| TUESDAY  
JUNE 25 | ROOM C |
|---------------|-------------|
| ENVIRONMENTAL ECONOMICS I  
CHAIRS: K. Aravossis, T. Pelagidis |
| 09:00 – 09:30  
Invited speaker  
Assessing the status of Greece’s economy and the austere policies implemented during 2010-2013. Identifying key policy challenges for the future  
T. Pelagidis |
| 09:30 – 09:45  
An environmental and economic analysis of waste transportation strategies in remote islands  
T. Zis, A. Tolis, and K. Aravossis |
| 09:45 – 10:00  
Estimating the willingness to pay of Thessaloniki’s residents for the increase of the green spaces and exploring its effects to the real estate values  
A. Xifilidou, D. Vagiona, N. Karanikolas |
| 10:00 – 10:15  
The Macroeconomic Impact of “Green” Investments on the Greek Economy: a Sectoral Approach (2010-2020)  
P. G. Michaelides, M. Markaki, A. Belegri-Roboli, S. Mirasgedis, D. P. Lalas |
| 10:15 – 10:30  
Economic, financial and technical issues of wind power generators for the transition to a zero carbon economy  
G. Varympopiotis, P. Papakonstantinou, A. Tolis, A. Rentizelas, K. Aravossis |
| 10:30 – 10:45  
Social cost benefit analysis of Renewable Energy Sources in Greece: The European project Helios case  
P. Vergoulis, S. Georgali, A. Mantikos and I. Michalopoulos |
Estimating the willingness to pay of Thessaloniki’s residents for the increase of the green spaces and exploring its effects to the real estate values

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Abstract
The beginning of the shift of urban planning towards the creation of urban green spaces has been observed during the 20th century due to the urbanization and the degradation of the environment. The percentage of green areas for the Municipality of Thessaloniki reaches 2.19 m²/prs. Therefore, the need for more green spaces despite their size is mandatory. This study, which is based on a sample of 100 people, either working or living in the center, estimates their willingness to pay (WTP) for more green spaces, the amount that they are willing to pay each month as a municipality and the increase in values that they are willing to accept as a result of the increase of the green spaces. The study is based on two models: a WTP model and a hedonic model for the increase in values. The area of residence, the working area, the education, the outdoor activities, the satisfaction with the existing recreational areas, the amount of payment and the income are the variables entered. Different factors influence the two models, with the effect of the economic crisis being present in the responses, providing a general view of how the city’s central users perceive the above issue.

Keywords: Real estate, Green spaces, WTP, hedonic model, Thessaloniki

1. INTRODUCTION

The benefits that green spaces provide are priceless and extend to social, economic and environmental level. Their integration in the city and the natural environment express and define simultaneously its identity and gradually become some of its irreplaceable symbols. The city’s needs determine their size and location at a great extent. In combination to this, the structure of a park, the sense of safety and the utilization of the non-biotic elements, as water, sun and wind, are very important [1].

The Municipality of Thessaloniki has a population of 356000 residents and it is estimated that the percentage of green per person is 2.19 m²/prs [2]. None of the green spaces exceed half hectare, a fact that represents the breakup of the green, decreases their exploitation opportunities and, therefore, makes their management more difficult. The largest green area is present at the Aristotle University and covers 25.75 ha out of 42.9 ha that exist in the whole municipality [3].

Green spaces increase the value of properties and the commercial value for shops and spaces for commercial uses. The increase can reach 20% for residential uses and 12% for commercial uses [4]. An urban park increases the value up to 2% at a distance of 150 m, a natural park up to 19% and a park for special uses up to 15.4% [5]. As far as suburban areas are concerned, values of properties with view of a forestry area increase up to 4.9% and drop up to 5.9% for each km distance from such areas [6]. Moreover, if a property is located near a wetland within a park or a lake, the increase reaches: 5.9%, 3.5% and 0.9 for a distance of 160 m, 500m and 1600 m respectively [7].
2. METHODOLOGY

The two methods that are used are WTP and hedonic model. The main tool of WTP method is special constructed questionnaires in which a hypothetical scenario is presented and described comprehensively to the respondents so that they are capable of answering general questions about the state of the area and whether they are Willing to Pay (WTP) an amount for its improvement or whether they are Willing to Accept (WTA) a certain degradation of the environment [8]. Hedonic pricing method is widely used in the real estate market and, especially, for measuring which is the influence of certain factors, mainly non-use values, to the real estate values [9]. The idea of the hedonic pricing method is evaluating the influence that a marketed good appears to have from the characteristics or services of a non-use or non-marketed good. The concept of the model is almost the same with the one used for WTP-WTA methods. Respondents answer to a special designed questionnaire and a regression model is conducted.

