THE EFFECTS OF TRANSPORT IMPROVEMENTS ON ECONOMY AND DEVELOPMENT: A RESEARCH IN EXAMPLE OF KONYA HIGH-SPEED RAIL

***Jonatan GONZALEZ*[*], *Özer KARAKAYACI*[**]**

ABSTRACT

In the last two decades, a major question in "Economic Geography" has experienced that growth of regions is related to the scale and nature of transport infrastructure's contribution to the broader economy. Since the effects of transport infrastructure investments has sought to go beyond direct benefits resulting from the reduction in transport costs, understanding of the general economic effects generated by changes in transport infrastructure quality has taken on greater importance. However, it has not been possible to reach a general consensus on the typology, magnitude and way of the mechanisms that operate in this relationship, although theoretical and practical discussions coincide with affirming the existence of causal mechanisms between transport infrastructure and economic activities. This causal relationship may have different economic effects due to the variability of the other factors that define the particular economic behaviour of each geographical area. Upon on an accessibility approach, this paper aims to identify and analyze the effects of transport infrastructure investment in economic growth at regional level in Turkey. In this study, Konya High Speed Rail (KHSR) providing fast access to and from major metropolises such as Ankara and Istanbul has been chosen as the case study since Konya has experienced significant economic developments, together with the high speed train connection.

Keywords: High-speed rail; accessibility; transport improvement; economic growth; Turkey

1. INTRODUCTION

Recent theoretical models in the framework of Economic Geography have developed the knowledge of transport impacts on the economy and the relevance of transport to regional development. While in the beginning,

[*] Konya Technical University, Department of City and Regional Planning, Konya, Turkey, joagonzalez@unal.edu.co

[**] Assoc. Prof. Dr., Konya Technical University, Department of City and Regional Planning, Konya, Turkey, okarakayaci@ktun.edu.tr

transport investment´s contribution to economic development was limited to effects on location of economic activities and productivity as result of transport time/costs. Currently, the effects of transport infrastructure investments are supposed to go beyond direct benefits resulting from the reduction in transport costs. Thus, transport-growth relationship analysis makes need to understand the causal mechanisms linking transport and development. These mechanisms create changes in the context in which economic activities are carried out, thereby changing the characteristics of economic activities as a whole: production, distribution and consumption (Bonanno & Constance, 2001; Knowles & Ferbrache, 2016; Puga, 2002). Causal mechanisms are as complex as imaginable; they can produce different results by different dynamics in different regions (Aschauer, 1989).

Upon on an accessibility approach, this paper aims to analyze the effects of transport infrastructure investment in economic growth in Konya-Turkey as a background for study the causal mechanism behind this relationship. In this study, KHSR providing fast access to and from major metropolises such as Ankara and Istanbul has been chosen as case study since Konya has experienced significant economic developments, together with the high speed train connection started ten years ago.

This document is organized as follows. The second section provides a brief review of the different schools that have studied the relationship between transportation and economic behaviour. At the end of this section, from the New Economic Geography (NEG), the theoretical support for accessibility as a key tool in understanding the relationship between transport and economy is developed. The following section presents our case study and describes the methodology developed for estimating the study variables. The fourth section presents the results of the changes in accessibility and their relationship with the variables that describe the socio-economic behaviour of the regions. Finally, the conclusions of the research are presented and some recommendations are put on the table to take into account in future research.

2. BACKGROUND OF CONTEXTUAL FRAMEWORK

2.1. General Background

The relationship between Transport-Development has been a matter of considerable theoretical interest and practical importance, and one of those that has occupied the most attention for several years among different approach researchers in economics. Hoyle (1973) pointed out that the quality and model of transport is a critical factor that affects economic and cultural progress, and

therefore must be taken into account in development plans at local, regional and country levels. Similarly, based on the need for transport in all economic activity and its importance as a variable that defines the market cost of any product, Hoyle asserts that the importance of the effect of transport on development is not questionable. Economic and cultural progress depends on the quality and model of transport. Besides, other authors point out that in spite of positive effects, given the limited capital resources condition, transport investment excess may generate adversely affects on economic behavior (Canning & Pedroni, 2004; Ansar, Flyvbjerg, Budzier, & Lunn, 2016). Then, it is necessary to question whether invest in the improvement and expansion of the transport network, in instead of other fields, is the most effective way to achieve development goals.

