Assessing the determinants of Firms' Competitiveness in Greece: A Structural Equation Modeling Analysis

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Abstract

The paper investigates the importance of territorial characteristics/assets (i.e. agglomeration economies, urban infrastructure, factors of labor and cost, development policies, qualitative factors, inter alia) on small- and medium-sized firms' competitiveness. The analysis uses primary data from 204 small- and medium-sized firms located in Thessaloniki (Greece). These firms operate in the sectors of industry, commerce and services. Through the use of Structural Equation Modeling (SEM) analysis, the importance of particular factors for the competitiveness of firms has been analyzed, coming out in valuable conclusions not only for the firms and the city of Thessaloniki considered but also for firms and areas with similar characteristics in Greece and the wider area of Balkans.

Key-Words: firms' competitiveness, territorial characteristics/assets, Structural Equation Modeling (SEM) analysis, Greece

JEL: O18, R5, R11

1. INTRODUCTION

There are two basic theories of strategic management, the Resource-Based View and the Industrial Organization Theory, which focus on the investigation of firms' competitiveness. The first one refers to the internal environment of firms and their abilities and resources to be competitive (Barney, 1991, 2001; Wernerfelt, 1984). The second one focuses on the external dynamics of firms' environment that affect their competitiveness (Porter, 2000) and their ability to design strategically and to be effective (McLarney, 2001; Mukherji and Hurtado, 2001). Among the forces of the external environment, (the combination of) territorial characteristics/assets (such as agglomeration economies, urban infrastructure, factors of labor and cost, development policies, qualitative factors etc.) is of extreme importance (i.e. Deas and Giordano, 2001; Maskell and Malmberg, 1999; Kresl and Singh, 1999; Keune, 2001; Christiaans, 2002; Fujita and Thisse, 2003). Several studies, most of them by using statistical, econometric and correlation analysis, measure firms' competitiveness at the international level. For instance, Bargegil and Modrego (2009) using sample of 2,357 firms in Spain, measure Impact of R&D organizations on medium-sized firms, Bayyurt and Duzu (2008) present a comparison of the relative efficiencies of manufacturing firms in China and Turkey, Kumar and Chadee (2002) evaluate the competitiveness of Asian manufacturing firms, while Parida (2008) using a sample of 1,471 ICT, conceptualize the dynamic capabilities, studied the influence of ICT in related small Swedish firms. Finally, Henderson and Cockburn (1994), through econometric and structural interviews, measure firms' productivity and the nature of competencies in pharmaceutical firms

By taking into consideration that the supply of a favorable business environment is crucial for both the attraction of new investments and the development of the existing ones, the paper, using Structural Equation Modeling (SEM) Analysis, focuses on the evaluation of the impact of territorial characteristics/assets on 204 small- and medium-sized firms (SMEs),

located in Thessaloniki (Greece), operating in the sectors of industry, commerce and services. The impact of the factors identified from the application of the SEM on the overall firms' competitiveness is assessed econometrically. The contribution of the paper is of twofold importance: a) the findings come from a primary research: the way the dataset is constructed allows us to capture the local firms' perceptions and opinions about the factors that affect the competitiveness dynamics of the area under investigation and, b) the relationship between local business environment and competitiveness in Greece and particularly in Thessaloniki has drawn a limited amount of research in the past, thus the present analysis contributes to the literature regarding the competitiveness determinants in the area of interest.

The next section of the paper presents literature review and in particular the variables (factors) under consideration as well as the corresponding sources. The third section describes the research profile and the methodology. The fourth sector presents the results of the SEM for firms under consideration. The fifth section presents the results of the econometric analysis as regards the determinants of firms' competitiveness. The last section of the paper offers the conclusions.

2. LITERATURE REVIEW: VARIABLES AND DATA SOURCES

The majority of previous studies in the field (Herrin and Pernia, 1987; Head *et al*., 1999; Shagqin *et al.,* 2009; Trofimenko, 2010, *inter alia*) use econometric analysis in order to identify the factors that affect the location decision of (foreign) firms. In addition, most of these studies use secondary data derived from official databases of international and European organisations, banks or national statistical services. The current study follows a methodological approach based on factor and reliability analysis but also econometric analysis, and by using primary data.

