

**To study the effect large infrastructure impose on urban
development and to generate a model using the example of the
canton of Geneva**

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Abstract

Procedure:

The periphery of Geneva, where a section of the city bypass opened in 1993, was studied on three different levels:

- Firstly, an analysis of the region's dynamics as a whole;
- Secondly, an analysis of the demographic evolution and employment market at a communal level; and
- Thirdly, an analysis of the evolution of the man-made environment at a district level.

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

Results:

The study showed that the relationship between the freeway and the urban development of the canton of Geneva was not obvious. The demographic redistribution from the city centre towards suburbia seems to have no apparent relationship with the new infrastructure. The influence of accessibility manifests on the employment location; this was observed by an increase in employment figures, higher than average, for the areas near the new bypass and city centre. These phenomena were not directly translated into building activity, as two neighboring sectors can develop totally differently. The relationship with accessibility is not obvious.

The model confirmed the perceived trends and revealed the importance of vacant land for building activity to exist. In other words, urban development is hampered by the shortage of available land and the other location factors become insignificant.

Introduction

This paper is a condensed version of the study I made during the Master of Science in Real Estate course delivered by the Center for Urban and Real Estate Management (CUREM) in Zurich. The work was to realize within four month at part-time.

The theme was 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 phenomenon observed in modern cities where the transportation infrastructures are well developed. The empirical research has shown that, despite the increase of speed, the time allocated to transport reminds constant over the past centuries. It means that people do cover greater distances for the accomplishment of their activities, and, thereby, that those activities are located in greater distance from each other. The impact on urban form is a wider less dense urban agglomeration.

The phenomenon of urban sprawling is easily observable in cities like Los Angeles, where the individual transportation infrastructures are strongly developed.

The comparison of various city across Europe made in a recent study (SCATTER), let a relation between transport efficiency and urban density appear.

Urban structure

Here I'd like to introduce the evidence demonstrated by different studies.

In empirical studies, where the companies and individuals where asked about the factors that had or would impact on the location choice they made or would make. In the answers, good accessibility comes regularly as one of the most important factors. This factor seems to be of more significance for companies than for individuals. In other words, extrapolating this idea, the development should be stronger along or near transportation infrastructures. This is not always observable because of other constraints, but some studies could show in several cities of the United States, that the urban development of the agglomerations is stronger along the major road infrastructures.

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 agglomeration of the metropolis area.

Until 1993, there were two highways leading to the city of Geneva; one from the south, connecting with the French motorway and one from the north connecting with the Swiss motorway. The two infrastructures weren't connected and all the traffic had to pass through the city. The government solved this problem and decided the construction of a city bypass which began in 1984 and ended in 1993.

As in other agglomerations, the bypass is today mostly used for inner-region trips. It has transformed the commutation habits in the region and let new traffic knots appear. The question this study tried to answer is the following: did the transformation of the accessibility in the region have an impact on the urban development of Geneva? And if yes, what kind of impact?

Method

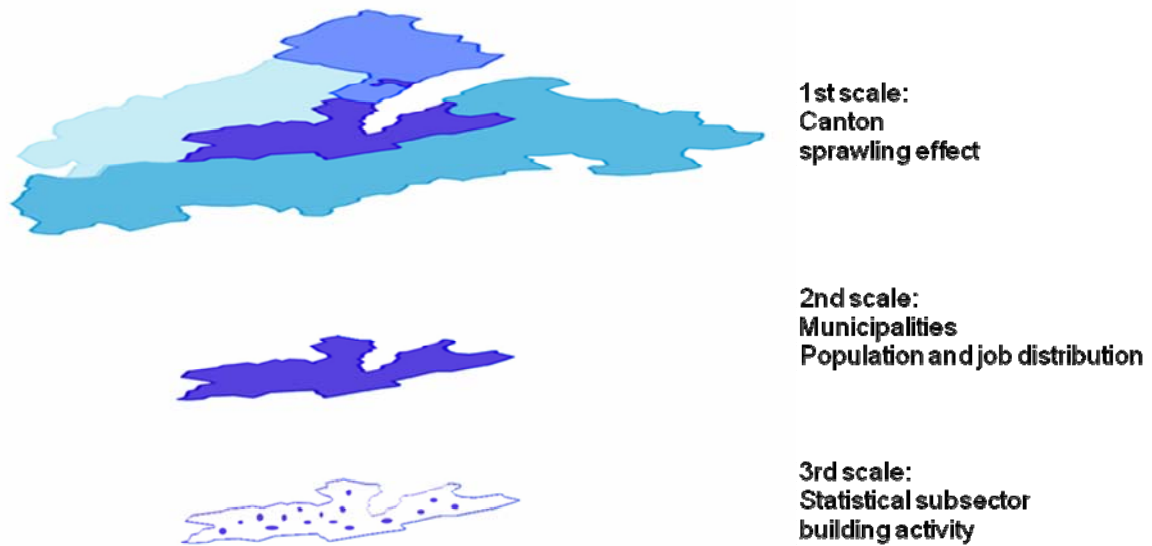
The region was studied at three different levels: firstly, an analysis of the region's dynamics as a whole, where we looked at the phenomena of urban sprawling, in relation with the new infrastructure.