Geography and economics have been the sciences with the greatest interest in this field. For geographers, the importance of transport comes from its characteristic as a guiding factor of the location and distribution of economic and social activities. For economists, the effect of transport on the broad economic becomes relevant under the implementation of endogenous economic models. These models define public capital – where transport infrastructure is one of the largest investment items – as one of the main factors in production, along with capital and the labor (Hoyle, 1973). According to Romer (1986), Barro (1990) and Rebelo´s (1991) economic models, an increase in public capital generates a permanent increase in growth rates. Recognizing the importance of spatial variables and economic models, both sciences have moved away from the unquestionable axiom which state that transportation investment automatically generates development, and accepted that transport is only one of the variables that defines development behavior and it does not necessarily cause positive effects in all cases (Kocherlakota & Yi, 1992; Yu, De Jong, Storm, & Ml, 2012; Crescenzi, Di Cataldo, & Rodríguez-Pose, 2016).

From a macroeconomic perspective, several studies have been carried out in this field. However, the wide range of results and the discrepancy in temporal and geographical aggregation levels make it impossible to reach a consensus on the nature of this relationship. (Aschauer, 1994). In the same way, macroeconomic model´s analytical apparatus remains as a black box (Lakshmanan, 2011; Aschauer, 1994).

In the attempt to make out the factors that determine the location of economic activities in space, the NEG looks at the mechanisms inside this black box. According to the NEG, the spatial location of firms and consumers is oriented by accessibility to spatially dispersed markets (Fujita & Thisse, 2002). The economic actors act in search of greater efficiencies caused by economies of scale, economies of spatial agglomeration, expansion and restructuring of the market,

and benefits of innovation. All these are part of a series of mechanisms that can be stimulated through investment in the improvement of the transport network (Lakshmanan, 2011; Yu, De Jong, Storm, & MI, 2012). Under this approach, the NEG defines proximity as one of the key factors in the location and development of economic activity. From a geographical point of view, proximity, since it has the ability to define the local market area of a region, has the ability to generate effects of change on the broad economy through demand. Krugman (1991a) shows how regional agglomeration patterns depend on the interaction of three variables: increasing growths due to economies of scale, transport costs and demand. Krugman (1991a; 1998) points out how the modification in the cost of transport, under certain initial conditions, can generate specific processes of regional economic divergence or convergence.

From a NEG´s approach, the concept of proximity is not limited to its geographical meaning. Proximity gains greater relevance when considering, within the processes that guide the creation and location of economic activities, its cognitive, organizational, social and institutional dimension. From this approach, accessibility, as an indicator of proximity, becomes a very useful tool to estimate the effects of transport infrastructure investment on economic behavior (Andersson & Karlsson, 2004). This measure represent the spatial distribution of economic agents and their activities in a simple way that imposes a very clear structure upon the relationship between these agents and their activities and their environment (Karlsson & Gråsjö, 2013). Weibull (1980, 54) maintains that accessibility measures can be seen as measures of (i) nearness, (ii) proximity, (iii) ease of spatial interaction, (iv) potential of opportunities of interaction, and (v) potentiality of contacts with activities or suppliers. From the point of supply (production), accessibility plays a fundamental role in internal production processes: flow of knowledge, adoption of technologies, breaking up of lock-in barriers, formation of social capital, labor mobility, etc. (Vickerman R. , 1996). Karlsson & Gråsjö (2013) pointed out that accessibility measures can be used in empirical explanations of various spatial phenomena, such as patent output, new firm formation, the emergence of new export products, and economic growth in different spatial units. In the study of the causal mechanisms that link transport and economic development, it is observed that accessibility plays a fundamental role in the generation and incentive of conditions that foster growth.

2.2. High Speed Rail Characteristics

It is necessary to bear in mind that the effects generated by transport on economic behavior are not independent of the characteristics of its infrastructure. Factors such as mode of transport, scale of infrastructure, scope, capacity, type of service,

cost (time/monetary) and characteristics of the operation define the type and magnitude of the effects on economic behavior. From this point of view, high speed rail (HSR) has particular characteristics that have the ability to guide the way in which the economic behavior of a region will be influenced after the implementation of a transport network.

