

Working Paper

The effect of large infrastructure on urban development: the example of the canton of Geneva

Keywords: urban dynamics, transportation infrastructures, urban structure

June 2007

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Paper to be presented at the 14th ERES Conference, London, United Kingdom, June 27–30, 2007

03/07

Introduction

This paper is an abstract of the study made for the Master of Science in Real Estate delivered by the Center for Urban and Real Estate Management (CUREM) in Zurich.

The Goal was to analyze the relation between big infrastructure and urban development, using a real case. The chosen area for this was the canton of Geneva where the city bypass opened in 1993. The evolution was observed from 1980 to 2000 in order to study both the evolutions previous to the new road infrastructure and the evolutions after it was opened.

Themes

Urban sprawling

Urban sprawling is a well-known phenomenon in relation with transportation infrastructures. Here, the speed of moving and the time allocated to transport are putted in relation. Most of the studies on this topic show that, despite the increase of speed, the amount of time allocated to transport remains constant. It means people cover greater distance for the accomplishment of their activities, and thereby that the activities are located in greater distance from each other. Transferred into urban form, the consequence is a wider, less dense urban agglomeration. This phenomenon is usually called sprawling city. Easily observable in cities like Los Angeles, it has been confirmed in a recent study made across Europe (SCATTER). The comparison between various cities shows a relation between efficiency of the transportation infrastructure and urban density.

Urban structure

It has been shown in the literature that the development of transport infrastructures had an impact on regional development. The impact looks to be different on peripheral region than it is on urban agglomeration. It reinforces the strength of the agglomeration centre and it weakens the peripheral region.

In the region itself, the accessibility appeared to be an important location factor for individual people and companies.

Other studies demonstrated that the urban development is stronger along the major roads of the agglomerations.

Let's keep this in mind while looking at the region of Geneva.

Situation

The city of Geneva is located in eastern part of the so-called "métropole lémanique", that is developing itself around the lake of Geneva, and which encloses approximately 1.5 millions inhabitants. Geneva is the biggest urban centre of the metropolis area.

Until 1993, there were two highways leading to the city of Geneva; one from the south, coming from France and one from the north coming from Switzerland. They weren't connected and the transit traffic had to pass through the city. So the government decided to solve this problem and the construction of a city bypass began in 1984 and ended in 1993.

As in other agglomerations, the bypass is actually mostly used for inner-region trips. It transformed the relations in the region and let new traffic knots appear. So the main question is: did the transformation of these relations in the region have an effect on the urban development of Geneva? And if yes, what kind of effect?

