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A Hedonic Model of House Prices in the Greek Islands

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Abstract

This paper examines the impact of local public amenities on house prices in the islands of Greece. By taking the Greek islands as the case study, which has not been studied in detail on this topic, we analyse how the presence of a public hospital, an airport, a higher educational institution along with other amenities affect the housing market (primary and second houses). The housing market attributes of the Greek islands are analysed e.g. the housing needs and consumption behaviour, determinants of the demand and supply, the significance of hospital care for the residents, and the need for fast transportation. With the use of hedonic modelling approach and a large dataset of residential properties in the islands of Greece, we try to ascertain the effects of these amenities on the house prices. The model also controls for several structural and locational characteristics of the properties as well as economic and demographic attributes of the islands. The econometric estimation attempts to address common sources of bias with such modelling framework i.e. unobserved heterogeneity, omitted variable bias, non-linear effects. Models are also tested for robustness across several specifications and samples.

Key words: public amenities, hedonic regression, islands

JEL Classifications: R21, O18, R53, R31

Introduction

This study examines how the presence of a public hospital, an airport and a higher educational institution (university) affects the housing prices in the islands of Greece. The research is mainly focused on 36 islands of Greece including those in the Ionian Sea, North East Aegean Sea, Cyclades, Dodecanese, Sporades and Islands of Argo Saronic Gulf with permanent population >1,000 residents, having at least 15-20 properties (minimum sample acceptable) and excluding Crete and Evvoia. Crete is the biggest island of Greece, almost 700,000 divided into four prefectures and "independent" in terms of amenities from the capital. Crete is quite distant from Athens and it has 3 prefectural general hospitals, universities and airports (the 2nd biggest of the country). Finally, Evvoia is the second biggest island of Greece, almost 200,000 permanent residents, it is very close and road connected to the capital of Greece, Athens, and therefore, not "independent" island in terms of amenities. For all the above, Crete and Evvoia constitute two completely different cases from the 36 islands which are under the scope of this research and they will have to be separately examined.

Regarding the literature review, initially the housing market attributes which characterise all housing markets and determine the house prices, the supply, the demand, the consumption and the overall behaviour of any specific market are under the scope. These attributes are depicted in every residential market but the extent and the contribution of each one to the behaviour of the market differs.

Similarly, in the residential market of the Greek islands, a set of attributes is distinguished. The major characteristic of the market is that it is rather heterogeneous. Moreover, it is described by high transaction costs as well as political economy issues which greatly increase the purchase value and make the transactions unattractive (high taxation and taxation complexity). Furthermore, immovability is an attribute of every housing market where the demand for amenities is important. But, in difficult to approach areas, this attribute becomes even more important. To continue with, it is significantly characterised by neighbourhood externalities which determine the desirability of the housing market as the positive effects of the pleasant environment, the beautiful landscapes, etc. which upscale the neighbourhoods and increase the housing demand (for permanent and second homes). In addition, since the islands of Greece compose an increasingly attractive tourism destination, the raising housing demand creates issues associated with planning, public services; and local public finance which are the country's Achilles heel especially after the recent recession.

The 36 Greek islands in the scope of this research are: from the Ionian Islands (Corfu, Kefallonia, Zante, Lefkada[1] and Ithaca) – Figure 1.3 of the Appendix, from the islands of North East Aegean Sea (Lesvos, Limnos, Chios, Samos, Ikaria) – Figure 1.4 of the Appendix, from Sporades Islands (Skyros, Skopelos, Alonyssos and Skiathos) – Figure 1.5 of the Appendix, from Cyclades Islands (Syros, Andros, Tinos, Mykonos, Paros, Thira/Santorini, Amorgos, Milos, Kea and Kythnos) – Figure 1.6 of the Appendix, from Argo-Saronic Islands (Salamina, Hydra, Spetses) – Figure 1.7 of the Appendix and from Dodecanese Islands (Rhodes, Kos, Kalymnos, Leros, Patmos, Karpathos, Astypalaia, and Symi) – Figure 1.8 of the Appendix. The islands are selected according to their latest population of census 2011 – Source: Hellenic Statistical Authority – El. Stat.). Figure 1.1 of the Appendix presents the map of Greece and Figure 1.2 the map of the Greek Islands respectively.

[1] *Lefkada has road connection with the mainland.*

The following section of the literature review is divided into two main parts. In the first one, we discuss concepts of the general housing market such as the housing market attributes, the amenities and their significance for a residential market – analysing three major amenities: transportation (ports/airports), hospital care provision (prefectural general hospitals) and higher education (universities). In the second section, the Greek Islands are considered as a case study area of the discussed terms in the literature. We mainly focus on the amenities that are provided to several islands to identify their influence on the housing market and the prices in the islands. The hospital care, the role of transportation in destination development, the higher educational institutions in the islands - which increase the demand for student accommodation will be under the scope of this research to identify any difference in the housing consumption in the distant and, in some cases, isolated regions as they constitute the islands.

The hedonic regression analysis is used to structure a model which explains the housing prices. A big data set including housing prices with several characteristics is provided by the Bank of Greece. The assessed housing prices - as the dependent variable - are explained in this model by several secondary data which include structural characteristics of the properties (such as the age, the living space, the land area, the property utilisation ratio, the floor number, the property type, etc.), locational characteristics (time distance to port/airport) but also as island locational characteristics with the use of dummy variables (the presence of hospital/airport/university on the island), several economic characteristics of the islands (such as the employment rate, the tourism penetration, etc.) as well as demographic characteristics of the population of the islands provided by the latest census of 2011 (i.e., age, origin-destination, etc.).

Combining the literature review available along with the hedonic model constructed by the several characteristics of the properties and the islands of our data set and the several secondary data, we will try to explain the several locational characteristics and more specifically the amenities which may affect the housing prices in the islands.

Literature Review

The Housing Market attributes

Every housing market, worldwide, is determined by a set of attributes that play a key role to the formation of the housing prices, the demand and the supply, the investments and the housing consumption, the housing stock as well as the overall behaviour of the market. This set of characteristics includes: a) the heterogeneity of a housing market (i.e. the differentiation of the locations, the neighbourhoods, the owners, the buyers, the employment, the services, etc., and therefore, the market constitutes a bundle of different aspects and it is not homogenous). b) The durability of a market (i.e. the age, the longevity and the depreciation of the properties are some of the elements that are under consideration when examining this market characteristic and its effect on the house prices curve over time). c) The imperfect information about a market (i.e. the lack of homogeneity, the variation in house quality or the default risk lead to hidden defects that need to be speculated for careful decision-making). d) The immovability of a market which increases the housing demand and therefore creates the need for public services, amenities, etc. and raises issues of formation, planning, housing supply, etc. e) The high transaction costs that increase the buyers' expenses and lead to lagged market adjustments and to the intermediaries' presence. f) The external

effects of a housing market (i.e. the presence or the lack of several amenities that determine the house prices and affect the desirability of the properties). g) The political economy which constitutes the bundle of regulations, policies and taxes that the government and the local authorities issues for each housing market (Kain, and Quigley, 1975; Xu, 2008).

Abelson (1979) described that the utility of the housing properties, and therefore, what residents are prepared to pay for a house, depends on the several property and market characteristics such as the size of the land and the property, its construction quality, its accessibility and proximity to work and the infrastructure, and several other environmental factors including the locational characteristics such as the quality of the neighbourhood.

Additionally, Garrod and Willis (1992), in trying to capture the housing market attributes of the countryside of the UK with the use of Hedonic Price Method, they divided the housing market characteristics in the five following categories: a) the physical attributes which include the structural characteristics of the residences such as the number of rooms/ bathrooms, the age, the structural condition, etc., b) the accessibility attributes of the housing such as the access to the employment, stores, etc., c) the public sector attributes including the amenities like the accessibility to schools, medical centres, etc., d) the neighbourhood attributes such as the view, the road traffic, water frontage, etc., and e) several alternative use attributes for that specific market under consideration.

Stadelmann (2010) mentioned that according to the theory of housing market, the housing prices in communities with more attractive characteristics such as the proximity to the amenities of the city centres, access to public transportation and other services, school quality, etc. are expected to be higher than in communities without these attributes.

The literature on the capitalisation of the attributes of the housing markets is quite broad and it is basically the estimation used to measure the willingness-to-pay for specific public goods or amenities. The overall concept of capitalisation could be summarised that every attribute/characteristic of the market can be capitalised (Oates, 1969, 1973; Pollakowski, 1973; Abelson and Markandya, 1985; Reback, 2005; Clapp et al., 2008; Stadelmann, 2010).

As Kain and Quigley (1970) described, there is a big number of published studies which have tried to estimate the individual contribution of each one of the above attributes to the purchase or the rent prices of the market, but failed; because they did not manage to represent adequately the complexity of these attributes. Therefore, it was suggested to correct these defects by using data of individual property units, so that, the physical and environmental quality and contribution of each attribute is adequately measured.

The Amenities

One of the most important housing market attributes that can be identified in all the above and several other researches is the characteristic of the external effects of the market which includes the public services or the amenities that determine the house prices and influence the willingness-to-pay of the households that are located close to these amenities.

Wu et al. (2013) conducted a research in order to approach the determinants that encourage the residential location choice in a housing market by taking Beijing as a case study house market. In their research, they used a big number of locational-specific characteristics as well as several socioeconomic characteristics to explain the locational housing choice of the residences in Beijing. Among the attributes that influence

the housing selection, and therefore, the housing demand and consumption are several amenities of the market such as the hospital care (number of 3-star hospitals per km^2 in each zone), the transportation services (number of bus/subway stops), as well as the provision of adequate educational institutions of the market (including the number of grade-A elementary and middle schools per km^2 in each zone as well as the highest education level - undergraduate/ graduate and postgraduate studies).

Similarly, Wenjie et al. (2010) in trying to quantitatively measure the value added from the access to jobs and to several amenities and public services (subway stations, schools, medical services of Grade A and B hospitals, commercial centres and sport facilities) to the residential market of Beijing, they concluded that they play a substantial role to the housing prices and the residential consumption and their spatial distribution reveals a highly centralised spatial structure.

Further to the above, there is a wide literature trying to capture the influence of several amenities and public services (transportation, health care, education, etc.) as well as their quality to the locational-specific choice, the house prices and the formatted housing consumption of several residential markets.

Hospital and Social Care

Regarding the hospital care and the amenities related to the health public services, it is undisputed that the most important amenity in every community is the provision of an adequate health system which covers the needs of the residents in hospital - medical care. And more importantly if this system is a public health and social care system, then its existence is even more necessary. Davies and Robb (1998) describe that we would all prefer to live healthy for a lifetime but unfortunately the provision of support, guidance, and more importantly medical and hospital care and treatment is absolutely necessary.

By taking into consideration the health care provision in small and isolated places, the population needs may be insufficiently covered for emergency cases and for high priority services, and moreover, the isolation creates high-costs for the constrained and low funded communities and territories of the islands, as well as additional high-costs to the transportation of the patients to off-island facilities (Royle, 1995).

Webster (2001) divided the health care system into three categories: a) the Primary health care which is necessary to the local community (i.e. the presence of local medical centres), b) the Secondary health care which relates to the activities of district hospitals which provide acute care services for the local population and can cover greater needs from the medical centres but cannot provide advanced specialist treatment or emergency incidents, and c) the Tertiary health care which is centred on regional hospitals and is concerned to the highest level of treatment, teaching and research.

As in most countries and communities nowadays, the modern health care system is continuously changing and it is rather complex. This complexity is mainly created due to the constantly changing process of increasing expectations, new medical and technological improvements, different patterns of diseases, but also due to the continuously changing political, economic and social policies.

Therefore, the provision of a sufficient health care system depends mainly on the amount of money spent by a country each year on formal health care per person (the national health expenditure per person). As Webster (2001) mentioned, even if trends in health care system have become extremely entrenched, the several alterations in society, economy may reverse the tide.

Furthermore, health expenditure of a country varies over time due to inflation which in fact in health sector is greater than the whole economy, the demographic changes creating additional demands, the rising intensive use of health services, etc. Moreover, Health Expenditures are often distributed very unequally within countries – e.g. between different areas or between urban and rural regions (Webster, 2001, p. 297-299, 304, 308).

The role of transportation in development of regions

It is undisputed that the transport technological breakthroughs have added to the humanities' ability to reach and travel to any place around the world and even to the most district corners of the planet within just a few hours. This ability has been provided mainly via the aviation developments which gave the opportunity for massive transportation during the 20th century and facilitated both the tourism industry but also the nation's development transportation networks (Prideaux 1993, Thurot, 1980). This provision has enabled us as travellers to go further, faster, for a cheaper price but comfortably and safely to any destination around the world.

Prideaux (2000) described that one of the most important factors for the growth of a specific region is the ability of tourists and residents to reach it. If this cannot be possible, then it is very likely, alternative regions to be selected for temporary or permanent destinations and he delineated transport as a factor not only for increasing tourism of the destination area but also as a means of overall development for the destination region. More specifically, although previous acknowledgement of the importance of transport systems has been performed by several authors and researches in the past, none of them highlights their significant role to the development of these areas, and therefore, to increased interest for the specific destination not only for tourism but also for permanent settlement – housing demand. Moreover, in most tourism researches, the role of transportation is defined just as the accessibility to the destination regions without any acknowledgment to its contribution to growth.

Carvalho et al. (2010) in a research examining the rural school transportation, they differentiated the difficulties in the transportation sector in rural areas compared to the metropolitan regions. Regarding Brazil as a case study explained how the lack of proper policies in rural areas of Brazil, has prohibited the rural population from taking advantage of the basic infrastructure and amenities and from having access to their rights as citizens.

The limited transportation alternatives in rural areas reduce the accessibility to several critical public services and amenities, preventing the residents to make use of them, as they are usually located in the urban distant centres; and therefore, by developing the transportation means would expand their accessibility to comfort the social inclusion of those in rural areas (Nutley, 2003).

