Impact assessment of cultural heritage development projects

Methodological overview

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1. Introduction

Commissioned by the Gyula Forster National Centre for Cultural Heritage Management, the Budapest Institute elaborated a control group (counter-factual) impact assessment methodology related to cultural heritage investments in Hungary between 2004 and 2013 from European Union funding. We have drawn up a methodological framework which is based on the analysis of publicly available settlement-level data and later, when the time has passed what is necessary for the impacts to unfold , it will be suitable for the impact assessment of investment into cultural heritage. In the second phase of the project we applied the methodology to measure the effects of CH projects launched between 2004 and 2013. Keeping in mind that only a few years have passed since these investments were carried out, for the time being the causal effects of investments in the period we examined cannot be confirmed with the help of settlement-level economic and social indicators. Based on the methodology described, the impact assessment is worth carrying out within a few years' time when long-term impacts might also appear.

2. The impacts of cultural heritage investment projects

Hiba! A hivatkozási forrás nem található. demonstrates several potential positive and egative impacts of cultural heritage investment (based on McLoughlin, Sodagar, and Kaminski 2006). Literature usually differentiates four major groups of impacts: individual, social, economic and environmental impacts (McLoughlin, Sodagar, and Kaminski 2006; Bowitz and Ibenholt 2009; Throsby 2012). It goes without saying that these impacts are not completely independent from one another, they mutually impact on each another. Increasing touristic activity as an economic impact, for example, might influence positively and negatively the quality of life of residents living in the neighbourhood (individual impact), through the increased incomes of hosts (positive) or due to the larger noise pollution caused by visitors (negative).

In our study we seek to answer the following questions:

1. What is the methodological framework suitable for estimating the socio-economic impacts of cultural heritage investment;
2. What publicly available data might demonstrate the socio-economic impacts; and
3. Is it possible to quantify the socio-economic impacts of cultural heritage investments carried out in Hungary between 2004 and 2013?

As **Hiba! A hivatkozási forrás nem található.** demonstrates very well, such investments might ave diverse impacts. The methodology we have elaborated tests the hypothesis whether any general impact quantifiable with settlement-level social and economic indicators might exist as a result of investment into cultural heritage. Through our methodology (for detailed description see below, chapters on the Methodological background, The methodology of calculating the index, Models and findings), we were able to examine dimensions which can be expressed with quantitative (numerically quantifiable) indicators available from existing databases and also allow retrospective observation (for details on the data used see the chapter Data).

3. Methodological background

The impact assessment based on comparison to the counter-factual status (Program Evaluation, Impact Assessment) examines to what extent, if at all, one programme or intervention – in this case the culture heritage investment – has contributed to the attainment of certain target indicators. The essence of the impact assessment is to measure the net impact of the given programme by filtering all other factors that might impact on the indicators examined. We do not define the impact of interventions simply in terms of the difference between the adequate indicator before and after the investment (e.g., the number of guest nights or the number of not-for-profit organisations): the reason is that it is not only the investment but several other factors that might influence the target to be attained, which in the case of a "before-after" comparison we would erroneously attribute to the investment. In our case the counter-factual status takes an attempt to demonstrate the socio-economic situation of individual settlements without the cultural heritage investment project (but with everything else unchanged). Certainly, we cannot observe this status because we only have data relating to the status and performance which has really taken place, we have no data as regards a "what if" scenario (Scharle et al. 2013).

We need to find a control group in order to model the counter-factual status. The control group must genuinely characterise the conditions which would have been typical of the settlements benefiting from support if no cultural heritage investment projects had been implemented.

In our study, we compare the settlements benefiting from cultural heritage support by the end of year 2010 (treatment group) with settlements where similar investments with similar funding were carried out but those were implemented after 2010 (counter-factual situation, control group). When planning the counter-factual impact assessment, the careful selection of the control group provides the right basis for the reliability of findings. Were we to compare the settlements benefiting from support with settlements where no similar investments were made, we would probably not receive reliable findings because there might be structural differences between beneficiary and non-beneficiary settlements which we are not able to observe, thus they might distort our estimates. For example, it is possible that a settlement where some sort of cultural heritage investment is made, is ab ovo better organised, disposes of a better formal and/or informal network of connections, or perhaps it is more known nationwide. These factors themselves might have an impact on our output variables (e.g. they contribute to a lower unemployment rate, a higher rate of business activity, more visitors). This is solved by our selection of the control group where both the treatment and the control group are selected from settlements winning or benefiting from support, the only difference is the date of the investment. Thus, we compare the settlements that have already benefited from aid to settlements which benefited from the support later and we assume that the fact whether a settlement receives this aid before or after 2010 is incidental (exogenous).

This comparison is only adequate if the settlements in the two groups are similar to one another in terms of all their observable and non-observable characteristics, however we can only control their observable visible characteristics. Based on these characteristics there are no significant differences between the two groups. (See *2*. Balance between the control and treatment groups (Balance test) Similarity between the non-observable characteristics cannot be tested but for the estimation methodology used by us to be valid (difference in differences), it is sufficient if these non-observable differences, even if they exist, do not change over time, i.e. they are time-invariant. We will test this assumption of ours in the chapter on the Common trend condition.

4. Data

In the impact assessment, based on settlement-level data, we evaluate the impact of cultural heritage investment financed by the operational programmes[1] or by the Norway Grants between 2004 and 2013. There was no information available concerning the date of completion of investment projects, but the date of the support decisions which were taken between 2004 and 2013 was included in the database. As Budapest is in a completely unique situation in the country, it would not be possible to find a basis of comparison in this case and also in terms of its size it would be very difficult to disregard impacts other than the investments, therefore we do not include it in the analysis. We have compiled settlement-level data from investment level data relating to cultural heritage investment projects what was received from the competent division of the Prime Minister's Office (former National Development Agency) through the Forster Centre. If at a particular settlement several investment decisions were taken in one year, we linked the amount of grants received to the settlement. The sample also included settlements which benefited from grants before and after 2010 within the 2004-2013 period. In these cases, the impacts of the investments cannot be separated from one another, thus we did not include these settlements in the analysis. Finally, to be accurate, only settlements with cultural heritage investments either during 2004-2010, or only in 2011-2013 were included in our sample (170 settlements in total).

In the table below (1.) we summarised the output variables and control variables we used. Output variables are variables where we examine whether or not the investment had any impact on them. We have examined the potential impact on eight indicators in total. Because in the case of such a large number of output variables the likelihood of identifying an incidental significant impact increases, we compiled a composite index from the variables used and we examine whether this composite index is impacted in any way by the investment projects (Anderson, 2008) (as for the detailed methodology of calculating the index see the chapter on The methodology of calculating the index).

Before selecting the output variables, we collected a wide range of potentially used output indicators . Based on this collection we selected the indicators where what data were publicly available at settlement-level. Compared to the previous stages of elaborating the study and the research plan, we did not use all output indicators for our final calculations. We disregarded the number of guest nights, the number of beds and number of taxpayers due to lack of data, and we disregarded or we did not include the number of not-for-profit organisations because the series of data was not reliable (Workshop in Sirok, 30 March 2015). Moreover, as regards the number of guest nights, a further problem was caused by the fact that accommodation establishments often under-report the number of guest nights. The idea of using the sales revenue data of local enterprises – primarily in the hotel, construction and retail trade sectors – when compiling the analysis was also raised. On the one hand, currently this data is not available in a ready –for-use format. On the other hand, the use of sales revenue data is cumbersome because they are based on the registered seats of businesses, but the location

1 During 2004-2007: Agriculture and Rural Development Operational Programmes (ARDOP) and Regional Operational Programmes (ROP), during 2007-2013: 7 regional operational programmes.

of establishments is frequently not identical with registered seats, therefore we cannot be sure whether or not the data we dispose of relate to the given specific settlement.

The workshop in Sirok on 30 March taught us several lessons concerning the accuracy and reliability of the variables used. It came to light that reality very often is not reflected in the figures. For example, in the case of outward and inward migration a problem might be caused by the fact that residents registered in a given settlement do not live there in reality, they only take advantage of some administrative benefits by registering in a settlement (e.g. a higher amount of social aid). We would not be able to check the individual settlement-specific features one-by-one with respect to the 170 settlements analysed, but our methodology makes it possible for us to filter out from the analysis the impacts of influencing factors which are identical and affect the settlements observed. Potential distortions are very important to remember when drawing up the analysis and interpreting the findings, however, these fortunately do not pose major problems because in most cases we talk about national impacts, therefore we might assume that they exert similar influence on various settlements.

1*. . Output and control variables*

Output variables
Number of live births
Number of newly registered residents (permanent and temporary together)
Number of de-registered residents (permanent and temporary together)
Amount of aggregate tax base (in 2013 in HUF 1,000)
Number of retail outlets
Number of catering facilities
Number of registered enterprises
Number of registered unemployed in total
Control variables
Size of settlement
Region
The ratio of the Roma in the settlement
Other infrastructure development with OP grant*
Distance from Budapest and from the closest motorway
The number of monuments in the micro-region

Source of data: output variables – T Star (Central Statistical Office), size of settlement and region – T Star (CSO), Ratio of the Roma – population census in 2011 (CSO), other infrastructure development – request for data from Prime Minister's Office (former National Development Agency) – TEIR, number of monuments in micro-regions – Forster

* Other infrastructure development between 2007-2013 include projects implemented in the framework of the Transport Operational Programme (KÖZOP with Hungarian abbreviation), priorities 1., 2. and 3 of the Economic Development Operational Programme (GOP with Hungarian abbreviation), the priorities 1., 2., 3. and 6. of the Environment and Energy Operational Programme (KEOP with Hungarian abbreviation). As regards the period between 2004 and 2006, we considered projects under priority 3. of the Economic Competitiveness Operational Programme (GVOP with Hungarian

abbreviation), Environmental Protection and Infrastructure Operational Programme (KIOP with Hungarian abbreviation) and Regional Operational Programme (ROP) as other infrastructure development.