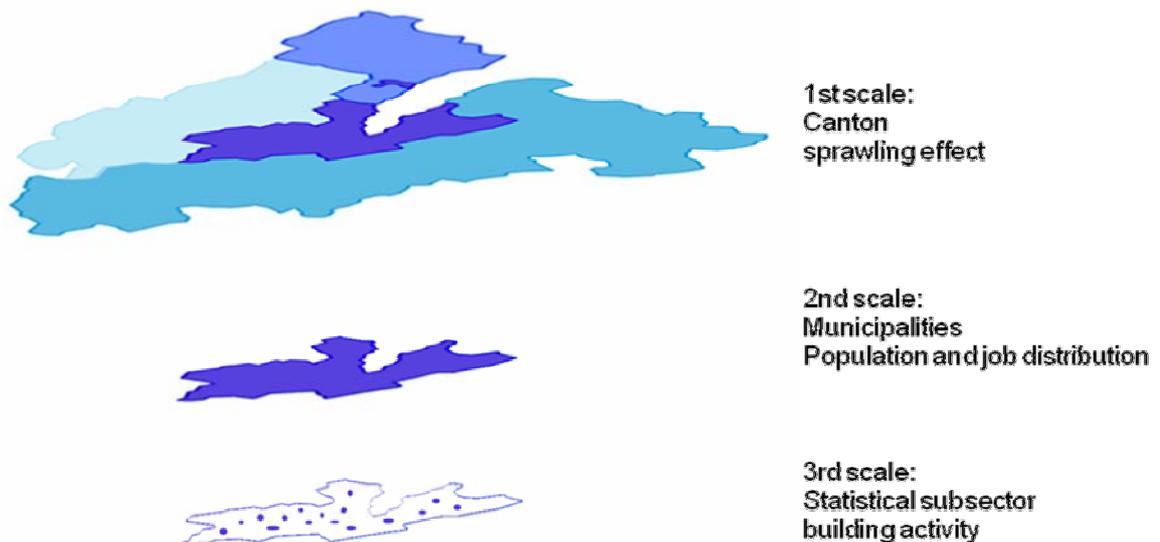
Method

The region was studied at three different levels: firstly, an analysis of the region's dynamics as a whole, where we looked at the phenomena of urban sprawling, in relation with the new infrastructure. The second step was an analysis of the demographic evolution and employment market at a communal level. The focus was on the analysis of the employment and demographic distribution and its evolution in the communes with improved accessibility relative to the communes without.

Thirdly, an analysis of the evolution in the man-made environment at a district level was made. Here, we looked at the evolution of the building activity during the period.

The afore-mentioned studies permitted the computation of a model that describes the relationship between the changes in the man-made environment of a certain area and its accessibility.

Chart 1: the three levels



Results

1st level

The selected area for the first level of analysis was the so-called “region franco-valdo-genevoise”. It goes beyond the frontiers of the canton of Geneva and integrates parts of France and parts of the canton of Vaud. The analysis showed that a phenomenon of urban sprawling was happening, as in other modern cities, but the correlation with the new infrastructure couldn't be demonstrated.

Second level

At the second level of analysis, we introduce the concept of accessibility. For the purpose of this study it was defined as the travel time from a location in the canton of Geneva to the next reference point. The reference points we used were the motorway accesses and the city centre. The measures were made with the help of the Swiss federal institute of technology in Zurich.