To continue with, it is evident that one of the most important issues of transportation is the economic significance – the travel expenses – which not only constitute a major factor for the transportation means selection but also for the course of the tourism demand (Martin and Witt, 1988). More specifically, they mentioned that the travel expenses to substitute destinations could also drive to destination selection. Further studies have also been performed to examine the relationship between log-haul or short-haul travels and travel costs showing that there is a significant sensitivity between long-haul travels and transportation cost (Crouch, 1994). Other researches have also focused on

the significant value of travel time as well as the opportunity cost between several transportation means (Morrison and Winston, 1985, cited by Prideaux, 2000).

The Role of Higher Education

With the term "Higher Education" in this paper are regarded the public universities and the Technological Educational Institutions of a country that accept thousands of students each year to study a variety of scientific or practical fields. These students create a substantial housing demand to the attendance area for their accommodation which has to be identified along with the other amenities.

There is a big number of very good and interesting researches studying the provision of adequate education in a school level (primary or high school level) to the residents of a housing market as well as the quality of this provision that influences the housing location choices, and therefore, the housing consumption patterns (Clapp et al., 2008; Reback, 2005; Bayer et al., 2007; Cheshire and Sheppard, 2004; Black, S.E., 1999; Gibbons et al., 2013).

However, there is no sufficient literature studying the impact of the presence of higher educational institutions to the housing market of an area and even more in a rural area. Wu et al. (2013), in trying to specify the residential location choices of a residential market, using Beijing as an example, they use the higher education variable by categorising it into levels of education between 1 to 4 (from lower to higher education) as well as the per capita median education level in each zone; and calculating the descriptive statistics of these variables for the housing market under specification.

The Greek Islands as a Case Study

The formation of the communities

To begin with and in order to consolidate the understanding of the housing market and its development in the Greek Islands, it is important to introduce the readers that are not familiar with the country's geographical, historical, socio-cultural background, a broad frame of how the formation of the communities took place.

Originally, the term 'community' was used to refer to the common people, or to a state or an organized society. In later studies, the term referred to 'the quality of having something in common and to a sense of common identity and characteristics' but also to a particular quality of relationship diversifying it from the terms of 'civil society', 'state' or even from the 'localities' (Williams, 1976). Eileen and Stephen Yeo (1988) in their survey on the use of communities presented three different aspects and characteristics of the term; from the usage of 'holding something in common' to the 'feeling of common identity' and more importantly to 'quality of mutual caring in human relations'. Many books and papers have given several definitions of the community but also of its usages, characteristics and diversities. For the purposes of this paper, the community is approached, as Bulmer (1987) initially defined it, as a group of people who live in a common geographical area - such as the residents of each island.

Not only the diversity and uniqueness of the Greek islands, but also their characteristics and the different historical backgrounds create and attribute to the several shapes of the residential grid and different types of housing. Indisputably, each and every island introduces communities and housing peculiarities that could be examined separately (Dimitropoulos, 2001). However, taking into consideration the number of the Greek islands, their geographical location, their historical formation, their size and population along with several other

characteristics, it is inevitable not to examine the islands in groups.

More specifically, as Dimitropoulos (2001) explains in his analysis on how the communities formatted in the islands of Aegean Sea, regarding the biggest islands of the Aegean Sea which are closer to the Ottoman coasts like Lesvos, Chios, Rhodes, they all structured their biggest communities on the coastal side of the closest mainland (the Ottoman coasts) - mainly for trade and other especially economical purposes of the islands - initially structured only within the surrounded great strongholds but later significantly expanded through the island. In contrast, the smaller islands of the Aegean Sea during the Ottoman period formed their main residential area with a quite different way, within the strongholds, and despite the local particularities or the geographical position (coastal community or on the hills) they shared some common characteristics (i.e. dense and compact building, small construction residences of maximum two-storey buildings, very narrow streets, etc.). In general, the overall sense of the formation of the communities in the small islands of the Aegean Sea is this of space economy which seems to dominate the residences in the islands in total (Papaioannou et al., 2001). In this type of community structure, the amenities and the several services that are necessary for the life are gathered in small and district areas where the main body constitution and management of the local community is the municipality (Dimitropoulos, 2001).

In the Ionian Sea, the communities of the islands were almost formatted having been greatly influenced by a completely different historical background as they were dominated by the Venetian and the English rule not by the Ottomans who conquered the rest of Greece (including the islands of Aegean Sea). Therefore, the architecture and the community formation of the Ionian Islands it is completely different and massively affected by the Roman, Venetian and the English architectural style.

Finally, the Greek islands are rather different in terms of geological distinctiveness, weather conditions, vegetation, water supply, etc. For example, the Ionian Islands are greatly greener than the Aegean Sea's islands due to often and heavy rain falls, in these islands the vegetation is rather developed. On the other hand, Cyclades Islands are rather steep, dry making them dependent on the water supply transferred to the islands; as well as extremely windy, making the transportation from the mainland rather difficult to impossible sometimes.

The Housing Market Characteristics of the Greek Islands

As in every housing market, the residential market of the Greek islands is also characterised by a set of attributes. Firstly, the market itself is greatly distinguished by heterogeneity as it includes different group of islands which constitute different submarkets and every island is completely different from the other.

It is rather insecure even to make assumptions for groups of islands, since the market is rather heterogeneous, and in many cases each island constitutes a completely different housing market. Therefore, the islands of Greece may share some common characteristics with the mainland of Greece, the urban areas or the rest rural areas and the countryside – i.e. structuring rules, taxation, country policies, general development strategies, etc. but the several islands are differently affected by the economy, the tourism penetration, the local communities and their traditions, the gentrification effect, etc. which all structure their own housing markets. These different and separate housing submarkets of the groups of islands

may incorporate various economic, social, religious, local, political, traditional and cultural characteristics that make their research rather hard and the assumptions quite uncertain.

Moreover, it is described by high transaction costs as well as political economy issues which greatly increase the purchase value and make the transactions unattractive (the taxation is one of the major issues of the Greek market - high taxation and taxation complexity). Furthermore, the several housing costs include the land value and its location, the property construction and further condition, but also from the local facilities and amenities that could offer the property additional value. These costs vary from community to community and from island to island and may depend on several externalities such as the distance of the island from the mainland (additional transportation costs), the size of the island, etc.

Additionally, it is significantly characterised by neighbourhood externalities which determine the desirability of the housing market as the positive effects of the pleasant environment, the beautiful landscapes, etc. which upscale the neighbourhoods and increase the housing demand (for permanent and second homes).

Finally, since the islands of Greece compose an increasingly attractive tourism destination, the raising housing demand creates issues associated with planning, public services; and local public finance which are the country's Achilles heel especially after the recent recession.

The Amenities in the Islands of Greece

Hospital and Social Care

As in every other community, similarly, the provision of an adequate health system which covers the needs of the residents in hospital - medical care, it is an amenity of great importance for the Greek Islands. Regarding the health care provision in small and isolated islands, the residents' needs may not be sufficiently covered for emergency evacuations and for high priority services, as well as the isolation of the island and the distance from the mainland creates high-costs for the constrained and low funded municipalities and territories of the islands, as well as additional high-costs to the transportation of the patients to several off-island facilities (helicopters, ambulances travelling by ships, etc.).

A basic problem that is related to the isolation and the proximity of the island to the main capital centres and the mainland is that the islands' health care services are often insufficient to deal with complex and expensive procedures or surgeries, so medical evacuation is inevitable. To these cases, the speed and the frequency of these incidents varies in accordance with the level of isolation. Not to mention here, the cases of difficult or even prohibited weather conditions that whatever happens like accident, fire incident, disease recrudescence, etc. has to be dealt with by the local medical staff.

Likewise Webster's (2001) health care division, as far as the health care system to the Greek islands is concerned, depending mainly on the permanent population of the island (the residents), as well as the tourism penetration and the size of the island the medical care differs. More specifically, according to the Gazette of the Greek Government issue fourth, No of gazette 285, date: 5th March 2005, regarding the decision no. 10788 on the approval of the urban planning standards and on paragraph C. Health and Social Care mentions that: In order to develop a full system of health services, in every healthcare district (territory) have been developed several healthcare units that are trying to cover equally and independently the population needs. In respect to the best ensuring of the

Public Health in national level, the main health and medical units are: a) Regional Hospitals – Operate in the capital of every healthcare territory, covering its entire medical and hospital needs, provide teaching for all medical specialties and contribute to the advancement of the medical research. b) Prefectural Hospitals - Located in the capital of the prefecture with capable infrastructure in labours and hospital beds. It is the main health and hospital care unit that covers the needs of the population for treatment (from the population depends the size, the number of hospital beds, other characteristics). c) Medical Centres – Decentralised Services of Primary Health and Social Care of the Prefectural Hospitals referring administratively and organically to them. They are divided into urban and non-urban medical centres. They mainly provide non-hospital services of treatment with very short-term stay of a few hours in exceptional cases. Location criteria: The urban medical centre serves population between 15,000 and 40,000 of residents, while the non-urban medical centre serves population between 5,000 and 30,000 of residents. Access time: 30mins (desirable) up to 1 hour (tolerable). They are basically located in communities over 1,000 of residents with main criteria the easy access. Moreover, a major factor for the location of a medical centre is the time of patient transport from the medical centre to the prefectural hospital. d) Regional dispensary – Decentralised Services on non-urban medical centres that provide non-hospital medical care. They serve population of 0-5,000 residents. The main location criterion is the easy access. e) Psychiatric care – which needs are covered from the respective hospitals, specialists and/or in smaller psychiatric medical units.

Regarding the Greek islands, most of the smallest ones in terms of permanent residents, are provided with a regional dispensary. The islands with more than 1,000 residents' permanent population have at least a medical centre, while the bigger islands are provided with prefectural hospital for covering the local hospital needs for treatment. Finally, regional hospital, covering the entire medical and hospital needs of the territories and by contributing to the advancement of the medical research, is located only in Crete Island among the islands (the Regional Hospital of Iraklion – Crete). Table 1 of Appendix presents the islands that are provided with at least a prefectural hospital.

By taking into consideration the continuously changing socio – political environment as well as the unforeseen economic situation of nowadays in Greece after the recent financial recession; it can be easily extracted that the health care system has been greatly affected creating many times unpleasant situations and a number of health issues, either clinical or with regard to health care delivery to the patients, the residents, the local authorities as well as to the insufficient – but willing to assist - health staff.

In trying to amplify the previous comment regarding the effects of the recent economic crisis on the provision of an adequate health care system; it is important to take into consideration the national health expenditure per person. It is undisputed that the provision of a sufficient health care system depends mainly on the amount of money spent by a country each year on formal health care per person. According to the World Health Report data from OECD, 2000, CREDOC/OECD, comparing the Health expenditure per person and GDP per person for 16 OECD countries and 8 developing countries, Greece held a moderate to low health expenditure per person position which nowadays, after the recent financial recession, has greatly deteriorated. This deterioration reinforces the finding of that research that the richer a country becomes, the more it will tend to spend on health; and regarding Greece, the opposite.

The uneven distribution in health care system could be monitored between the capital or other big cities and the majority of the islands and the rest of the rural regions whereas the Health Expenditure is focused on the big Urban Centres to mainly cover the needs of the majority of the population. Therefore, it is evident that the development of health care including the hospital and the social and medical services is determined by a very wide range of social, economic and political factors that some are common for most of the countries but also some are very specific to a national or even regional and local level.

The role of transportation in development of the Islands

Considering here the islands of Greece, all the islands are provided with ports which facilitate the sea transportation. The timetables, the frequencies and the connections of the itineraries depend on the island (population, tourism interest, geographical position, etc.) as well as the cyclical period of the year (e.g. the frequency is increased during the summer period). The sea transportation is regarded as the cheapest transportation means for the islands of Greece (although that after the recent recession and the ticket increases, the often transportation of the islanders is rather unaffordable), but in many cases, where the islands are quite distant from the capital (Athens) and the biggest port (Piraeus), the travel to these islands might be very time consuming (i.e. sometimes even more that 10-12 hours) which makes them rather unattractive in terms of regular visit or permanent residency. By taking into consideration the islands that do not have airports; they are reliant only upon scheduled, but rather occasional, access by ship which is rather time-consuming. Therefore, by comparing the sea transportation with the aviation which is quite time saving but more expensive, we can easily notice that the travel cost and the travel time are variables of a major importance for the Greek islands. However, not all the Greek islands are provided with the facilities of aviation, where the research of the influence by the presence of such amenities in the islands makes it rather explicit for the housing demand and the development of these destinations. Table 2 in Appendix presents the islands that are provided with an airport.

Furthermore, as it was mentioned earlier in incidents of urgent medical evacuation, the ascension and the transportation of patients through air evacuation can be arranged more easily than through the sea and the constraints on the islands without airports are clearly visible since there is no provision for immediate emergency help.

Higher Education in the Greek Islands

It is unnecessary to mention the need of higher education in general and more specifically the great importance of such institutions to the educational growth and the overall development of the islands. The influence of their presence includes among others: increased temporary population and therefore, increased demand of goods, trade, etc. as well as increased demand for housing and accommodation. In the Appendix part, Table 3 presents, with the use of dummy variables, the presence or the absence of a public University or a Technological Educational Institution to each island, whereas, Table 4, presents the schools and the Departments present to each island.

Finally, it is important to be clarified that in Greek islands, there are no private higher educational institutions, (apart from a couple of departments in the island of Crete), and therefore, they are not under consideration. Furthermore, the lower level of education (primary, secondary, high school) are not

also taken into consideration, as all of the islands are provided with this level of public education (of lower or higher quality) and it is considered that the basic education will not affect the total housing demand of the island (taking for granted that none family would leave the island and migrate to the mainland or to another island because of the school provision quality of their island).

