SERIE RESEARCH MEMORANDA

CULTURE AND REGION

A MULTIDIMENSIONAL EVALUATION OF MONUMENTS

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Researchmemorandum 1987-71 december 1987

VRIJE UNIVERSITEIT
FACULTEIT DER ECONOMISCHE WETENSCHAPPEN
EN ECONOMETRIE
AMSTERDAM

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A Multidimensional Evaluation of Monuments

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Paper presented at the 27th
European Conference of the
Regional Science Association,
Athens, August 1987

PN/652/mvk

Culture and Region

A Multidimensional Evaluation of Monuments

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This paper addresses the issue of assessing the compound socio-economic and historico-cultural values of monuments. Monuments are part of the historical and cultural heritage of a country, region or city. They are a potential source of economic development (e.g. by means of tourism), but they also have their own indigenous value.

The paper makes a plea for planning for preservation of our cultural heritage by emphasizing the intangible attributes of urban monuments. In this context, the notion of option value plays an important role.

The actual compound evaluation of cultural monuments based on both user value and option value is then undertaken by means of a recently developed multicriteria technique for qualitative assessment, viz. the regime method. The method is briefly described and next applied to evaluate the socio-economic and functional-urban value as well as the historico-cultural value of 20 churches in the city of Thessaloniki. The results are presented in visual form by means of some diagrams, based on three different types of scenarios. These outcomes appear to be reasonably robust across all scenarios.

Finally, the paper is concluded with some prospective remarks on the use of such methods in the broader context of monument restoration policy.

1. Introduction

The assessment of the socio-economic and historico-cultural value of urban monuments is fraught with many difficulties. Monuments represent part of the historical and cultural heritage of a country or city, and do not usually offer a direct productive contribution to the economy. Clearly, tourist revenues may sometimes reflect part of the interest of society in monument conservation and/or restoration, but in many cases this is a biased and incomplete measure, so that monument policy can hardly be based on tourist values. On the contrary, in various places one may observe a situation where large-scale tourism (sometimes marked by congestion) does affect the quality of a cultural heritage (Venice, e.g.).

There is another reason why a solid analysis of the value of monuments is of utmost importance. In many cities all over the world we are observing a period of rapid transition. In some cities a continued population growth or a new infrastructure means a threat for the traditional city centre encompassing most of the city's ancient heritage, while in other cities a policy of gentrification or revitalization may also lead to a decline in the quality of historical monuments.

The foregoing problems are especially relevant, because in the current period of economic stagnation there is a risk that budget cuts will first affect the 'less productive' or 'soft' sectors like monument conservation, arts and so forth. Therefore, it is necessary to pay due attention to the socio-economic and historico-cultural significance of urban monuments.

In our contribution, we will abandon the narrow conventional economic viewpoint that the meaning of a certain good can be derived from the revealed preferences of economic agents who express their desires on an artificial market. Instead, we take for granted that the socio-economic and historical-artistic value of a cultural good is a multi-dimensional indicator which cannot be reduced to one common denominator (like the measuring rod of money). In fact, we are much more interested in the 'complex social value' of cultural resources (see Fusco Girard 1986). This implies that the meaning of historical cultural resources is not in the first place dependent on its absolute quantities, but on its constituent attributes or features (like age, uniqueness, historical meaning, visual beauty, physical condition, artistic value, etc.). For instance, cities like Venice, Firenze, Sienna or Padova would not have received an international reputation without the presence of intangible values inherent in their cultural monuments. In the present paper we will design a multi-attribute utility methodology which may provide an operational basis for selec-

ting monument conservation plans in the context of a comprehensive plan for the maintenance of the cultural heritage of a city or nation. Section 2 will present a background discussion of the multidimensionality principle of conservation strategies, while in section 3 an operational evaluation method, the so-called regime analysis, will be presented. The use of this method will be illustrated by means of an empirical application to the socio-economic and historico-cultural value of churches (and related monuments) in Thessaloniki. The paper will be concluded with some remarks on the relevance of this type of approaches in a planning context.

2. Planning for Preservation of our Cultural Heritage

The sixties and seventies have been marked by a strong dominance of economic evaluation tools in public planning (e.g., cost-benefit analysis, cost-effectiveness analysis). A major stimulus to the use of such tools was given by UNIDO, OECD and the World Bank. It was a widely held belief that a systematic application of rigorous economic thinking in evaluating and selecting public projects would be a major instrument in improving the performance of the public sector (see for instance Little and Mirrlees 1974).

This conventional economic appraisal methodology found its basis in welfare economics and was originally rather normative and prescriptive in nature, while it also implied various value judgements such as the emphasis on efficiency and the suppression of equity. Besides, the use of 'fictitious' shadow prices in order to assess benefits foregone is a major source of uncertainty in any project evaluation (see also Warr 1982). Especially the aim to transform all relevant impacts into one monetary 'measuring rod of money' has become a source of major criticism (see for an interesting review Renard 1986).