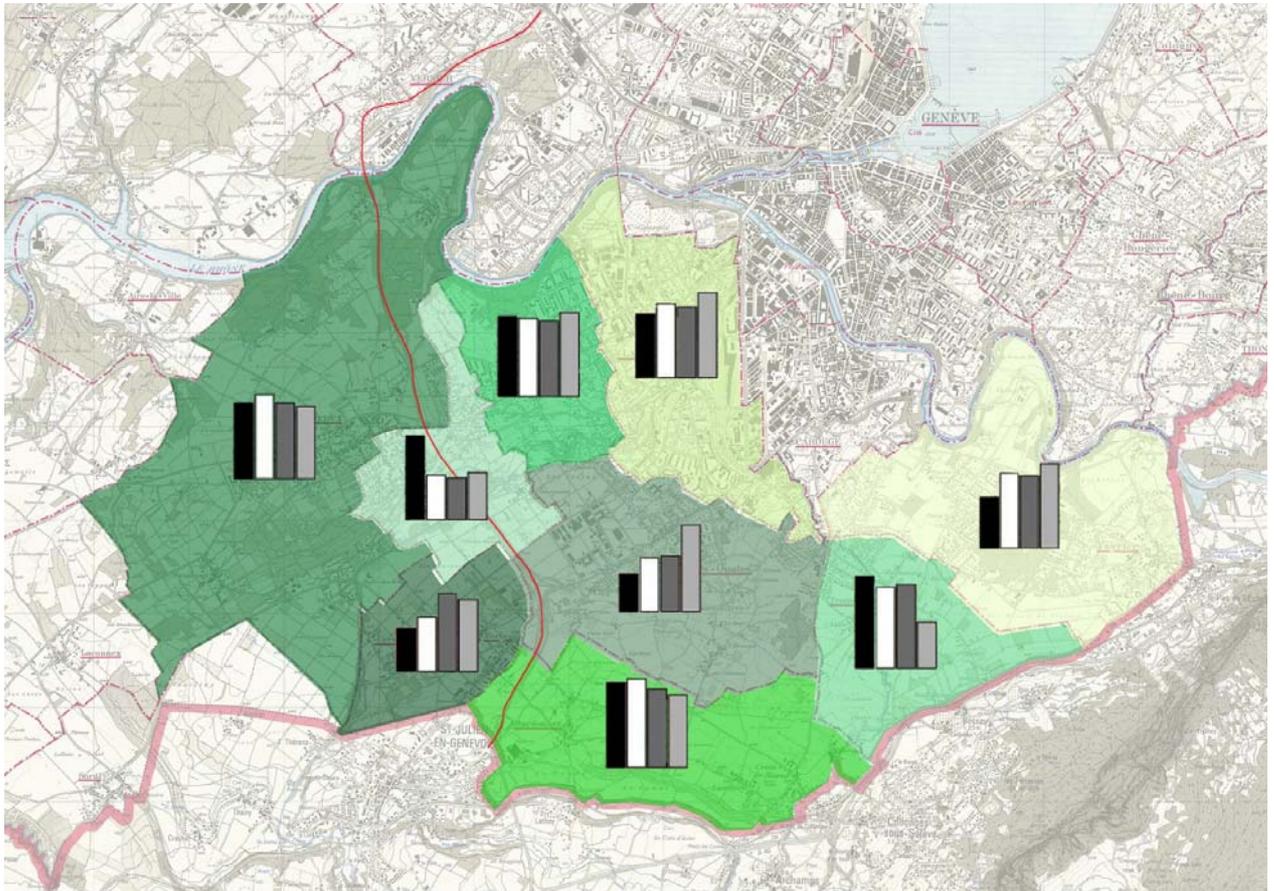
This method enabled us to divide the canton into seven groups of communes, according to their level of accessibility to the new infrastructure and city centre before and after the bypass construction. Then the population and number of jobs were noted at five-year intervals from 1980-2000.

Analyses of the demographic evolution did not produce a clear trend. There is however a phenomenon of population redistribution from the city center towards the communes of the agglomeration. This trend occurs in the whole canton, but no clear difference can be observed between municipalities with improved access to the highway and those without. As in previous analysis, urban sprawl goes on, but the highway does not have a significant effect on its regional structuring.

On the contrary, according to the study result, the accessibility manifests on the employment location; this was observed by a positive trend in employment figures for areas near the bypass and city centre. The group of commune where the accessibility improvement was the stronger also registered the higher growth in the number of jobs. The detail study of the communes composing the group shows that the phenomenon was stronger for the communes situated on the side of the bypass nearest the city. According to these results, the employment market reacts to accessibility factors. One has noted that the raise in employment figures only is evident in the last quarter, after the bypass construction. There was no early reaction.

As seen in the population figures, a phenomenon of job redistribution is also seen between the city centre and adjacent communes.

Chart 2: employment evolution in the communes of group 2, from 1985-2000 at five years intervals



3rd level

For the study of the building activity, we reduced the scale. The idea was to examine the changes in various parts of the canton using representative samples. For each sub-sector, the number of buildings constructed in the four 5-year periods from 1980 to 2000 was noted.

The analysis of construction density and how it changed showed the sectors with the highest density form a corridor parallel to the motorway. The relationship is not obvious, as the least dense sector lies two minutes from the motorway junction and the periods of change in density do not match the periods of existence of the bypass.

Then, the morphological changes were analysed qualitatively. The urban form is heterogeneous and strongly influenced by the building regulations prevailing in the different construction zones. We observed three types of buildings that blend together to form the urban morphology. In areas with detached houses, the morphology is made up of small entities. The second type, are industrial buildings, usually wide and large in area. The third type, are groups of residential or office buildings generally organized in a linear arrangement. The traditional morphology of buildings in contiguous order is almost non-existent. Recent constructions are physically separate from each other, and more usually their relationship to each other is not obvious. This trend is in line with the prevailing philosophy in contemporary urban theory, but also indicates the development of a less dense

morphology, which accords with the increased speed of movement of individuals, goods and information.