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, the concept of accessibility had to be introduced. 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 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 me 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

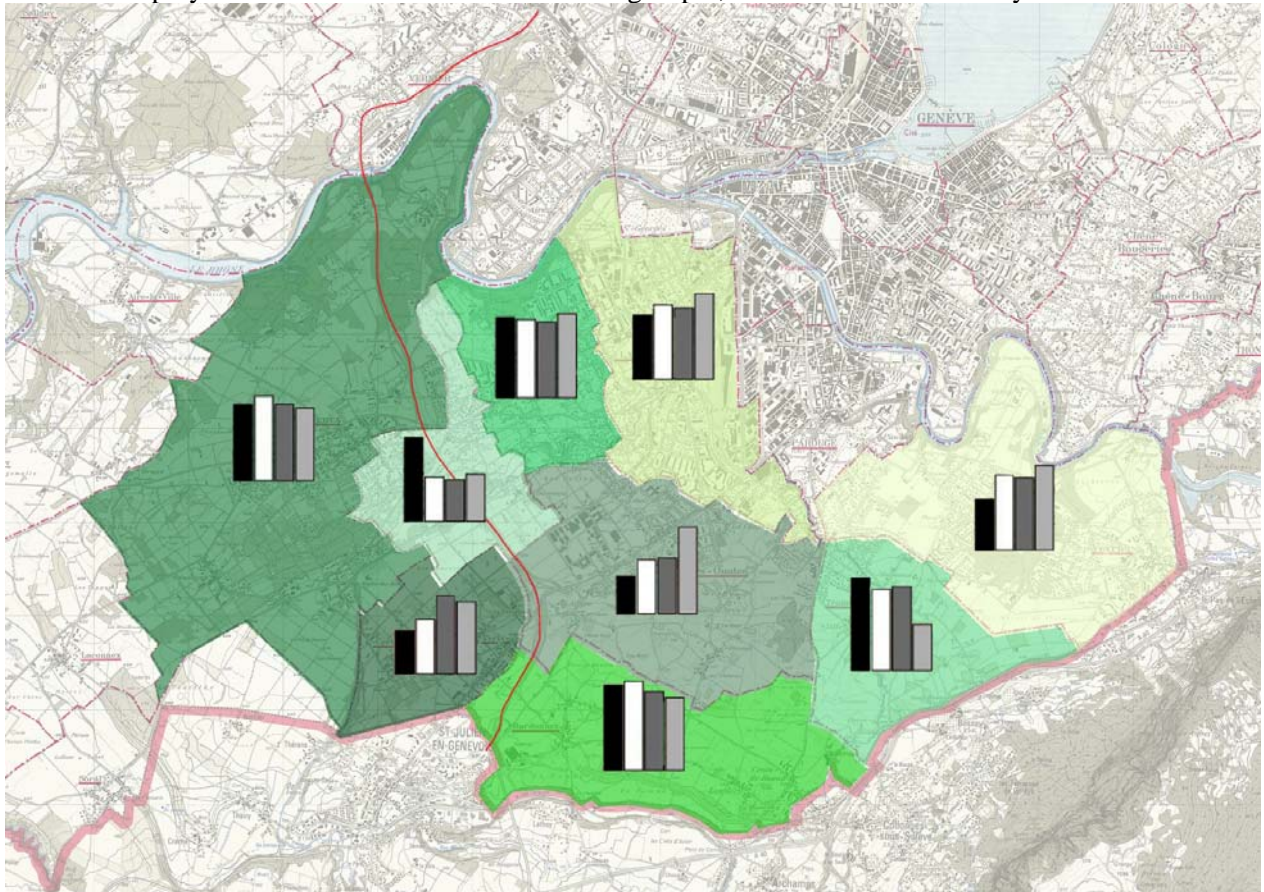
1980-2000 in order to consider both the anticipating processes and the evolution after the opening of the new infrastructure.