Demographics

According to the latest demographic census of 2011 – which was conducted from the 10th to the 24th of May 2011 (The provisional published results) of the permanent population (the people who habited each location for at least 12 months), the total population of Greece is 10,787,690 permanent residents. The islands of Greece are inhabited by 1,646,680 permanent residents (the tourists or the temporary residents for employment and/or tourism are not included). More specifically, the Ionian Islands have about 206,470 permanent residents, the North Aegean Sea islands are inhabited by 225,270 residents including the Sporades group of islands and the islands which administratively belong to the geographical department of Macedonia and Thrace, the South Aegean Sea islands which have 383,390 inhabitants including the Dodecanese group of islands, Cyclades group of islands, and the Argo-Saronic group of islands which administratively belong to the prefecture of Attica. (Source: Hellenic Statistic Authority – El. Stat.)

Methodology

Hedonic Regression Method

The Hedonic Regression method is a method of estimating a cumulative housing prices index as it decomposes the residential prices into their constituent characteristics, and obtains assessments of the contributory value of each specific characteristic. This fact requires that the composite property under research can be analysed by its constituent parts and that the market values can also decompose to their constituent parts as well. For this reason, hedonic method is the preferred method in this research, since the housing prices in the islands are decomposed to their structural, locational, economic and other characteristics.

Rosen (1974) developed a hedonic theory on which many other researches later on based their methodology in several markets including housing. Rosen in his research, analysed that several differentiated products can be fully described by a vector of objectively measured attributes. As he mentioned, the observed product prices and the specific characteristics of this good, may outline a set of implicit or "hedonic" prices. In his theory, the entire set of hedonic prices drives both the buyer and the seller in locational decisions in characteristics space and he based his hypothesis that products are valued for their utility - bearing characteristics. Therefore, he defined that the hedonic prices are revealed from the observed prices of the differentiated goods and the specific amounts of attributes associated with them. In other words, if we measure the several characteristics of any good, we can calculate its hedonic price which is measured by the analysis of the regression price and its characteristics.

In fact, p(z) is the set of “hedonic prices” equalizing differences and is determined by several market clearing conditions such as the amounts of commodities offered by producers at any time must equal the amounts demanded by buyers who are located there. These hedonic prices are relating prices with characteristics. By following the assumption that the

consumers' marginal willingness to pay for z_i is a function of f_i; and similarly, assuming that the marginal supply price for z_i is a function of g_i, he structured the following equations:

$P_i(z) = f_i (z_1,\ldots, z_n, y_1)$, and

$P_i (z) = g_i (z_1, \ldots, z_n, y_2)$

Where y_1 and y_2 are exogenous vectors of demand (income) and supply respectively.

Overall, Rosen's approach (1974) to estimating demand, by using hedonic model includes two phases. In the first one, the prices of products are regressed based on their attributes whose coefficients are regarded as implicit prices or as the consumer's marginal willingness-to-pay for each attribute. In his second phase, he run the regressions of the marginal prices of each characteristic at groups actually purchased onto the characteristics of the product and the buyer's demographic variables. This second approach was supposed to create a demand function for each attribute. Later on, (Brown and Rosen, 1982; Epple, 1987) it was found that this approach was dealing with a concurrency issue since buyers with increased preference for a specific characteristic would purchase groups of products that highly incorporated this characteristic. This pitfall of concurrency creates inconsistencies to the estimations. Epple (1987) suggested that this issue could be faced regarding a big number of markets where the consumers' preferences can be considered the same, but, that much data where buyers' tastes could be considered alike is rather difficult to find, and therefore, Rosen's second part of analysis is not broadly used nowadays.

Roback (1982) in trying to explain the role of wages and rents and the quality of life delineated that there is a big number of studies which are trying to capture the implicit price of urban attributes by using hedonic regression methods by estimating either the wage differentials or the rent differentials but focusing only on the consumer side of the market without taking into consideration the behaviour of the firms. Indeed, if we omit the firm/ producer's side of the market, the matching aspect to the equilibrium of Rosen's theory (1974) on hedonic method has been lost. Moreover, in her research, she pointed out a rather serious problem of the hedonic model which is the spatial allocation problem of the real estate products. Even if we consider that all consumers' preferences, firms and goods are identical, not all buyers can occupy the same space. And this issue becomes even sharper when two markets clear simultaneously.

In her general equilibrium model, she incorporates the site-specific factors (rent) with the mobile factors (labour) as well as the possibility of the amenities to influence productivity. As it was proven by the findings of this study, the conventional thought that the local amenities only influence the land prices is incorrect; as the contribution of each amenity to the wages and rents is significant while the precise degree of its impact depends on its effect on production and the strength of the consumer preferences. Moreover, it is shown that the local amenities greatly explain the regional wage differences.

Black (1999) proposed boundary fixed effect approach to measure how much the parents are willing to pay for a better school quality. More specifically, she explained that the standard hedonic method reveals an inelastic supply of housing with several buyers whose preferences for several attributes alter. In equilibrium condition, all consumers with same tastes and income can gain identical levels of satisfaction while prices capture the differences in amenities. So, the hedonic model that she structured initially, was expressing the sales price as a bundle - expression of the house attributes, its

location and the test scores in the school district:

$$\ln(\text{price}_{i\alpha j}) = \alpha + X'_{i\alpha j}\beta + Z'_{j}\delta + \gamma test_{\alpha j} + \varepsilon_{i\alpha j}$$

where: $p_{i\alpha j}$ is the house price I in district α in school district j,

$X_{i\alpha j}$ represents the house characteristics,

Z_j stands for the locational characteristics of the neighbourhood and the school,

while $test_{i\alpha j}$ represents the average test score in the school coming from the children that live in district α but they would get if they would attend the school in district j.

But this model, structured in previous studies, as she mentioned is biased since it is impossible to observe all the house and locational characteristics and several variables are omitted such as the tax rates and public goods provision but also variables that differ according to space. Therefore, in order to diminish this kind of problems she recreated the model by replacing the Z_j characteristics with a full set of boundary dummies which identify the houses that share the same characteristics in a district boundary:

$$\ln(\text{price}_{i\alpha b}) = \alpha + X'_{i\alpha b}\beta + K'_{b}\phi + \gamma test_{\alpha j} + \varepsilon_{i\alpha j}$$

where: K_b stands for the boundary dummy variables.

By this way, she managed to calculate the differences in mean house prices on either side of district boundaries - by controlling same time the house characteristics – and enable her to check the differences in test scores. With the use of this second model, she achieved to overcome the pitfalls of the first model related to the neighbourhood characteristics; where considering the houses close to the boundaries she managed to capture the discrete changes in school qualities.

Later on, Bajari and Benkard (2005) followed Rosen's theory of hedonic model, but with some differentiations. Based on Rosen's approach, they used the first part for product attributes that are not observed to let the hedonic pricing method to have a general non-distinct form while for the second part, they used another approach assuming that utility is known, but without placing any restrictions on the aggregate distribution of utility parameters. In their research, they showed that if there are not many products, they could construct restrictions on individuals' utility parameters, aggregate demand, consumer surplus, etc.

However, Bajari and Benkard followed a different approach with more positive results. If there are a substantial number of goods such that the preference set is continuous, then a buyer's product preference must satisfy a set of primary conditions that require the buyer's marginal rate of substitution between each continuous product attribute and the composite commodity to be equal with the implicit (or marginal) price of that product attribute at the chosen group of goods. If the buyer is observed only once, then it is impossible to understand his entire preference relation from observing this single selection. Rosen's solution to this issue was to impose homogeneity across the individual consumers. In contradiction, Bajari and Benkard followed a semi-parametric method mainly applied in industrial organization and marketing researches.

Despite the goodness of the Bajari and Benkard's method, this analysis, as it has been also mentioned by the authors, suffers from some defects. Firstly, the first-stage estimation requires significantly more data than other methods. This disadvantage would place restrictions on its applicability in markets with a small numbers of goods or alternatively a large number of attributes. Secondly, this method requires a stronger

independence assumption, although that this defect is slightly decreased by the fact that the error term is nonseparable, and therefore, the model suffers from high heteroskedasticity. Finally, the method permits only a single-dimensional, vertically differentiated unobserved attribute.

Coulson in his chapter on the theoretical background and demand estimations, stated that in hedonic method, we start by making an assumption that housing is a commodity that can be described as a set, or vector of several incorporated attributes or characteristics, x (i.e. x constitutes a collection of several housing characteristics/attributes such as x_1, x_2, x_3, … that represent housing characteristics such as the size of the house in sq. meters, the number of rooms, etc.).

In most of the researches on the capitalisation of the several housing attributes, the researchers are trying to explain the main variable with the use of cross sectional and/ or panel data and a number of several factors/ variables that control the variable under consideration and have to be very carefully selected. The willingness-to-pay for several public services, amenities or other communal characteristics can be affected by leaving out significant variables and/ or including unnecessary estimators that add noise to our model. Therefore, the selection of the independent variables has to be rather careful (Stadelmann, 2010).

Goodmann and Thibodeau (1998) examined the housing submarkets using hedonic price models which are a method that decomposes the several submarkets and their housing attribute components. As it is described, it is a method that provides a link between the housing price and housing quantity or quality as the several qualitative characteristics of the housing can be quantitatively represented in a hedonic model. Moreover, as it is delineated the households have specific preferences for neighbourhood amenities. With hedonic price methods, the valuations of neighbourhood amenities, or the proximity to those amenities, can be estimated.

Assessed Values

Clapp and Giaccotto, 1992, mention the significance of accurate estimation of price indices on the residential properties for real estate research. They compare and contrast the Assessed Values (AV) to the Repeat Sales (RS), to which presents that in large samples available with AV method, the measurement error issues are minimised. As it is explained, for most people, their residencies are the biggest component of their wealth and any changes in their housing prices have a great influence on their personal investment decisions afterwards which in total may have a significant impact on the development of the economy (Case, 1990 cited by Clapp and Giaccotto, 1992). Moreover, they indicate that there are two methods for price index estimation according to the literature: the hedonic regressions and the repeat sales analysis to which it is described that the first method uses data on a number of characteristics for each property to control the quality. On the other hand, RS method controls quality through the use of prices at different points in time for the same property.

The Hedonic Model for House Prices in the Islands of Greece:

Considering the Housing Market of the islands of Greece as a case study to apply the hedonic regression method; a simple hedonic

model which could explain the housing prices made by its components i.e. the houses', islands' and market's characteristics:

In this research, the dependant variable (Y) is the **Assessed Housing Prices** - AHP or P for every property (i) , island(j), group of island(k)

$$P_{i,j,k} = \alpha + \sum\beta\ X_{i,j,k} + \varepsilon_{i,j,k}$$

In order to mitigate the problem of heteroskedasticity as well as to compare percentage-wise the effect on the Assessed Housing Prices

(1) $\log(P_{i,j,k}) = \alpha + \sum\beta\ X_{i,j,k} + \varepsilon_{i,j,k}$

But

There are also **island characteristics** ($Z_{j,k}$) for each island (j), therefore:

(2) $\log(P_{i,j,k}) = \alpha + \sum\beta\ X_{i,j,k} + \sum\gamma Z_{j,k} + \varepsilon_{i,j,k}$

Controlling for the **Fixed Effects** for each island j:

(3) $\log(P_{i,j,k}) = \alpha + \sum\beta\ X_{i,j,k} + \delta_j + \varepsilon_{i,j,k}$

where δ is the total unobserved effects for each island (j) - dummies

There are also **group of islands characteristics** - Controlling the **Fixed Effects** of each group of islands (k):

(4) $\log(P_{i,j,k}) = \alpha + \sum\beta\ X_{i,j,k} + \sum\gamma Z_{j,k} + \Delta_k + \varepsilon_{i,j,k}$

where Δ is the total unobserved effects for each group of islands (k) - dummies

Problems of Hedonic Model

The above hedonic model includes several defects that need to be under great consideration, and thus, the model has to be revised so as to cure and overcome these issues:

Firstly, many of the independent variables (x_s) are highly correlated to each other (multicollinearity issue), which has to be detected and cured. In the presence of multicollinearity, the estimate of one variable's effect on $y_{i,j}$, while controlling for the others, tends to be less precise than if regressors were uncorrelated.

Secondly, the collection of random variables is heteroskedastic since the error terms have different variance (non-constant). The presence of heteroskedasticity is of major concern in the application of hedonic regression analysis, as it can invalidate the statistical tests of significance that assume that the errors are uncorrelated and normally distributed and their variances do not vary with the effects being modeled.

Lastly, the model suffers from unobserved heterogeneity; which produces misleading results due to the inclusion of variables that are measured with unobserved errors due to the rather heterogeneous market of the islands.

Data

The dataset provided by the Bank of Greece (Real Estate Market Analysis Department) consisted two files of of 14.937 house properties in total in several islands of Greece that were assessed by the banks between 2005 and 2013:

file 1	11,553
file 2	3,384
Total	**14,937 pr.**

In Table 1.5 of the Appendix, the provided information for every observation is presented which includes information such as the address the property, the assessed value, the size, the age, the parking/storing provision, the construction quality, the view, etc.

The dataset had a lot of limitations such as the not exact location (address/number of the property). In many cases there was not available not even the name of the village but only a local toponym of settlement and not the formal name of the place. This was either because the dataset itself was incomplete but mainly because the house properties in the Greek islands do not have an exact address themselves but they refer to the closest village/settlement/municipality. With this very limited information about the exact location of the properties, it was very difficult and very time-consuming to spot the properties in Google Earth and calculate their actual physical time distances from the amenities (ports/airports) but only an approximation. Moreover, there were lots of missing and incomplete values from the evaluators (eg. view, land, year of completion/permit).

Therefore, from the 14,937 house properties I received, after excluding: the 3,620 properties that referred to Crete and Evvoia (that I have excluded from this research), 850 approx. duplications, 500 approx. that concerned incorrect entries (not to islands), 3,000 approx. to which land area was not available (a basic variable), 300 approx. to which the year of completion or the year of permit was not available (not able to calculate the age of the property), 300 approx. that concerned islands with population <1,000p or islands with insufficient number of observations/island (<15). So, the total number of house properties, to be spotted and calculate their time distances from the amenities, was 6,350 approx. in 36 Greek islands.

