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Housing market trend and rail transport investments in the city of Naples

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Abstract

Rail transport investments can influence housing market trends, as demonstrated in the literature. However many empirical researches highlight that different results can derive from different urban context applications and that each case should be threaten separately. It is for this reason that this paper is focused on the single case of the city of Naples, where many rail transport investments have been carried out in the last decades.

The aim of this study is to give an interpretation of the housing values changes due to the opening of new metro stations. This study applies GIS tools in order to show the spatial distribution and the intensity of rail impacts in different areas of the urban system from 1994 to 2004.

This study shows that the extent of the impacts varies from place to place and the effects intensity requires the presence of several complementary factors such as central location of the new stations and the presence of urban planning policies in the transit corridors. This again testifies how housing market is strictly related to the infrastructures investments planning and urban design.

1 Transit network and housing market: an overview

Interaction phenomena between rail infrastructures and urban systems have been studied using different approaches in both transport and urban studies disciplines, with the aim of defining theories and analysis methods to be applied to transport and land use system behaviour [1]. From many studies it is clear the strong relationship between the construction of new infrastructures, in particular rail transit lines and stations, and a change in the housing market trend in the stations influence areas.

Many empirical studies on transit and housing market interactions are mainly focused on the measuring and on the interpreting of the transit impacts on urban areas, including different impacts assessments and with various interpretative methods [2]. In Europe, quantitative methods for the housing market and transport impacts assessments have only been applied relatively recently to the latest European projects [3]. Some empirical study results are contradictory, perhaps due to the different analytical techniques, data quality and regional differences.

The economic transformations related to the rail system evolution consist of micro-economic impacts, such as property and rent value changes for different uses, and macro-economic effects such as urban economic competition change, potential development increase or economic viability of the central business districts [4, 5]. Most studies focus on housing values changes: some of them demonstrate an increase in housing property values in the station areas that is higher than the municipality average change [6]. Many factors contribute to these values changes, such as the regional economic trend or housing physical characteristics. In the literature, different methods have been developed to analyse these factors and, in particular, the hedonic pricing approach is widely applied to define the property value change as a function of the physical or functional features of different properties [7, 8].

The extent of the impacts vary from study to study and the results often have to be interpreted with caution. The impacts are generally small and indirect and depend on the presence of several complementary factors, such as vacant land near new transit stations, a positive regional economic trend, good housing quality and central locations of the new stations.

Accordingly, one of the main aims of this study is to define the relation between housing market and transit investments. This goal is primarily achieved on the basis of two different steps, described on the basis of the Naples study case. The first phase, described in section 2, consists in the quantitative measurement and the interpretation of the impacts of the construction of a new metro line on the urban system (property value changes). The second step, developed in section 3, focuses on four stations in different urban context in Naples (central and suburban areas), comparing the results of the quantitative analysis with a qualitative study of the renewal intervention in the station areas.

2 Transit impacts on housing market in Naples

Naples is the biggest city of the south of Italy with about 1 million inhabitants on 117 square km (85,11 inh/ha and 27,78 jobs/ha), and it belongs to the conurbation of the Province of Naples, with a population of 3 million inhabitants [9]. Since 1993 the rail transit system expanded with new lines and new stations being constructed (see Fig.1). In 1991, the rail network was made of 5 transit lines and 45 stations. In 2004, the rail system consisted of 6 lines, 69 stations and 7 interchange nodes. The main change is the development of the line 1 that goes from the city centre to the northern periphery and of a new 12 km line section of the line 3, in the east periphery. Many other smaller interventions were carried out in the whole municipality area, in order to revitalize existing station areas and to increase the accessibility to the rail network, as defined in the *100 Station Plan* [10] and the *Master Plan*, approved in 2004 [11].



Figure 1: Naples rail transit network in 1994 and 2004

Station areas transformation assessment has been carried out over a 10-year period (from 1994 to 2004) using longitudinal data that allows before and after comparisons of housing property values within rail transit station areas. In addition, GIS analysis techniques allowed to represent the time series spatial database. Georeferenced time series data have been related to Naples census tracts and to each transit node in the network.

Furthermore, with GIS support, station influence areas have been defined as census tracts join within 500 meters from the station exits. This measure is widely used as the average walking distance to reach a station. Moreover, the analysis puts forward some GIS layouts that show the impacts intensity in different station areas according to their position in the urban structure and their connectivity in the transit network (see Fig.2 and 3). *Agenzia del Territorio* is the main data source [12, 13], concerning property values in 1994 and 2004 for different property types (high quality housing and low quality housing). The property values changes is measured as the average change of the join of the census tracts k belonging to the station area i (€/mq), where $value_{yearkt}$ is the value of the property in the defined year, in the census tract k , for the property type t :

$$\Delta\%value_{it} = \sum_{k=1}^p \frac{value_{2004kt} - value_{1994kt}}{value_{1994k}} \cdot 100 \quad (1)$$