A compound evaluation of collective goods - and especially public capital goods like churches, palaces, parks, landscapes, 'cityscapes' etc - is far from easy and cannot be undertaken by exclusively considering the tourist and recreation sector.

Especially in the Anglo-Saxon literature the expenditures made to visit recreational destinations are often used as a proxy value for assessing the financial-economic meaning of natural parks, palaces, museums etc. A spatially interesting problem here is the fact that such recreational commodities and the various users are unequally distributed over space. This means that recreational expenditures are co-determined by distance frictions, so that the evaluation of recreation opportunities has to take into account the transportation costs inherent in recreational and tourist visits. Consequently, the socio-economic value of such recreational opportunities depends both on

their indigenous attractiveness and on their location in geographic space. Consequently, increase of accessibility may thus also be an instrument in enhancing the socio-economic value of cultural heritage. But the indigenous historico-cultural value of monuments is invariant with respect to geographical location, so that we are still left with the problem of a compound evaluation.

In order to obtain a compound evaluation of recreational opportunities (museums, parks, palaces, etc.) a systematic typology of the functions of such public capital has to be made. In conventional economic approaches such a functional classification forms the basis for a monetary assessment of the socio-economic value of such goods (cf. Driver and Harris 1981). In the framework of our broader analysis, the following typology of effects of recreation will be made (see also Filius 1986):

(1) psychological and behavioural effects. Such effects emanate from an enhancement of mental well-being caused by an enjoyable visit to a valuable scarce cultural or environmental heritage. Clearly, congestion may lead to negative feelings of well-being.

(2) spin-off effects. These effects are the result of behavioural changes caused by visits to natural parks, cultural heritage etc. and are among others reflected in productivity increases and decline in illness rates (see Kelley 1983).

(3) effects on non-users. Such effects are related to the potential value of as commodity, even though this commodity is not actually used. In this framework the notion of a so-called option value is relevant (see Weisbrod 1964). This concept may have various meanings (see also Hyman and Hufschmidt 1983):
- risk aversion: potential visitors are not sure that they will ever visit the opportunity concerned, but do not want to lose the possiblity to visit it in the future.
- quasi-option demand: potential visitors have an interest in visiting the recreational good concerned, but wait until sufficient information is available.
- existence value: non-users attach a high value to the fact that the scarce commnodity is maintained.
- vicarious use value: non-users want to keep a certain public good intact, because they like it when others can enjoy this good.
- bequest value: non-users see it as their moral responsibility (or altruism) to protect and maintain a certain public good for future generations.

Consequently, the concept of option value is strongly related to

the symbolic value of a good. The monetary assessment of 'option values' is however far from easy (see Greenley et al. 1981).

(4) effects on regional development. The presence of a scarce cultural or environmental commodity is not only appealing for daily recreation, but attracts also many foreigners, whose spending capacity may be of great importance for regional development (e.g. expenditures made in restaurants and hotels). Such revenues for the region may also exert various indirect multiplier effects.

(5) effects on infrastructure and public management. These effects refer to the fact that the maintenance of a public commodity requires the use of many instruments by the government, for instance, information supply, fire protection, waste disposal, daily maintenance, etc.

(6) environmental effects. Any use of a public good has various environmental consequences, and these social spillover effects have to be taken into consideration as well.

Traditional economics has made an attempt at using the measuring rod of money for evaluating the direct and indirect effects of recreational commodities, on the basis of inter alia the notion of consumer surplus (incorporating also the so-called travel cost method). This consumer surplus represents the financial sacrifices (in terms of distance and time) a visitor is willing to pay (the so-called willingness-to-pay) minus the actual costs of a visit (see also Sinden and Worrell 1978). Usual research methods in order to assess the willingness-to-pay are survey techniques and interviews. A problem in this case is the specification of a demand function due to heterogeneity among individual users, the importance of remaining (omitted) explanatory variables, synergetic effects caused by other recreation users (congestion, e.g.), the evaluation of time (or time preference), and the intangible nature of historico-cultural heritage. The historico-cultural heritage encompasses a wide variety of (mainly public) capital goods embodying (part of) the history of a country, region or city. Beside its historical, artistic or scientific value (the symbolic heritage function), cultural heritage has usually also an actual user value, as well as a potential future value. Consequently, cultural heritage may be conceived of as a resource (see also Ashworth and Voogd, 1986). The importance of this resource is among others reflected in the average annual growth rate of approximately 5 percent in tourism and recreation in the past 25 years in many countries. The historic cities of Europe (London, Paris, Roma, Copenhagen, Amsterdam, Athens etc.) house collections of cultural and historical artifacts of

an intrinsic and important international dimension. Although usually the supply of cultural heritage is locally determined, the demand is dominantly non-local and frequently international. Clearly, demand is here mainly a response to the supply side, and consequently planning and maintenance of the historic city is a task of utmost importance (see also Ashworth 1986, Dobby 1978, Sinnott and Wall 1980, Tarn 1985, Ward 1968, and Williams et al. 1983).