But, due to the insufficient information available about the house property location, I was not able to spot more than 2,000 properties. Therefore, the final number of properties, spotted and having calculated their time distances from the public amenities was, **4,369**. Figure 1.9 presents how the properties were approximately spotted in Google Earth and Figure 1.10 presents is a zoom in of the properties in the islands.

Secondary Data

The population data come from the Publication of provisional results of the 2011 Population Census (Source: Hellenic Statistic Authority).

The following data – island characteristic variables ($Z_{j,k}$) where collected by a travel agency (Express Holidays):

- Sea Transportation:
  - The travel duration from each island to the capital (slow and fast boat – in minutes)
  - The travel duration from each island to the closest mainland (slow and fast boat- in minutes)
  - The cost of travel from each island to the capital (slow and fast boat – in €)
  - The frequency of travel to capital (slow and fast boat, summer and winter – in travels/week)

- Air Transportation:
- The duration of the flight from each island to the capital airport (Athens)
- The cost of flight from each island to the capital airport (average)
- The frequency of flights to capital (summer and winter – in travels/week)

Data Analysis

Initially, the Data Analysis started by extracting the useless entries (as mentioned above the properties that referred to Crete and Evvoia, the duplications, the incorrect entries, the missing values to several variables).

After cleaning the data, the remaining approx. 6,350 properties had to be spotted in Google Earth. Due to the incomplete information about their exact location this process was the most difficult the most time-consuming. Moreover, since for the islands of Greece it is meaningless to use the actual distance in km, the use of GIS was not possible. This is because the km distances are not comparable from island to island (different ground morphology, traffic, road conditions, etc) but also the km distances especially in the smaller islands are relatively small and since the exact location of each property is not available, the use of km distances is senseless and vague.

To continue with, after locating (approximately) in Google Earth, the next step was to calculate the time distances of each property to the port and the airport (if applicable) of the island. This process was performed in Google maps as it is the only one which can provide with time distances (approximately). Google maps - in calculating the time distances - takes into consideration the ground morphology of each island (mountains, etc.), the average traffic condition (e.g. of the island's capital), the road condition (e.g. the open roads) in approximation. Figure 1.11 presents how the time distance calculation of each property (village) to the port/airport was performed.

Property Utilisation Ratio

Furthermore, I calculated the Property Utilisation Ratio (PUR) for every property to identify the significance of the use of each land area to the islands, and therefore, the importance of gardens/yards/open spaces:

$$PUR_i = \frac{living\_space(m^2)}{land\_area(m^2)} \times 100$$

Age

The age of each property at the year of evaluation was calculated from the year of completion (the year that the construction ended):

$$Age = Year\ of\ Evaluation - Year\ of\ Completion$$

But since for most of the properties the completion of the construction in the dataset was not available, the Year of Permit was used instead:

$$Age = Year\ of\ Evaluation - Year\ of\ Permit + 2$$

where: 2 is the average duration of construction for housing properties in Greece (source: BoG)

and Age≥0 (for the properties that were evaluated prior to their completion, i.e. Age<0, their age is considered as 0)

Deflation of the housing prices

As mentioned above, the house prices of the provided dataset were evaluated between 2005 and 2013. Therefore, in order for the prices to be comparable though this time period as well as to incorporate the deep financial recession, they had to be deflated and expressed in the same time period. By

using the tables of the HICP, the prices were deflated and expressed in December 2012 values by using the following formula:

$$Real\ Prices_{Dec2012} = Nominal\ Prices_{t} \times HICP_{Dec2012} / HICP_{t}$$

where:

$HICP_{Dec2012}$= 123.28

$HICP_t$ = the HICP of the month year of the evaluation

(Source of the HICP tables: Hellenic Statistic Authority)

New Variables and Dummies

After finishing spotting the properties (villages) in Google Earth (approximately), the calculation of their time distance from the amenities of the port and the airport started. Therefore, two new variable where created and these were: a) the time distance to port and b) the time distance to airport.

For the islands that have more than one ports (i.e. Samos with 2 ports – Vathi and Karlovasi, Ikaria with 2 ports – Evdilos and Agios Kirukos, Amorgos with 2 ports – Katapola and Aigiali and Kefallonia with 3 ports – Argostoli, Sami and Poros), I calculated the time distances from the properties to all ports and I kept the minimum for each one by making the assumption that the home owners are using the port that it is closer to their properties regardless the duration of the travel from this port, the frequencies per week and the destination port.

Moreover, after collecting the data of duration, cost, frequency of travels from the islands to the capital/closer Greek mainland, new variables were created to represent the duration of the travel in minutes, the cost in euro and the frequencies in travels/week for slow/fast boats as well as during summer and winter.

Furthermore, dummy variables were created to represent the property characteristic – type (into flat, detached houses/ maisonette – t1/t2/t3) which in the model the variable flat (t1) was omitted so as to compare the coefficient of t2 and t3 towards the omitted variable t1-flat.

Dummy Variables ($Z_{j,k}$) were also created for controlling the island characteristics of the presence of the following amenities on the islands:

- The Presence of Airport on the island
- The Presence of Prefectural General Hospital on the island
- The Presence of University on the island

To continue with, dummy variables (δ_j) were also created for the fixed effects - controlling the unobserved heterogeneity of the islands (one dummy for each island). By creating islands' Ids and then creating one dummy for every Id to the following island ids:

ISLAND IDs

1	Alonnisos	19	Milos
2	Amorgos	20	Mykonos
3	Andros	21	Naxos
4	Astypalaia	22	Paros
5	Chios	23	Patmos
6	Corfu	24	Rhodes
7	Ikaria	25	Salamina
8	Ithaki	26	Samos
9	Kalymnos	27	Skiathos
10	Karpathos	28	Skopelos
11	Kea	29	Skyros
12	Kefallonia	30	Spethes
13	Kos	31	Symi
14	Kythnos	32	Syros
15	Lefkada	33	Thira
16	Leros	34	Tinos
17	Lesvos	35	Ydra
18	Limnos	36	Zante

And finally, dummy Variables (Δ_k) were also created for the fixed effects - controlling the unobserved heterogeneity of the groups of islands (one dummy for each group).

Group of Island IDs

1.	Sporades Islands
2.	Cyclades Islands
3.	NorthEast Aegean Sea Islands
4.	Ionian Islands

5.	Dodecanese Islands
6.	Argosaronic-Gulf Islands

E-VIEWS – Every island separately

Firstly, I run one regression model for each one of the 36 islands including the log(real assessed values) as the dependent variable, while the following property characteristics ($X_{i,j,k}$) were the independent variables:

- Log(living space),
- Log(land area),
- PUR,
- Floor (dummies),
- T2 (for the detached houses),
- T3 (for the maisonettes),
- Age,

And then by taking out the residuals of this regression, I run a second one by having the residuals of the first regression as the dependent variable and:

- Time distance to port,
- Time distance to Airport (if applicable – for the islands that have airports)

as the independent variables to identify the significances.

Then I run a second model for each island separately, including all the previous variables as before, but this time I kept the floor number as a continuous variable and without taking the residuals out since I had already identified that for specific islands the time distances to ports/airports were significant. The results are in the following section.

Stata – All Islands

In Stata, the first simple OLS regression included all 36 islands including the following property characteristics ($X_{i,j,k}$) only $[\log(P_{i,j,k}) = \alpha + \sum\beta X_{i,j,k} + \varepsilon_{i,j,k}]$:

- Log(living space),
- Log(land area),
- PUR,
- Floor (dummies),
- T2 (for the detached houses),
- T3 (for the maisonettes),
- Age,
- Time distance to port

Then a second OLS regression was run including the islands that have an airport by running apart from all the above variables, the $[\log(P_{i,j,k}) = \alpha + \sum\beta X_{i,j,k} + \varepsilon_{i,j,k}]$::

- Time distance to Airport.

The next OLS regression included some island characteristics ($Z_{i,j,k}$) apart from the above property characteristics ($X_{i,j,k}$) as well $[\log(P_{i,j,k}) = \alpha + \sum\beta X_{i,j,k} + + \sum\gamma Z_{i,j,k} + \varepsilon_{i,j,k}]$ excluding the time distance to airport so as to include the presence of airport as a dummy only:

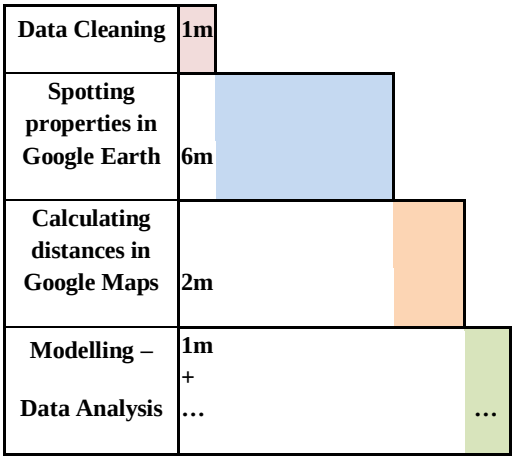
- Population,
- Geographical size,
- Presence of Airport
- Presence of Hospital,
- Presence of University,
- Duration of travel from island to capital by slow boat,
- Frequency of slow boat to the capital during summer,
- Frequency of slow boat to the capital during Winter,
- etc.

This model can be run several times including different combinations of variables characteristics for every island to observe the effect of each one on the house prices.

The next regression was run, included the fixed effects dummy variables (δ_j) one dummy for every island and excluding the island characteristics ($Z_{i,j,k}$) for co-linearity reasons $[\log(P_{i,j,k}) = \alpha + \sum\beta X_{i,j,k} + \delta_j \varepsilon_{i,j,k}]$

Finally, the last regressions that were performed included property characteristics, some island characteristics and the fixed effects dummy variables (Δ_k) one dummy for every group of islands [$\log(P_{i,j,k}) = \alpha + \sum\beta X_{i,j,k} + \sum\gamma Z_{i,j,k} + \Delta_k \varepsilon_{i,j,k}$].

This last model can be run several times including different combinations of variables characteristics for every island.



Time Agenda

A time Agenda that could describe the Analysis of the data up to now is presented in the following table:

Findings

Regarding the results of every island separately the results are presented in the below tables for every group of islands:

1) Ionian Islands

IONIAN ISLANDS					
Dependent Variable: LOG(REAL_ASSESSED_VALUES)					
Variables ($X_{i,j,k}$) / ISLAND	CORFU	KEFALLONIA	ZANTE	LEFKADA	ITHAKI
C	8.264*** (41.53)	8.859*** (28.56)	8.125*** (22.28)	7.859*** (16.02)	7.518*** (11.68)
LOG(LIVING_SPACE)	0.793*** (15.94)	0.652*** (8.45)	0.683*** (9.56)	0.754*** (9.20)	0.723*** (4.25)
LOG(LAND)	0.090*** (3.10)	0.108*** (3.43)	0.137*** (3.04)	0.149** (2.41)	0.274** (2.39)
PUR	-1.84E-05 (-0.02)	3.46E-05* (1.67)	0.001 (1.42)	0.003** (2.01)	0.005 (1.60)
FLOOR	0.0001 (0.03)	0.046* (1.74)	-0.003 (-0.09)	-0.053 (-1.09)	-0.014 (-0.21)
T2	-0.184*** (-4.19)	-0.330*** (-4.87)	-0.122 (-1.55)	-0.022 (-0.21)	-0.587*** (-4.55)
T3	-0.200** (-2.19)	0.007 (0.10)	0.032 (0.21)	-0.061 (-0.62)	-
AGE	-0.003** (-2.55)	-0.007*** (-4.07)	-0.003 (-1.53)	-0.010** (-2.49)	-0.001 (-0.28)
TIME_DISTANCE_TO_PORT	**-0.015*** (-3.93)**	**-0.007** (-2.37)**	0.002 (0.11)	-0.002 (-0.43)	0.011 (1.34)
TIME_DISTANCE_TO_AIRPORT	**0.007* (1.75)**	0.000 (0.09)	-0.004 (-0.31)	-	-
R^2	**0.70**	**0.58**	**0.51**	**0.75**	**0.58**
Adj. R^2	**0.69**	**0.56**	**0.49**	**0.73**	**0.54**
No of Observations	**357**	**236**	**204**	**93**	**85**

2) Sporades Islands

SPORADES ISLANDS				
Dependent Variable: LOG(REAL_ASSESSED_VALUES)				
Variables ($X_{i,j,k}$) / ISLAND	SKIATHOS	ALONNISOS	SKOPELOS	SKYROS
C	8.746***	9.718***	8.426***	9.527***
	(7.34)	(14.80)	(15.06)	(8.49)
LOG(LIVING_SPACE)	0.685***	0.567***	0.616***	0.617***
	(3.10)	(4.01)	(5.87)	(3.72)
LOG(LAND)	-0.007	0.030	0.118*	0.035
	(-0.06)	(0.476)	(1.94)	(0.37)
PUR	0.001	-0.003	0.001	-0.002
	(0.43)	(0.002)	(0.53)	(-0.76)
FLOOR	0.052	0.153	0.057	0.126
	(0.089)	(0.19)	(0.90)	(1.10)
T2	-0.347*	-0.177	0.142	-0.346**
	(-1.89)	(-1.54)	(1.349)	(-2.16)
T3	-	-	-0.618***	0.019
			(-4.08)	(0.09)
AGE	-0.008	-9.04E-05	-0.005**	-0.006
	(-1.47)	(-0.02)	(-2.06)	(-1.20)
TIME_DISTANCE_TO_PORT	**-0.234***	0.006	0.004	0.005
	(-2.09)	(0.39)	(0.83)	(0.24)
TIME_DISTANCE_TO _AIRPORT	**0.275****	-	-	-0.007
	(2.25)			(-0.29)
R^2	**0.71**	**0.60**	**0.69**	**0.42**
Adj. R^2	**0.51**	**0.54**	**0.66**	**0.35**
No of Observations	**21 (n<30)**	**49**	**84**	**78**