It is possible to classify between two types of transport infrastructure according to the scale of their impact area. Puga and Venables (1997), Puga (2002), and Ottaviano (2008) have distinguished between the economic effect of long-distance interregional transport infrastructure, which affects overall "accessibility" and provokes further economic concentration, and short-distance or intraregional infrastructure, that generally facilitates the diffusion of public services and the formation of human capital within peripheral regions. Studies outside the NEG framework focusing on core-periphery differences in factor endowments have reached similar conclusions (Vickerman, 1995; Cappelen et al., 2003; Rodriguez-Pose and Fratesi, 2004). A HSR network generally constitutes a transport service on an interregional scale, even beyond the borders of the countries. Thus, the HSR network has the potential to intensify agglomeration economies. Its operating characteristics - high speed and easy logistics - make its ability to encourage agglomeration even more efficient.

In terms of service, HSR networks normally carry only passengers, and not goods. For this reason, it is expected that they will not have a greater effect on the location of the manufacturing industry, Puga (2002). From a production point of view, HSR only transport labor. Therefore, its effect is supposed yo be stronger in activities that require specialized work, for example, business services, financial services, R&D activities, among others (Graham, 2007). Vives (2001) exposes how the reduction of transport costs, due to the implementation of the Madrid-Barcelona TAV line, together with lower communication costs, reinforcing the location of administrative units in the capital, give rise to a change in the production structure and development of cities. Puga (2002) points to the existence of informal evidence that the construction of the Paris-Lyon HSR line led to the relocation of the administrative headquarters from Lyon to Paris.

The impact of new HSR is found to be similarly mixed. For the Shinkansen, there is evidence that regions with a station experienced faster population growth, per capita income growth and employment growth, particularly in sectors classified as 'information exchange industries'. Effects were particularly strong for cities with both an expressway and a Shinkansen station (Nakamura and Ueda 1989). New research also suggests that it has increased business links, with firm-to-firm trade enhanced by proximity to Shinkansen stations (Bernard et al. 2014). In EU the HSR impact across the countries has been varied. "Development has been

inconsistent across station locations, as impacts have been variable and highly localized. The extent of development has depended on the overall economic strength of the local economy and the presence of service sector firms requiring access to Paris" Bannister and Berechman (2001). For Germany, there is evidence of increased economic activity at intermediate stations along the Cologne – Frankfurt high speed line (Ahlfeldt et al, 2010).

2.3. Study Case.

Interpreting transport as one of the main key factors for regional economic development, Turkey has made a great investment in modernizing, developing and making more effective the national transport network that will serve as the basis for regions development and integration. To this aim, in the last two decades, Turkey has decided to promote the national railway network. The key point of this project focuses on high-speed train lines that, due to their technological characteristics, have the capacity to reduce distance in terms of time between regions, mitigating geographical barriers and promoting social, political and economic interaction withing and between regions.

Konya region is one of the most important economic centers benefiting from the implementation of the first lines forming the HSR network. Following the introduction of the Konya-Ankara HSR line in 2011, in 2014 by integration to Ankara-Istanbul HSR line, Konya-Eskişehir-Istanbul HSR line goes into operation and brought Konya to a relevant position in terms of the railway network. Table 1 summarizes the change in journey time. These investments will bring about significant changes in the social and economic dynamics of the Konya region.

Table 1 Journey time before and after HSR

Jorney	Jorney time (hour:min)	
	before[1]	After[2]
Konya - Ankara	4:30	1:45
Konya - Eskişehir	5:00	1:40
Konya - İstanbul	11:00	4:30

In this context, this study aims to identify the impact of the Konya-Ankara and Konya-Eskişehir-İstanbul HSR lines in significant changes on economic dynamics of the Konya region. The methodology used to estimate the impact of the HSR network consists of two stages.

1 Average duration of bus travel

2 HSR travel time, www.wbilet.tcddtasimacilik.gov.tr

3. METHODOLOGY

The objective of this study is to analyze whether the implementation of the HSR line linking Konya Region with the main cities of the country has an appreciable effect on the economic behavior of the region. In this context, the study is based on the assumption that increase in accessibility resulting from HSR network promotes regional integration that serves as a platform for economic growth.

The reduction in travel time can also be understood as an increase in proximity. For our particular case, as we have mentioned previously, the change in accessibility conditions only impacts on the mobility of the labor. Therefore, the change in proximity, at first glance, would not have considerable effects on the demand and supply of consumer goods. Therefore, the effects are more likely to manifest themselves on the demand and supply of services. However, under the NEG, increased proximity, in its various dimensions, has the ability to facilitate interaction between economic actors. Thus, promotes both increased productivity and the development of new economic activities to through the different economic sectors (Venables, Laird, & Overman, 2014). In the same way, to the extent that proximity promotes the interaction of economic actors, it becomes a key factor that determines how R & D-generated knowledge contributes to economic growth, (Karlsson, Gråsjö, & Andersson, 2006).