The selection of the variables (factors), which constitute criteria for firms' location in specific areas, was mainly based on the report of CEC (1993), and, also, on the empirical studies of Herrin and Pernia (1987) and Trofimenko (2010).

According to CEC report (CEC, 1993), in particular, industrial firms pay more attention, comparing to the commercial/services ones, to the existence of agglomeration economies, to the geographical location, to the existence of supporting services, and to the low taxes in an area. In addition, factors associated to labour and to the existence of effective urban infrastructure (i.e. airports, ports, telecommunications) are considered important to their competitiveness. However, large commercial enterprises pay more attention to qualitative factors, to the workforce, and to economic factors that concern the size of the markets and their accessibility to customers and suppliers.

Herrin and Pernia (1987), on a basis of 34 criteria, which form 6 groups, and using primary data, on a 1 to 5 Likert scale, from 100 local and foreign firms in Philippines, found that closeness to major customers, easy road access, reliable electrical power, adequate telephone/telex services, availability of a suitable plot of land, availability of a suitable building, and adequate space for expansion are, more a less, equally important location factors for local and foreign firms.

Trofimenko (2010), using data from the World Bank's Study of Competitiveness, Technology and Firm Linkages, for 1,409 exporters and foreign-owned firms in China, examined 4 groups of location criteria. The empirical results indicated that exporters and foreign-owned firms are attracted by the size of the local market, the quality of telecommunications, and the supply of skilled labour, while the quality of the transportation was not significant.

The aforementioned studies besides traditional economic factors, such as the size of local market, the production structure, and the labor cost, give great importance on other, non-

conventional, factors, such as the quality of cultural and social infrastructure, the existence of investment support agencies as well as partnerships among local public authorities and private sector (Metaxas, 2011). This list of non-conventional factors can be enriched with input from other studies, such as D' Archy and Keogh (1999), Rogerson (1999), and Craglia *et al*., (1999), which use the variables of land use and values, quality of life, and international connections, respectively. These studies examine how firms that belong to different sectors, and located in particular areas, evaluate and exploit local and regional assets and policies in order to support their development and competitiveness.

On the basis of the discussion held previously, the literature identifies several groups of local/regional factors that affect firms' competitiveness. Agglomeration Economies, including proximity to customers/suppliers – market size – supporting services – availability of natural resources - similar business existence (Crozet *et al*., 2004; Nachum and Keeble, 2003; Rocha and Stenberg, 2005; Graham, 2007; Doeringer *et al.,* 2004; Combes *et al*., 2008). In this case clusters enhance firm access to specialized labour, materials, and equipment and enable lower operating costs. Highly concentrated markets attract skilled local workforce by offering job mobility and specialized suppliers and service providers by providing substantial business opportunities in close proximity (Austrian, 2000; Keune, 2001; Alonso-Villar, 2002; Trofimenko, 2010), while, the creation and application of innovative and entrepreneurial knowledge locally, is held to especially critical for securing regional economic advantage (i.e. Keeble and Wilkinson, 2000; Simmie, 2002; Karlsson et al 2008).

Furthermore, the management of labor relationships is related directly with the existence of employees' satisfaction that derives from this work. There are a number of studies stressing the fact that the provision or the absence of motives influences the behavior of employees and, consequently, the firms' efficiency (Herzberg *et al*., 1959; Locke, 1976; Parsons and Broadbridge, 2006). In addition, urban infrastructure, including road/highway, train, seaport

and air connections, plays a crucial role on firms' competitiveness as well as on cities' development since it is strongly related with the direct distribution of goods, the easy access to markets, the decrease of transport cost and, finally, the price of the goods (Vickerman, 1996; Wheeler and Mody, 1992; Glaeser, 1999; EC 2003). A number of studies support the importance of transport cost and land use cost on firms' decision making process for establishment (Harrington and Warf, 1995; Zhu 2000). Finally, quality factors, including, urban aesthetic, attractiveness of physical environment and quality of education, research and training, contribute to business creativity, especially for SMEs, to the increase of their productivity and the development of innovative actions (Keune, 2001; Twomey, 2002).