3) Argo Saronic Islands

ARGO SARONIC ISLANDS			
Dependent Variable: LOG(REAL_ASSESSED_VALUES)			
Variables ($X_{i,j,k}$) / ISLAND	YDRA	SPETSES	SALAMINA
C	6.859***	8.477***	8.560***
	(4.28)	(12.79)	(26.64)
LOG(LIVING_SPACE)	-0.597	0.741***	0.586***
	(-0.70)	(7.75)	(5.49)
LOG(LAND)	1.469	0.153	0.213***
	(1.63)	(1.50)	(3.10)
PUR	0.015	0.001	0.002
	(1.23)	(0.26)	(1.35)
FLOOR	0.089	0.234*	0.052
	(0.31)	(1.87)	(1.42)
T2	-0.019	-0.130	-0.139**
	(-0.065)	(-1.24)	(-2.25)
T3	-	-	-0.312**
			(-2.46)
AGE	-0.009***	-0.001	-0.010***
	(-3.16)	(-0.58)	(-4.87)
TIME_DISTANCE_TO_PORT	0.026	-0.027	**-0.023***
	(0.37)	(-0.42)	**(-3.16)**
TIME_DISTANCE_TO _AIRPORT	-	-	-
R^2	**0.67**	**0.54**	**0.60**
Adj. R^2	**0.50**	**0.49**	**0.59**
No of Observations	**21 (n<30)**	**83**	**251**

4) North East Aegean Sea Islands

NORTH EAST AEGEAN ISLANDS					
Dependent Variable: LOG(REAL_ASSESSED_VALUES)					
Variables ($X_{i,j,k}$) / ISLAND	LESVOS	SAMOS	LIMNOS	CHIOS	IKARIA
C	8.739***	8.260***	8.318***	8.332***	7.973***
	(22.61)	(29.60)	(19.93)	(23.56)	(6.72)
LOG(LIVING_SPACE)	0.662***	0.924***	0.694***	0.833***	0.427
	(7.84)	(12.46)	(6.73)	(8.49)	(1.27)
LOG(LAND)	0.119***	0.004	0.156**	0.024	0.198
	(2.91)	(0.09)	(2.51)	(0.31)	(1.48)
PUR	-0.000	-0.003***	-0.001	-0.001	0.011**
	(-0.48)	(-2.72)	(-0.40)	(-0.49)	(2.90)
FLOOR	-0.006	0.010	-0.045	-0.034*	0.037
	(-0.26)	(0.52)	(-1.48)	(-1.74)	(0.47)
T2	-0.304***	-0.224***	-0.184**	-0.073	0.363
	(-4.88)	(-3.57)	(-2.26)	(-1.43)	(0.90)
T3	0.178**	0.126	-	0.446***	-
	(2.51)	(0.97)		(5.86)	
AGE	-0.006***	-0.007***	-0.006***	-0.007***	0.004
	(-4.97)	(-4.94)	(-3.31)	(-5.41)	(0.70)
TIME_DISTANCE_TO_PORT	0.003	-0.003	-0.005	**-0.005****	-0.010
	(0.28)	(-0.99)	(-1.59)	**(-1.99)**	(-0.55)
TIME_DISTANCE_TO_AIRPORT	-0.005	-0.003	5.60E-05	-0.001	0.001
	(-0.46)	(-1.32)	(0.01)	(-0.22)	(0.33)
R^2	**0.56**	**0.73**	**0.71**	**0.68**	**0.77**
Adj. R^2	**0.55**	**0.72**	**0.68**	**0.67**	**0.60**
No of Observations	**347**	**213**	**70**	**264**	**20 (n<30)**

5) Cyclades Islands

CYCLADES ISLANDS											
Dependent Variable: LOG(REAL_ASSESSED_VALUES)											
Variables ($X_{i,j,k}$) / ISLAND	NAXOS	SYROS	TINOS	THIRA	PAROS	MILOS	KEA	KYTHNOS	MYKONOS	AMORGOS	ANDROS
C	8.38***	7.815***	8.72***	8.894***	7.622***	9.329***	8.730***	11.276***	9.038***	8.732***	9.742***
	(19.60)	(20.26)	(12.03)	(12.12)	(11.07)	(16.40)	(14.83)	(10.50)	(17.96)	(17.02)	(24.26)
LOG(LIVING_SPACE)	0.918***	0.720***	0.597***	0.658***	1.026***	0.529***	0.938***	0.009	0.828***	0.710***	0.643***
	(8.02)	(6.52)	(4.93)	(2.75)	(8.65)	(5.69)	(7.25)	(0.04)	(11.17)	(5.90)	(5.69)
LOG(LAND)	0.178	0.221***	0.156*	0.088	-0.200	0.169**	-0.079	0.18	0.042	0.059	0.029
	(0.26)	(2.97)	(1.94)	(0.54)	(-0.22)	(2.02)	(-0.97)	(1.69)	(0.80)	(0.89)	(0.62)
PUR	-0.002	0.002	0.004	0.002	-0.003	0.002	-0.003	0.004	0.001	-0.003	-0.001
	(-1.15)	(1.27)	(1.31)	(0.42)	(-1.03)	(0.91)	(-0.90)	(1.43)	(0.60)	(-1.41)	(-0.92)
FLOOR	0.059	-0.019	-0.029	0.012	0.049	0.033	0.053	-0.33**	0.104	0.054	0.079**
	(1.33)	(-1.16)	(-0.88)	(0.16)	(0.53)	(1.10)	(0.60)	(-2.65)	(1.09)	(0.56)	(2.12)
T2	-0.402***	-0.192**	-0.093	-0.027	-0.237**	-0.002	0.224	-0.162	0.017	0.101	-0.42***
	(-4.00)	(-2.34)	(-0.82)	(-0.24)	(-2.09)	(-0.02)	(1.33)	(-1.00)	(0.15)	(0.87)	(-5.54)
T3	0.009	0.304**	-0.487***	0.001	0.492	0.401***	0.136	-	0.287	-	-0.654***
	(0.05)	(1.99)	(-3.09)	(0.01)	(2.21)	(3.20)	(0.59)		(1.36)		(-7.91)
AGE	-0.008***	-0.003	-0.015***	-0.010**	-0.003	-0.005**	-0.007***	-0.008**	-0.008***	-0.001	-0.008***
	(-3.93)	(-1.50)	(-4.42)	(-2.41)	(-1.06)	(-2.08)	(-3.13)	(-2.31)	(-4.02)	(-0.65)	(-4.03)
TIME_DISTANCE_TO_PORT	0.024	-0.0004	-0.004	0.001	**0.029*** **	**0.048** **	-0.002	-0.016	0.001	-0.004	-0.0002
	(1.39)	(-0.05)	(-0.77)	(0.08)	**(2.83)**	**(2.30)**	(-0.52)	(-1.16)	(0.04)	(-0.55)	(-0.11)
TIME_DISTANCE_TO_AIRPORT	-0.019	-0.007	-	0.001	-0.003	**-0.705*** **	-	-	-0.010	-	-
	(-1.27)	(-0.64)		(0.08)	(-0.45)	**(-3.50)**			(-0.76)		
R^2	**0.65**	**0.68**	**0.70**	**0.58**	**0.77**	**0.66**	**0.69**	**0.77**	**0.70**	**0.68**	**0.51**
Adj. R^2	**0.61**	**0.66**	**0.67**	**0.51**	**0.73**	**0.62**	**0.66**	**0.54**	**0.69**	**0.60**	**0.48**
No of Observations	**79**	**132**	**78**	**68**	**67**	**77**	**85**	**15 (n<30)**	**158**	**37**	**166**

6) Dodecanese Islands

DODECANESE ISLANDS								
Dependent Variable: LOG(REAL_ASSESSED_VALUES)								
Variables ($X_{i,j,k}$) / ISLAND	RHODES	PATMOS	KOS	KALYMNOS	SYMI	ASTYPALAIA	KARPATHOS	LEROS
C	8.282*** (26.92)	8.050*** (21.27)	6.702*** (24.18)	7.671*** (17.08)	9.249*** (8.04)	9.253*** (6.39)	8.008*** (36.71)	7.927*** (16.72)
LOG(LIVING_SPACE)	0.729*** 9.36)	0.639*** (7.10)	0.915*** (12.41)	0.842*** (7.427)	1.056** (2.57)	0.591* (2.01)	0.939*** (8.51)	0.734*** (13.06)
LOG(LAND)	0.121*** (2.60)	0.218*** (4.00)	0.167*** (3.82)	0.069 (1.12)	-0.281 (0.63)	0.149 (0.67)	-0.021 (-0.34)	0.181*** (3.52)
PUR	0.001 (1.18)	0.004** (2.58)	0.001 (1.11)	-0.0002 (-0.15)	0.001 (-0.20)	-0.001 (-0.34)	-0.0004 (-0.47)	0.002 (1.65)
FLOOR	-0.008 (-0.31)	-0.077 (-1.31)	0.021 (0.77)	-0.008 (-0.47)	-0.140 (-0.54)	0.379 (1.04)	-0.031 (-0.94)	-0.082* (-1.80)
T2	-0.037 (-0.73)	-0.241*** (-2.72)	-0.145 (-1.58)	-0.081 (-0.84)	-0.084 (-0.50)	0.078 (0.29)	-0.038 (-0.29)	-0.10 (-1.45)
T3	0.031 (0.36)	-	0.845*** (8.52)	-0.869** (-2.47)	-0.021 (-0.11)	-	-	-
AGE	-0.008*** (-5.73)	-0.002 (-1.21)	-0.006*** (-3.72)	-0.004** (-2.34)	-0.003 (-0.83)	-0.002 (-0.37)	-0.013*** (-3.14)	-0.002 (-0.90)
TIME_DISTANCE_TO_PORT	**-0.008*** (-4.48)**	0.008 (0.80)	0.002 (0.73)	-0.009 (-1.18)	-0.004 (-0.34)	-0.054 (-1.26)	0.006 (1.25)	-0.019 (-1.43)
TIME_DISTANCE_TO_AIRPORT	**0.005*** (3.28)**	-	**0.008** (2.36)**	**0.017** (2.02)**	-	-0.038 (-1.23)	-	-0.013 (-0.89)
R^2	**0.65**	**0.72**	**0.82**	**0.68**	**0.60**	**0.80**	**0.91**	**0.83**
Adj. R^2	**0.64**	**0.69**	**0.80**	**0.65**	**0.47**	**0.71**	**0.87**	**0.81**
No of Observations	**503**	**83**	**157**	**104**	**34**	**25 (n<30)**	**26 (n<30)**	**56**

Some Interpretation of the Results

According to the above tables including results of each group of island having run the model for each island separately, for all islands the living space is positively very significant to the house prices (1% significance level). More specifically, every 1% increase in the living space causes from 0.52 to 1.06% increase to the house prices (0.74% increase in weighted average).

For some of the islands, the land space is positively very significant (1% or 5% significance level). More specifically, for 16/36 islands including all Ionian Islands, Skopelos-Sporades, Salamina - Argo Saronic, Lesvos and Limnos - North East Aegean, Syros, Tinos and Milos - Cyclades, Rhodes, Patmos, Kos and Leros - Dodecanese Islands). Every 1% increase in the land area creates from 0.09 to 0.27% increase to the house prices (0.15% increase - weighted average).

The Property Utilisation Ratio is relatively not significant for most of the islands (gardens/yards not significant to the house prices of most of the islands).

Similarly, the floor number is relatively not significant for most of the islands.

Regarding the property type (flats/ detached houses/ maisonettes) of the house properties seems to be very significant for most of the islands. Since the property type is represented into the model by the use of dummy variables, everything is compared to the omitted variable of the model - which here is the t1 variable – i.e. the flat. Therefore, to 14 out of the 36 islands the detached houses are negatively very significant (1-5% significance level) compared to flats which means that the flats are more expensive compared to detached houses – probably because the flats are located to the islands' capitals, so, the proximity to the capital is very important for these islands.

Similarly the maisonettes, to 7 out of the 23 islands they are negatively very significant (1-5%

significance level) compared to flats which means that the flats are more expensive compared to maisonettes – probably because the flats are located to the islands' capitals, so, the proximity to the capital is very important for these islands.

In contrast, to 5 out of 23 islands, maisonettes are positively very significant (1-5% significance level) compared to flats which means that the flats are less expensive compared to maisonettes – probably because of their construction quality/ the property special features and characteristics / the extra facilities/ the landscape, etc.

Considering the age of the properties to 22 out of 36 islands, the age is negatively very significant (1-5% significance level). More specifically, every additional year to the house properties, creates from 0.3 to 1.5% decrease to the house prices (0.69% decrease - weighted average).

Regarding the time distance of the properties to the ports/ airports:

By regarding the results of each island separately:

Ionian Islands

Corfu

There is negative significance to the port*** (1%). I.e. The closer the property to the port, the more expensive the price. Corfu is a respectively big island with big distances to cover or the

Some general conclusions about the time distance from the properties to the port of each island are the following:

- For the bigger islands (with big distances to cover on the islands) the time distance to the ports are negatively very significant (1-5%) – the closer to the ports, the more expensive – apart from specific cases (e.g. Lesvos)
- For the smaller islands (with smaller distances to cover on the islands) or the islands that are relatively close to the capital, the time distance of the properties to the ports were not very significant – apart from specific cases (e.g. Paros – Milos – Salamina).

Moreover, a general conclusion regarding the time distances from the properties to the airport of each island is the following:
- For some of the islands, especially to the islands that have the biggest airports of the country; the time distance to the airport is positively very significant (1-10%) – the closer to the airport the less expensive the house properties are – apart from specific cases (e.g. Milos) – Probably this is because of the noise and the disturbance that it is created to the neighbourhoods around the areas of the airports.

island (592km^2). Moreover, it has one main port and the capital of the island is structured all around the port. Therefore, the more we leave the island's capital, the less expensive the prices to the villages far away from the capital.