In this framework, the relationship between investment in transport infrastructure and the economic performance of Konya region is analyzed with linear regression[3] method. Linear regression model is as follows (Greene & H., 2003, p. 8).

$$Y_i = B_0 + B_1X_1 + B_2X_2 + B_nX_n + \mu \qquad (1)$$

For this purpose, *X* represents the independent variables, accessibility potential; while *Y* represents the dependent variables, socio-economic variables.

3.1. Variable independinte: Accesibility Measure

The first part consists of estimating the change in accessibility of the study region as a result of the start-up of the HSR network. There are a variety of approaches to measuring accessibility, for an overview see Geurs and Van Eck (2001). However, the potential model is the most widely used to express the effects of transport

[3] Linear regression analyses analyze relations between dependent and independent variable. In regression analysis, causality is certainly in question. Main aims of the regression analysis is to estimate the given values of independent variables and the given values of dependent variable, To examine whether independent variables have an important impact on dependent variables or not, and to anticipate average values of dependent variable and given values of independent variable or to estimate the value it will have in the future.

investments (Gutiérrez, Condeço-Melhorado, López, & Monzón, 2011; Stępniak & Rosik, 2013). The generalized formulation of potential accessibility is guided by a gravitational approach. That is, as the distance between two points decreases, the greater the value of accessibility potential between them. In this context, there are different functions to incorporate the negative effect of distance in the calculation of the accessibility potential. These functions are called Decay Funtion. For our case study, with a national and regional scale of analysis, the use of a negative exponential function is recommended (Song, 1996; Handy & Niemeier, 1997; Haynes, Lovett, & Sünnenberg, 2003):

$$PA_i = \sum_j P_j \exp\left(-\beta t_{ij}\right) \qquad (2)$$

where PA_i is the accessibility of unit *i*, *Pj* represents the attractiveness of the destination *j* (i.e. population) and t_{ij} is a travel time between *i* and *j*, β is an adjustment coefficient for user perception that reflects their travel preferences according to: travel purpose, available means of transport, travel distance and local socio-economic conditions, see Geurs & Van Eck (2001). For our case study, β will be constant and equal to 0,039[4].

The impact on accessibility is analyzed on two geographical scales: local, interaction within Konya; regional, interaction with other regions. As destination purpose, the population variable at Local Administrative Units (LAU-1) geographical scale has been defined. As a result, two estimates of the accessibility potential are obtained for each administrative unit; see Fig. 2 and Fig. 3. The potential accessibility values for the region will correspond to the population weighted average. Additionally, according to the characteristics of transport infrastructure under study, it is expected that the effects will differ between the center and the periphery. Table 3 summarizes the statistical behavior of the independent variables.

The transport network of the accessibility model for estimating travel times is made up of the national road network and HSR network. This transport network includes modal exchange in the nodes of HSR network. Fig. 1 summarizes the accessibility model used.

[4] Based on impedance funtion for potencial job accesibility by public transport in accordance with Dutch National Travel Survey (Geurs & Van Eck, 2001). Due to the lack of a comprehensive national travel survey in Turkey, there are difficulties defining a β value to the local conditions of our case study.