Control variables are variables which might have impacts on the output variables in addition to cultural heritage investment. We include these variables in our calculations to isolate their impacts and to be able to separate those from the impacts of investment. For example, if new roads were constructed in a settlement in addition to the cultural heritage investment programme, the reason why the new retail outlets were established there might have been the better accessibility in the first place and not the renovation of the monument. Applying the size of the settlement or the region as a control variable is also important because the impacts may vary according to the size of the settlement. If we do not apply these controls, the measured impact might not show the impact of the investment but it might show some selection according to the size of settlement (e.g. if in larger cities the applied output indicators are more favourable from the outset).

Balance between the control and treatment groups (Balance test)

Table 2. shows the statistics of the treatment and control group. In this table we can also check whether there were significant differences between two groups before the investment projects were implemented (so-called balance test). In the Control and Treatment columns the means of the specific indicators are included, whereas the next two columns show the number of settlements in the group. We checked by means of the T-test whether the two groups of settlements are significantly different from each other. 1 in the last column of the table indicates the significant difference between the two groups, however, this was not typical of most variables.

2.. *Descriptive statistics on the data of the treatment and control groups*

	Control	Treatment	N(Control)	N(Treatment)	p-value	Different?
Grants (aggregated at settlement level)						
Amount of grant (in 2013 in HUF 1,000)	439,761.61	356,022.08	63	107	0.3093	0
Grant per capita (in 2013 in HUF 1,000)	199.70	103.90	63	107	0.1308	0
How many investment projects took place in the given year at a given place	1.13	1.23	63	107	0.1817	0
Outliers						
Grant over 4 billion	0.00	0.00	63	107	.	0
Grant over 3 billion	0.00	0.00	63	107	.	0
Grant over 2 billion	0.02	0.01	63	107	0.7051	0
Grant over 1 billion	0.10	0.03	63	107	0.0593	0
Classification of Beneficiary						
Not-for-profit	0.24	0.32	63	107	0.2842	0
Municipality	0.57	0.67	63	107	0.3201	0
Business	0.13	0.11	63	107	0.7850	0
Budgetary organ	0.11	0.07	63	107	0.4227	0

Other	0.08	0.01	63	107	0.0167	1
Demographic data (Data per capita – except for permanent population, 2003)						
Permanent population	8,754.29	6,205.09	63	107	0.0698	0
Number of live births	0.01	0.01	63	107	0.6624	0
Number of newly registered residents (permanent and temporary in total).	0.05	0.05	63	107	0.7956	0
Number of de-registered residents (permanent and temporary together)	0.04	0.04	63	107	0.9496	0
Average age (*2005)	39.25	39.02	63	107	0.4949	0
Economic data (per capita, 2003)						
Number of taxpayers (except for those in public work schemes)	0.40	0.39	63	107	0.5248	0
Amount of aggregate tax base (in 2013 in HUF 1,000)	718.70	702.55	63	107	0.6644	0
Personal income tax in total (in 2013 in HUF 1,000)	131.13	126.26	63	107	0.6723	0
Number of retail outlets	0.02	0.02	63	107	0.9102	0
Number of catering facilities	0.01	0.01	63	107	0.6273	0
Number of guest nights at commercial accommodation establishments	5.93	7.08	41	55	0.8118	0
Number of guest nights at community accommodation establishments	0.47	1.29	14	29	0.1373	0
Number of registered enterprises in construction industry	0.01	0.01	63	107	0.3294	0
Number of registered enterprises in commerce	0.02	0.01	63	107	0.1281	0
Number of registered enterprises in hotel/catering	0.01	0.00	63	107	0.4009	0
Number of registered businesses	0.09	0.08	63	107	0.2166	0
Number of registered not-for-profit organisations	0.01	0.01	63	107	0.8164	0
Number of registered unemployed in total	0.05	0.05	63	107	0.6416	0
Size of settlement (ratio of settlements in the given size category)						
Budapest	0.00	0.00	63	107	.	0
County seat	0.02	0.01	63	107	0.7051	0
Town	0.57	0.37	63	107	0.0122	1
Village – over 10 thousand people	0.00	0.01	63	107	0.4445	0
Village – 5-10 thousand people	0.03	0.04	63	107	0.8486	0
Village – 2-5 thousand people	0.13	0.19	63	107	0.3118	0

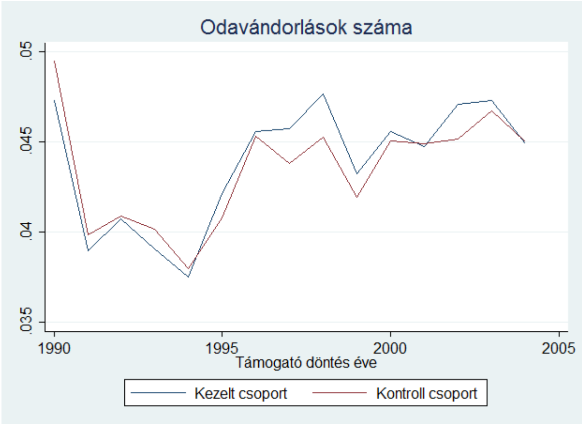
Village – 1-2 thousand people	0.14	0.19	63	107	0.4637	0
Village – under 1,000 people	0.11	0.20	63	107	0.1500	0
Region (ratio of settlements in the given region)						
Central Hungary	0.13	0.16	63	107	0.5733	0
Central-Transdanubia	0.11	0.10	63	107	0.8660	0
Western-Transdanubia	0.10	0.19	63	107	0.1100	0
Southern-Transdanubia	0.21	0.07	63	107	0.0116	1
North-Hungary	0.22	0.14	63	107	0.1716	0
Northern Great Plain	0.14	0.22	63	107	0.1970	0
Southern Great Plain	0.10	0.11	63	107	0.7311	0
Accessibility data (TEIR, 2008, km)						
Fastest way to the county capital	43.21	41.29	63	107	0.5694	0
Fastest way to a motorway junction	43.89	41.58	63	107	0.6432	0
Fastest way to Budapest	159.29	171.76	63	107	0.3291	0
Schooling, qualifications (data of population census of 2011)						
Ratio of university degree holders	0.11	0.10	63	107	0.3968	0
Ratio of those with GCSE	0.21	0.21	63	107	0.4775	0
Ratio of those finishing secondary education	0.47	0.47	63	107	0.7764	0
Other						
Ratio of the Roma in the given settlement (data of population census of 2011)	0.04	0.05	63	107	0.5596	0
The number of patients visiting the GP and the number of those visited (2003)	51,627.34	37,773.95	58	95	0.0566	0

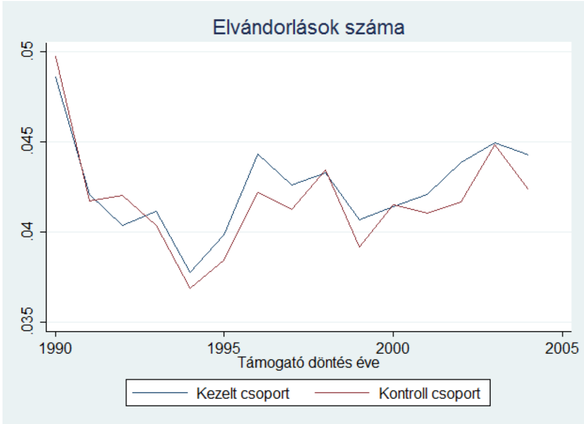
Common trend condition

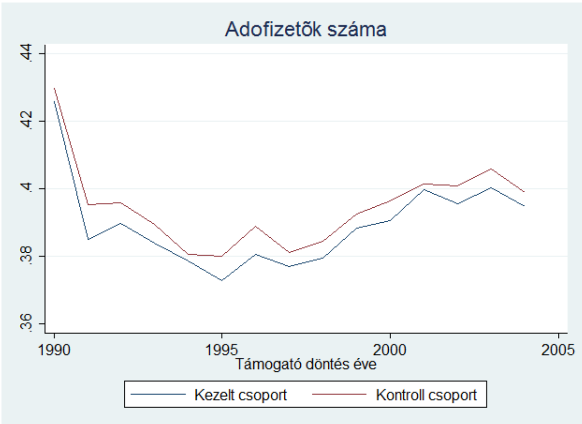
For the purpose of applying the difference in differences methodology, we need the examined output indicators to be parallel in the two groups in terms of their temporal trend in the absence of intervention (i.e. before the intervention). Only if this condition is met can we believe that in the absence of investment projects, the characteristics of the two groups would have changed the same way on average, i.e. the control group is indeed suitable. Not all of the output indicators used in the impact assessment are accessible in terms of the period before the intervention, therefore we can check this condition only in the context of a smaller or more narrow range of variables 2. In the following figures we compare the change over time of output indicators permanently available as of 1990 in the treatment and control group between 1990 and 2004.