In the present analysis, a set of indicators grouped in three categories were chosen, in specific the three categories constitute *"Agglomeration Economies"*, *"Quality of Life / Labour"*, *"Urban Infrastructure"* . The indicators grouped under these three categories were chosen based on their performance and significance in the estimated model, a total of nine independent variables were finally included in the analysis.

Before turning to the methodological discussion, the next section presents the business profile of the Thessaloniki area and the reasons for choosing this area to conduct our research.

3. WHY THESSALONIKI?

Thessaloniki, is the second-largest city in Greece and the capital of the periphery of Central Macedonia as well as the de facto administrative capital of the Greek regions of Macedonia and Thrace (Figure 1).

…….[insert Figure 1 about here]…….

According to the 2011 census the municipality of Thessaloniki today has a population of 322,240, while the Thessaloniki Urban Area (the contiguous built up area forming the "City of Thessaloniki") has a population of 790,824; making it the fifth largest and most populated

city in the Balkans and the second most populated city that is not a capital. Furthermore, the Thessaloniki Metropolitan Area extends over an area of 1,455.62 km^2 (562.02 sq mi) and its population in 2011 reached a total of 1,006,730 inhabitants (National Statistical Service of Greece, 2011). With a history of over 2,300 years, it is one of Europe's oldest cities. Thessaloniki is Greece's second major economic, industrial, commercial and political centre, and a major transportation hub for the rest of southeastern Europe; its commercial port is also of great importance for Greece and the southeastern European hinterland. The city itself has faced a rather severe "de-industrialization" over the period of the last two decades mainly due to changes in the international industrial environment, the restructuring of the Greek economy, the new priorities of the European Union and the unstable environment in the Balkan States (RIMED Report No.9, 2005; Konsolas *et al*. 2002; Coccosis and Psycharis, 2008). The Port of Thessaloniki, is one of the largest ports in the Aegean and as a free port, it functions as a major gateway to the Balkan hinterland. In the first six months of 2010, more that 7.2 million tons of products went through the city's port, making it one of the largest and most used ports in the Balkans. Recently Thessaloniki is also slowly turning into a major port for cruising in the eastern Mediterranean (Thessaloniki Port Authority, 2010). The city is also a major transportation hub for the whole of south-eastern Europe, carrying among other things, trade to and from the neighboring countries. The economy of Thessaloniki is being transformed into a service economy with a rapidly grown logistic sector, whereas its economic hinterland shows industrial concentration. Its exports (20% of total national exports) are oriented to EU member countries such as Germany and the United Kingdom, while in the last 15 years exports towards Eastern Europe and Balkans have been growing rapidly. In 2009, the regional unit of Thessaloniki had a Gross Domestic Product of €21.321 billion (ranked 2nd amongst the country's regional units), comparable to Bahrain or Cyprus, and a per capita of €18,400 (ranked 15th). In Purchasing Power Parity, the same indicators are

€22.998 billion (2nd) and €19,800 (15th) respectively. In terms of comparison with the European Union average, Thessaloniki's GDP per capita indicator stands at 78% the EU average and 84% in PPP. Overall, Thessaloniki accounts for 9.2% of the total economy of Greece. In 2009 the economy contracted by –1.6% (Eurostat, 2010).