A major instrument for enhancing the socio-economic value of cultural heritage in historic city planning is marketing of urban heritage so as to attract more tourism. But in this respect it is important to gather adequate insight into the socio-economic and historico-cultural value of monuments. As mentioned before, a conventional financial analysis does not do justice to the cultural wealth incorporated in urban monuments. And therefore, it is necessary to develop an analysis framework that is capable to assess the compound value of urban heritage. This will be the theme of the next section.

3. Multicriteria Analysis as a Tool for Assessing the Compound Value of Urban Monuments

There is a need for an integrated cultural and functional economic urban development strategy, in which economic, social, architectural and historical aspects of city life are brought into harmony with each other. Therefore, it is no use to look exclusively at the cost side of monument policy. Monuments have a social benefit whose (economic, social and cultural) value is related to the history of society, and it is perceived by the present generation (including all direct and indirect users) in view of the future.

These benefits are clearly multidimensional in nature. Here a parallel may be drawn with antiquities sold on the market. The value of an antique good (paintings, e.g.) depends on its age, its degree of uniqueness, its artistic quality and its representation of a certain style period. The same holds true for an urban monument, although here an additional important consideration plays a role, viz. its integration in the existing historical urban structure (in addition to the revenues generated by this historical cultural resource).

This implies essentially that an urban monument has to be valued from the angle of a multi-attribute utility approach. Its value for society is determined by various attributes such as age, uniqueness, artistic value, style period, integration in urban structure, and economic revenues. This multidimensional profile constitutes the indigenous socio-economic and historical-artistic value of a cultural resource, seen from the viewpoint of a multi-dimensional utility theory.

In case of the assessment of the value of cultural assets it has to be realized that most information on the pertaining attributes is qualitative, soft or fuzzy in nature. This problem of 'measuring the unmeasurable' (Nijkamp et al. 1985) is an intriguing issue in evaluation research. In the present paper we will therefore concentrate our attention on qualitative evaluation methods, usually called 'qualitative multicriteria methods'. There is a wide variety of such methods (see for surveys among others Nijkamp 1981, Rietveld 1980 and Voogd 1983). There is unfortunately often a discrepancy between simple - but analytically wrong - methods and sophisticated - but analytically proper - methods. In recent years a new method has emerged which tries to meet reasonable criteria such as methodological soundness, mathematical-statistical accessibility and easy computer use. The method is called the regime method and will also be used in the present paper (see Hinloopen et al 1983, and Hinloopen and Nijkamp 1986). The method will be described here in a concise way.

Suppose a problem with I choice options or alternatives i (i=1,...,I), characterized by J judgement criteria j (j=1,...,J). The basic information we have is composed of qualitative data regarding the ordinal value of all J judgement criteria for all I choice options. In particular we assume a partial ranking of all I choice options for each criterion j, so that the following effect matrix can be constructed:

$$E = \begin{bmatrix} e_{11} & \cdots & e_{1J} \\ \vdots & & \vdots \\ e_{I1} & \cdots & e_{IJ} \end{bmatrix} \qquad (3.1)$$

The entry e_{ij} (i=1,...,I; j=1,...,J) represents thus the rank order of alternative i according to judgement criterion j. Without loss of generality, we may assume a rank order characterized by the condition 'the higher, the better', in other words: if $e_{ij} > e_{i'j}$, then choice option i is preferable i' for judgement criterion j.

As there is usually not a single dominating alternative, we need additional information on the relative importance of (some of) the judgement criteria. In case of weighting methods this information is given by means of preference weights attached to the successive criteria. If we deal with ordinal information, the weights are represented by means of rank orders w_j (j=1,...,J) in a weight vector w:

$$w = (w_1,...,w_J)^T \qquad (3.2)$$

Clearly, it is again assumed that $w_j > w_{j'}$ implies that criterion j is regarded as more important than j'.

Next, the regime method uses a pairwise comparison of all choice options, so that then the mutual comparison of two choice options is not influenced by the presence and effects of other alternatives. Of course, the eventual rank order of any two alternatives is co-determined by remaining alternatives (cf. the independence of irrelevant alternatives problem).