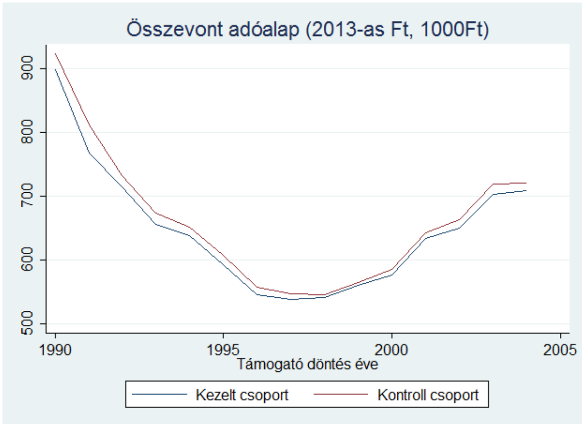
2 This is exactly the reason why we used the balance test described in the previous chapter.

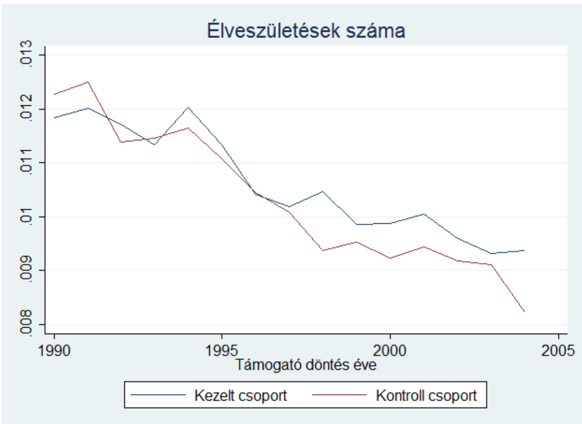
1. *Figures used to check the common trend condition.* (*All figures show the per capita data*)











Remark: Registration and de-registration contain the registration and de-registration of temporary and permanent addresses.

5. The methodology of calculating the index

In our study we make attempt at identifying those variables of the many potential ones (see previous chapters) in whose case it is possible to prove that they were affected by cultural heritage investment. In the course of the impact assessment of such a large number of output variables methodological problems might arise which question the adequacy of the statistical tests used. In order to avoid this (based on Anderson (2008)) we elaborate a composite index from the variables used and we examine whether or not this index is influenced in any way by investment projects. The weighting of individual variables within the index depends on the amount of new information they contain compared to the other variables, thus variables moving strongly in tandem carry lower weighting in the calculation. The index can also be applied to reflect in a concise manner the changes that have taken place there, taking into account all possible aspects in respect of which we hope to see some impact.

In order to calculate the index, first we need to ensure that all variables are in a format where larger values correspond to more favourable situations. To this end, we multiplied the unemployment and de-registration variables by minus one. After this, we standardise 3 variables, ensuring to put them on a comparable scale. This is a very important step, as this is the way to give a uniform format to our variables expressed in different units of measurements (forint, person, enterprise), which will make it possible to compare changes. For the purpose of standardisation, we made a cross-sectional sample which contains the average values corresponding to all the years examined in respect of each settlement. We standardized the variables using control group mean and standard deviation in this sample. This way all the variables are in a format which shows the divergence from the mean and its unit of measurement is the variance of the control group.

From the standardised variables elaborated this way we made a so-called co-variance matrix. An individual element in the co-variance matrix shows the co-variance between two indicators in the given row and column, i.e. to what extent the two indicators move together. After this, we take the inverse co-variance matrix (see **Hiba! A hivatkozási forrás nem található.**.), hus every element of the matrix will be inversely proportional to the co-variance of the two indicators. Consequently, the closer the two variables move, the lower will be the value in the given cell of the matrix.

When calculating the index, we applied weighting, i.e. not all variables carry the same weight in it (Anderson 2008). The weightings resulted from adding up the elements of the inverse co-variance matrix row by row, and dividing them by the sum of weights (**Hiba! A hivatkozási orrás nem található.**). As a result, the less a variable moves together with the other ones, i.e. the more ”new” information it contains compared to the other variables, the higher the weight attached to it will be.

The primary objective of calculating the index is to manage the statistical distortion when jointly treating multiple hypotheses (multiple testing, see Anderson (2008)). The more output variable we used to test a model, the more likely it becomes that we incidentally find a significant impact. If we aggregate individual output variables into one index, the number of statistical tests carried out will drop to 1 and the problem ceases to exist. The other advantage of the method is that it enables the testing of the general impact of investment.

3In the course of standardisation, we transform every variable into a new variable with zero mean and unit standard deviation. The standardised version of X variable $Z = \frac{X-\mu}{\sigma}$, where μ the population average and σ the population variance.

6. Models and findings

In the following parts of the paper, we will present the econometric models we used to estimate the impact of the investment projects. In our methodology, the point of department will be a 4 generalized difference-in-differences (DiD) (Angrist and Pischke 2009) model specification and we will make estimates of its variations. This model makes it possible for us to identify those general economic tendencies, long-term trends, which would have impacted on the examined output indicators irrespective of the investment projects anyway and exclude them from the estimation. In the data we observe what changes took place over the time period examined in the control settlements, and we will use this as the basis for comparison regarding the changes in settlements which won grants in the first half of the period.

Before a detailed discussion of the models, it is worth taking a glimpse at the values of the output variables in 2012 in the control and treatment groups, which is summarised in *3.* . The structure of the table is identical with the structure of *2.*, which we used to check whether the control and treatment groups were similar prior to the investment projects. From *3.* it is visible that there was no significant difference in 2012 between the output variables of the two groups.

3. *. The value of output variables in the control and treatment groups in 2012*

	Control	Treatment	N(Control)	N(Treatment)	p-value	Different?
Number of people	63.00	107.00	.	.	.	.
Number of registered unemployed total	-0.07	-0.07	63	107	0.8638	0
Number of registered businesses	0.16	0.16	63	107	0.8253	0
Number of catering facilities	0.01	0.01	63	106	0.7061	0
Amount of aggregate tax base (in 2013 in HUF 1,000)	743.66	733.98	63	107	0.7726	0
Number of live births	0.01	0.01	62	105	0.2941	0
Number of retail outlets	0.01	0.01	63	106	0.2639	0
Number of newly registered residents (permanent and temporary together)	0.05	0.05	63	107	0.1246	0
Number of de-registered residents (permanent and temporary together)	-0.05	-0.05	63	107	0.1303	0
Composite index	-0.01	0.03	63	107	0.1354	0

Simple difference-in-differences

First we estimate the most simple possible difference-in-differences model as a basis for comparison. To this end, we divided the winning projects into two periods (2004-2010 and 2011-2013), thereby establishing the treatment and control group. We classified as treatment group the settlements where the decision on cultural heritage investment was made during 2004-2010 and we compare these settlements to control settlements where similar investment projects were launched later, in the period 2011-2013. For the examined period we also simplified the output variables covering 2004-2013 to two periods. To this end, we used the

4 A similar methodology is applied by, among others, Card and Krueger (1993), Kiel and McClain (1995), Pope and Pope (2012) and Pischke (2007).

settlement means of the indicators used during the first (2004-2010) and second (2011-2013) period.

Formally our model is the following:

$$y_{it} = \alpha + \beta_1 Period_t + \beta_2 Treatet_i + \gamma Grant_{it} + \boldsymbol{\delta Control} + \varepsilon_{it} \quad (1)$$

, where

- the y_{it} values are the value of the output variable for settlement *i* and point in time *t*;
- the $Period_t$ value of the variable is 0, if the observation covers 2004-2010 and 1, if the observation covers 2011-2013;
- the $Treated_i$ value of the variable is 0, if at the given settlement the investment decision was taken after 2010 and 1, if the investment decision at the given settlement was taken between 2004 and 2010;
- the variable $Grant_{it}$ is generated by multiplying $Period_t$ and $Treatet_i$ variables (interaction), this is the main explanatory variable,
- the variable $\boldsymbol{Control}$ indicates control variables, which are as follows:
    - region,
    - size of settlement,
    - ratio of the Roma,
    - was there any other investment financed by operational programmes,
    - the distance from Budapest and the closest motorway,
    - the number of historical monuments in the micro-region in proportion to all the settlements in the micro region (”monument intensity”).

In this model the γ coefficient shall reflect the impact of the investment.

Table *4*. presents the findings of the most simple difference-in-differences models. Column one and four show the result of the estimate without control variables. In the first case, we measure the impact of the binary grant variable, in the latter case the explanatory variable contains the amount of grant. The coefficients of variables showing treatment are always insignificant values, close to zero. These models show that grants have no impact on the composite index, which contains all our output variables.

4*. . Difference-in-differences models*

	1	2	3	4	5
Output variable	Composite index				
Grant for the protection of cultural heritage	0.003	-0.004	-0.111		
	0.902	0.888	0.461		
Funding from other OP		-0.058	-0.154		
		0.153	0.302		
Received grants for cultural heritage protection and other purposes			0.117		
			0.439		
Amount of cultural heritage protection grant (HUF 1,000)				0.000	0.000
				0.134	0.163

Amount of other grants (HUF 1,000 Ft)					0.000*
					0.022
Settlement size (8 categories)		✓	✓		✓
Region		✓	✓		✓
Ratio of the Roma		✓	✓		✓
Distance from Budapest (km)		✓	✓		✓
Distance from motorway (km)		✓	✓		✓
"Monument intensity"		✓	✓		✓
Number of observations in the sample	340	340	340	340	340
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001				

Fixed effect panel model

Then we make estimates concerning a so-called fixed effect model or a generalised difference-in-differences model (Angrist and Pischke, 2008). The essence of the fixed effect model is that identifies the impacts which are permanent at the settlement level, therefore, it concentrates on all characteristics of settlements which are permanent in time (e.g. geographical location, the size category of the settlement, non-observable variables permanent in time). Consequently, the typical feature of the fixed effect model is that we can involve only time-variant variables as control variables because the model ab ovo disregards the impact of permanent characteristics of settlements. Such control variable is, e.g. the existence of other infrastructure investment or renovation programmes in the vicinity.