The analysis shows that property values in the new station areas increased faster than the urban municipality average (+33%). In new and central subway stations, the prices are also increasing faster and with a higher intensity because of the presence of other urban renewal interventions (urban renewal, new pedestrian areas, open spaces rehabilitation), as for houses property values in Dante (+41%), Materdei (+45%), and Salvator Rosa (+47%) stations. In suburban and semi-central station areas, property values are increasing more slowly than in central station areas, and this may explain the inhabitants decentralization phenomenon in the Naples area. As GIS layouts show, economic transit impacts are not uniform and occur with stronger intensity only where other economic conditions are already beneficial to these increases. For example, GIS layouts clearly show the impact on new urban transformation in the increasing property values in the Bagnoli area, in Naples west periphery, where a big former industrial area is being transformed into a new urban green area. Finally, the property value changes in new station areas highlight the structuring effect of the transit system development on urban transformations. In fact, the average increase of new line 1 property values for different uses is higher compared to the municipality average value change.

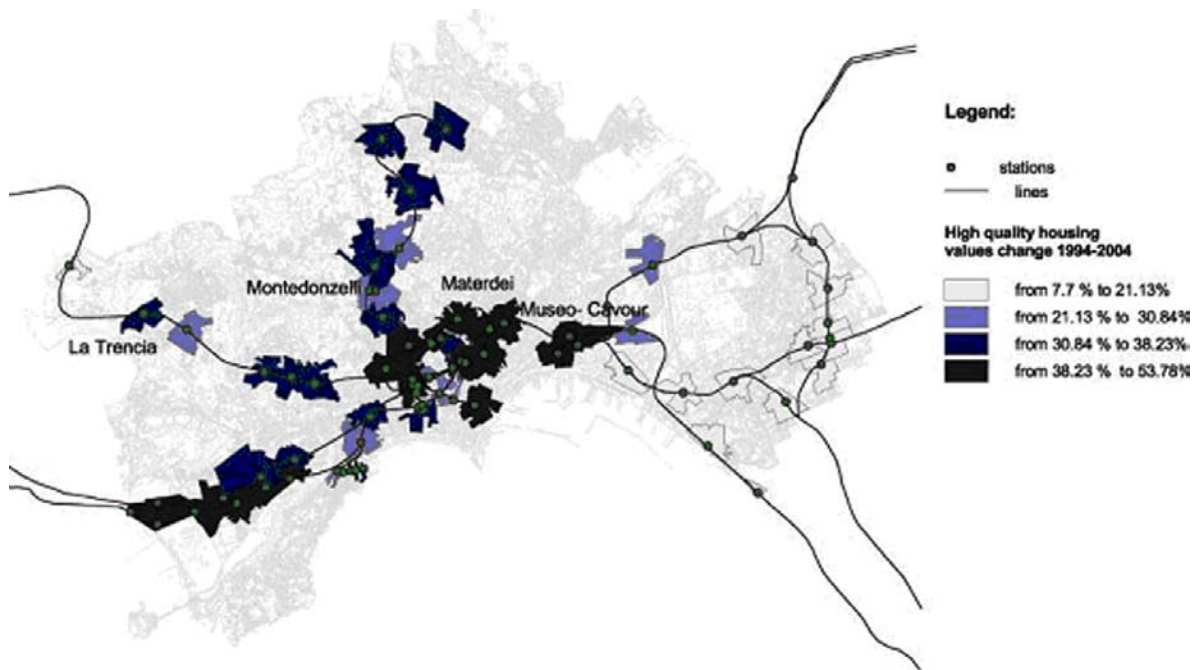


Figure 2: High quality housing value change of in the station areas 1994-2004



Figure 3: Low quality housing property value change of in the station areas 1994-2004

3. Housing market trend and station areas projects in Naples city centre and its periphery

The analysis, described in paragraph 2, demonstrated the impacts of the development of new infrastructures on housing market trend. This section focuses on four station areas (Materdei, Museo-Cavour, Montedonzelli and La Trencia) of Naples municipality, in order to show some qualitative differences that could have influenced the impacts intensity on housing values (see table 1).