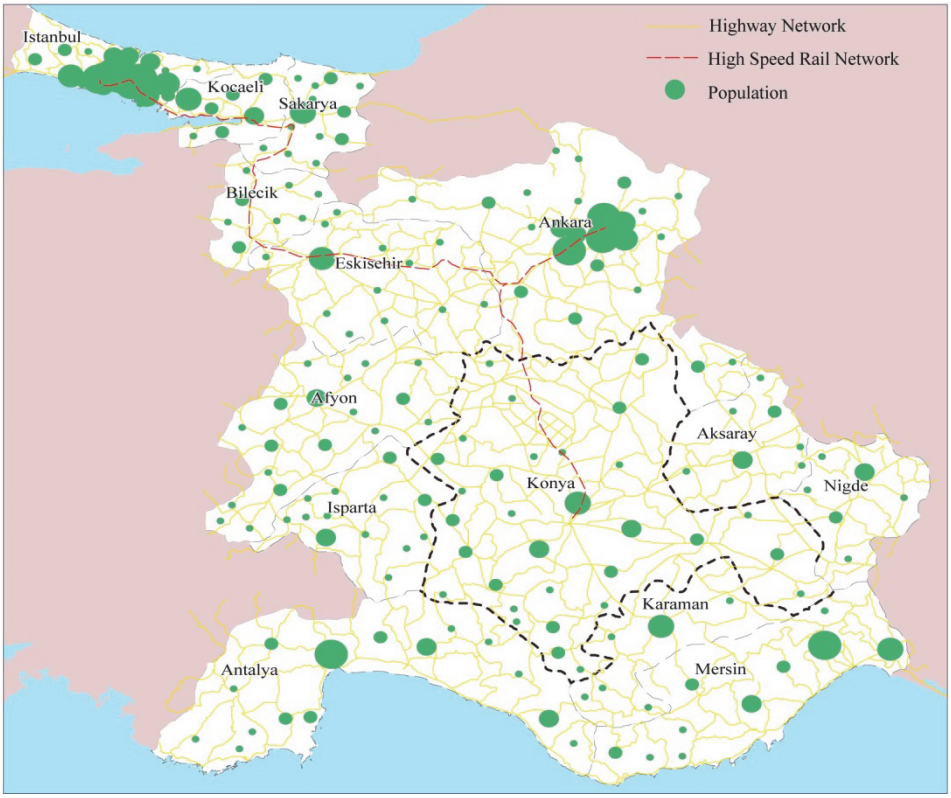

Fig. 1 Accesibility model.

3.2. Dependent Variable: Konya's economic behavior.

Using statistical information from Turkish Statistical Organization (TurkStat) and Turkish Patent and Trade Mark for Konya region during the study period, the relationship between economic behavior and change in accessibility is analyzed. In light of these data, 5 variables related to the economic behavior of the industrial, services, tourism and GDPC sectors were obtained. These variables and their statistical behavior are presented in Table 2.

Table 2 Dependent Variables

Codes	Variable	Data Periode	n	Min.	Max.	Mean	Std. Deviation
GDPC	Gross Domestic Product per Capita (Thousand TL)	2007-2012	12	8.976	30.054	17.071	7.102,9
NEI	New Entrerprises on Industry	2009-2017	9	87.508	99594	91.405	4.437,3
NT	Number of Tourist	2007-2018	12	11.790	63.598	40.974	14.802,4
PT	Patents Registration	2007-2019	13	1.644	4104	2.972	1.003,3
NESS	New Enterprises on Servis Sector	2009-2017	9	1.441	1.909	1.656	175,4

4. FINDINGS OF THE STUDY

4.1. Potencial Accessibility Change.

It was previously mentioned that HSR networks, due to their own operation characteristics, tend to concentrate the benefits spatially. For our case study, given that the Konya region has only one access station to the HSR network, which coincides with the largest population center, the changes in the potential for regional accessibility are strongly concentrated on this area, see Fig. 2.

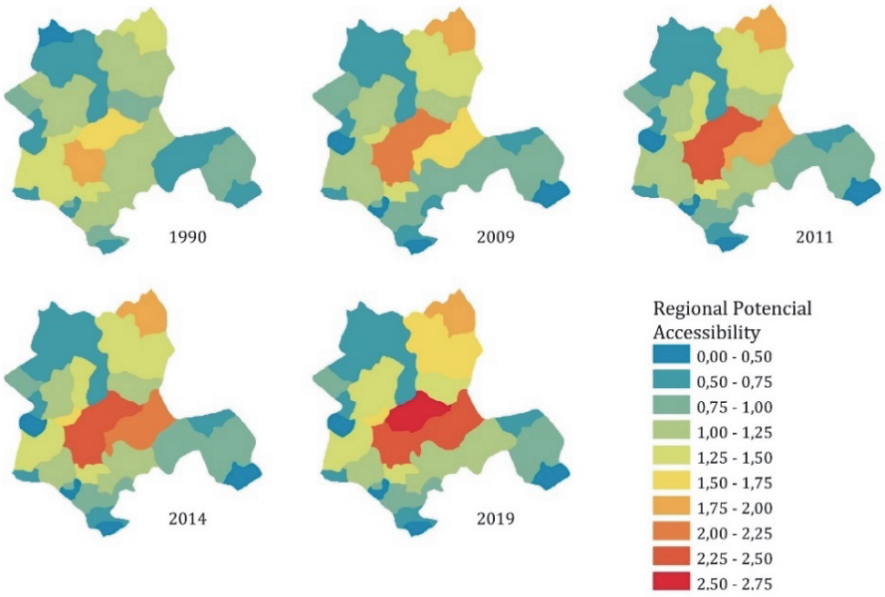

Fig. 2 Changes in Konya Regional Potential Accessibility.