The fixed effect model can formally be described as follows:

$$y_{it} = \alpha + A_i + \text{É}\boldsymbol{v_t}\boldsymbol{\beta_t} + \gamma Grant_{it} + \boldsymbol{X_{it}}\boldsymbol{\delta} + \varepsilon_{it} \qquad (2)$$

, where

- the y_{it} values are the value of the output variable for settlement *i* and point in time *t*;
- the A_i values indicate the settlement fixed effects, which include all the characteristics of the settlement that do not change over time and leads to differences between settlement (e.g., region, size, distance from motorway),
- variables $\text{É}\boldsymbol{v_t}$ are binary denoting each year, which take the value 1, if the observation is dated in year *t* and are otherwise set to 0;
- the value of variable $Grant_{it}$ is set to 0 in every year if the investment was made in the given settlement after 2010 and 1 (or the investment amount) as of 2011, if the investment was implemented in the given settlement between 2004 and 2010; (i.e. the settlement is considered as a treated settlement)
- in vector $\boldsymbol{X_{it}}$ we include time-variant settlement-level control variables, which in practice means either the existence of grants from other operational programmes or the amounts of grants.

The impacts of investments will again be reflected by coefficient γ.

In the case of fixed effect models, we essentially examined two types of specifications. In one case (*5.* A.) we set the variable indicating treatment (”Did it benefit from grant for cultural heritage protection?”) to 1 in the treatment group over the period 2011-2013, thus we assumed that all the impacts of investments made before 2011 will appear during 2011-2013. In the other type of model (*5.* B.) we started to measure the impact of investments two years after signing the grant contract in every case. In these models we also exploit the variance of investments over time. The findings in this variation also show that investment projects did not have any impact on the indicators examined. The only significant finding - which however, also relates to a 0 coefficient - can be seen in the amount of other grants in column five of *5.* A.

5*. . Fixed effect models*

A. Fixed effect model. We expect to see the impact of treatment between 2011-2013 in all ”treated” settlements.

	1	2	3	4	5
Output variable	Composite index				
Grant for the protection of cultural heritage	0.003	-0.008	-0.172		
	0.925	0.818	0.438		
Funding from other OP		-0.095	-0.240		
		0.095	0.274		
Received grants for cultural heritage protection and other purposes			0.179		
			0.424		
Amount of grant for cultural heritage protection (HUF 1,000)				0.000	0.000
				0.147	0.091
Amount of other grants (HUF 1,000 Ft)					0.000**
					0.006
Number of observations in the sample	1700	1700	1700	1700	1700
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001				

B. Fixed effect model. We expect the impacts of the treatment to appear at every settlement as of the 2nd year after the first investment.

	1	2	3	4	5
Output variable	Composite index				
Grant for the protection of cultural heritage	-0.026	-0.027	0.033		
	0.254	0.237	0.367		
Funding from other OP		-0.013	0.015		
		0.569	0.515		
Received grants for cultural heritage protection and other purposes			-0.083*		
			0.019		
Amount of grant for the protection of cultural heritage (HUF 1,000)				0.000	0.000
				0.106	0.129

Amount of other grants (HUF 1,000)					0.000
					0.235
Number of observations in the sample	1700	1700	1700	1700	1700
Indication of significance levels: (under the coefficients, the p-values can be seen) (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001				

Other model specifications

Beyond the basic models presented in the previous two sub-chapters, we also worked out other model specifications. These models currently can be used as testing robustness, i.e. they help to see clearly to what extent our findings depend on individual specifications. If the findings in multiple models are by and large similar and compatible with one another, our findings are ”more robust”, more credible, plausible. In the future when the procedure is repeated, they might clarify the interpretations of estimated impacts, identifying factors which might contribute to the positive impact of cultural heritage investment.

Heterogeneous treatment

We tried to divide our available investment data in two ways along individual dimensions to see whether different types of investments result in different impacts: according to the type of the beneficiary (e.g. business, municipality) and according to the services developed from the grant (e.g. renovation only, touristic service, other types of services, as well).

First we divided the sample according to the ”classification” found in the database of investments. The ”classification” shows the beneficiary of the grant. There are five categories of beneficiaries: 1) Not-for-profit organisation, 2) Municipality, 3) Business, 4) Budgetary organ and 5) Other. As we have a settlement-level sample, whereas the ”classification” can be interpreted according to investments, we prepared a binary (dummy) variable for the five categories each ($\boldsymbol{Grans_{it}}$) and we generated five new explanatory variables by multiplying these with our original explanatory variable. Thus, settlements where both the municipality and the not-for-profit organisation benefited from grants for the protection of cultural heritage before 2011, benefited from both types of treatment, thus the value for both the ”municipality” and the ”not-for-profit” dummy shall be set to 1.

The breakdown of the sample according to classification is included in *6*. The majority – 49.33% – of all the examined investment was implemented through the municipality

6*. . The breakdown of the sample according to the classification of investment*

	Investment				Settlements			
	Total		Sample		Control		Treatment	
	Number	%	Number	%	Number	%	Number	%
Not-for-profit	100	26.81	49	24.75	15	14.02	33	30.84
Municipality	184	49.33	108	54.55	34	31.78	62	57.94

Business	35	9.38	20	10.1	7	6.54	12	11.21
Budgetary organ	41	10.99	15	7.58	7	6.54	8	7.48
Other	13	3.49	6	3.03	5	4.67	1	0.93
Total	**373**	**100**	**198**	**100**	**63**	**100**	**107**	**100**
Note: We examined altogether 388 cultural heritage investment projects between 2004 and 2013. 15 investment projects of these were not implemented within the operational programmes, we do not see the classification of these.								

We also grouped investment projects according to the type of investment. In the database we received there was a short narrative description of each investment project on the exact content to implement within the framework of the project. We used these narrative descriptions as a point of departure when preparing the categorisation. From the description the diversity of investment projects was clear, ranging from church renovation to the construction of a wellness hotel. It would not be reasonable to expect such a diverse range of investments to have similar impacts on our examined output indicators, the models we have had so far treat all the investments as one and estimate their average aggregate impact. Based on the descriptions, we developed a categorical (ternary) variable that can take three values as regards the services developed according to the following:

1. The investment includes the renovation and/or energetic upgrading of a given historical monument (e.g. renovating the church on the main square of the settlement, landscaping of the main square),
2. The investment instead of (in addition to) the renovation (also) includes the development of a related tourism service (e.g. the establishment of a new museum, extending the existing museum with a new section, installing an interactive simulation),
3. The investment includes instead of (in addition to) the renovation and related tourism services other services not linked closely to the historical monument (e.g. opening an accommodation establishment, opening of a restaurant, constructing a spa).

Our sample included 15 investments in four settlements that had no corresponding description. Similarly to the heterogeneous treatment according to the ”classification”, we also worked out separate binary variables relating to the type of service, which show in the case of every settlement whether there was a given type of investment in the settlement before 2011.

7. The breakdown of the sample according to the type of service supported in the investment projects

	Investment		**Settlements**			
	Sample		Control		Treatment	
	Number	%	Number	%	Number	%
n.a.	15	7.39	11	17.46	4	3.74
Renovation only	125	61.58	35	55.56	74	69.16
Tourism service	52	25.62	16	25.40	34	31.78
Other related service	11	5.42	5	7.94	6	5.61
Total	203	100	63	100	107	100

We estimated the heterogeneous treatment in a simple difference-in-differences model and the fixed effect model as shown by the two equations below.

Difference-in-differences
$$y_{it} = \alpha + \beta_1 Period_t + \beta_2 Treatet_i + \boldsymbol{\gamma Grans_{it} \cdot Group_j} + \boldsymbol{\delta Control} + \varepsilon_{it} \quad (3)$$

Fixed effect
$$y_{it} = \alpha + A_i + \text{É}\boldsymbol{v_t \beta_t} + \boldsymbol{\gamma Grans_{it} \cdot Group_j} + \boldsymbol{X_{it}\delta} + \varepsilon_{it} \quad (4)$$

Equations no. (3) and (4) are identical with equations (1) and (2) with the difference that instead of the so far only “treatment” variable ($Grant_{it}$), now the models always contain 5 and 4 ”treatment” variables, which are generated by the multiplication of the $Grant_{it}$ original variable and the j group variables (binary variables indicating classification or types of service).

The findings of our heterogeneous treatment models are shown in the two tables below (*8.* and *9.*). These models could prove the significant positive impacts behind the zero coefficient findings we have so far, which differ group by group - e.g., in the case of renovation only 0, but in the case of related other services, a significant positive impact. Because in such a case opposite impacts would ”neutralise” one another and this is how we get the 0 coefficient as a result. Even though some difference in the estimated coefficients is visible in every group, the coefficients also in these models typically show insignificant values, close to zero, which lends itself to the conclusion that there is no difference in the impacts according to the ”classification” and the type of services financially supported.