In order to explain the mechanism of the regime method, we will first define the concept of a regime. Consider two alternative choice options i and i'. If for criterion j a certain choice option i is better than i' (i.e. $s_{ii'j} = e_{ij} - e_{i'j} > 0$), it should be noted that in case of ordinal information, the order of magnitude of $s_{ii'j}$ is not relevant, but only its sign. Consequently, if $\sigma_{ii'j}$ = sign $s_{ii'j}$ = +, then alternative i is better than i' for criterion j. Otherwise, $\sigma_{ii'j}$ = -, or (in case of ties) $\sigma_{ii'j}=0$. By making such a pairwise comparison for any two alternatives i and i' for all criteria j(j=1,...,J), we may construct a J×1 regime vector $r_{ii'}$, defined as:

$$r_{ii'} = (\sigma_{ii'1},\ldots,\sigma_{ii'J})^T, \qquad \forall\, i,i',\ i'\neq i \qquad (3.3)$$

Thus, the regime vector contains only + and - signs (or in case of ties also 0 signs), and reflects a certain degree of (pairwise) dominance of choice option i with respect to i' for the unweighted effects for all J judgement criteria. Clearly, we have altogether I(I-1) pairwise comparisons, and hence also I(I-1) regime vectors. These regime vectors can be included in an J×I(I-1) regime matrix R:

$$R = \Big[\underbrace{r_{12}\ r_{13}\cdots r_{1I}}_{I-1} \qquad \underbrace{r_{I1}\cdots r_{I(I-1)}}_{I-1}\Big] \qquad (3.4)$$

It is evident that, if a certain regime vector $r_{ii'}$ would only contain + signs, alternative i would absolutely dominate i'. Usually however a regime vector contains both + and - signs, so that then additional information in the form of the weights vector (3.2) is required.

In order to treat ordinal information on weights, the assumption is now made here that the ordinal weights w_j (j=1,...,J) are a rank order representation of an (unknown) underlying cardinal stochastic weight vector $w^* = (w_1^*,\ldots,w_J^*)^T$ with $\max_j\{w_j^*\} = 1$, $w_j^* \geq 0$, $\forall_j$. The ordinal ranking of the weights is thus supposed to be consistent with the quantitative information incorporated in an unknown cardinal vector

w^*; in other words: $w_j > w_{j'} \rightarrow w_j^* > w_{j'}^*$. Next, we assume that the weighted dominance of choice option i with regard to i' can be represented by means of the following stochastic expression based on a weighted summation of cardinal entities (implying essentially a additive linear utility structure):

$$v_{ii'} = \sum_{j=1}^{J} \sigma_{ii'j} w_j^* \qquad (3.5)$$

If $v_{ii'}$ is positive, choice option i is dominant with respect to i'. However, in our case we do not have information on the cardinal value of w_j^*, but only on the ordinal value of w_j (which is assumed to be consistent with w_j^*). Therefore, we introduce a certain probability $p_{ii'}$ for the dominance of i with respect to i':

$$p_{ii'} = \text{prob}\,(v_{ii'} > 0) \qquad (3.6)$$

and define as an aggregate probability measure:

$$p_i = \frac{1}{I-1} \sum_{i' \neq i} p_{ii'} \qquad (3.7)$$

Then it is easily seen that p_i is the average probability that alternative i is higher valued than any other alternative. Consequently, the eventual rank order of choice options is then determined by the rank order (or the order of magnitude) of the p_i's.

However, the crucial problem here is to assess $p_{ii'}$ and p_i. This implies that we have to make an assumption about the probability distribution function of both the w_j^*'s and of the $s_{ii'j}$'s. In view of the ordinal nature of the w_j's, it is plausible to assume for the whole relevant area a uniform density function for the w_j^*'s. The motive is that, if the ordinal weights vector w is interpreted as originating from a stochastic weight vector w*, there is without any prior information no reason to assume that a certain numerical value of w* has a higher probability than any other value. In other words, the weights vector w* can adopt with equal probability each value that is in agreement with the ordinal information implied by w. This argument is essentially based on the 'principle of insufficient reason', which also constitutes the foundation stone for the so-called Laplace criterion in case of decision-making under uncertainty (see Taha, 1976). However, if due to prior information in a specific case there is reason to assume a different probability distribution function (a normal distribution, e.g.), there is no reason to exclude this new information. Of course, this may influence the values of $p_{ii'}$ and hence the ranking of alternatives. The precise way in which in general rank order results will be derived from a probability distribution in case of qualitative information will not be further

discussed here, as this has been extensively described elsewhere (see Hinloopen en Nijkamp, 1986). But it may suffice to mention here that in principle the use of stochastic analysis, which is consistent with an originally ordinal data set, may help to overcome the methodological problem emanating from impermissible numerical operations on qualitative data.