Taking into account that HSR network constitutes an interregional mobility option and does not present routes that can supply the demand for trips within Konya region, it is possible to expect that the accessibility potential of the different LAUs will not present appreciable changes. However, as observed in the Fig. 3, the potential for local accessibility presents a divergent trend. While the larger-central cities increase their potential for local accessibility, the smaller-peripheral cities maintain their value almost constant. It should be noted that prior to the start-up of the first HSR line in Konya (year 2011), the differences in local accessibility potential remain relatively stable.

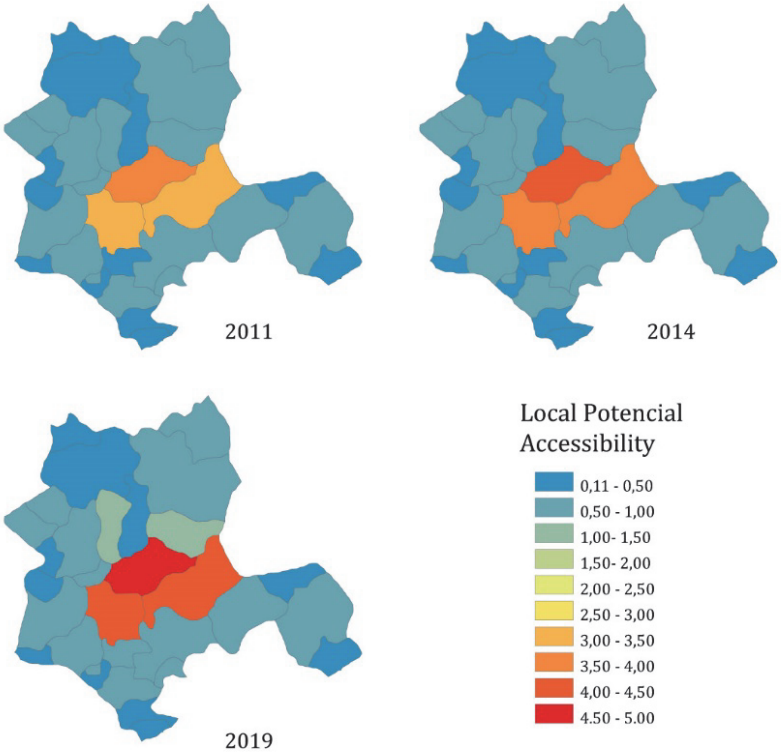

Fig. 3 Changes in Konya Regional Potential Accessibility

The results, both at the regional and local level, confirm a divergent trend between the accessibility values of central cities and those of the periphery. Although, prior to the TAV the differences in accessibility between the center and the periphery were already appreciable, the implementation of the TAV presents a multiplier effect of this difference.

Table 3 Region Potential Accessibility

Relative Potential Accessibility		Min.	Max.	Mean	Sta. Deviation
Regional	Konya	1,51	1,93	1,74	0,15
	Konya Core	1,97	2,47	2,26	0,19
	Konya Periphery	1,01	1,12	1,06	0,04
Local	Konya	2,18	3,02	2,57	0,30
	Konya Core	3,57	4,54	4,01	0,36
	Konya Periphery	0,70	0,75	0,72	0,02

4.2. Correlation Between Accessibility and Economic Behavior.

In order to analyze the impact of changes in accessibility, we have carried out a statistical study between the accessibility potential of the region – Independent

variables – and the economic variables under study – dependent variables. First, the relationship between independent variables is analyzed by means of a Pearson Correlation Test. The results can be seen Table 4.

A high degree of correlation is observed between the Konya and Konya Core variables in both geographic scales. Thus, statistically, it is possible to affirm that these two variables are strongly dependent on each other. Therefore, it is valid to affirm that one of the two variables can represent the other one. Regarding the correlation between the accessibility potential between the core and periphery, at both regional and local scales, the low value found confirms the independence between both variables.