8. . *Heterogeneous treatment according to the classification of the beneficiary*

	1	2	3	4
Type of model	**DiD**	**DiD**	**FH**	**FH**
Output variable	Composite index			
Not-for-profit	0.035	0.025	0.032	0.023
	0.161	0.361	0.345	0.535
Municipality	-0.04	-0.041	-0.041	-0.044
	0.147	0.126	0.242	0.202
Business	0.024	0.035	0.038	0.035
	0.534	0.372	0.426	0.452
Budgetary organ	-0.002	0.002	-0.004	-0.008
	0.977	0.973	0.964	0.922
Received other grant		✓		✓
Settlement size (8 categories)		✓		
Region		✓		
Ratio of the Roma		✓		
Distance from Budapest (km)		✓		

Distance from motorway (km)		✓		
"Monument intensity"		✓		
Number of observations in the sample	340	340	1700	1700
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001			
Legend: DinD – difference-in-differences, FE – fixed effect				

9. . *Heterogeneous treatment according to the type of supported services*

	1	2	3	4
Type of model	**DiD**	**DiD**	**FH**	**FH**
Output variable	Composite index			
n.a.	-0.086	-0.053	-0.12	-0.113
	0.101	0.286	0.098	0.113
Renovation only	-0.009	-0.008	-0.01	-0.017
	0.688	0.736	0.757	0.605
Tourism service	0.015	0.004	0.025	0.015
	0.576	0.886	0.543	0.711
Other related service	0.005	0.027	0.009	0.022
	0.921	0.596	0.909	0.777
Received other grant		✓		✓
Settlement size (8 categories)		✓		
Region		✓		
Ratio of the Roma		✓		
Distance from Budapest (km)		✓		
Distance from motorway (km)		✓		
"Monument intensity"		✓		
Number of observations in the sample	340	340	1700	1700
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001			
Legend: DinD – difference-in-differences, FE – fixed effect				

Breakdown of sample

If we wanted to assess the impact of time-invariant factors, we cannot use them as variables in our models described so far, because in the fixed effect models only time-variant control variables might be included. For the purpose of measuring the impacts of such variables (size of settlement, number of monuments in the vicinity), we divided the sample into sub-samples and we applied our already presented models to individual sub-samples one by one.

The main constraint of this methodology is the sufficient size of sub-samples even after the breakdown of the original sample. Therefore we created 3 groups of the settlement size variable consisting of eight categories included in the T-Star database

According to the size of settlement, we divided the sample into three groups:

1. Towns
2. Villages (over 2,000 people)
3. Villages (under 2,000 people)

If we expect an impact from investment into cultural heritage protection through the upswing of tourism, it is worth thinking about the mechanism which might lead to the improvement of output variables. As in many cases we talk about smaller settlements or investment projects which themselves are not significant enough to serve as the main attraction for tourists (e.g. church renovation, landscaping of the main square of the village). Therefore, it is worth taking into account the other sites in the vicinity of the specific settlement. Our hypothesis is that in an environment with several sites, local development might induce a larger positive impact than investment in an area with fewer sites, fewer attractions. In order to demonstrate this, we elaborated a so-called ”monument intensity” variable. This we did by dividing the number of settlements with historical monuments in the micro-region with the total number of settlements in micro-regions. In more simple terms, the variable resulting this way shows the relative number of attractions in a given micro-region. Based on the monument intensity, we divided the sample into two sub-samples of by and large the same size. We considered settlements in micro-regions with a ”monument intensity” of over 0.7 as being more attractive, whereas the remaining settlements were considered as less attractive.

Similarly to models estimated with heterogeneous treatment, the breakdown of the sample according to some criterion also serves the purpose to see whether or not the impacts of cultural heritage investment projects differ along these dimensions. Contrary to the ”heterogeneous treatment” models, the sample in this case was divided along the settlements included in the sample and not according to the financially supported investment projects.

10*. Breakdown of sample according to size of settlement*

	1	2	3	4	5	6
Type of model	**DiD**	**DiD**	**FE**	**FE**	**FE(-2)**	**FE(-2)**
Output variable	Composite index					
Impact of grant						
Towns	-0.015	-0.015	-0.015	-0.015	-0.046	0.008
	0.633	0.638	0.716	0.716	0.14	0.858
Number of observations in the sample	156	156	780	780	780	780
Villages (over 2,000 people)	-0.012		-0.012	0.000	0.002	-0.037
	0.751		0.81	0.999	0.961	0.582
Number of observations in the sample	70	70	350	350	350	350
Villages (0-2,000 people)	-0.046	-0.124	-0.046	-0.152	-0.028	-0.022
	0.466	0.457	0.58	0.5	0.561	0.648

Number of observations in the sample	114	114	570	570	570	570
Impact of grant per capita						
Towns	0.000	0.000	0.000	0.000	-0.001	-0.001*
	0.503	0.741	0.621	0.703	0.053	0.042
Number of observations in the sample	156	156	780	780	780	780
Villages (over 2,000 people)	0.000	0.000	0.000	-0.000*	0.000	0.000
	0.996	0.053	0.982	0.028	0.92	0.503
Number of observations in the sample	70	70	350	350	350	350
Villages (0-2,000 people)	0.000	0.000	0.000	0.000	0.000	0.000
	0.411	0.741	0.47	0.506	0.162	0.202
Number of observations in the sample	114	114	570	570	570	570
Received other grant		✓		✓		✓
Settlement size (8 categories)		✓				
Region		✓				
Ratio of the Roma		✓				
Distance from Budapest (km)		✓				
Distance from motorway (km)		✓				
"Monument intensity"		✓				
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001					
Legend: DiD – difference-in-differences, FE – fixed effect, FE(-2) – fixed effect model with a two-year delay grant variable.						

11. *Breakdown of sample into more attractive and less attractive settlements in micro-regions determined according to the number of attractions*

	1	2	3	4	5	6
Type of model	**DiD**	**DiD**	**FE**	**FE**	**FE(-2)**	**FE(-2)**
Output variable	Composite index					
Impact of grant						
Less attractive micro-regions	-0.002	0.057	-0.002	0.149*	-0.065	0.011
	-0.952	-0.244	-0.963	-0.036	-0.072	-0.847
Number of observations in the sample	150	150	750	750	750	750
More attractive micro-regions	0.003	-0.124	0.003	-0.199	0	0.05
	-0.946	-0.411	-0.959	-0.377	-0.987	-0.24
Number of observations in the sample	190	190	950	950	950	950
Impact of grant per capita						
	0.000*	0	0.000*	0	0	0

Less attractive micro-regions	-0.038	-0.304	-0.049	-0.182	-0.348	-0.712
Number of observations in the sample	150	150	750	750	750	750
More attractive micro-regions	0	0	0	0	0	0
	-0.386	-0.657	-0.444	-0.394	-0.196	-0.197
Number of observations in the sample	190	190	950	950	950	950
Received other grant		✓		✓		✓
Settlement size (8 categories)		✓				
Region		✓				
Ratio of the Roma		✓				
Distance from Budapest (km)		✓				
Distance from motorway (km)		✓				
"Monument intensity"		✓				
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001					
Legend: DiD – difference-in-differences, FE – fixed effect, FE(-2) – fixed effect model with a two-year delay grant variable.						

The impact of total grants

The models presented so far focused on the impact of investment into cultural heritage protection. As these models did not demonstrate any visible positive impacts, we formulated a hypothesis according to which the reason behind the zero impact might be the similar impact mechanism of grants for cultural heritage investments and other grants which we use for the control. It is possible that grants for cultural heritage protection and other grants are not different from one another to an extent which would justify them being treated separately (one as the explanatory variable, the other as the control variable). It is possible that these grants basically exert their influence jointly by the flow of "money" into the given settlement, which might have spillover effects. Consequently, we examined whether or not the joint impact of all the grants together may be demonstrated. Were we to see such a positive impact, we would be able to conclude that investment into cultural heritage protection has no additional impact beyond the otherwise positive impacts of the total amount of grants received.

Table *12*. shows our findings as for the joint impact of the total amount of grants. Our model specifications do not identify any impact on the output indicators we examined, our finding is a significant 0.

12. *. The impact of grants total*

	1	2	3	4
Type of model	**DiD**	**DiD**	**FH**	**FH(-2)**
Output variable	Composite index			

Total amount of grants (per capita)	0.000*	0.000*	0.000*	0.000
	0.021	0.042	0.021	0.228
Settlement size (8 categories)		✓		
Region		✓		
Ratio of the Roma		✓		
Distance from Budapest (km)		✓		
Distance from motorway (km)		✓		
"Monument intensity"		✓		
Number of observations in the sample	340	340	1700	1700
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001			
Legend: DiD – difference-in-differences, FE – fixed effect, FE(-2) – fixed effect model with a two-year delay grant variable.				

Interaction models

In the course of examination, we worked out further interaction models in order to explore further heterogeneous impacts. To this end, we used settlement characteristics which might influence the impact made by investment into cultural heritage. This way we examined the following variables:

- the number of monuments in the vicinity (in a given micro region),
- the number of monuments in the vicinity compared to all settlements in micro regions (”Monument intensity”),
- distance from motorway,
- distance from Budapest,
- total personal income tax,
- permanent population.

