Medicinal and Thermal Baths: Lost Investments or Key to the Future? A Regional Comparison of Settlements With or Without Baths

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Our research examines the competitiveness of settlements with medicinal and/or thermal baths (focusing on regional differences) and is being carried out within the framework of OTKA project No.106283. The ultimate aim is job creation. We analyse two settlement groups and the expected result is that we hope to be able to show that settlements with similar characteristic features and which operate medicinal and/or thermal baths, perform better economically than those without such baths.

Our paper contains analyses of settlements selected on the basis of specific factors in two Hungarian regions, West and South Transdanubia. We aim to measure the potential effect of health tourism on the development level of any settlement with the help of econometric methods using statistical data. We attempt to determine whether the existence of medicinal and thermal baths can create any measure of economic or touristic difference regarding that particular settlement. Eight settlements with baths in West and South Transdanubia were selected from the database assembled to date during our research - together with eight settlements without baths. The basis for selection was location, settlement size and number of inhabitants.

Our primary empirical aim is to prove the hypothetical connection, according to which an operating medicinal and thermal bath strongly contributes to the development of the settlement concerned. Our further aim is to discover whether the regional location is a decisive factor in terms of utilising the positive effects rooted in operating a bath - in other words, whether the extra potential arising from operating a bath shows any form of regional difference. Our further aim is to define those factors and indicators in which significant differences can be seen - apart from the obvious touristic indicators - and in which settlement pairs these differences are significant. In terms of methodological tools we use descriptive and discriminant analysis.

Introduction

The aim of our study is to monitor the effects of health tourism. Health tourism, in our case medicinal and thermal bath-related tourism may exert a beneficial influence on the life of a given settlement in various ways. Improved cost efficiency can be achieved through the utilisation of thermal water for the provision of hot water and district heating and additionally, tourism may also have a settlement boosting effect. Among the positive externalities can be mention a well organised environment and an attractive site which must be developed in the immediate vicinity of the bath complex and which can gradually be extended to the entire settlement. The financial resources should be provided by the local authority's tourist tax revenues – which

show significant increase with the enhanced number of guest nights (Tatár, 2003). The creation of a bath may result in the emergence of new enterprises through the investment boosting effects of medicinal and thermal tourism (Michalkó, 2010). These, through their tax payments will continuously surplus revenue for the local authority. The benefits linked to the availability of a bath could be listed almost endlessly, but our primary objective is not an exhaustive discussion of these but to outline a possible approach to detecting their effects.

The fact that these effects exist is unquestionable and numerous theoretical and practical examples prove their existence. However, demonstrating their operation is the function of two distinct processes. On one hand, these effects can be detected in the economic life of a given settlement, and, consequently, in its development level, only if the benefits inherent in a bath are exploited effectively, if an appropriate institutional and financial framework is available and if a sufficiently high standard of operation of the spa is guaranteed (Ilbery & Saxena, 2009; Jancsik, 2008). On the other hand, tourism must be among the growth industries in the economic sector of a given settlement (Poon, 1993) and within the sector, medicinal and thermal tourism must be accorded a primary role, since, inversely, a higher standard of settlement infrastructure does not automatically result from the positive impacts of tourism.

The primary aim of the current study is to compare settlements located in the same county or region (to avoid problems arising from differences in administration) with similar population numbers, where one member of the resulting settlement pairs has a bath, whilst the other does not. This might appear at first glance to be a rather subjective categorisation, but if we consider the settlement structure of the two regions which serve as the target areas of our investigation (West and South Transdanubia), we find that the settlement pairs can hardly be constructed in any other way. We created 16 pairs (8 from South Transdanubia and 8 from West Transdanubia). West Transdanubia is a centrally located region from the perspective of tourist flows, whilst South Transdanubia is a peripheral region = and so is the source of significant regional disparities (Ács & Laczkó, 2008). The following table (*Table 1*) shows the pairs selected:

Table 1: Settlement pairs and population numbers

With bath	Population	Without bath	Population	With bath	Population	Without bath	Population
West Transdanubia				South Transdanubia			
Bük	3417	Csepreg	3384	Harkány	4160	Kozármisleny	6109
Zalakaros	2277	Pacsa	1758	Igal	1349	Kadarkút	2583
Hévíz	4943	Zalalövő	3021	Siklós	10147	Szentlőrinc	6848
Csorna	10569	Tét	3877	Tamási	8558	Simontornya	4028
Sárvár	15204	Körmend	11676	Nagyatád	11360	Csurgó	5186
Vasvár	4461	Őriszentpéter	1167	Szigetvár	10928	Komló	25020
Zalaegerszeg	59272	Nagykanizsa	49302	Dombóvár	19621	Tolna	11367
Celldömölk	11395	Kőszeg	12055	Dunaföldvár	8910	Bátaszék	6388

Source: Author's own construction on the basis of data from the Hungarian Central Statistical Office

These settlements, as a sample, form the target of our analysis, and our hypotheses are:

H1: The touristic indicators of settlements with baths (regarding their infrastructural assets and settlement environment) show a more favourable image than in the case of settlements without baths examined similarly.
H2: In terms of touristic and infrastructural assets, settlements operating a bath and those without a bath show greater differences in West Transdanubia than in South Transdanubia.

Testing the hypotheses

Testing proved to be a highly complex process. According to our basic hypothesis, the settlements which operate medicinal and thermal baths show a higher development level than those without a bath and so lack the above positive products of tourism.

During the first phase of the test, we defined the factors which determine the current development level of settlements. This produced a highly diverse analytical picture which would have made the results obtained from our analysis quite redundant' I seemed, therefore, more prudent to establish artificial variables through factor analysis which contain the information content of the original variables and are orthogonally independent (Hajdu, 2004). On the basis of the KMO criterion (whose value is 0.564 in the present case) our selected variables are suitable for performing factor analysis (*Table 2*) and on the basis of the 0.000 significance value related to the Bartlett test, the other important condition of factor analysis is also satisfied, namely that the variables are uncorrelated in the basic multitude (Sajtos & Mitev, 2006).

Table 2: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.564
Bartlett's Test of Sphericity	Approx. Chi-Square	264.534
	Df	66
	Sig.	0.000

Source: Authors' construction

The factors included in the analysis were combined into 4 factors after the application of a dimension reducing procedure, permitting 80.969% of the variance of the original variables to be explained - which proves to be a satisfactory result (*Table 3*):

Table 3: Total Variance Explained

Component	Extraction Sums of Squared Loadings	Rotation Sums of Squared Loadings		
	Cumulative %	Total	% of Variance	Cumulative %
1	28.989	2.928	24.403	24.403
2	52.902	2.534	21.113	45.516
3	68.841	2.219	18.494	64.010
4	*80.969*	2.035	16.959	80.969
5				
6				
7				
8				
9				
10				
11				
12				

Source: Authors' construction

The following table (*Table 4*) illustrates which variables from the basic multitude were included in which factor, and we follow by analysing the highlighted factors together:

Table 4: Rotated Component Matrix

Factor 1	*Factor 2*	*Factor 3*	*Factor 4*
No. of guest nights in commercial accommodation (guest nights)	Total surface of green area (m2)	No. of dwellings with district heating (nr/capita)	Length of public sewage collection netwrk (km/capita)
No. of beds of total commercial accommodation	No. of recreation areas, keep-fit trails, rest areas	No. of dwellings connected to hot water network (nr/capita)	Length of public utility potable water network (km/capita)
Tourism tax per 1 guest night (HUF) as shown on local authorty websites	No. of petrol-engine cars (nr/capita)		Quantity of total transit gas supply (no conversion) (1000 m3/capita)
			Length of public roads and public space (km/capita)

Source: Authors' construction

The above table demonstrates Factor 1 measuring touristic potential and Factor 2 the state of the environment of a given settlement (in terms of both a positive and negative impact: by measuring the proportion of green areas and recreation areas and by taking into account the number of cars polluting the environment). The third factor shows the most significant costs of public utilities (district heating and hot water supply in settlements) whilst the fourth consists of the other public utilities and

services and the length of the municipal road network - which symbolise the infrastructural assets.