Table 4 Correlation Matrix

Potencial Accesibility			Regional			Local		
			Konya	Konya Core	Konya Periphery	Konya	Konya Core	Konya Periphery
Regional	Konya	Pearson Cor.	1,00	,976**	0,29	,622*	0,55	-0,10
		Sig. (bilateral)		0,00	0,34	0,02	0,05	0,74
	Konye Core	Pearson Cor.	,976**	1,00	0,25	0,50	0,50	-0,12
		Sig. (bilateral)	0,00		0,41	0,08	0,08	0,69
	Konya Periphery	Pearson Cor.	0,29	0,25	1,00	0,02	0,16	,820**
		Sig. (bilateral)	0,34	0,41		0,94	0,61	0,00
Local	Konya	Pearson Cor.	,622*	0,50	0,02	1,00	,891**	-0,01
		Sig. (bilateral)	0,02	0,08	0,94		0,00	0,97
	Konye Core	Pearson Cor.	0,55	0,50	0,16	,891**	1,00	0,23
		Sig. (bilateral)	0,05	0,08	0,61	0,00		0,45
	Konya Periphery	Pearson Cor.	-0,10	-0,12	,820**	-0,01	0,23	1,00
		Sig. (bilateral)	0,74	0,69	0,00	0,97	0,45	

** significant at the 0.01 level, * significant at the 0.05 level.

Based on the statistical analysis of the independent variables, four equations have been proposed to relate the accessibility potential with the economic variables under study. These four equations have the purpose of allowing comparison between: (i) the relevance of accessibility at the local scale vs accessibility at a regional scale (eq. 3 and eq. 4), (ii) the relevance of the accessibility of the core vs the accessibility of the periphery (eq. 5 and eq. 6).

$$\Delta Y_i = X_{CL} + X_{PL} \qquad (3)$$

$$\Delta Y_i = X_{CR} + X_{PR} \qquad (4)$$

$$\Delta Y_i = X_{PR} + X_{PL} \qquad (5)$$

$$\Delta Y_i = X_{CR} + X_{CL} \qquad (6)$$

where *Y* represents the economic variables and *X* the variables of potential accessibility. Being C = Core, P = Periphery, L = Local, R = Regional; suffixes that define the nature of the variable.

For each equation, linear regression analysis was performed with each of the dependent variables. In order to take into account the variability in time, linear regressions have been carried out with the delta data for each measure.

Table 5 Linear regression results for relationship between local potential accessibility and economic variables

Independent Variable		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R
		B	Std. Error	Beta			
GDPC	Cte	7,25	3,04		2,38	0,04	0,57
	Periphery Local	-0,83	1,64	-0,14	-0,51	0,62	
	Core Local	2,90	1,41	0,58	2,06	0,07	
NEI	Cte	1,16	1,40		0,82	0,44	0,27
	Periphery Local	0,30	0,45	0,26	0,67	0,53	
	Core Local	0,04	0,56	0,03	0,07	0,95	
NT	Cte	-0,34	10,06		-0,03	0,97	0,46
	Periphery Local	-3,14	5,44	-0,18	-0,58	0,58	
	Core Local	7,10	4,66	0,46	1,52	0,16	
PR	Cte	-1,86	9,35		-0,20	0,85	0,47
	Periphery Local	-6,39	4,95	-0,37	-1,29	0,23	
	Core Local	5,88	4,34	0,39	1,35	0,21	
NESS	Cte	1,97	2,88		0,68	0,52	0,28
	Periphery Local	-0,53	0,93	-0,23	-0,57	0,59	
	Core Local	0,54	1,15	0,19	0,47	0,65	

When comparing the results of the regression between the local accessibility potential (Table 5) and the regional accessibility potential (Table 6), according to the adjustment coefficient R, it is easily possible to notice that the accessibility at a regional scale describes with greater precision the economic performance of the region, especially in the tourism and service sector.

Although the effect of regional accessibility is greater, the results do not rule out the relevance of local accessibility as a conditioning factor of the economic behavior of the region.

Table 6 Linear regression results for relationship between regional potencial accessibility and economic variables

Independent Variable		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R
		B	Std. Error	Beta			
GDPC	Cte	9,76	2,44		4,00	0,00	0,49
	Periphery Regional	0,30	1,70	0,05	0,17	0,87	
	Core Regional	1,24	0,78	0,48	1,59	0,15	
NEI	Cte	2,07	0,70		2,97	0,02	0,51
	Periphery Regional	-0,07	0,41	-0,06	-0,18	0,87	
	Core Regional	-0,26	0,19	-0,49	-1,34	0,23	
NT	Cte	0,15	5,67		0,03	0,98	0,75
	Periphery Regional	0,58	3,95	0,03	0,15	0,89	
	Core Regional	5,94	1,82	0,74	3,26	0,01	
PR	Cte	11,52	6,91		1,67	0,13	0,48
	Periphery Regional	-8,52	4,91	-0,50	-1,73	0,11	
	Core Regional	0,87	2,25	0,11	0,39	0,71	
NESS	Cte	5,08	1,16		4,40	0,00	0,72
	Periphery Regional	-1,17	0,68	-0,50	-1,71	0,14	
	Core Regional	-0,46	0,32	-0,42	-1,42	0,20	