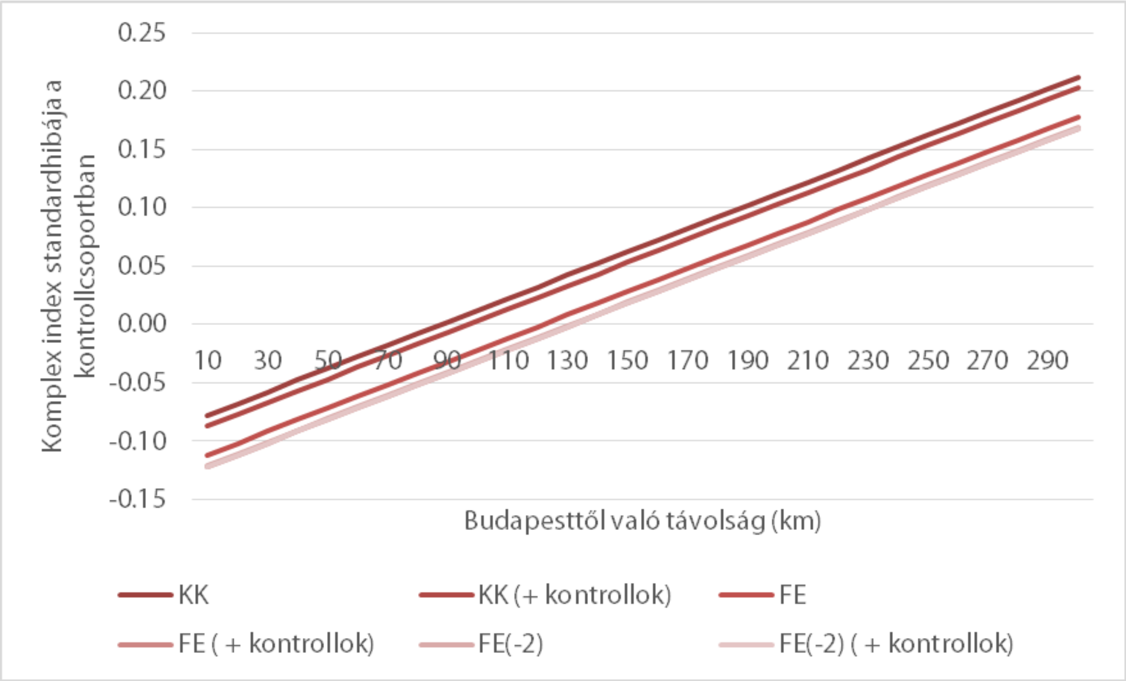
Through the interaction models we examine the following: if virtually the same type of investment was made in two settlements and the only difference between the two settlements is demonstrated only by the given variable, is there any difference as regards the impact of investment resulting purely from this variable? For example, it is possible that one investment brings a larger impact to a settlement which is worse-off in economic terms, because from a lower baseline, from a worse point of departure it is ”easier” to demonstrate achievements. At the same time, it is also possible that the impact of investment may unfold more spectacularly in a settlement which is better-off.

Interaction models

$$y_{it} = \alpha + \beta_1 Period_t + \beta_2 Treatet_i + \beta_3 Grans_{it} + \beta_4 Variabló_i + \gamma Grans_{it} \cdot Variable_i + \boldsymbol{\delta Control} + \varepsilon_{it} \quad (5)$$

The findings of interaction models are included in Annex F. Findings different from the significant zero were identified only in the models based on the distance from Budapest. On the basis of these findings, (first table in Annex (F.), we compiled *2.* , which shows the impact of the investment depending on the distance from Budapest based on the estimated coefficients. In the figure, we indicate the findings of six model specifications, which essentially show similar results: the larger the distance between the settlement and Budapest, the larger impact the cultural heritage investment has and in the case of cultural heritage investment in the direct vicinity of Budapest this impact is still in the negative domain. Finding an explanation for a negative impact is difficult, therefore in order to have a more profound understanding of the issue and checking the robust nature of these findings, we generated further model specifications in order to measure the impact of the distance from Budapest.

2. . *The impacts of cultural heritage investment depending on the distance from Budapest*



Impact of distance from Budapest

Of our interaction models, it was the one applying the distance from Budapest that brought an output different from zero, therefore we tried some other specifications in order to check how robust such findings are. We came up with three types of models:

1. Based on the distance from Budapest we divided our sample into three sub-samples (<100 km, 100-200 km, 200< km distance).
2. We compiled a binary variable, which is 0 if the distance between the settlement and Budapest is shorter than 150 km5, and is set to 1, if the distance is longer than that. Then we applied this variable as an interaction component in our model (see the chapter on Interaction models).
3. We added a quadrant term to our previous interaction model, thus instead of the linear function we use a more flexible form of function to characterise the impact of distance from Budapest on investment impacts.

No significant results appeared from the first model group. In the second model group significant results were arrived at, however, these do not provide any additional information

5 We also made this estimation with 100 km and 200 km division but we did not arrive at substantially different results.

compared to the interaction results so far, they only confirm those. On this basis, in the case of investment further away from Budapest, there is a larger impact on the composite index compared to the control group. In the models supplemented with the quadrant term, the coefficients of the new quadrant term had non-significant zero values.

In summary, as to the heterogeneous impacts according to the distance from Budapest we might conclude that the impact of investments might depend on the location of the settlements, but the impact between the individual specifications is not robust, therefore it is not suitable for drawing major conclusions from.

Alternative control group

In our original models, we used settlements with investment into heritage protection but implemented later then in the treatment group as a control group. As we presented in detail in Chapter 3., this was necessitated by the fact that those settlements where some CH investment was implemented probably differ from other settlements in terms of certain features that are not visible (e.g. the motivation of the mayor to prettify the settlement).

In spite of this, we compared the treatment group not only to the original control group but also to a sample where the control group consists of settlements where there are monuments but in the examined period there was no investment. This method is to disregard the similarity between settlements because we only examine settlements with monuments, but we cannot treat the fact that the venue of the investments probably is not chosen at random. Therefore, the resulting coefficients cannot be interpreted as the impact of investment. It is possible that the results gained indicate some difference in selection which had already existed before the investment due to some other factor (e.g., the motivation level of the mayor, strong non-governmental groups).

Neither do these models show significant differences between the changes of the socio-economic features of the control group and the treatment group, which indicates that the previous findings are robust, irrespective of the methodology applied to select the control group.6

13*. Model estimations through using the alternative control group*

	1	2	3	4
	DiD	**DiD**	**FH**	**FH**
Output variable	**Composite index**			
Grant for the protection of cultural heritage	-0.006	-0.020	-0.006	0.000
	-0.682	-0.326	-0.764	-0.998
Funding from other OP		0.017		-0.008
		-0.383		-0.767

6 We also tested two further methods. The essence of one is to re-assign weights to the control group settlements in the models in order to further improve the balance between the treated and the control group (entropy balancing, see Hainmueller (2012)) Entropy balancing did not change the results. The other method is the quantile regression, which examines the impact in individual sections of the variance of the output variable – this did not provide significant results, either. We will not discuss these results here due to the limits of this paper, but of course they are available on request from the authors.

Number of observations in the sample	6132	6102	42924	42924
Amount of grant for the protection of cultural heritage (HUF 1,000)	0.000	0.000	0.000	0.000
	-0.471	-0.795	-0.727	-0.902
Amount of other grants (HUF 1,000 Ft)		0.000**		0.000
		-0.007		-0.099
Number of observations in the sample	6099	6095	42655	42655
Settlement size (8 categories)		✓		
Region		✓		
Ratio of the Roma		✓		
Distance from Budapest (km)		✓		
Distance from motorway (km)		✓		
"Monument intensity"		✓		
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001			
Legend: DiD – difference-in-differences, FE – fixed effect, FE(-2) – fixed effect model with a two-year delay grant variable.				

7. Conclusion, proposals

In our study we examined through a counter-factual framework based on settlement-level data whether or not the investment into cultural heritage funded by the European Union and the Norway Grants, implemented during the 2004-2013 period, had measurable socio-economic impacts. We estimated the impacts through a composite index generated from eight indicators and by doing so, we remedied the statistical error resulting from separate estimates and examined in substance whether the investment had any average positive impact.

The difference-in-differences and the fixed effect models we used as a point of departure showed insignificant results around zero. We also worked out several other model specifications through which we checked whether the impact is different according to the type of the beneficiary (municipality, not for profit, business, budgetary organ), or according to the types of services developed by the investment (renovation of monuments only, services in tourism, other related services). We also examined whether the different sizes of settlements influence the impacts of investment and whether the number of monuments located in the vicinity (micro region) of the supported settlement is significant, i.e. we were trying to reflect the attractiveness of certain environment. All our specifications confirmed the result, namely the investment has no demonstrable impact based on the data we used and the time interval we examined.

We also checked whether some result can be arrived at if we examine the impact of cultural heritage investment together with other grants. Were we to see such a thing, we could conclude that cultural heritage investment does have an impact on the socio-economic indicators of a settlement, but it does not go beyond the general positive impact of other types of grants. Our models measuring the impact of all the grants together also show that grants have no impact on the examined output indicators.

Our results may also show that investment has indeed no impact on our output variables and it will also hold true in the future. Another possible explanation is that these impacts have not yet unfolded because the decisions on the investment concerned were mostly taken after 2009 and the implementation of the projects took place more or less two years later on average. Thus, only 2-3 years have passed since most interventions examined, which can also be observed in our database. On this basis, we suggest that the impact assessment should be repeated within a few years' time, when the long-term impacts will also have unfolded.

In the course of elaborating the study, the shortcomings of available data limited our opportunities. Generally, the absence of ”finer” indicators was a problem, these are indicators which might change over a relatively shorter period of time as a result of an investment (e.g. the number of guest nights, the income of catering facilities). To remedy the shortcomings, we have formulated certain proposals which might contribute to a more accurate analysis of impacts at a later date.