4. METHODOLOGY

Dataset

The dataset utilized in the study is drawn from a questionnaire survey to managers and business owners of firms, as they are considered to be the most appropriate to answer questions regarding specific firm characteristics related to their territorial environment, development policies, future prospects and competitiveness issues. The survey was conducted during the period in April 2007- June 2008, and the target of the survey is firms located in the region of Thessaloniki in Greece. The method of programming was preferred, instead of random interviewing, in order to sustain the chance of clarifying ambiguous questions, and to avoid "quick" and "non-skeptical'" answers; A Likert scale from 1 to 10 (Stathakopoulos, 2005) was used. The dataset contains detailed information regarding the characteristics that are addressed by the literature as the most important in assessing firms' competitiveness. The response rate ranged to approximately 90% (out of 227 questionnaires, 204 with complete information). The vast majority of the firms responded was local (87,1%), something that means that the appreciation of firms is extremely important, since they are aware of the territorial environment (weaknesses and strengths) as well as of the development policies applied by the local authorities, for the benefit of the cities and the firms. The firms that are included in the sample were required to employ at least 20 employees. Interviews were made with high level managers and also business-owners and each interview lasted 25-30 minutes. Interviews were certified with the signature of the responder who filled in the questionnaire and the business stamp. Finally, the selection of the firms was based on data that the

Commercial and Industrial Chamber of Thessaloniki. Regarding the profile of the *studied firms*, 32,3% of them belongs to the industrial/ manufacture sector, 25,9% to the commercial sector, 22,0% to the services and 19,6% to the tourism sector. Furthermore, concerning the number of employees the average is 62 employees. Consequently we report on small-medium firms in total.

Variables

A large number of information regarding the most important determinants of firms' competetiveness are included in the questionnaire. Based on the existing research, various questions are asked about those indicators that are found consistently to affect firms' competitiveness, namely *Agglomeration Economies*, *Quality of Life and Labour* characteristics and *Urban Infrastructure*. The detailed definitions and variable names, along with the descriptive statictics of the variables utilised in the study are presented in Table 1.

Based on the mean values of Table 1, we observe that the mean values of the respondents' answers are relatively low in most cases, just a little above of the cut-off value of six. The lowest mean value is observed for the question regarding the existence of *"Natural Resources Availability"*, indicating that in Greece there is not an efficient availability of natural resources. The highest respective mean value is observed for the *"Size of Local Market"*.

…….[insert Table 1 about here]…….

The Model

Structural Equation Modeling (SEM) it can be viewed as a combination of factor analysis and regression or path analysis (Hox and Bechger, 1998). The basic idea is that, after the indirect and direct pathways that operate on the relationships of interest are defined, the latent variables, though they cannot observed by the researcher, can be estimated by their relation to observed variables (multiple indicators) (Maruyama, 1997).

Regarding firms' competitiveness and management studies, SEM has been used in a variety of scientific works. For instance, Ling *et al*. (2012) investigates in Porter's 'diamond' environment the components of competitiveness, and develops and validates mathematical models to predict the competitiveness levels of architectural, engineering and construction firms headquartered in mainland China. Momeni *et al.* (2011) through questionnaire survey and using factor and SEM analysis investigate the relationship between knowledge management process capabilities and core competencies in Iranian companies. Furthermore, Tong *et al.* (2010) used SEM analysis in order to evaluate the core competence of insurance companies, Wu (2008) through empirical research in 108 Hong Kong-based China family owned manufacturing firms and using regression and SEM analysis, examined the mediating role of information sharing in the relationships between dimensions of social capital and firm competitiveness. Finally, Graig *et al.* (2007) applied SEM in order to investigate how the promotion of family-based brand identity influences competitive orientation (customer versus product) and firm performance in family businesses. Generally, SEM models are applied in order to simultaneously examine more complex relationships between observed and latent variables and to incorporate the latent variable of *"Firm Competitiveness"* in the analysis.