Table 7 Linear regression results for relationship between periphery potential accessibility and economic variables

Independent Variable		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R
		B	Std. Error	Beta			
GDPC	Cte	10,81	2,47		4,37	0,00	0,34
	Periphery Regional	3,40	3,17	0,60	1,07	0,31	
	Periphery Local	-2,99	3,27	-0,51	-0,91	0,38	
NEI	Cte	1,91	0,48		4,00	0,01	0,74
	Periphery Regional	-1,39	0,55	-1,22	-2,53	0,04	
	Periphery Local	1,46	0,55	1,27	2,64	0,04	
NT	Cte	5,06	6,90		0,73	0,48	0,52
	Periphery Regional	15,87	8,83	0,91	1,80	0,11	
	Periphery Local	-14,86	9,11	-0,83	-1,63	0,14	
PR	Cte	5,06	6,90		0,73	0,48	0,50
	Periphery Regional	15,87	8,83	0,91	1,80	0,11	
	Periphery Local	-14,86	9,11	-0,83	-1,63	0,14	
NESS	Cte	4,69	0,93		5,03	0,00	0,77
	Periphery Regional	-3,07	1,07	-1,31	-2,87	0,03	
	Periphery Local	2,06	1,08	0,87	1,91	0,10	

Table 8 Linear regression results for relationship between core potencial accessibility and economic variables

Independent Variable		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R
		B	Std. Error	Beta			
GDPC	Cte	7,18	2,95		2,44	0,04	0,60
	Core Regional	0,74	0,81	0,28	0,91	0,39	
	Core Local	2,01	1,56	0,40	1,29	0,23	
NEI	Cte	1,08	1,18		0,91	0,40	0,59
	Core Regional	-0,35	0,20	-0,65	-1,77	0,13	
	Core Local	0,48	0,52	0,34	0,92	0,39	
NT	Cte	-0,57	7,45		-0,08	0,94	0,75
	Core Regional	5,80	2,05	0,72	2,83	0,02	
	Core Local	0,78	3,93	0,05	0,20	0,85	
PR	Cte	-2,68	9,88		-0,27	0,79	0,36
	Core Regional	-1,75	2,69	-0,22	-0,65	0,53	
	Core Local	6,27	5,18	0,41	1,21	0,25	
NESS	Cte	1,53	2,18		0,70	0,51	0,69
	Core Regional	-0,82	0,36	-0,74	-2,24	0,07	
	Core Local	1,42	0,96	0,49	1,47	0,19	

Comparison between the results of the linear regression of accessibility in the periphery (Table 7) and accessibility in the core (Table 8) do not indicate the prevalence of either of the two in economic behavior. However, in relation to the dependent variable GDPC, core accessibility presents a considerably higher adjustment value R. While accessibility in the core has a strong effect on the number of tourists, periphery accessibility describes in a better way the development of new enteprises in the industrial sector.

CONCLUSION

In the first place, it is observed that the implementation of the HSR network, in general, has generated a positive effect on the accessibility potential of the region at both regional and local scale. Similarly, the change in accessibility has a positive effect both in the core and in the periphery. However, in relative terms, it is found that HSR network functions as a potentiating factor of the difference in accessibility core and periphery.

We have found that the variables that best describe economic behavior are the accessibility potential at a regional geographic scale and core potential accessibility. These results indicate a growth for the region supported mainly in the core zone and put into question whether said growth occurs at the expense of the peripheral zone. It is possible that these dynamics reinforce an environment of economic interaction with a tendency to agglomeration in the center at the expense of the periphery. The analysis of the socio-economic variables at the LAU-1 scale is pending for a future investigation with the purpose of advancing

in the understanding of the effects of the HSR network on the center-periphery economic interaction.

During the development of our case study, according to what was expressed by Puga (2002), the relationship between the potential for accessibility in the development of new ventures in the industrial sector is weak. On the contrary, confirming what was expressed by Graham (2007), we have found that the effects of TAV have a greater relationship with organization of activities in the service sector with a strong concentration of specialized labor: information and communication, finance and insurance, administrative and support.

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