- We suggest that incentives should be included in the procedure to collect T-Star settlement-level database, which results in more reliable data. Currently, municipalities are in charge of entering the majority of indicators into the database, whose quality is deteriorated by the data not reported to the government or documented insufficiently (e.g. the number of guest nights at various types of accommodation establishments many times shows inconsistent patterns and the number of not-for profit organisations based on our field work does not reflect the number of organisations active in reality). Besides, local actors that have reporting duties are also not motivated to do it properly (e.g. accommodation establishments often under-report the number of guest nights).
- We suggest building and making publicly available a yearly settlement-level database that would include indicators calculated from the existing reported balance sheets in the company registry, in a breakdown according to the year concerned, the settlement, the sector and size (as a panel database). Such a database would be a very important source of several studies. Currently, the one-off compilation of such a database would take months. A further difficulty concerning the data is that these are based on the registered seats of businesses but the establishments of the companies, where incomes might actually be generated, are not identical with the seats.
- We suggest designing the evaluation criteria of tenders for European Union sources in a way that supports the conduct of impact evaluations later on. This could be done by summarising all evaluation criteria in one index, which would be publicly available in a database format; making the data of those who have applied but did not win available and collecting them, cleaning and making publicly available the end-date of the investment projects.

F. ANNEX

F1. Inverse co-variance matrix

	Number of registered unemployed per capita	Number of registered businesses per capita	Number of catering facilities per capita	Amount of aggregate tax base (in 2013 in HUF 1,000)	Number of live births per capita	Number of retail outlets per capita	Number of newly registered residents per capita	Number of de-registered residents per capita	Sörösszegek	Súlyok
Number of registered unemployed per capita	3.252E+14								2.872E+14	**1.412E-01**
Number of registered businesses per capita	-1.079E+13	1.306E+14							1.795E+14	**8.826E-02**
Number of catering facilities per capita	-2.976E+13	3.985E+13	6.636E+14						7.467E+14	**3.671E-01**
Amount of aggregate tax base (in 2013 in HUF 1,000)	-1.382E+12	7.357E+12	-4.560E+12	1.330E+14					1.406E+14	**6.913E-02**
Number of live births per capita	3.781E+12	1.015E+13	2.387E+13	1.390E+12	6.080E+13				1.118E+14	**5.497E-02**
Number of retail outlets per capita	3.170E+12	-1.086E+13	2.564E+13	-9.770E+12	5.802E+12	2.740E+14			2.964E+14	**1.457E-01**
Number of newly registered residents per capita	1.871E+13	1.278E+13	6.288E+13	1.627E+13	2.822E+11	6.485E+12	1.699E+14		2.599E+14	**1.278E-01**
Number of de-registered residents per capita	-2.173E+13	3.912E+11	-3.480E+13	-1.658E+12	5.754E+12	1.989E+12	-2.743E+13	8.923E+13	1.174E+13	**5.772E-03**
									2.034E+15	**1.000E+00**

F2. Findings of interaction models

Impact of the grant for the protection of cultural heritage

	1	2	3	4	5	6
Type of model	**KK**	**KK**	**FH**	**FH**	**FH(-2)**	**FH(-2)**
Output variable	Composite index					
Impact of grant						
Distance from Budapest	**-0.000**	**-0.000**				
	(0.844)	**(0.815)**				
Grants for cultural heritage protection * distance from Budapest	**0.001*** **	**0.001*** **	**0.001*** **	**0.001*** **	**0.001** **	**0.001** **
	(0.001)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.002)**	**(0.003)**
Grants for cultural heritage protection	**-0.088** **	**-0.097** **	**-0.122** **	**-0.132** **	**-0.131*** **	**-0.132*** **
	(0.009)	**(0.005)**	**(0.002)**	**(0.002)**	**(0.000)**	**(0.000)**
Number of observations in the sample	**340**	**340**	**1700**	**1700**	**1700**	**1700**
Impact of grant per capita						
Distance from Budapest	**0.000**	**0.000**				
	(0.283)	**(0.711)**				
Amount of cultural heritage grants * distance from Budapest	**0.000***	**0.000***	**0.000** **	**0.000***	**0.000***	**0.000***
	(0.019)	**(0.014)**	**(0.006)**	**(0.014)**	**(0.024)**	**(0.036)**
Amount of cultural heritage grants	**-0.001**	**-0.001***	**-0.001***	**-0.001***	**-0.001**	**-0.001**
	(0.053)	**(0.038)**	**(0.023)**	**(0.044)**	**(0.053)**	**(0.068)**
Number of observations in the sample	**340**	**340**	**1700**	**1700**	**1700**	**1700**
Received other grants		✓		✓		✓
Settlement size (8 categories)		✓				
Region		✓				
Ratio of the Roma		✓				
Distance from motorway (km)		✓				
„Monument intensity”		✓				
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001					

	1	2	3	4	5	6
Type of model	**KK**	**KK**	**FH**	**FH**	**FH(-2)**	**FH(-2)**
Output variable	**Composite index**					
Impact of grant						
	-0.000	**-0.000**				

Distance from the closest motorway	(0.430)	(0.141)				
Grants for cultural heritage protection * Distance from the closest motorway	0.001*	0.001	0.002*	0.001	0.001	0.001
	(0.021)	(0.094)	(0.030)	(0.089)	(0.284)	(0.292)
Grants for cultural heritage protection	-0.049	-0.045	-0.062	-0.060	-0.058	-0.058
	(0.128)	(0.173)	(0.154)	(0.163)	(0.119)	(0.119)
Impact of grant per capita						
Distance from the closest motorway	0.000	-0.000				
	(0.496)	(0.783)				
Amount of cultural heritage grants * Distance from the closest motorway	-0.000	0.000	0.000	0.000	0.000	0.000
	(0.987)	(0.696)	(0.891)	(0.799)	(0.288)	(0.210)
Amount of cultural heritage grants	0.000	0.000	0.000	0.000	-0.000	-0.000
	(0.497)	(0.842)	(0.564)	(0.673)	(0.890)	(0.691)
Number of observations in the sample	340	340	1700	1700	1700	1700
Received other grants		✓		✓		✓
Settlement size (8 categories)		✓				
Region		✓				
Ratio of the Roma		✓				
Distance from Budapest (km)		✓				
„Monument intensity”		✓				
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001					

	1	2	3	4	5	6
Type of model	KK	KK	FH	FH	FH(-2)	FH(-2)
Output variable	Composite index					
Impact of grant						
„Monument intensity”	-0.008	0.018				
	(0.862)	(0.731)				
Grants for cultural heritage protection * „Monument intensity”	-0.030	-0.048	-0.054	-0.096	0.013	0.010
	(0.791)	(0.671)	(0.712)	(0.510)	(0.935)	(0.950)
Grants for cultural heritage protection	0.024	0.029	0.041	0.058	-0.035	-0.034
	(0.777)	(0.727)	(0.716)	(0.601)	(0.781)	(0.788)
Impact of grant per capita						
„Monument intensity”	0.017	0.044				
	(0.704)	(0.378)				
	-0.001***	-0.001**	-0.002***	-0.001**	-0.001*	-0.001

Amount of cultural heritage grant * „Monument intensity”	(0.000)	(0.005)	(0.000)	(0.007)	(0.021)	(0.054)
Amount of cultural heritage grant	0.001***	0.001**	0.001***	0.001**	0.001**	0.001*
	(0.000)	(0.001)	(0.000)	(0.001)	(0.006)	(0.025)
Number of observations in the sample	340	340	1700	1700	1700	1700
Received other grants		✓		✓		✓
Settlement size (8 categories)		✓				
Region		✓				
Ratio of the Roma		✓				
Distance from Budapest(km)		✓				
Distance from motorway (km)		✓				
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001					

	1	2	3	4	5	6
Type of model	KK	KK	FH	FH	FH(-2)	FH(-2)
Output variable	Composite index					
Impact of grant						
Number of monuments in the vicinity (in a given micro region)	-0.000	-0.001				
	(0.485)	(0.223)				
Grants for cultural heritage protection * Number of monuments in the vicinity (in a given micro region)	0.002	0.002	0.003	0.002	0.003	0.003
	(0.117)	(0.223)	(0.159)	(0.318)	(0.238)	(0.247)
Grants for cultural heritage protection	-0.033	-0.033	-0.039	-0.039	-0.067	-0.066
	(0.329)	(0.343)	(0.386)	(0.394)	(0.080)	(0.081)
Impact of grant per capita						
Number of monuments in the vicinity (in a given micro region)	0.001	-0.000				
	(0.311)	(0.975)				
Amount of cultural heritage grants * Number of monuments in the vicinity (in a given micro region)	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.058)	(0.216)	(0.092)	(0.184)	(0.452)	(0.607)
Amount of cultural heritage grants	0.000*	0.000	0.000*	0.000	0.000	0.000
	(0.025)	(0.117)	(0.040)	(0.070)	(0.189)	(0.264)
Number of observations in the sample	340	340	1700	1700	1700	1700
Received other grant		✓		✓		✓
Settlement size (8 categories)		✓				

Region		✓				
Ratio of the Roma		✓				
Distance from Budapest(km)		✓				
Distance from motorway (km)		✓				
„Monument intensity”		✓				
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001					

	1	2	3	4	5	6
Type of model	**KK**	**KK**	**FH**	**FH**	**FH(-2)**	**FH(-2)**
Output variable	**Composite index**					
Impact of grant						
Permanent population	**0.000**	**0.000**				
	(0.765)	**(0.127)**				
Grants for cultural heritage protection * Permanent population	**-0.000**	**-0.000**	**-0.000**	**-0.000**	**-0.000**	**-0.000**
	(0.082)	**(0.276)**	**(0.079)**	**(0.343)**	**(0.316)**	**(0.332)**
Grants for cultural heritage protection	**0.018**	**0.007**	**0.024**	**0.005**	**-0.015**	**-0.017**
	(0.550)	**(0.834)**	**(0.545)**	**(0.912)**	**(0.592)**	**(0.562)**
Impact of grant per capita						
Permanent population	**-0.000**	**0.000**				
	(0.974)	**(0.147)**				
Amount of cultural heritage grants * Permanent population	**-0.000**	**-0.000**	**-0.000**	**-0.000**	**-0.000***	**-0.000***
	(0.127)	**(0.093)**	**(0.119)**	**(0.074)**	**(0.048)**	**(0.039)**
Amount of cultural heritage grants	**0.000**	**0.000**	**0.000**	**0.000***	**0.000***	**0.000***
	(0.099)	**(0.079)**	**(0.096)**	**(0.038)**	**(0.017)**	**(0.014)**
Number of observations in the sample	**340**	**340**	**1700**	**1700**	**1700**	**1700**
Received other grant		✓		✓		✓
Settlement size (8 categories)		✓				
Region		✓				
Ratio of the Roma		✓				
Distance from Budapest (km)		✓				
Distance from motorway (km)		✓				
„Monument intensity”		✓				
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001					

