.
RealSurface	352.3154 *
year registered (base year=2005)	
2006	-1421.36
2007	8335.966 *
2008	2803.115
2009	6707.186
2010	362.3277
Commune (base Commune= Bethune)	
Bruay la Buissiere	11629.66
Carvin	20260.75 *
Henin Beaumont	-5102.02
Lens	17460.45 *
Lievin	-35095 *
Noeux les Mines	-1395.47
it_bus	-17.7181
it_gares	-6.98556 *
it_parking	6.915502 *
it_industr	-2.41506
it_sante	7.991265 *
it_culture	-8.54634
it_spacena	-18.7729 *
id_sports	-3.08583
Constant	159492.4 *

* Significant at 5%

Table 2 – Regression analysis

5. CONCLUSIONS

Although the analysis should include detached and semi-detached housing it does give some hints. For example, it shows the relevance of being close to a rail station (*gare* in French), which is a negative coefficient and significant at 5%. Although the distance to the closest bus stop is not significant, it has a negative sign. We found other interesting results, for example, being close to sport activities, green zones, cultural buildings, poles of economic activity (industry). Conversely, we find positive signs for the distance to parking lots, and to clinics and hospitals (*santé*). The former may be related to the fact that, where apartments are located (new areas), they may have less parking restrictions on the streets or the buildings may have their own garage. In the case of distance to the hospitals, it seems to be a negative externality, which is in the same line of Mejia-Dorantes et al. (2011). Finally, it is not conclusive about the announcement effect of the new tramway lines although it shows that the trend notably increases in 2009. It may be due to the general trend rather than due to the tramway (and Louvre) projects.

As we said before, this study leaves many doors opened for further research. Moreover, a more sophisticated study to analyze the time-series taking into account the market trend should be tested. It might help to be more conclusive about the announcement effect.

6. ACKNOWLEDGEMENTS

The authors would like to thank the Regional Council of Nord-Pas-Calais for their support to carry out this research which is part of the SUIM project.

7. REFERENCES

Andersson, D.E., Shyr, O.F., and Fu, J. (2008) Does high-speed rail accessibility influence residential property prices? Hedonic estimates from southern Taiwan. *Journal of Transport Geography*.

Anselin, L. (1988) *Spatial Econometrics: Methods and Models*. Springer.

Bailey, M.J., Muth, R.F., and Nourse, H.O. (1963) A Regression Method for Real Estate Price Index Construction. *Journal of the American Statistical Association*, 58, 933-942.

Caratini, D. (2012):

http://www.lavenirdelartois.fr/Dossiers/articles_globaux/2012/02/09/article_pourquoi_le_tramway_va_derailler.shtml. *L'Avenir De l'Artois*, 2012.

Cervero, R. and Duncan, M. (2002) Transit's value-added effects: Light and commuter rail services and commercial land values. *Transportation Research Record: Journal of the Transportation Research Board*, 1805, 8-15.

- Cohen, J.P. and Coughlin, C.C. (2008) Spatial hedonic models of airport noise, proximity, and housing prices. *Journal of Regional Science*, 48, 859-878.
- Dubin, R.A. (1988) Estimation of Regression Coefficients in the Presence of Spatially Autocorrelated Error Terms. *The Review of Economics and Statistics*, 70, 466-474.
- Farber, S., Páez, A., and Volz, E. (2009) Topology, Dependency Tests and Estimation Bias in Network Autoregressive Models. *Anonymous*, pp. 29. Springer.
- Gutiérrez, J. and García-Palomares, J.C. (2008) Distance-measure impacts on the calculation of transport service areas using GIS. *Environment and Planning B: Planning and Design*, 35, 480-503.
- Institut National de la Statistique et des Études Économiques. (2011) Bases de données INSEE. [Http://www.insee.fr/fr/](http://www.insee.fr/fr/), 2011.
- Mejia-Dorantes, L., Paez, A., and Vassallo, J.M. (2011) Analysis of House Prices to Assess Economic Impacts of New Public Transport Infrastructure. *Transportation Research Record: Journal of the Transportation Research Board*, 2245, 131-139.
- Paez, A., Uchida, T., and Miyamoto, K. (2001) Spatial association and heterogeneity issues in land price models. *Urban Studies*, 38, 1493.
- Parsons, G.R. and Noailly, J. (2004) A value capture property tax for financing beach nourishment projects: an application to Delaware's ocean beaches. *Ocean and Coastal Management*, 47, 49-61.
- Rodriguez, D. and Targa, F. (2004) Value of accessibility to Bogotas bus rapid transit system. *Transport Reviews*, 24, 587-610.
- Rosen, S. (1974) Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. *Journal of Political Economy*, 82, 34.
- Sommervoll, D.E. (2006) Temporal Aggregation in Repeated Sales Models. *The Journal of Real Estate Finance and Economics*, 33, 151-165.
- Won Kim, C., Phipps, T.T., and Anselin, L. (2003) Measuring the benefits of air quality improvement: a spatial hedonic approach. *Journal of Environmental Economics and Management*, 45, 24-39.