The regime method is also able to handle ties in the effect matrix and in the weight vector, while finally a very powerful characteristic of the regime method is its ability to deal with mixed (qualitative and quantitative) information. The regime method is available on a diskette for a PC, so that it can easily be used by planners in the field. Now the regime method will be applied to an evaluation problem regarding urban monuments in Thessaloniki.

4. An Application of the Regime Method to the Evaluation of Urban Monuments in Thessaloniki[1)]

Thessaloniki, the second largest city in Greece after Athens, has a long and remarkable history. It has a rich heritage from the past in the form of old churches which sometimes date back to the Roman period. In the context of our study, we have selected the most important churches - 20 in total - in the city in order to assess the socio-economic and historico-cultural value of these monuments in terms of a rank order of importance. Much information on these churches can be found in Papagiannopoulos (1985). The 'effect matrix' for these churches (see also (3.1)), can be found in Table 1. Two major classes of data are used in evaluating these urban monuments, viz. data on the user value (i.e., the socio-economic and functional-urban value) encompassing tourist, religious, locational and uniqueness considerations, and the option value (i.e. the historico-cultural value for present and future generations) encompassing artistic, symbolic, representative, integrative, visual and age considerations (see for more details Table 1).

The churches included in Table 1 reflect differrent style periods: Roman (no.1), Hellenistic (nos. 2 and 3), Byzantine (nos. 4-14), Post-Byzantine (nos. 15-19) and Neoclassical (or Eclectic) (no.20).

The following criteria have been used:

A. Socio-economic/functional-urban value (user value)

1. tourism (domestic and foreign)

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1) The author acknowledges the great support to the field work offered by Vassilis Colonas and Maria Giaoutzi.

	A					B					
	1	2	3	4	5	6	7	8	9	10	11
1. Rotonda	5	1	4	5	5	5	5	4	2	4	5
2. St. Dimitrius	5	5	4	5	5	5	4	4	4	4	5
3. Aheropeitos	5	5	5	5	5	4	5	5	3	4	5
4. Osios David	5	2	3	5	4	3	3	4	2	1	4
5. St. Sophia	5	5	5	5	5	4	5	4	4	4	4
6. Panagia Halkeon	4	3	5	5	4	4	5	5	4	5	4
7. St. Catherine	4	5	3	4	4	4	5	5	2	5	4
8. Holy Apostles	4	5	3	4	4	4	5	5	3	5	4
9. St. Nicolaos Orphanos	5	2	3	4	5	4	4	5	5	5	4
10. St. Panteleimon	4	3	4	4	3	4	4	4	3	4	4
11. Prophet Elias	4	5	3	4	3	4	3	2	2	2	4
12. Vlatades Monastery	4	5	3	4	4	4	3	3	4	3	4
13. Taxiarches	2	5	3	2	2	2	2	2	2	1	4
14. Transfiguration of the Saviour	4	2	5	4	3	3	4	4	1	4	4
15. St. Minas	2	5	4	2	2	4	4	4	1	2	3
16. Ypapanti	1	5	4	2	1	2	3	4	2	1	3
17. Panagouda	1	5	4	2	1	2	3	4	1	2	3
18. Nea Panagia	1	5	4	2	1	2	3	4	2	2	3
19. Hamza-Bey Dzami	3	1	4	3	3	3	4	4	1	2	4
20. Yeni Dzami	2	1	2	3	2	4	5	5	3	4	2

Table 1. 'Effect Matrix' for 20 churches in Thessaloniki.

Legend: Rank orders

5: most important / relevant
4: "
3: "
2: "
1: unimportant/irrelevant

2. religion (actual use for worship, marriage, baptising, etc)
3. location (i.e., geographic accessibility, e.g. distance from city centre)
4. degree of uniqueness (monovalence)

B. Historico-cultural value (option value)
5. artistic value (beauty of icons, mosaics, frescoes, e.g.)
6. symbolic value (historical memory, e.g.)
7. representativeness for a given style period
8. integration of different style periods (internal complex value)
9. integration with external environment (external complex value)
10. visual beauty of exterior of monument
11. age (period of first construction)

The meaning of the multicriteria analysis used here is to derive a plausible and appropriate ranking of these monuments, based on their compound user and option value. In the context of our investigation it is assumed that three alternative types of information on the relative importance attached to the successive judgement criteria have to be explored as to their consequences for monument policy, viz. equal importance for both class A and class B of the pertaining criteria (scenario 1), a higher importance for class A with respect to class B (scenario 2), and a lower importance for class A with respect to class B (scenario 3). The results of the regime analysis are presented in Figures 1-3.[1] Figure 1 is based on the assumption that all 11 criteria in Table 1 have an equal weight (a neutral scenario). Figure 2 assumes that the user value is regarded as more important than the option value (a socio-economic and functional-urban scenario). And finally Figure 3 takes for granted that the option value has the highest priority (i.e., a historico-cultural scenario). The diagrams in the figures represent the success scores (or probability scores) of each of the 20 monuments, obtained by applying the regime analysis (see also (3.7)).