There is positive significance to the airport* (10%). i.e. the closer the property to the airport, the less expensive the house houses around the airport area. Corfu has the 5th biggest island of the country and, therefore, this traffic probably causes noise and disturbance to the house properties next to the airport.

Kefallonia

There is negative significance to the port** (5%). i.e. the closer the property to the port, the more expensive. Kefallonia is the biggest island of the Ionian Sea (781km^2) and therefore big distances from one side of the island to the other. But, the island has three main ports: Argostoli, Sami and Poros. By making the assumption that the home owners are using the port that is closer to their

property (no matter the duration of the travel, the frequencies per week from this port and the destination port) the distances from the towns/villages to the port become smaller since there is relatively close to each town/village one of the ports of the island. Therefore, no significance was expected. But, there was negative significance, which means that, despite the presence of three ports on the island, the house properties to the areas around the three ports, the house prices are much more expensive compared with the rest of the island.

Regarding the airport of Kefallonia, there was no significance to the airport. The airport is to the South side of the island, not a quite busy airport to create much noise and disturbance.

Lefkada

To Lefkada island there is no significance to the house prices because of the one port considered (Nydri) from which is the connection to the rest of the Ionian Islands. Lefkada is the only Road connected Island of the Ionian Sea to the mainland of Greece. Therefore, the main transportation of the residents or visitors is performed through the bridge while they use the port only to be transferred to the neighbor islands (Kefallonia, Ithaki). For this reason, the time distance of the properties to the port of Nydri is not significant to the house prices of this island.

Lefkada does not have an airport itself but there is an airport quite close to the island (only 17 km) from the capital of Lefkada through the bridge.

Zante

There is no Significance to Zante island. Zante is a medium – sized island among the islands of Greece (406km^2) but most of the islands villages/towns are gathered to the South East part of the island since at the Northern and Western part of the island there are mountains and not many villages around them. Due to this concentration to the South East part of the island, the distances of the villages/towns to the capital and the port of the island are not significant.

Ithaki

Ithaki or Ithaca island is a quite small island (96km^2) in terms of distances of the villages from the island's main port and therefore, no significance to the house prices. Ithaki does not have an airport.

Dodecanese Islands

Rhodes

There is negative significance to the time distances of the house properties to the port*** (1% significance level). I.e. the closer the properties to the port, the more expensive they are. Rhodes Island is the biggest island of the Dodecanese group (1400.68km^2), one of the biggest islands of the country with big distances from one side of the island to another. The one main port is at the North edge of the island and the capital structured all around the port at the Northern side of the island. The proximity to the port and the capital of the island influences the house prices around the capital and the port significantly.

Regarding Rhodes's airport, it is the 3rd biggest airport of the country, and therefore, a quite busy airport that probably creates noise and disturbance to the areas around the airport and for this reason the house prices are less expensive around the airport.

Kos

There is no significance to the island's port. The island is a medium- sized island among the islands of Greece (290.3km^2) where the main port and the capital are at the Northern East side of it. The distances to cover on the island are not very large and there are no bid discrepancies to the house prices around the capital/port and the rest of the island.

However, Kos has the 6th busiest airport of the country which accommodates the also the rest of the neighbour smaller islands that do not have an airport. Therefore, Kos's airport is rather busy compared to the size of the island and this probably creates a lot of noise and disturbance to the house properties around it and makes them less expensive.

Kalymnos

There is no significance to the island's port. The island is a medium- sized island among the islands of Greece (110.58km^2) where the main port and the capital are at the Southern side of it. The distances to cover on the island are not very large and there are no bid discrepancies to the house prices around the capital/port and the rest of the island.

However, Kalymnos island, same as Kos's, seems to be rather busy for the island's size and this probably creates a lot of noise and disturbance to the house properties around it and makes them less expensive.

Patmos/ Symi/ Astypalaia/ Karpathos/ Leros

There is no significance to these islands' ports. The islands are medium to small sized islands among the islands of Greece (from 34.14-300.15km^2) where the distances are not quite big on the islands and this does not create any significance to the house prices across the islands.

Regarding Patmos, Symi and Karpathos they do not have airports on the islands. While considering Astypalaia and Leros' airports, they are not quite busy airports and therefore they don't affect the house prices of the properties around the areas of the airports.

Argo Saronic Islands

Salamina

Salamina island is an island of the Argo Saronic Gulf that it is very close to the capital of Greece, Athens – only 15 minutes by boat. It is also a relatively small island in terms of geographical size (95km^2) but because of its proximity to Athens – it constitutes one of Athens' suburbs – Salamina has a quite big population (approx. 39,000 permanent residents). Because of the island's size with small distances to cover on the island and compared to the rest of the islands with similar size, it was not expected for Salamina the time distances to the port to have significance. But because of the population of Salamina that greatly commutes to Athens on a daily bases throughout the year constitutes the port of Salamina and the capital that is next to it very significant***(1% significance level). The house prices around the port are rather expensive compared to the rest of the island and especially to the most distant areas from the port.

Ydra & Spetses

Ydra and Spetses are two islands of Argo Saronic Gulf that are relatively small in size (50 and 22.2 km^2 correspondingly) with small distances to cover on the islands. The main characteristic of

these two islands is that the use of the car is not allowed – only motorbikes – in order to maintain the tradition of these islands. The small distances of these islands do not really affect the house prices of the properties across the islands. Finally, neither of these two islands has an airport.

Sporades Islands

Skiathos

Sporades Islands are a group of quite small sized islands in the central part of Greece and where only Skiathos and Skyros have airports on the island. Among the group of the islands that are one very close to other (so leaving aside Skyros), only Skiathos has an airport. Despite the fact that the final sample available for Skiathos was quite small (only 21 properties), because of the importance of the island due to its amenities, I run the model for Skiathos to inspect the significance for it. Indeed, there is positive significance to the time distances to the port** (5% significance level) since this airport accommodates the rest of the islands of the group that do not have an airport and constitutes the specific airport quite busy for the size of the island that it is relatively small (48km^2). Therefore, for a small island like Skiathos, having a busy airport, probably creates noise and disturbance to the house properties around it.

Due to the busy airport of the island, there is a busy airport as well to commute from Skiathos island to the rest of the islands of the group, therefore, the closer the properties to the port, the more expensive the house prices on the island.

Alonnisos & Skopelos

Alonnisos and Skopelos are two islands of the Sporades group that are relatively small compared to the rest of the Greek islands (64.50 and 95.5 km^2 correspondingly). Therefore, the time distances of the house properties to the ports are not big and because of this the house prices are not affected because of the time distance of the properties to the ports. Finally, neither of these two islands have airport.

Skyros

Skyros island is a medium to small sized island (209.5km^2) with not very big distances to cover on the island. Moreover, since the Northern and the Southern parts of the island are full of mountains; the towns/villages are concentrated at the central part of the island which also makes the distances rather small. Therefore, the house prices are not affects from the time distance of the properties to the port.

Moreover, regarding the airport of the island, there is no significance to the house prices since the airport is located at the Northern edge of the island, relatively far from the main settlements so as not to create disturbance. But since the island is not quite big, it doesn't create any negative significance either.

North East Aegean Sea Islands

Chios

Chios island a relatively big sized island (842 km^2) with big distances from one side of the island to another. Moreover, it has one main port located at the central West side of the island while its capital is structured all around it. To this island the time distance of the house properties to the port is negatively very significant** (5% significance level) which means that the more we leave the capital and the port, the less expensive the properties are to the villages that are quite distant. Therefore, the proximity to island's capital and port affects the house prices and makes more expensive.

The airport of Chios is not one of the biggest airports and considering the size as well as the location of the villages/towns does not cause any disturbance and any discrepancy to the prices.

Lesvos

Lesvos island is the biggest island of the North East Aegean Sea group and among the biggest islands of Greece (1,636km^2) with big distances to cover on the island. For this reason and comparing it with other islands of similar size, it was expected that to Lesvos island the time distance of the properties to the port would affect the house prices as well. But from the results, the house properties of Lesvos were not affected by the time distances. This is probably due to: firstly, Lesvos island has a lot of big and rather beautiful villages and towns all around the island even distant from the capital of the island - Mytilini – and the port where the house prices are not less expensive. Secondly, I compared Lesvos island with similar sized islands as Rhodes and Corfu. As mentioned above, Corfu has the 5^{th} biggest airport of the country while Rhodes has the 3^{rd}. Lesvos' airport is not even in the top ten list with the airports of the country. This means that people travelling to Lesvos prefer to travel by boat rather than by airplane. But, travelling to Lesvos by boat is 13 hours trip, therefore, people who travel to this island after being 13 hours in the boat; they don't really mind of the 1-2 our driving to their properties.

Regarding the airport, as already mentioned, Lesvos' airport is not very busy, and therefore, it was not affecting the house prices around the airport districts.

Samos

Samos is a medium to big sized island (476km^2) with relatively big distances from the one side of the island to the other. But Samos island has 2 main ports – Vathi at the West side and Karlovasi at the East side of the island. This characteristic of Samos makes the time distances of all the villages/towns relatively close to one of the two ports. To this island, we make again the assumption that the home owners are making use of the port that it is closer to their properties (ignoring the the duration of the travel, the frequencies per week from this port and the destination port). Therefore, Samos by having 2 ports, the time distances of the properties to the ports do not affect the house prices.

Regarding Samos' airport it is located at the Southern side of the island relatively in the middle of the two ports, while it is not a busy airport creating disturbance to the settlements around it. Therefore, there is no significance to the time distances of the properties to the airport either.

Limnos

Limnos island is a medium sized island (476km^2) compared to the rest islands of Greece with one main port at the East side of the island. The villages/ towns are concentrated at the central part of the island by not making the time distances from the properties of each settlement to the other or to the port rather big.

The airport of the island is located in the centre of the island between the settlements but it is not among the busiest airports of the island, therefore, it doesn't affect the house prices of the properties around it.

Ikaria

Ikaria island is a medium sized island (255km^2) with 2 main ports – Evdilos and Agios Kurikos. This characteristic of Ikaria makes the time distances of all the villages/towns relatively close to one of the two ports. To this island, we make again the assumption that the home owners are making use of the port that it is closer to their properties (ignoring the the duration of the travel, the frequencies per week from this port and the destination port). Therefore, Ikaria by having 2 ports, the time distances of the properties to the ports do not affect the house prices.

Moreover, regarding the airport of the island, there is no significance to the house prices since the airport is located at the Northern West edge of the island, relatively far from the main settlements so as not to create disturbance. But since the island is not very big, it doesn't create any negative significance either.

Cyclades Islands

Initially, Cyclades islands are a group of islands that are relatively close to the Greek capital, Athens. They are numerous islands - some of them are very small in size – one close to another. Some of the Cyclades islands have quite increased tourism rate which the housing market of this group is rather heterogeneous including islands that are completely different in characteristics one from another. Since most of the islands are relatively medium to small in size (from 77 to 429km^2) no significance of the time distances of the properties to the port was expected. But, because of some particular island characteristics of some islands, there were some differentiated results.

Paros

Paros island is a medium sized island (196.31km^2) but among the biggest of Cyclades group. Paros's result was positive significance to port*** (1% of significance level), i.e. the closer to the port, the less expensive the house properties are. This happens to Paros probably because: Paros's port is located at the West side of the island where around it a town is formed called Paroikia. At the North side of the island there is a town called "Naousa" which is rather touristic, cosmopolitan and more expensive in house prices compared to Paroikia. Therefore, the more we leave the port and the town of Paroikia and the more we approach Naousa, the house prices become more expensive.

Regarding the airport of the island, it is located at the Southern west side of the island relative far from the main settlements. Moreover, it is not one of the busiest airports of the country and therefore, it probably does not create any serious disturbance issues to the residents and consequently any effect to the house prices around it.

Milos

Similar to Paros, for Milos island the time distance to the port is also positively significant** (5% significance level). This is probably created because Milos' capital and other main settlements are not formed around the port but in a distance from it. Moreover, to the Southern part of the island many of the most beautiful beaches and landscapes are located where the house prices are increased and they are quite far from the main port of the island. Therefore, the positive significance i.e. the more distant from port, the more expensive the house prices of Milos island.

Considering the airport of the island, there is a negative significance to the airport*** (1% significance level, i.e. the closer to the airport the more expensive the house prices around it. This is probably because: Milos' airport is located at the central part of the island and therefore closer to the very beautiful beaches and landscapes of the island. Furthermore, this airport is not a quite busy, so, taking all the above into consideration, there is negative significance to the airport.

Syros, Tinos, Thira, Kea, Kythnos, Naxos, Andros and Amorgos

As mentioned above, regarding the Cyclades group of islands, they are relatively small to medium sized islands (from 77 to 429km^2) with relatively small distances to cover on the islands and therefore no significance to the time distances to the ports is expected. Moreover, the Cyclades islands are relatively all close to another and close to the Greek capital.

Therefore, all these islands, although that have many different characteristics one from the other previous property variables, the $[\log(P_{i,j,k}) = \alpha + \sum\beta X_{i,j,k} + \varepsilon_{i,j,k}]$: time distance to Airport.

The next OLS regression included some island characteristics ($Z_{i,j,k}$) apart from the several property characteristics ($X_{i,j,k}$) as well $[\log(P_{i,j,k}) = \alpha + \sum\beta X_{i,j,k} + + \sum\gamma Z_{i,j,k} + \varepsilon_{i,j,k}]$

This model can be run several times including different combinations of variables characteristics for every island to observe the effect of each one on the house prices.

The next regression was run, included the fixed effects dummy variables (δ_j) one dummy for every island and excluding the island characteristics ($Z_{i,j,k}$) for co-linearity reasons $[\log(P_{i,j,k}) = \alpha + \sum\beta X_{i,j,k} + \delta_j \varepsilon_{i,j,k}]$

Finally, the last regressions that were performed included property characteristics, some island characteristics and the fixed effects dummy variables (Δ_k) one dummy for every group of islands $[\log(P_{i,j,k}) = \alpha + \sum\beta X_{i,j,k} + \sum\gamma Z_{i,j,k} + \Delta_k \varepsilon_{i,j,k}]$.