The historical center of Thessaloniki is the study area. As the area presents a quite low percentage of green/prs, it is interesting to investigate the resident’s willingness to pay for the creation of more green spaces and the increase in real estate values. Specially formed questionnaires were conducted and distributed to 100 users of the area (residents, workers and visitors). In order to organize the collected data so as to comply with the needs of the above mentioned models, SPSS Statistics Software was used. The questions referred to their residence area, their working area, their education, their income, whether their free-time activities include outdoor ones or not and whether they are satisfied with the existing recreational areas. Their willingness to pay for the increase of green spaces, the amount that they are willing to pay and the increase in values that they expect and accept to appear by the increase of the green are also examined.

Firstly, a WTP model was conducted with the eight variables so as to determine whether they are willing to pay, which factors influence this decision as well as the amount of payment. Secondly, a hedonic model was developed with all the variables in the model so as to analyze which factors influence the accepted increase in values. Apart from the variables, though, economic crisis and its effects on the real estate values cannot be ruled out. Real estate market in Greece is inactive at the moment, even if the idea of good investment by buying a property for residential or commercial uses in order to rent it or not was the main initiative. Nowadays, when the taxes for even one property are creating the opposite results, the demand for properties for all uses has dropped quite significantly but not strongly enough yet [10].

4. RESULTS AND DISCUSSION

The derived models are based on a 100 sample of respondents. An error of estimation less than 10% is accepted. It is worthy mentioned that there was only one outlier and all the other variables were suitable for both models. This fact is explained by the special economic period that exists in Greece and shows that the answers were seriously considered, mainly due to the fear of having to pay more taxes or dues in the future.

The WTP model is based on a logistic regression. The entered variables in the model are WillTPay, ResidArea, WorkArea, Education, FreeTime, RecrAreas (recreational areas), AmWillTPay (amount to pay) and Income. However, only the variables “FreeTime”, “RecrAreas” and “Income” remained in the model, as their significance level is lower than 10%. The variable “AmWillTPay” was finally excluded from the analysis, as although it played quite an important role in the model, it was not the main influential factor. This is one of the main advantages of the model as the respondents did not have to answer the question “if more green spaces exist, what are you going to pay for them?” but they were asked if they are going to use these spaces or not. Moreover, the belief that these green
spaces will never be conducted, due to the economic situation and the inability of the Greek authorities, as well as the decrease in their income did not hypothetically influence their answers of accepting an amount to pay. These are the reason for which the WTP model is more reliable and represents the real situation.

Table 1 shows the percentage of correct predicted values according to the two answers (Yes/No) to the question ‘Are you willing to pay for the increase of parks (green spaces)?’. The overall percentage shows the suitability as far as the predictive power of the model is concerned. The percentage of 85.9% is highly satisfactory.

<table>
<thead>
<tr>
<th>Observed</th>
<th>Willingness to pay for the parks</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Step 3</td>
<td>Willingness to pay for the parks</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Overall Percentage</td>
<td></td>
</tr>
</tbody>
</table>

The cut value is .500

Table 2 shows the influence each variable has on the willingness to pay. Specifically, each positive answer to the “FreeTime” variable increases the willingness to pay by 0.639, when, on the contrary, each positive answer to the “Recrareas” variable decreases the willingness to pay by 0.408. The SE shows the value for the standardized error, the Wald column shows the values on which the test of statistical significance of $X^2$ distribution is based on. Finally, all variables have a significance level lower than 0.05. Therefore, they are all considered statistically important.

<table>
<thead>
<tr>
<th>Step 3</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeTime</td>
<td>5.159</td>
<td>1.140</td>
<td>20.478</td>
<td>1</td>
<td>.000</td>
<td>174.039</td>
<td>18.629</td>
</tr>
<tr>
<td>RecrAreas</td>
<td>-5.019</td>
<td>1.313</td>
<td>14.610</td>
<td>1</td>
<td>.000</td>
<td>.007</td>
<td>.001</td>
</tr>
<tr>
<td>Income</td>
<td>.466</td>
<td>.238</td>
<td>3.822</td>
<td>1</td>
<td>.051</td>
<td>1.594</td>
<td>.999</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.934</td>
<td>1.019</td>
<td>8.297</td>
<td>1</td>
<td>.004</td>
<td>.053</td>
<td></td>
</tr>
</tbody>
</table>

c. Variable(s) entered on step 3: Income.

The function of the model is:
\[ \text{WillTPay(WTP)}=-2.934+5.159\text{FreeTime}-5.019\text{RecrAreas}+0.466\text{Income} \]

The hedonic model analyzes the influence of the increase of green spaces to real estate values. The model is based on linear regression analysis.

The entered variables in the model are IncrValues (% of accepted increase in real estate values), WillTPay ResidArea, WorkArea, Education, FreeTime, RecrAreas (recreational areas), AmWillTPay (amount to pay) and Income. The R coefficient (83%) indicates the correlation between observed and predicted values of the dependent variable. The indicator R square (68.9%) shows the percentage of dispersion that can be interpreted by the dependent variable. Both
indicators are considered satisfactory. The value of the adjusted R square (68.2%) shows a satisfactory predictive power of the regression model.