	1	2	3	4	5	6
Type of model	KK	KK	FH	FH	FH(-2)	FH(-2)
Output variable	Composite index					
Impact of grant						
Total personal income tax	0.000	0.000				
	(0.697)	(0.053)				
Grants for cultural heritage protection * Total personal income tax	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Grants for cultural heritage protection	0.083*	0.075*	0.111*	0.095	0.059	0.058
	(0.015)	(0.046)	(0.012)	(0.050)	(0.109)	(0.115)
Impact of grant per capita						
Total personal income tax	-0.000	0.000				
	(0.086)	(0.986)				
Amount of cultural heritage grants * Total personal income tax	-0.000	-0.000	-0.000	-0.000	-0.000**	-0.000**
	(0.203)	(0.187)	(0.079)	(0.086)	(0.005)	(0.008)
Amount of cultural heritage grants	0.000	0.000	0.000*	0.000*	0.001**	0.001**
	(0.082)	(0.089)	(0.032)	(0.028)	(0.002)	(0.003)
Number of observations in the sample	340	340	1700	1700	1700	1700
Received other grant		✓		✓		✓
Settlement size (8 categories)		✓				
Region		✓				
Ratio of the Roma		✓				
Distance from Budapest (km)		✓				
Distance from motorway (km)		✓				
„Monument intensity”		✓				
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001					

Total impact of cultural heritage and other grants

	1	2	3	4
Type of model	KK	KK	FH	FH(-2)
Output variable	Composite index			
Impact of total grant				
Distance from Budapest	0.000	0.000		
	(0.552)	(0.835)		

Received grant for cultural heritage protection and other grant as well	-0.093**	-0.089**	-0.107**	-0.152***
	(0.002)	(0.004)	(0.007)	(0.000)
Received grant for cultural heritage protection and other grant as well * Distance from Budapest	0.000*	0.000**	0.001***	0.001**
	(0.011)	(0.009)	(0.001)	(0.007)
Impact of total grant per capita				
Distance from Budapest	0.000	0.000		
	(0.089)	(0.518)		
Amount of total grant * Distance from Budapest	0.000	0.000	0.000	0.000
	(0.647)	(0.588)	(0.477)	(0.116)
Amount of total grant	0.000	-0.000	-0.000	-0.000
	(0.995)	(0.923)	(0.830)	(0.229)
Settlement size (8 categories)		✓		
Region		✓		
Ratio of the Roma		✓		
Distance from motorway (km)		✓		
„Monument intensity”		✓		
Number of observations in the sample	340	340	1700	1700
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001			

Type of model	1 KK	2 KK	3 FH	4 FH(-2)
Output variable	Composite index			
Impact of total grant				
Distance from the closest motorway	-0.000	-0.000		
	(0.674)	(0.195)		
Received grant for cultural heritage protection and other grant as well	-0.076*	-0.068*	-0.065	-0.091*
	(0.021)	(0.035)	(0.163)	(0.028)
Received grant for cultural heritage protection and other grant as well * Distance from the closest motorway	0.001*	0.001	0.002*	0.001
	(0.045)	(0.063)	(0.049)	(0.225)
Impact of total grant per capita				
Distance from the closest motorway	0.000	-0.000		
	(0.616)	(0.478)		
Amount of total grant * Distance from the closest motorway	0.000**	0.000**	0.000**	0.000***
	(0.008)	(0.001)	(0.006)	(0.000)
Amount of total grants	-0.000	-0.000	-0.000	-0.000*

	(0.760)	(0.424)	(0.684)	(0.023)
Settlement size (8 categories)		✓		
Region		✓		
Ratio of the Roma		✓		
Distance from Budapest (km)		✓		
„Monument intensity”		✓		
Number of observations in the sample	340	340	1700	1700
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001			

Type of model	**1 KK**	**2 KK**	**3 FH**	**4 FH(-2)**
Output variable	**Composite index**			
Impact of total grant				
„Monument intensity”	-0.015	0.016		
	(0.731)	(0.750)		
Received grant for cultural heritage protection and other grant as well	-0.008	-0.003	0.043	-0.056
	(0.932)	(0.975)	(0.730)	(0.675)
Received grant for cultural heritage protection and other grant as well * „Monument intensity”	-0.021	-0.016	-0.052	-0.000
	(0.862)	(0.895)	(0.751)	(1.000)
Impact of total grant per capita				
„Monument intensity”	0.006	0.031		
	(0.892)	(0.528)		
Amount of total grant * „Monument intensity”	-0.000*	-0.000*	-0.000*	-0.000**
	(0.031)	(0.026)	(0.040)	(0.002)
Amount of total grants	0.000**	0.000**	0.000**	0.000***
	(0.004)	(0.004)	(0.006)	(0.000)
Settlement size (8 categories)		✓		
Region		✓		
Ratio of the Roma		✓		
Distance from Budapest (km)		✓		
Distance from motorway (km)		✓		
Number of observations in the sample	340	340	1700	1700
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001			

Type of model	1 KK	2 KK	3 FH	4 FH(-2)
Output variable	Composite index			
Impact of total grant				
Number of monuments in the vicinity (in a given micro region)	-0.000	-0.001		
	(0.804)	(0.346)		
Received grant for cultural heritage protection and other grant as well	-0.052	-0.045	-0.033	-0.073
	(0.134)	(0.200)	(0.508)	(0.078)
Received grant for cultural heritage protection and other grant as well * Number of monuments in the vicinity (in a given micro region)	0.002	0.002	0.003	0.001
	(0.264)	(0.281)	(0.274)	(0.612)
Impact of total grant per capita				
Number of monuments in the vicinity (in a given micro region)	0.001	-0.000		
	(0.310)	(0.876)		
Amount of total grant * Number of monuments in the vicinity (in a given micro region)	-0.000	-0.000	-0.000	-0.000
	(0.388)	(0.488)	(0.490)	(0.231)
Amount of total grants	0.000	0.000	0.000	0.000
	(0.127)	(0.201)	(0.176)	(0.151)
Settlement size (8 categories)		✓		
Region		✓		
Ratio of the Roma		✓		
Distance from Budapest (km)		✓		
Distance from motorway (km)		✓		
„Monument intensity"		✓		
Number of observations in the sample	340	340	1700	1700
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001			

Type of model	1 KK	2 KK	3 FH	4 FH(-2)
Output variable	Composite index			
Impact of total grant				
Permanent population	0.000	0.000		
	(0.950)	(0.128)		
Received grant for cultural heritage protection and other grant as well	-0.009	-0.002	0.025	-0.057
	(0.754)	(0.934)	(0.540)	(0.058)
	-0.000	-0.000	-0.000	0.000

Received grant for cultural heritage protection and other grant as well * Permanent population	(0.245)	(0.215)	(0.225)	(0.951)
Impact of total grant per capita				
Permanent population	0.000	0.000		
	(0.845)	(0.092)		
Amount of total grant * Permanent population	-0.000**	-0.000**	-0.000**	-0.000
	(0.004)	(0.002)	(0.005)	(0.107)
Amount of total grants	0.000**	0.000*	0.000**	0.000
	(0.005)	(0.012)	(0.005)	(0.157)
Settlement size (8 categories)		✓		
Region		✓		
Ratio of the Roma		✓		
Distance from Budapest (km)		✓		
Distance from motorway (km)		✓		
„Monument intensity”		✓		
Number of observations in the sample	340	340	1700	1700
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001			

Type of model	1 KK	2 KK	3 FH	4 FH(-2)
Output variable	Composite index			
Impact of total grant				
Total personal income tax	-0.000	0.000		
	(0.830)	(0.138)		
Received grant for cultural heritage protection and other grant as well	0.046	0.056	0.107*	0.015
	(0.167)	(0.108)	(0.019)	(0.691)
Received grant for cultural heritage protection and other grant as well * Total personal income tax	-0.001***	-0.001**	-0.001***	-0.001**
	(0.001)	(0.001)	(0.000)	(0.004)
Impact of total grant per capita				
Total personal income tax	-0.000	-0.000		
	(0.088)	(0.976)		
Amount of total grant * Total personal income tax	-0.000*	-0.000*	-0.000**	-0.000**
	(0.010)	(0.016)	(0.003)	(0.010)
Amount of total grants	0.000**	0.000**	0.000**	0.000*
	(0.003)	(0.006)	(0.001)	(0.019)
Settlement size (8 categories)		✓		

Region		✓		
Ratio of the Roma		✓		
Distance from Budapest (km)		✓		
Distance from motorway (km)		✓		
„Monument intensity”		✓		
Number of observations in the sample	**340**	**340**	**1700**	**1700**
Indication of significance levels: (under the coefficients, the p-values can be seen)	* p<0.05, ** p<0.01, *** p<0.001			