This last model can be run several times including different combinations of variables characteristics for every island.

(more than one port on the island, size, population, tourism, etc.), they do not show significance to the time distances of the properties to the ports and the airports (if applicable – if the islands have airports).

Results of the big model – all islands included

After running each island separately in E-views, there were a few trials of the general big model in Stata. As described in Data Analysis section, the first simple OLS regression included all 36 islands including the some property characteristics ($X_{i,j,k}$) only $[\log(P_{i,j,k}) = \alpha + \sum\beta X_{i,j,k} + \varepsilon_{i,j,k}]$ to all the islands (and therefore excluding the property characteristic time distance to airport which applies only to the islands that have an airport).

Then a second OLS regression was run including the islands that have an airport by running all the

The Results of these regressions are presented to the following table:

Variables/ Models	OLS (1a)	OLS (1b) With airport	OLS (2)	Fixed Effects j (3)	Fixed Effects (4a)	Fixed Effects (4b)
C	8.165*** (115.74)	8.093*** (97.97)	8.270*** (100.19)	8.176*** (106.91)	8.236*** (117.34)	8.092*** (96.68)
Log(living_space)	0.773*** (44.51)	0.764*** (37.85)	0.777*** (39.62)	0.793*** (42.56)	0.776*** (46.47)	0.784*** (40.73)
Log(land)	0.124*** (10.93)	0.141*** (10.54)	0.131*** (10.00)	0.101*** (8.02)	0.116*** (10.45)	0.123*** (9.62)
Pur	0.000 (0.06)	0.0003 (1.01)	0.000 (0.72)	-0.000 (-0.21)	0.000 (0.73)	0.000 (0.29)
Floor	-0.015** (-2.17)	-0.136* (-1.82)	-0.000 (-0.04)	0.001 (0.16)	-0.001 (-0.17)	-0.003 (-0.39)
T2	-0.173*** (-10.38)	-0.187*** (-9.59)	-0.210*** (-10.94)	-0.204*** (-11.19)	-0.207*** (-12.74)	-0.205*** (-10.95)
T3	0.065 (1.42)	0.865* (1.72)	0.088* (1.80)	0.830* (1.80)	0.043 (0.98)	0.081* (1.70)
Age	-0.002*** (-8.52)	-0.002*** (-7.27)	-0.003*** (-7.86)	-0.003*** (-8.70)	-0.002*** (-8.74)	-0.002*** (*7.62)
Time_distance_to_port	-0.0047*** (-9.31)	-0.001 (-0.87)	-0.002*** (-2.88)	-0.004*** (-4.25)	-0.004*** (-7.43)	-0.004*** (-4.38)
Time_distance_to_airport	-	-0.005*** (-6.12)	-0.002*** (-2.64)	-0.001 (-0.97)	-	-0.001 (-0.78)
Presence of Airport	-	-	-	-	0.014 (0.57)	-
Presence of Hospital	-	-	-362*** (-11.95)	-	-0.271*** (-7.81)	-0.189*** (-4.85)
Presence of University	-	-	-0.037 (-1.26)	-	0.048 (1.27)	-0.043 (-1.09)
Population	-	-	0.002*** (5.34)	-	-0.000 (-0.63)	0.002*** (3.38)
Geographical Size	-	-	-6.54E-06 (-0.23)	-	0.0001*** (4.35)	0.0001*** (2.92)
R^2	**0.563**	**0.589**	**0.613**	**0.659**	**0.605**	**0.630**
Adj. R^2	**0.562**	**0.586**	**0.611**	**0.656**	**0.603**	**0.628**
Observations	**4,357**	**3,168**	**3,168**	**3,168**	**4,357**	**3,168**

The Results of these regressions need to be interpreted carefully as well as running several other regressions by including several combinations of variables, islands, fixed effects, etc.

Conclusions

This research considers the effect of the local public amenities (port/ airport/ hospital/ university) on the assessed house prices of the Greek islands. By examining 36 islands of Greece, we are trying to identify the significance of the presence (of all the above amenities) and the time distance of the properties to ports and airports. The model controls several property characteristic (structural and locational) as well as economic, locational and demographic characteristics of the islands. It is the first academic research on the housing market of the Greek islands and it also tries to explain the several variables and factors that the evaluators are influenced by in terms of amenities when assessing house properties in the Greek islands but there variables are not included into their criteria list.

The islands of Greece that are the selected geographical area, constitute a unique area on the planet as they constitute hundreds of pieces of land in the sea belonging in the same nation (laws, policies, tradition, culture, economy, etc.) but with lots of different characteristics from island to island. Some of them especially during the winter period are rather difficult to approach areas. Finally, it is very important to mention the

heterogeneity of this specific housing market as the islands are very different one from the other having completing different characteristics.

The literature review of this research is based on the housing market attributes of all housing markets around the world focusing on the most characteristic attributes that describe the housing market of the Greek islands which are: the heterogeneity of the islands as mentioned above, the several external effects that differentiate each island as well as the immovability of the difficult to approach areas that constitute the need for public amenities even more important. Moreover, the needs for amenities are described to the housing markets globally as well as their impact on the housing demand and consumption. Regarding the Greek islands, the formation of the communities (for trade, defense, architectural restrictions purposes, etc.) and their impact to the house prices are examined as well as the islands' role of transportation, hospital care and higher education.

A hedonic regression approach has been followed to identify the influence of the several property characteristics ($X_{i,j,k}$) including the time distance of the house properties to the port/ airport as well as a set of island characteristics ($Z_{i,j,k}$) – such as the population, the geographical size, the presence (dummies) of the several amenities, the time distance from the capital, etc. - of the assessed house prices of the Greek islands.

A big dataset of house properties in the Greek islands was collected from the Bank of Greece along with several property characteristics. Furthermore, secondary data were collected from the Hellenic Statistic Authority including information about the latest provisional population census as well as information about the sea and air transportation regarding the connection of the islands with the capital and the Greek mainland from a travel agency.

The Data Analysis started by cleaning the dataset, spotting the house properties in Google Earth (the hardest and most time-consuming process), calculating the time distances of the properties to the islands' ports/airports and finally applying the Hedonic Regression Models to the data set in 2 steps: the first step included the hedonic models of each island separately in E-views to identify the significances of the several property characteristics and the time distances to ports/ airports on the house prices of each island; and secondly, to apply the hedonic regression models in Stata including simple OLS and fixed effects approach for each island and each group of islands for all islands together.

The Provisional Results of this research confirmed the huge heterogeneity of the market of the Greek islands, the significant effect of several property structural, locational, demographic, etc. characteristics but most importantly, the significant role of the public amenities because of their presence and their time distance on the house prices of the properties.

Future Work

- Splines to the Age, the Living Space and the Time Distance to the port and the airport.
- The exact interpretation of the influence of the variables to the house prices
- Improve the big model with all the islands included by trying several combinations of island characteristics as well as the Fixed Effects.

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1.9 Appendix

1.9.1 Tables

Table 1.1 Hospital Provision in the Islands of Greece

HOSPITAL PROVISION					
No.	**ISLAND**	**No. OF PROPERTIES (sample)**	**PERMANENT POPULATION**	**GEOGRAPHIC SIZE (in km2)**	**PUBLIC GENERAL HOSPITAL CARE (dummy variable)**
1	**RHODES**	503	115.290	1.400,68	1
2	**CORFU**	359	101.080	592,00	1
3	**LESVOS**	347	85.330	1.636,00	1
4	**KEFALLONIA**	236	35.590	781,00	1
5	**ZANTE**	205	40.650	406,00	1
6	**SAMOS**	217	32.760	476,00	1
7	**CHIOS**	194	51.320	842,00	1
8	**KOS**	157	33.300	290,30	1
9	**SYROS**	132	21.390	84,07	1
10	**KALYMNOS**	104	16.140	110,58	1
11	**LEFKADA***	95	22.710	325,00	1
12	**NAXOS**	80	19.440	429,00	0
13	**TINOS**	79	8.590	194,59	0
14	**PAROS**	67	13.710	196,31	0
15	**THIRA**	69	15.250	76,19	0
16	**LIMNOS**	70	17.000	476,00	0
17	**ANDROS**	166	9.170	379,70	0

18	**LEROS**	56	8.130	54,05	1
19	**MYKONOS**	160	10.190	86,13	0
20	**ITHAKI**	85	3.180	96,00	0
21	**KARPATHOS**	26	6.160	300,15	0
22	**SKIATHOS**	21	6.110	48,00	0
23	**KEA**	85	2.420	131,69	0
24	**MILOS**	77	4.960	150,60	0
25	**SKOPELOS**	68	4.830	95,50	0
26	**IKARIA**	20	8.410	255,00	0
27	**PATMOS**	67	8.130	34,14	0
28	**ALONISSOS**	49	2.800	64,50	0
29	**SYMI**	34	2.580	57,87	0
30	**AMORGOS**	37	1.940	121,46	0
31	**KYTHNOS**	15	1.310	99,43	0
32	**ASTYPALAIA**	25	1.310	96,90	0
33	**SKYROS**	78	2.960	209,50	0
34	**SPETSES**	84	4.070	22,2	0
35	**SALAMINA**	251	39.220	95,00	0
36	**YDRA**	21	1.980	50,00	0
	TOTAL	**4.369**	**754.320**	10.762	12

Table 1.2 Airport Provision in the Islands of Greece

AIRPORT PROVISION					
No.	**ISLAND**	**No. OF PROPERTIES (sample)**	**PERMANENT POPULATION**	**GEOGRAPHIC SIZE (in km2)**	**AIRPORT PRESENCE (dummy variable)**
1	**RHODES**	503	115.290	1.400,68	1
2	**CORFU**	359	101.080	592,00	1
3	**LESVOS**	347	85.330	1.636,00	1
4	**KEFALLONIA**	236	35.590	781,00	1
5	**ZANTE**	205	40.650	406,00	1
6	**SAMOS**	217	32.760	476,00	1
7	**CHIOS**	194	51.320	842,00	1
8	**KOS**	157	33.300	290,30	1
9	**SYROS**	132	21.390	84,07	1
10	**KALYMNOS**	104	16.140	110,58	1
11	**LEFKADA***	95	22.710	325,00	0
12	**NAXOS**	80	19.440	429,00	1
13	**TINOS**	79	8.590	194,59	0
14	**PAROS**	67	13.710	196,31	1
15	**THIRA**	69	15.250	76,19	1
16	**LIMNOS**	70	17.000	476,00	1
17	**ANDROS**	166	9.170	379,70	0
18	**LEROS**	56	8.130	54,05	1
19	**MYKONOS**	160	10.190	86,13	1
20	**ITHAKI**	85	3.180	96,00	0
21	**KARPATHOS**	26	6.160	300,15	0
22	**SKIATHOS**	21	6.110	48,00	1

23	**KEA**	85	2.420	131,69	0
24	**MILOS**	77	4.960	150,60	1
25	**SKOPELOS**	68	4.830	95,50	0
26	**IKARIA**	20	8.410	255,00	1
27	**PATMOS**	67	8.130	34,14	0
28	**ALONISSOS**	49	2.800	64,50	0
29	**SYMI**	34	2.580	57,87	0
30	**AMORGOS**	37	1.940	121,46	0
31	**KYTHNOS**	15	1.310	99,43	0
32	**ASTYPALAIA**	25	1.310	96,90	1
33	**SKYROS**	78	2.960	209,50	1
34	**SPETSES**	84	4.070	22,2	0
35	**SALAMINA**	251	39.220	95,00	0
36	**YDRA**	21	1.980	50,00	0
	TOTAL	**4.369**	**754.320**	10.762	21

Table 1.3 Higher Educational Institutions in the Islands of Greece

HOSPITAL PROVISION					
No.	**ISLAND**	**No. OF PROPERTIES (sample)**	**PERMANENT POPULATION**	**GEOGRAPHIC SIZE (in km2)**	**HIGH EDUCATION (dummy variable)**
1	**RHODES**	503	115.290	1.400,68	1
2	**CORFU**	359	101.080	592,00	1
3	**LESVOS**	347	85.330	1.636,00	1
4	**KEFALLONIA**	236	35.590	781,00	1
5	**ZANTE**	205	40.650	406,00	1
6	**SAMOS**	217	32.760	476,00	1
7	**CHIOS**	194	51.320	842,00	1
8	**KOS**	157	33.300	290,30	0
9	**SYROS**	132	21.390	84,07	1
10	**KALYMNOS**	104	16.140	110,58	0
11	**LEFKADA***	95	22.710	325,00	1
12	**NAXOS**	80	19.440	429,00	0
13	**TINOS**	79	8.590	194,59	0
14	**PAROS**	67	13.710	196,31	0
15	**THIRA**	69	15.250	76,19	0
16	**LIMNOS**	70	17.000	476,00	1
17	**ANDROS**	166	9.170	379,70	0
18	**LEROS**	56	8.130	54,05	0
19	**MYKONOS**	160	10.190	86,13	0
20	**ITHAKI**	85	3.180	96,00	0
21	**KARPATHOS**	26	6.160	300,15	0
22	**SKIATHOS**	21	6.110	48,00	0

23	**KEA**	85	2.420	131,69	0
24	**MILOS**	77	4.960	150,60	0
25	**SKOPELOS**	68	4.830	95,50	0
26	**IKARIA**	20	8.410	255,00	0
27	**PATMOS**	67	8.130	34,14	0
28	**ALONISSOS**	49	2.800	64,50	0
29	**SYMI**	34	2.580	57,87	0
30	**AMORGOS**	37	1.940	121,46	0
31	**KYTHNOS**	15	1.310	99,43	0
32	**ASTYPALAIA**	25	1.310	96,90	0
33	**SKYROS**	78	2.960	209,50	0
34	**SPETSES**	84	4.070	22,2	0
35	**SALAMINA**	251	39.220	95,00	0
36	**YDRA**	21	1.980	50,00	0
TOTAL		**4.369**	**754.320**	10.762	10