Following the necessary preparatory steps, a comparison of the two groups (settlements with and without baths) in terms of these four factors will be possible, but to successfully compare the average values of the groups it is required that the values of factors show a normal distribution. The normality tests of analyses of variance usually produce negative results and so we normalised the distributions on the basis of skewness and of kurtosis benchmark. The following table clearly shows that each factor may dispose of outliers, while the distribution is far from normal (*Table 5*):

Table 5: Statistics

		REGR factor score 1 for analysis 4	REGR factor score 2 for analysis 4	REGR factor score 3 for analysis 4	REGR factor score 4 for analysis 4
N	Valid	32	32	32	32
	Missing	0	0	0	0
Skewness		1.916	4.140	2.304	0.630
Std. Error of Skewness		0414	0.414	0.414	0.414
Kurtosis		3.390	19.735	7.646	1.120
Std. Error of Kurtosis		0.809	0.809	0.809	0.809

Source: Authors' construction

We removed the extreme values from the touristic factor and thus obtained a multitude with a 0.861 skewness and 1.009 kurtosis value, where the number of elements was reduced to 29, which permitted us to perform the analyses. The last column of the Table below (*Table 6*) contains the significance level pertaining to Levene's test, which indicated that the homogeneity of variances could be observed in the groups, allowing our analysis to proceed to a further phase.

Table 6: Test of Homogeneity of Variances

REGR factor score 1 for analysis 4

Levene Statistic	df1	df2	Sig.
0.049	1	27	0.26

Source: Authors' construction

On the basis of the significance value of 0.002 in the last column of the ANOVA Table (*Table 7*) it can be stated that a correlation exists between the touristic factor and the fact of whether or not a given settlement operates a bath.

Table 7: ANOVA

REGR factor score 1 for analysis 4

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.232	1	2.232	12.299	0.002
Within Groups	4.900	27	0.181		
Total	7.132	28			

Source: Authors' construction

We had no doubts concerning the veracity of the above statement even before performing our analysis, but the other three factors may be interesting and will allow us to demonstrate the positive impacts associated with tourism.

The examination of Factor 2 may reveal much more interesting interdependencies. We tested the correlation between the settlement's environmental factor and the presence of a medicinal bath in a similar way. The distribution was not normal in this case either, and so normalisation was required on the basis of the skewness-kurtosis criterion, and the necessary tests could be run by 29 observations.

The Table entitled Homogeneity of Variances (*Table 8*) clearly shows that the significance value related to Levene's Test exceeds 5%, and so the homogeneity of the variances of groups can be justified, permitting us to glean valuable information from the ANOVA Table (*Table 9*).

Table 8: Test of Homogeneity of Variances

REGR factor score 2 for analysis 4

Levene Statistic	df1	df2	Sig.
0.687	1	27	0.415

Source: Authors' construction

Table 9: ANOVA

REGR factor score 2 for analysis 4

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.000	1	0.000	0.000	0.989
Within Groups	2.028	27	0.075		
Total	2.028	28			

Source: Authors' construction

This Table clearly shows that the value of the F statistics is 0, which means that no model can be constructed for the detection of the correlation between the settlement environmental factor and the presence of a medicinal or thermal bath. Therefore, the presence of a bath included in the environmental component referred to by us in the first place as the factor characterising the living standard of settlements does not produce any detectable difference.

We proceeded by analysing Factor 3 related to hot water and district heating supply, in which case we had to normalise the distribution once more and were thus able to utilise the data of 31 settlements.

The homogeneity of variances clearly indicates that the homogeneity of the variance of the groups can be justified on the basis of Levene's Test, and so an analysis can be performed by using the ANOVA Table (*Tables 10 and 11*).

Table 10: Homogeneity of Variances Test

REGR factor score 3 for analysis 4

Levene Statistic	df1	df2	Sig.
0.632	1	29	.0.433

Source: Authors' construction

Table 11: ANOVA

REGR factor score 3 for analysis 4

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.189	1	1.189	2.652	0.114
Within Groups	12.995	29	0.448		
Total	14.183	30			

Source: Authors' construction

The ANOVA Table shows a 11.4 significance value connected to the F-statistics which is situated on the frontier of rejection. If we respect the rule of thumb related to econometric tests, we can declare that there is no correlation between the presence of a medicinal and thermal bath and Factor 3. However, since the significance value was situated at the frontier, we can declare that, despite the fact that no obvious statistical correlation can be detected on the basis of the above sample, we can assume that the quantity of thermal energy distributed through district heating and hot water supply is higher in the case of settlements with a medicinal and thermal bath. Since thermal water may also be utilised for the provision of the above services in order to satisfy the demands of the population, the availability of thermal water may also be a cost-effective solution. This leads us to assume the existence of this correlation despite the uncertainty arising from the statistical test.