A SEM model of the following form is utilized in order to examine the relationships of interest, namely the relationships of firms' competitiveness with factors that are established in the empirical literature as important indicators of the former. In detail, the measurement and the structural equation models described below are estimated:

$$y_i = \lambda_{ij} \cdot \eta_i + \varepsilon_i \qquad (1)$$

$$\eta_i = \beta_{ij} \cdot \eta_j + \zeta_i, \quad i = 1,2,3 \;\; j = 1 \qquad (2)$$

Where y_i are the observed variables that are indicated by the latent variables as they are presented in Table 1. The latent variables *"Agglomeration Economies"*, *"Quality of Life /*

Labour", *"Urban Infrastructure"* are symbolized with η_i. The η_j variable is the latent factor of *"Firm Competitiveness"*. λ_{ij} are the factor loadings indicating the effect of the latent variables on the observed indicators and ε_i are the measurement errors that are assumed to be uncorrelated between measurement equations and with η_i, i.e. $E(\varepsilon_i)=0,\ Cov(\varepsilon_i,\eta_i)=0$. ζ_i are the measurement errors in the measurement and the structural equations respectively and β_{ij} are the factor loadings indicating the effect of the latent variables *"Agglomeration Economies"*, *"Quality of Life / Labour"*, *"Urban Infrastructure"* upon *"Firm Competitiveness"*. The scale of the latent factor *"Firm Competitiveness"* is fixed by assuming that it has a unit variance (Jöreskog and Sörbom, 2001). It is also hypothesized that $E(\zeta_i)=0,\ Cov(\zeta_i,\eta_j)=0,\ Cov(\varepsilon_i,\zeta_i)=0$. The hypothesized SEM model estimated as described above is presented in Figure 2.

…….[insert Figure 2 about here]…….

The method of estimation is Weighted Least Squares (WLS), analysing the matrix of polychoric correlations. When the observed variables are ordinal with highly non-normal distribution, WLS method should be preferred in order to produce correct estimates, standard errors and goodness of fit statistics (Jöreskog and Sörbom, 2001). The estimated parameters presented in the study are standardized since they are considered more appropriate for a clearer interpretation and comparison of the estimated effects (Diamantopoulos and Siguaw, 2000; Moustaki and Knott, 2000). Furthermore, correlated error terms are introduced in the models as sawn in Figure 2. While correlated error terms are generally viewed with suspicion by researchers, however they can be justified in cases such as ours, where the observed indicators come from similar wording questions, reflecting very close meanings (Diamantopoulos and Siguaw,2000) and have been introduced in the past in a similar manner (van de Ven and van der Gaag, 1982).

5. RESULTS

The results of the SEM model are presented in Table 2. All estimated factor loadings are positive and statistically significant. Regarding the latent factor *"Agglomeration Economies"* we can see that it is positively related to all outcomes. In specific, *Agglomeration* is higher among firms who operate in a market of larger size, enjoy higher availability of natural resources and there exist other similar firms in the market as well. Actually, the estimated correlation for the outcome variable "similar business existence" seems to be the highest among the observed estimated correlations.

"Quality of Life" is also strongly related to its outcomes. In particular, firms enjoy with *"Quality of Life"* with increasing levels of labour availability, quality of local training and cultural factors that can affect the firms' performance and productivity. The strongest correlation is found for the outcome variable of *"Quality of Local Training / Continuing Education"*.

Finally, *"Urban Infrastructure"* is, as expected, also strongly and positively related to its outcome indicators. Firms enjoy higher levels of urban infrastructure with increasing sufficiency of road/highway, train and seaway connections. For this factor of infrastructure, the greater loading is observed for the outcome variable of train connections.

When the relationship of the latent factors is examined, it is evident that Firms' Competitiveness is strongly and positively related to all three *"Agglomeration Economies"*, *"Quality of Life / Labour"*, *"Urban Infrastructure"*, indicating that these factors are important indicators for competitiveness of firms. A very high loading is observed for the factor *"Urban Infrastructure"* in comparison to the remainder, revealing the very strong correlation this factor has with competitiveness of firms. Based on the fit indices presented in the last rows of Table 2, it seems that the model adequately fits the data.

…….[insert Table 2 about here]…….