Table 1: Comparative analysis of four stations economic impacts

			Materdei	Museo - Cavour	Montedonzelli	La Trencia
Context features	Location	Central area	X	X		
		Semi-central area			X	
		Suburban area				X
	Population density	Higher than the municipality average	X	X	X	X
		Lower than the municipality average				
	Job density	Higher than the municipality average	X	X	X	
Lower than the municipality average					X	
Main use	Residential	X		X	X	
	Functional mix (Residential, commercial and services)		X			
Station features	Node typology	Station	X		X	X
		Interchange node		X		
	Belonging line	Line 1 (new line)	X		X	
		Line 6 (new line)				X
		Line 1 (new line) and 2 (existing line)		X		
Project features	Interventions	Pedestrian area addition	X	X	X	X
		Open spaces renewal	X	X	X	X
		Urban furniture addition	X	X	X	X
		Housing rehabilitation	X	X		
		Artworks addition	X	X	X	
		<i>Tapis-roulant</i> links		X		
		Parking improvement			X	X
Impacts on housing value		High quality housing	+45%	+44%	+35%	+26%
		Low quality housing	+40%	+49%	+33%	+12%

Materdei station area has a population density of 336,98 inh/ha and 86,81 jobs/ha. It is located in the historical centre of the city and its construction. Materdei is located in the district Avvocata and has a main residential use. The station Materdei was opened in 2003 and it belongs to the new line 1. The station project allowed also to renovate the blight areas surrounding the new metro exits [14]. In fact Scipione Ammirato square and Marsicano street were made pedestrian, with new urban furniture and artworks addition (see Fig 4). The buildings that lean out in the square have been recovered, revitalizing the whole district. The increase of the real estate values for houses of high quality is equal to +45%, which is higher than the municipality average value change (+33%) and also higher than the central station areas average value change (+36%).

Another example of central station area is the interchange node Museo-Cavour, that is set in Cavour square and it is located in the Stella district. It belongs to the central business district of Naples with a high functional mix. The station area has a population density of 259 inh/ha and a jobs density of 150,85 jobs/ha. This node is made by two stations: Museo (that was opened in 2002 and that belongs

to the new line 1) and Cavour, that belong to the existing line 2. These two stations are linked by an underground connection of 330 meters, with a tapis roulant. In 2005 a second underground connection with the Archaeological Museum was inaugurated (see Fig. 5). With the opening of Museo station, the Cavour square was renewed thanks to the project of Gae Aulenti [14]. The square is now a big open space for pedestrians with gardens. In this area the increase of the real estate values for houses of high quality is equal to +44,5%.



Figure 4: Materdei station and the pedestrian access to the metro exit (photo by Emilia Trifiletti)



Figure 5: Museo station area renewal (photo by Emilia Trifiletti; rendering Comune di Napoli)

An example of semi-central station area is Montedonzelli, located in the north residential district of Arenella. The station Montedonzelli (213,80 inh/has and 259,05 jobs/ha) is an example of an urban area revitalization close to the new metro exits. The station, that belong to the new line 1, was opened in 1993. In February 2006 a new exit was inaugurated and this gave the opportunity for the station area requalification. Before the intervention, post-earthquake containers occupied the site. The station area is now equipped with a basketball field, green areas, a skating area and a playground (see Fig. 6). Near the station a three-floor parking was realized with 300 car places and a commercial area. The values increase of high quality housing is +35% and for low quality housing is +33%. Those values are higher compared to north semi-central station areas increase (+32% and +25%).

Another examples is La Trencia station that belongs to the Circumflegrea line, that link the west periphery and the Campi Flegrei area to the city centre. The station, designed by Nicola Pagliara, was opened in July 2005, and is located in the western suburban and residential district of Pianura (189,22

inh/ha and 24,96 jobs/ha). In the station area is going to be completed a new big parking and a green open space. Housing values increases (for high quality housing +26%, and for low quality housing +12%) in La Trencia station area are higher compared to the west suburban station areas increases (+23% and +8%).



Figure 6: Montedonzelli station and the new public space (photo by Emilia Trifiletti)



Figure 7: La Trencia Station and the new parking building (photo by Emilia Trifiletti)

3. Conclusions

This study has proposed a framework for the analysis of transport impacts on housing market, with particular attention on the transit role in urban transformation processes. Using a GIS impacts assessments application, the study has presented an analysis of the Naples case study while evidence transit impacts on housing market has been verified in a quantitative manner. Finally, the study proposed some examples in the Naples municipality in order to stress how the impact intensity can be related also to planning interventions on the new station areas. It has come out that new central station areas experienced a higher increase of housing property values compared to the values of the city of Naples. Suburban stations are characterized by an increase in the property value which is close to the Naples average values. The results show that property values along the line has experienced an values increase which is markedly higher than the city average. This effect suggests an increasing structuring effect of the transit line on housing property values.

Furthermore, the presence of renewal interventions both in new and existing station areas contribute to increase transport impact intensities, as demonstrated in paragraph 3. Integrated transformation processes influenced the housing market trend in a stronger manner than in the municipality average. This testifies how housing market is strictly related to infrastructures planning and urban design. For this reason it is important to take into account the combined transport-land use interventions economic impacts in the planning phase, in order to maximize the return on transport investments and to build more liveable cities.

The research agenda based on these findings aims to focus on developing a more complete methodology for the urban planning interventions definition in station areas and in transit corridors in order to define a SDSS (Spatial Decision Support System) for the transit land use integrated planning and transformations management.

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