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.

The observations for the evolution of the job distribution were different; 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. 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 once again 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

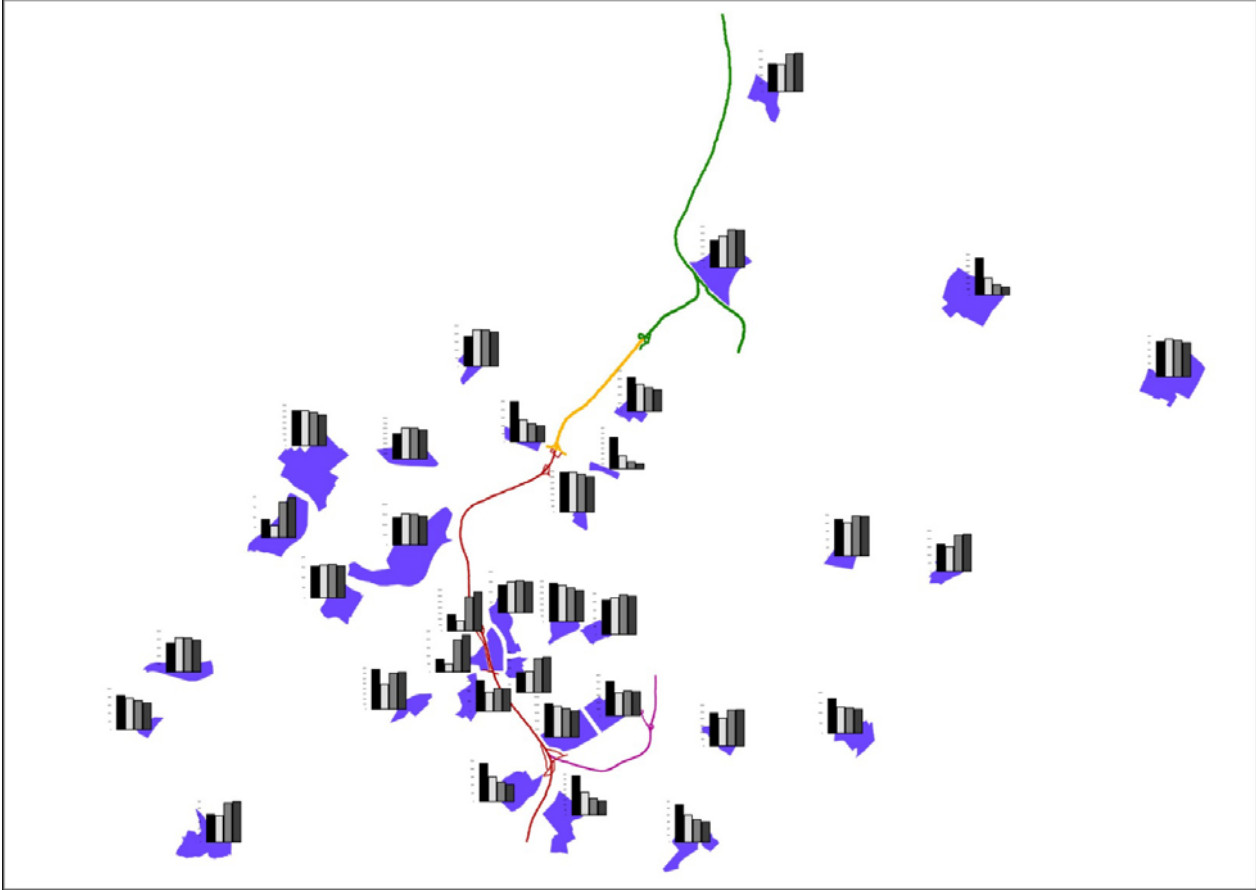
The computation of the multiple linear regression, based on the same samples, confirmed the perceived trends and revealed the importance of vacant land for building activity to exist. All the variables tested in the model were statistically insignificant, with exception of the construction potentials 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 can be observed.

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.

The application of the model for the period from 2000 to 2020 was made assuming that the guiding lines expressed in the canton's Master plan would be effectively observed by the planning authority.

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

Chart 3: evolution of the built-up area in each sample district from 2000 to 2020.



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.

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