The results of the three scenarios are relatively robust. In all cases, church no.3 (i.e., Aheropeitos) appears to have the highest score. However, the ranking of the second- and higher-order options is dependent on the scenario at hand. In the neutral scenario, St. Dimitrius and St. Sophia appear to have equal scores. But in the socio-economic and functional-urban scenario St. Sophia appears to win from St. Dimitrius (which is also plausible in the light of the specific historical style elements of St. Dimitrius). Finally, for the historico-cultural scenario, St. Sophia appears to score much lower, which is again plausible in view of the specific cultural attributes

1) The author acknowledges the computational support provided by Jaap Hartog.

of Panagia Halkeon, Rotonda and St. Nicolaos Orphanos. It is also worth mentioning that the position of the lowest scoring churches is very robust.

5. Epilogue

The previous analysis can be used as a prioritization scheme for monument policy, as it provides directives for the way the supply of (the quality of) cultural heritage may be improved so as to achieve the highest compound socio-economic and historico-cultural value.

An intriguing problem emerges if we have to take into account the existence of a limited budget for monument policy. Then a simultaneous realization of monument conservation plans is unfeasible, so that an intertemporal ranking of plans has to be made. Also in this case, a multicriteria analysis may be helpful.

A more difficult problem arises if certain - as such extremely valuable - monuments are in a very bad physical condition (see also Nijkamp, 1987). In that case, the previous analysis might easily lead to a neglect of such monuments. Therefore, in such cases one has to assess the potential value of all monuments (based on the values of attributes after a restoration plan has been carried out). Then a multicriteria analysis can also be employed to design a ranking scheme for restoration plans of urban monuments.