Table 1.4 Higher Educational Institutions in the Islands of Greece (Universities – Technical Institutions)

HIGH EDUCATION IN THE ISLANDS			
Island:	**Institution**	**School**	**Department**
LESVOS	**University of the Aegean**	Social Sciences	Social Anthropology and History
			Geography
			Sociology
			Cultural Technology and Communication
		Environment	Environment
			Marine Sciences
LIMNOS	**University of the Aegean**	Environment	Food and Nutrition Sciences
CHIOS	**University of the Aegean**	Business	Business Administration
			Shipping, Trade and Transport
			Financial and Management Engineering
SAMOS	**University of the Aegean**	Sciences	Mathematics
			Information and Communication Systems Engineering
			Statistics and Actuarial-Financial Mathematics
RHODES	**University of the Aegean**	Humanities	Primary Education
			Pre-school Education and Educational Design
			Mediterranean Studies
SYROS	**University of the Aegean**		Product & Systems Design

CORFU	**Unit of Syros** **Ionian University**	Engineering
		History
		Foreign Languages, Translation and Interpreting
		Music Studies
		Archival and Library Sciences
		Informatics
		Audio and Visual Arts
		Asian Studies
KEFALONIA	**Technological Educational Institute of Ionian Islands**	Public Relations & Communication
		Business Administration
		Sound and Musical Instruments Technology
		Organic Farming and Food Technology
ZANTE	**Technological Educational Institute of Ionian Islands**	Environmental Technology and Ecology
		Protection and Conservation of Cultural Heritage
LEFKADA	**Technological Educational Institute of Ionian Islands**	Applications of Information Technology in Administration and Economy
		Information Technology and Telecommunications

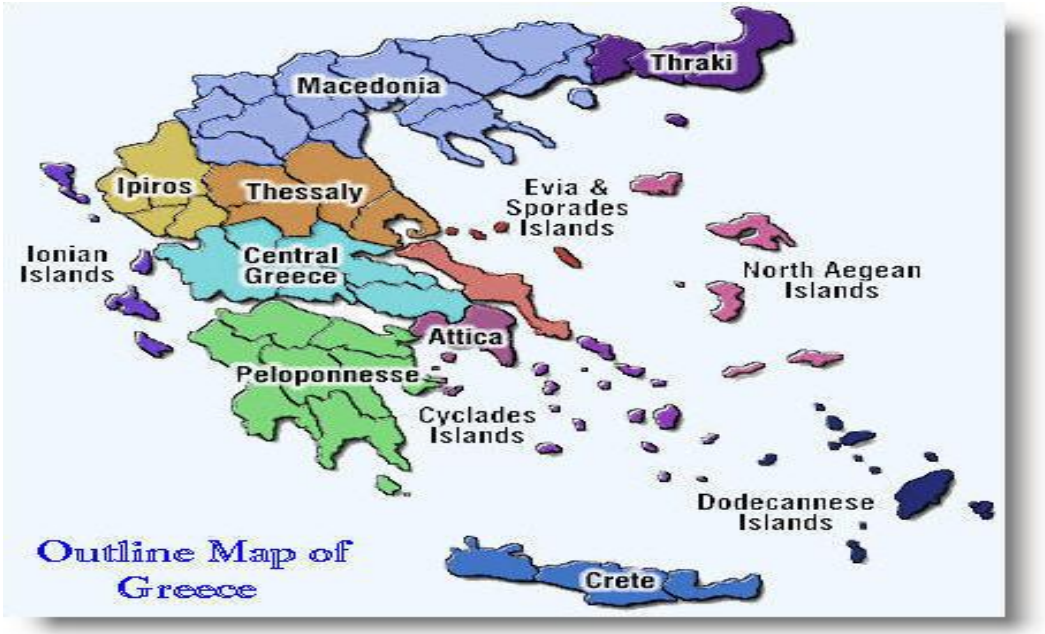
Table 1.5 Data set specification variables – Bank of Greece

Property ID
Property Type
Street
Postal Code
Municipality
District
Prefecture
ISLAND
Land area (m^2)
Main space area(m^2)
Excellent position VIEW environment (dummy)
Property total assessed value
Store rooms assessed values
Parking spaces assessed values
Total construction cost
Total administrative value
Loan type

Figure 1.1 Map of Greece

Source: Google images (picture used from: http://www.greece-map.net/)

Figure 1.2 Map of the group of Islands



Source: Google images (picture used from: http://mappery.com/Map-of-Greece)

Figure 1.3 Ionian Sea Islands

Source: Google images (picture used from: http://www.ionian-islands.org/map.htm)

Figure 1.4 North Aegean Sea Islands

Source: Google images (picture used from: http://greeceathenstours.odysseygreektravel.gr/greece/content/view/138/1/lang,en/)

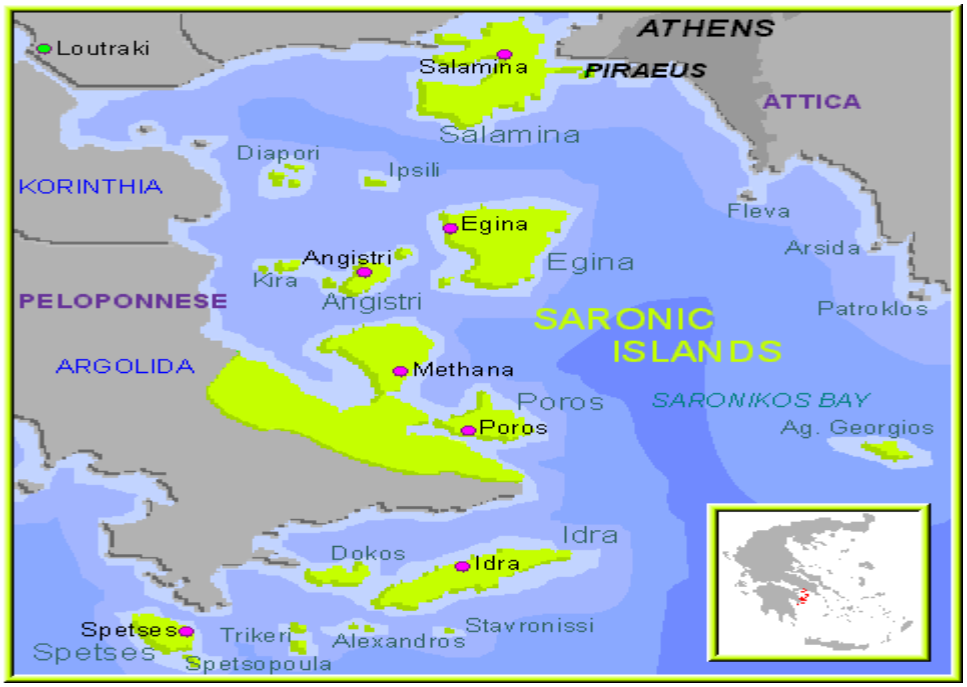
Figure 1.5 Sporades Islands

Source: Google images (picture used from: http://greeceholidays.biz/travelguide/all-destinations/sporades-islands.html)

Figure 1.6 Cyclades Islands

Source: Google images (picture used from: http://www.greece-travel.gr/cyclades_map.htm)

Figure 1.7 Argo – Saronic Islands



Source: Google images (picture used from: http://cymvolon.com/news/2012/06/geography-argo-saronic-hellas-index/)

Figure 1.8 Dodecanese Islands

Source: Google images (picture used from: http://www.greece-map.net/dodecanese.htm)

Figure 1.9 Spotting the properties in Google Earth (approximately)

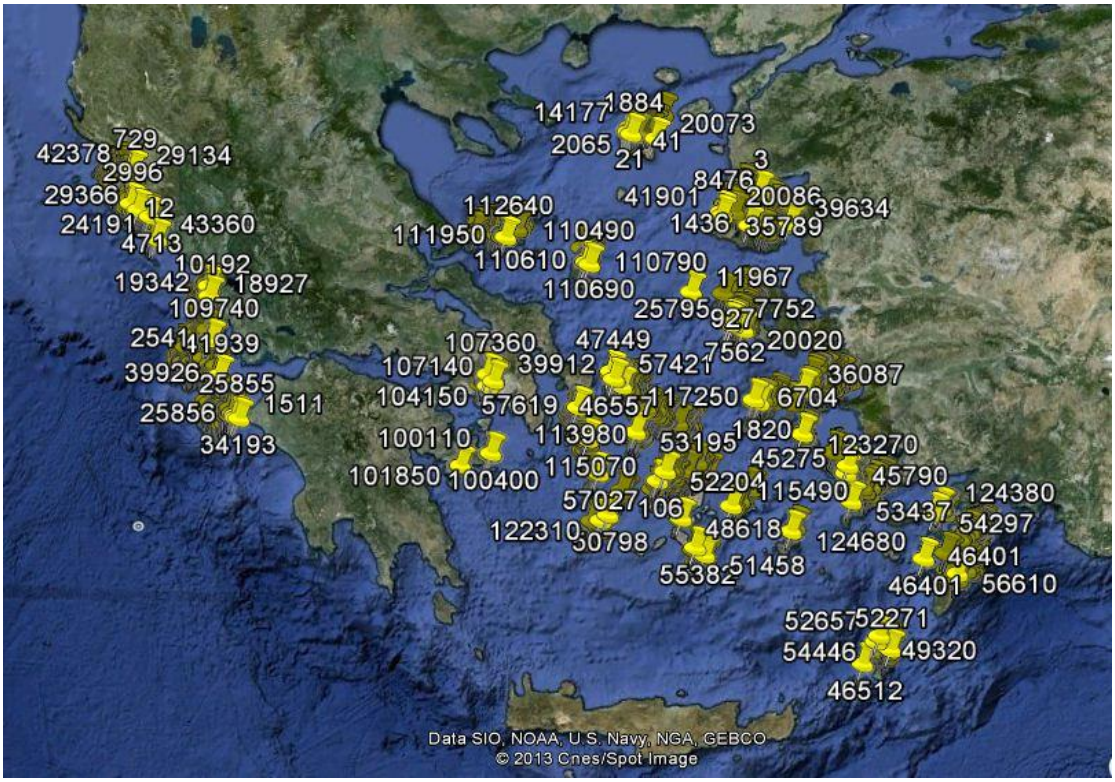
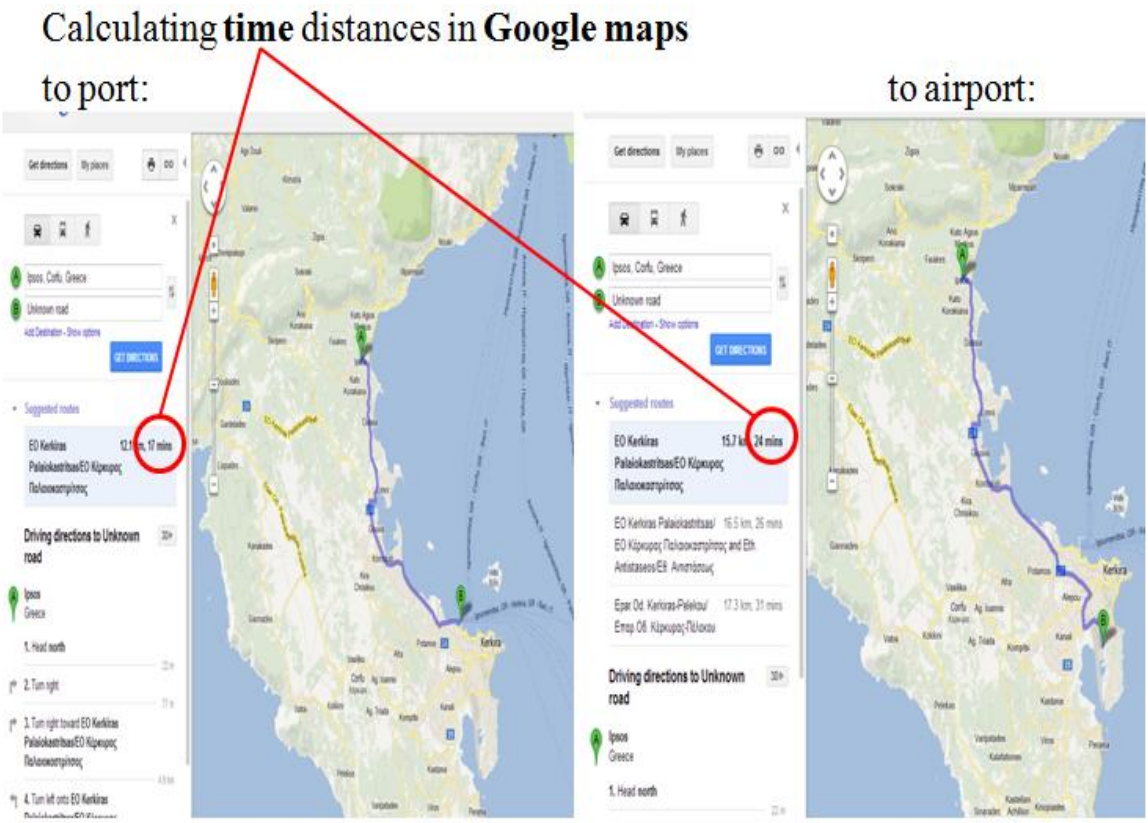


Figure 1.10 Islands in Google Earth

Figure 1.11


Calculating time distances in Google maps
to port:
to airport:
Get directions
My places
Ipsos, Corfu, Greece
Unknown road
GET DIRECTIONS
Suggested routes
EO Kerkiras
Palaiokastritsas/EO Kipkupos
Παλαιοκαστρίτσας
Driving directions to Unknown road
Ipsos
Greece
1. Head north
2. Turn right
Kerkira