6. CONCLUSIONS

The present study examines the external environment factors that affect firms' competitiveness, in a regional area of Thessaloniki in Greece. A number of factors are used namely *"Agglomeration Economies"*, *"Quality of Life / Labour"*, *"Urban Infrastructure"*, that are considered to mainly affect competitiveness (Deas and Giordano, 2001).

All estimated relationships are found to be statistically significance and in accordance to the findings of previous research. In detail, *"Agglomeration Economies"* are significantly associated with local market size, availability of natural resources and similar business existence in line with previous empirical findings (Crozet *et al*., 2004; Duranton and Puga, 2004; Nachum and Keeble, 2003; Rocha and Stenberg, 2005; Graham, 2007; Doeringer *et al.,* 2004; Combes *et al*., 2008). Similarly, *"Quality of Life / Labour"* is higher with higher values of labour availability, greater cultural and recreational environment and higher quality of local training. As the literature argues, these findings are expected since they are accompanied with higher productivity and innovation in the production process (Keune, 2001; Twomey, 2002). Finally, *"Urban Infrastructure"* is increased with higher availability of road/highway, train and seaport connections. Based on existing research, these factors are identified as major determinants of firms' competitiveness since they facilitate firms' ability to reach new markets for its products and at the same time, decreases transportation costs and consequently prices, leading to higher competitiveness advantages (Vickerman, 1996; Wheeler and Mody, 1992).

As expected, all the above mentioned three factors are significant indicators of firms' competitiveness with *"Urban Infrastructure"* exerting the higher effect among all. Once again, *"Agglomeration Economies"*, *"Quality of Life / Labour"*, *"Urban Infrastructure"*, are shown to be highly associated with firm competitiveness since regional market characteristics,

greater availability and quality of labour force and availability of adequate connections will facilitate production process, productivity and opening to other markets.

All in all, this study presents evidence on the factors that are major determinants of firms' competitiveness at the regional level. Still, more research is needed with the use of large scale surveys that will facilitate us to examine in more detail the main determinants of firm competitiveness.

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Table 1: Variable Definitions and Descriptive Statistics

Variables	***Variable Measurement***	***Mean***	***Standard Deviation***
Agglomeration Economies			
Size of Local Market	1-10, 10: Highest degree	7.225	1.713
Natural Resources Accessibility	1-10, 10: Highest degree	5.794	2.011
Similar Business Existence	1-10, 10: Highest degree	5.995	2.013
Quality of Life - Labour			
Labour Availability	1-10, 10: Highest degree	6.230	2.136
Culture / Recreation	1-10, 10: Highest degree	6.686	1.705
Quality of Local Training / Continuing Education	1-10, 10: Highest degree	6.515	1.757
Urban Infrastructure			
Sufficient Road / Highway Connections	1-10, 10: Highest degree	6.809	1.713
Sufficient Train Connections	1-10, 10: Highest degree	6.466	1.732
Sufficient Seaway Connections	1-10, 10: Highest degree	6.456	2.504
Observations	204		

Source: Authors' calculations

Table 2: SEM Results on the Effects of Firms' "Competitiveness" on Firms Characteristics

(Completely Standardised Estimates), WLS

Ind. Variables	***Agglomeration Economies***	***Quality of Life – Labour***	***Urban Infrastructure***
Size of Local Market	0.701		
Natural Resources Accessibility	0.688 ***		
Similar Business Existence	0.719 ***		
Labour Availability		0.405	
Culture / Recreation		0.821 ***	
Quality of Local Training / Continuing Education		0.859 ***	
Sufficient Road / Highway Connections			0.593
Sufficient Train Connections			0.608 ***
Sufficient Seaway Connections			0.198 ***
Dep. Variable	***Agglomeration Economies***	***Quality of Life – Labour***	***Urban Infrastructure***
Firm Competitiveness	0.550 ***	0.725 ***	1.043 ***
Chi square (prob.)		21.032 (0.335)	
DoF		19	
RMSEA		0.023	
CFI		0.997	
NNFI		0.994	
GFI		0.992	
Observations		204	