Model

The computation of the multiple linear regression, based on the same samples, confirmed the perceived trends and revealed the importance of vacant land for building activity to exist. All the variables tested in the model were statistically insignificant, with exception of the construction potentials and the building activity in the previous period. In other words, it means that no correlation between accessibility, to the city centre or to the bypass, and the urban development of the canton of Geneva exists.

The construction potentials are given by the public authority in the form of zone planning. So, we can say, in the canton of Geneva, the urban development is mostly driven by the government's decisions. One reason is certainly the shortage of available land. In these conditions other location factors become insignificant.

For the application of the model, it was assumed that the guiding lines expressed in the canton Master plan would be applied.

The results show strong development for sectors close to the motorway interchange from the 3rd period (2010-2015), while the general trend is downwards. Single family areas also benefit from the new legislation.

Conclusion

The study has shown that there is no obvious relationship between the construction of the motorway and urban development in the canton of Geneva. At the regional level, urban sprawl, clearly under way, has not so far been exacerbated by the new motorway. In the canton, municipalities newly connected to the motorway do not seem to have benefited of accelerated demographic change. However, a phenomenon of demographic redistribution between the urban centre and the peripheral municipalities could be observed. The influence of accessibility has been stronger on the location of jobs, since municipalities close to the new motorway and close to the city centre have experienced higher than average growth in the number of jobs.

These phenomena are not translated directly into construction activities. There is no obvious relationship with accessibility and the typology of constructions is heterogeneous. Recent buildings are physically separate from each other and appear as individuals. The result is a patchwork urban structure without overall coherence.

The model confirmed the trends perceived and reveals the significance of construction potentials for building activity. In other words, urban development is hampered by the shortage of available land and the other location factors become insignificant.

Apart from these conclusions, this study has enabled a systematic analysis to be carried out of developments in the canton of Geneva over the last twenty years, and of their relationship with the new section of motorway. It follows other studies by the Federal Regional Development Office (ARE), and in the case of Geneva provides another example of the difficulty in showing a direct

relationship between the development of an infrastructure and urban development. The production of a model has suffered from a lack of available data at sub-sector level for the start of the observation period. The Cantonal Office of Statistics is currently gathering data at this level, which will enable the model developed to be improved in future.

Selected readings

- *Streets and Patterns*
Marshall, S., 2005, Spon Press, London.
- *Accessibility, spatial organization and demography in Switzerland through 1850 to 2000: First Results*,
Tschopp, M., Fröhlich, P., Keller, P., Axhausen, K. W., 2003, Arbeitsbericht Verkehrs- und Raumplanung, 186, Institut für Verkehrsplanung und Transportsysteme, ETH Zürich, Zürich.
- *Evaluation of accessibility impacts on land-use scenarios*
Geurs, K. T. and Ritsema, J. R.. 2002, Environment and planning B, 30 (1), 69-87
- *Land use and growth impacts from highway capacity increases*
Sanchez, T. W., 2004, Journal of urban planning and development, 6, 75-82.
- *Sprawling Cities And Transport: from Evaluation to Recommendations (SCATTER)*
Gayda, S., Haag, G., Besussi, E., Lautso, K., Noël, C., Martino, A., Moilanen, P., Dormois, R. ,
www.casa.ucl.ac.uk/scatter, 2005.
- *Räumliche Auswirkungen der Verkehrsinfrastrukturen in der Magadinoebene – eine ex-post Analyse: Zusammenfassung*
Office fédéral du développement territorial, 2004, Bern.
- *Raumentwicklung im Verborgenen : die Entwicklung der Metropolregion Nordschweiz*
Thierstein, A. Kruse, C., Glanzmann, L., Gabi, S., Grillon, N., 2006, NZZ libro, Zürich.