### Table 3. Model Summary

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.830</td>
<td>.689</td>
<td>.682</td>
<td>1.21361</td>
<td>1.910</td>
</tr>
</tbody>
</table>

Table 4 is the most important after the test of predictive ability of the model. It indicates the amount of influence of each variable on the dependent variable. Specifically, each positive answer to the “AmWillTPay” variable increases the accepted increase in real estate values by 0.124, while the “Income” variable increases it by 0.526.

### Table 4. Coefficient Table

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized Coefficients</th>
<th>t</th>
<th>95,0% Confidence Interval for B</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td></td>
<td>Lower Bound</td>
</tr>
<tr>
<td>(Constant)</td>
<td>-1.375</td>
<td>.452</td>
<td>-3.041</td>
<td>-2.273</td>
</tr>
<tr>
<td>AmWillTPay</td>
<td>.124</td>
<td>.033</td>
<td>3.745</td>
<td>.058</td>
</tr>
<tr>
<td>Income</td>
<td>.526</td>
<td>.176</td>
<td>2.985</td>
<td>.176</td>
</tr>
</tbody>
</table>

The function of the hedonic model is:

\[ \text{IncrValues} = -10375 + 0.124 \times \text{AmWillTPay} + 0.526 \times \text{Income}. \]

It is noticeable that only the clearly economic variables were entered in the model. The fact that the increase in real estate values is most probable to happen in combination with the existing bubble of the values for at least 8 years before the economic crisis explains the answers of the respondents. Employment, unemployment and population play almost a insignificant role, a fact that proves that there is a real estate value bubble until now and there is no interest for transactions even in densely populated areas [11,12,13]. Moreover, the taxation for a property averts the selection for investment in a property. Others have not repaid their loans yet and the ones that want to take a loan are blocked by the banks which have closed their liquidity tubes [14]. Lastly, it is worthy mentioned that the B coefficient of the constant variable is much higher than of the other two. This is due to the fact that the increase or decrease in values mostly depends on the constructors and the sellers will, indicating that real estate values are still very high, despite the current economic crisis.

The reliability of the model is the next important test.

- Independence test
  Durbin-Watson indicator identifies if the variables are positively, negatively or not at all correlated, as wanted. When values fluctuate between 1.5 and 2.5, the variables are independent and no related problem exists in the model. In this case, the value is 1.910 (Table 3).
- Residuals’ normality test
  In every linear regression analysis, the existence of outliers is very dangerous for the stability and the accuracy of the model. Figure 1 and 2, which include the std. residuals, state clearly that approximately normality is satisfied.
- Linearity test
  Both charts are sufficient for the linearity test.
- Collinearity test
The indicators used for the collinearity diagnostics are the Tolerance factor and VIF. If the tolerance factor is near 1, then no problem of collinearity is observed. In this case of study, both indicators prove the absence of collinearity or multicollinearity.

To summarize, the economic crisis has altered citizens’ everyday decisions in quite an interesting way. The amount of taxes, the decrease in the income and the remaining high prices of goods of every category [15] have decreased their willingness to pay more, even for an amenity that would improve their quality of life either directly or indirectly. On the contrary, willingness to pay is influenced by the income, if the respondent uses the green spaces in their free time and if they are satisfied with the existing spaces in Thessaloniki. The residential or working area did not play any significant role, as the respondents did not care about these areas, but they considered the fact that an additional amount of payment would be added to their budget. A very interesting factor is that of the education. The most expected correlation is that generally a most educated person would appreciate more the advantages of the green spaces and its positive effects to the environment. Moreover, the economic and non-economic needs for the preservation and management of such places would be easier to be appreciated. This WTP model didn’t validate this theory.

As far as the hedonic model is concerned, the findings are more complicated. Property possession was and, in some cases, is considered the safest investment in Greece. This idea in combination with the economic bubble caused the real estate values to increase extremely [16]. These are the reasons for which all factors except the income and the amount of money to pay were excluded from the hedonic model. Even until now, with the economic crisis being present, real estate values have not dropped significantly, especially for the new properties. Therefore, respondents are not willing to accept a great increase in values, a fact that is proved by the B coefficient of the constant variable. If the other two variables were zero, the percentage of increase in values would be negative.

4. CONCLUSIONS

Property values increase by the existence of green spaces. This study has proved that when a financial crisis or any other outstanding global event appears none of the regular reactions of the citizens as far as their quality of life remains the same. Nowadays, the desire not to lose any more from their budget is the main initiative for participating and offering for an amenity. At this point, it is worth mentioning that many of the responders complained that the creation of more green spaces is an obligation of the local authorities and that they have already contributed a lot of money to the
municipalities and the government. So, even without the economic crisis, the unwillingness to pay for something that should be offered already would be presumed.

Real estate values have been very high for at least 8 years before the crisis. Their increase and the constructors’ profit were so high that even after 4 years of financial crisis, values have not dropped significantly. On the other hand, private sellers want to sell their properties for two main reasons: the taxation, which has reached the point where a property is not such a good investment, and, the repayment of loans, as many people took loans to invest in businesses or properties which have gone bankrupt [17].

References