Factor 4 is related to the settlement road network and the availability of other public utilities (bar heating and hot water supply). We were able to include the values of 26 settlements in our analysis following normalisation, and according to Levene's Test the analysis is possible since the criterion of the homogeneity of the variances of both groups is satisfied (*Table 12*).

Table 12: Homogeneity of Variances Test

REGR factor score 4 for analysis 4

Levene Statistic	df1	df2	Sig.
0.121	1	24	0.731

Source: Authors' construction

Table 13: ANOVA

REGR factor score 4 for analysis 4

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.214	1	.214	1.077	.310
Within Groups	4.763	24	.198		
Total	4.977	25			

Source: Authors' own construction

The ANOVA Table (*Table 13*) demonstrates that, based on the sample analysed, no obvious correlation could be detected between the infrastructural assets of settlements with or without a bath (p=0.310). We are not thinking of a correlation but would have liked to test whether the active presence of health tourism in a specific settlement can generate sufficient extra income to improve the infrastructural assets of settlements. This is the product of the parallel existence of numerous other factors - especially settlement size - which we did not consider separately in this phase of analysis, trying rather to undertake our analysis independently of this factor.

To analyse the individual factors also regionally, we use simple, descriptive statistical methods, since the number of elements is so small following this limitation that the reliability of statistical tests would become highly questionable. Therefore, we prefer to operate with the average values for each category - as illustrated in the following table (*Table 14*):

Table 14: Regional disparities between settlements with and without a bath

	West Transdanubia		South Transdanubia	
	Settlement with bath	Without bath	Settlement with bath	Without bath
Guest nights	322,896.38	11,290.13	30,027.50	4,320.13
Accommodation No.	2,769.38	255.38	638.88	83.88
Length of sewage pipeline (km/1000 persons)	5.06	6.70	4.42	4.27
Length of potable water network (km/1000 persons)	5.62	7.11	8.70	5.74
gas pipeline (1000m3/1000 persons)	1,137.09	467.55	495.61	329.74
Constructed road network (km)	5.79	4.91	6.23	4.61

Source: Authors' own construction

The above table clearly shows that higher regional disparities can be detected in South Transdanubia in the case of guest nights and in West Transdanubia in respect of the number of accommodation places. No significant disparities can be observed in the length of the sewage tunnel, although the noticeably more advanced settlement structure of West Transdanubia is clearly visible. The length of the potable water network shows the same tendency, West Transdanubian settlements without a bath are more advanced in this respect, while the disparities are obvious in South Transdanubia. More significant regional disparities can be detected in terms of gas

pipeline provision in West Transdanubia, and in South Transdanubia in terms of public roads.

Conclusion

The various analytical procedures presented in the study aimed to reflect on the developmental disparities between settlements with and without medicinal and thermal baths. Two hypotheses were defined during the analysis (*Table 15*):

Table 15: Hypotheses and theses

HYPOTHESIS	RESULT	THESIS
H1: The touristic indicators of settlements with baths, regarding their infrastructural assets and settlement environment show a more favourable image than in the case of settlements without baths investigated from the same perspectives.	PARTIALLY JUSTIFIED	T1: The touristic indices of settlements with baths are more favourable than those without baths, although they do not show a more favourable image in terms of the development level of infrastructure and settlement environment. Statistical differences can only be seen in respect of district heating and hot water supply.
H2: In terms of touristic and infrastructural assets, settlements operating a bath and those without a bath show greater differences in West Transdanubia than in South Transdanubia.	NOT JUSTIFIED	T2: In terms of touristic indices, greater differences were observed in South Transdanubia than in West Transdanubian settlements, but no obvious tendency can be traced in terms of infrastructural assets.

Source: Authors' own construction

It appears from our study that the impacts of medicinal and thermal tourism will only be clear after a much more complex analysis, and definite conclusions can only be drawn after the examination of a larger sample.

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