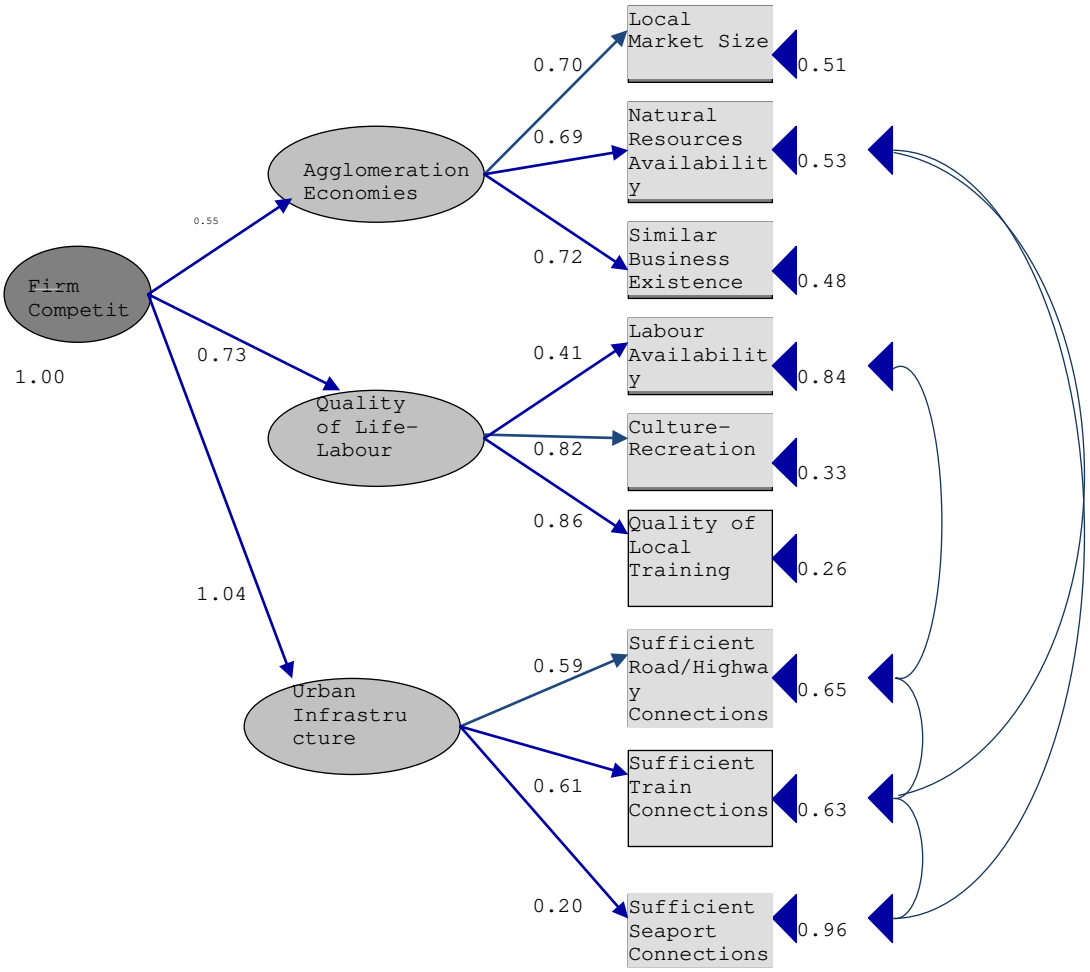
[a] The asterisks next to the coefficients indicate *** significance at 1%, ** significance at 5%, * significance at 10%.

[b] Error terms are allowed to correlate as shown in Figure 1. All error term correlations are statistically significant.

Figure 1: The TEN-T (Trans European Transportation Network) in Greece (only roads shown).

Source: *http://ec.europa.eu/ten/transport/*

Figure 2. SEM Model for Firms' "Competitiveness"



Chi-Square=21.03, df=19, P-value=0.33505, RMSEA=0.023