Figure 1

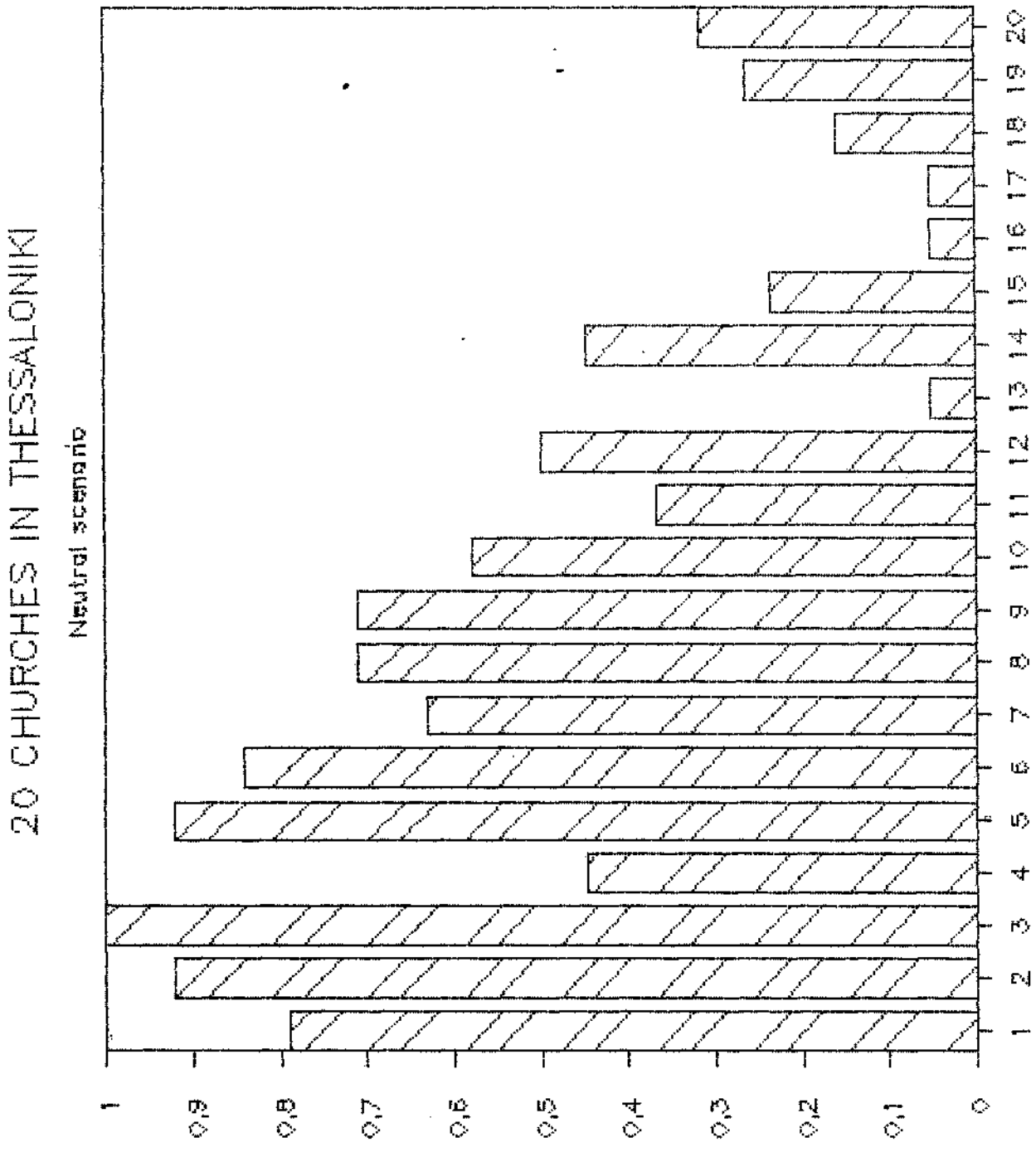

20 CHURCHES IN THESSALONIKI
Neutral scenario
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0

Figure 2

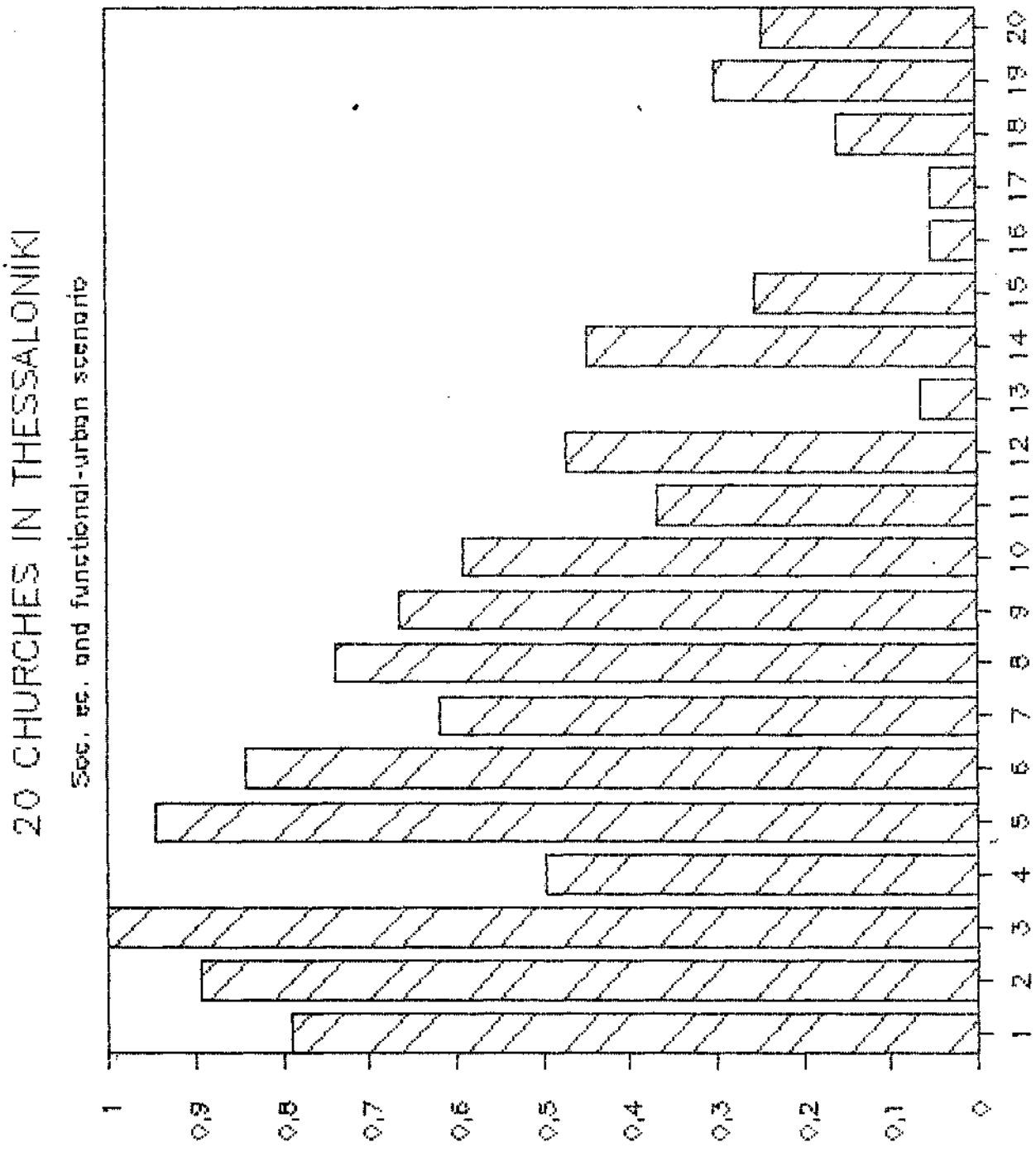
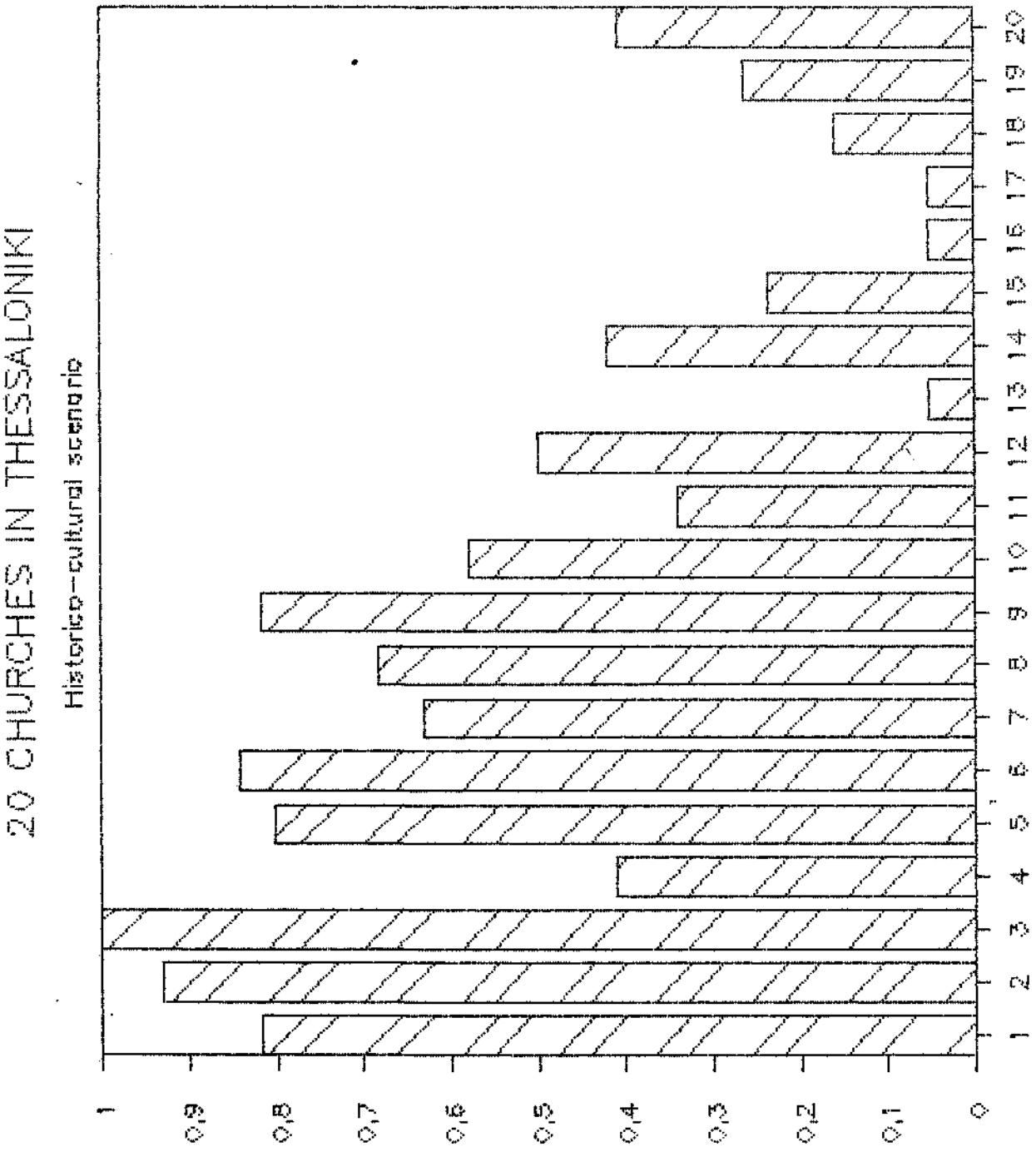

20 CHURCHES IN THESSALONIKI
Soc. ec. and functional-urban scenario
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
1 0,9 0,8 0,7 0,6 0,5 0,4 0,3 0,2 0,1 0

Figure 3


20 CHURCHES IN THESSALONIKI
Historico-cultural scenario
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

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