Vol. XXVI., No. 150. 2023/2

# Forum on Economics and Business

## Közgazdász Fórum

UNIVERSITATEA BABEŞ-BOLYAI
BABEŞ-BOLYAI TUDOMÁNYEGYETEM
BABEŞ-BOLYAI UNIVERSITÄT
BABEŞ-BOLYAI UNIVERSITY
TRADITIO ET EXCELLENTIA

ROMÁNIAI MAGYAR KÖZGAZDÁSZ TÁRSASÁG

PARTIUMI KERESZTÉNY EGYETEM

### Contents:

3. **Gábor Murai**
What drives demand for content creator-generated product reviews, the product or the creator?

24. **Leticia Pekk – András Hary**
Features of technology development in the industrial transformation

37. **Mónika Hoschek – Nikoletta Németh – Katalin Mészáros**
Travel habits and active tourism in 2020

54. **Réka Horváth – Tünde Petra Szabó**
The unintended effects of the Cohesion Policy: The wealthiest regions attract more EU funds

**Published with the support of the Hungarian Academy of Sciences**


Publisher:

**Hungarian Economists' Society of Romania**

12 Aurel Suciu street
400440 Kolozsvár/Cluj-Napoca
tel./fax: + 40 (0) 264-431-488
e-mail: office@rmkt.ro
web: www.rmkt.ro

---

# FORUM ON ECONOMICS AND BUSINESS


## Contents

**GÁBOR MURAI**
What drives demand for content creator-generated product reviews, the product or the creator? .....3

**LETICIA PEKK – ANDRÁS HARY**
Features of technology development in the industrial transformation .....24

**MÓNIKA HOSCHEK – NIKOLETTA NÉMETH – KATALIN MÉSZÁROS**
Travel habits and active tourism in 2020 .....37

**RÉKA HORVÁTH – TÜNDE PETRA SZABÓ**
The unintended effects of the Cohesion Policy: The wealthiest regions attract more EU funds .....54

# What drives demand for content creator-generated product reviews, the product or the creator?

**GÁBOR MURAI**[1]

Product reviews produced by content creators are popular on social media and constitute an important source of brand information for consumers. Understanding the consumption of such content is, therefore, important for marketing scholars and practitioners interested in how consumers learn about brands.

This paper examines whether the demand for content creator-generated reviews is driven by the product reviewed, or by the content creator's personality. In order to study the underlying drivers behind the demand for reviews, hierarchical regressions were estimated using longitudinal data on video reviews of personal smart devices posted on YouTube. The results show that both the product and the content creator are significant drivers of demand. Up to now, the literature has not offered evidence supporting either of these approaches. We discuss the implications of this finding and draw conclusions for managers.

**Keywords:** product review, content creator, earned media, user-generated content, YouTube.

**JEL codes:** D83, M31.

## Introduction

Consumers spend an increasing amount of time on social media, which makes it an ever more important source of product and brand information. Product-related content on social platforms can be classified as owned, paid and earned media, depending on whether the content is commissioned by or independent from the vendor of the product or brand featured in the content. In this paper, I focus on the latter group, the earned media.

A prominent stream of prior literature on earned media focused on user-generated reviews (UGR). Such content impacts sales (Chevalier–Mayzlin 2006; Babić Rosario et al. 2016; Moon–Kamakura 2017; Marchand et al. 2017), product evaluations (Langan et al. 2017), firm profit (Zhao et al. 2013; Wu et al. 2015), firm strategy (Chen–Xie 2005), firm value (Chen et al. 2012; Tellis–Johnson 2007), product choice (Kostyra et al. 2016) and can be used to extract information

[1] PhD candidate**,** University of Pécs, Faculty of Business and Economics, Department of Economics and Econometrics, e-mail: murai.gabor@ktk.pte.hu.

about consumer preferences (Decker–Trusov 2010) and the brand's customer base (Moon–Kamakura 2017).

In recent years, another genre of earned media has been gaining in popularity among consumers, namely the reviews created by content creators. Content creators are commercial enterprises, usually individuals or small companies, producing product reviews which they publish on social media platforms. These product reviews are the topic of this study.

Thus, I define content creator-generated reviews (CCGR) as a genre of earned media characterised by the following features: the content of the CCGR is a review of a specific product, it is available to the public free of charge via an online social media platform and it is produced by a person or organisation producing multiple reviews. The creators of the reviews get financial incentives based on the size of the audience reading the review.

Despite the importance of understanding the CCGR for marketers, there is a gap in the literature examining the nature of this new phenomenon. The literature has not studied the demand for the CCGR. Therefore, in this paper, I study a fundamental aspect – the key drivers of demand for content creator-generated reviews: the product being reviewed and the content creator.

The paper is organised as follows: review of the literature on earned media and the possible drivers of demand for the CCGRs, model development, data, and results. It ends with the discussion of the results, their implications, the limitations of the study, and suggestions for future research.

**Literature review**

Content creator-generated reviews, on the one hand, can be considered earned media, as they are brand-focused content which is not generated by the brand vendor (Stephen–Galak 2012; Lovett–Staelin 2016; Colicev et al. 2018)[2]. This understanding of the phenomenon is in line with Huang et al.'s (2022) and Silaban et al.'s (2022) studies, showing that consumers' purchase intentions are impacted by the CCGRs on YouTube, which implies that there is a product information seeking motive behind the demand for reviews.

[2] A common argument regarding the independency of product reviews mentions that content creators often have sponsorship deals with brands. Given that, in these cases, product reviewers have to disclose that the content was sponsored, Pfeuffer et al. (2021) examined the effect of those disclosures and found that they did not have a significant impact on the attitudes towards the product, the brand, or the reviewer.

On the other hand, the fact that the review is devoted to a particular product does not imply that learning about the product is the sole reason behind the audience's interest in a given CCGR. It is possible that the demand for content creator-generated reviews is driven by other motivations. For instance, similarly to television, magazines or shows, the audience can look for entertainment (Haridakis–Hanson 2009; Khan 2017) or to connect with the content creator through parasocial interaction (McCracken 1989, Lee–Watkins 2016; Sokolova–Kefi 2020). While these studies do not focus on product reviews specifically, it is possible that these non-product related motivations are also what drives CCGR audiences. In conclusion, demand for the CCGR can be driven by product or/and non-product related motivations.

From the perspective of product information-related motives, content creator-generated reviews are similar to user-generated reviews such as those hosted by Amazon or Yelp examined by Chevalier–Mayzlin (2006), Babić Rosario et al. (2016), Zhao et al. (2013), Wu et al. (2015), Tirunillai–Tellis (2012) and Hu et al. (2012), or product reviews published by traditional media. These types of earned media can serve as a source of product information, highlighting the consumers' information-seeking motive to consume these media. More recently, Huang et al. (2022) and Silaban et al. (2022) also examined whether consumers' purchase intentions were affected by the CCGRs. They found a significant positive relationship, which further implicates that this motive could be present in the case of YouTube product reviews as well. The CCGRs are also related to news media as they provide news about the product in a fashion that resembles traditional news or magazine segments on a specific topic. The audience can have similar motivations to watch the news and the CCGR, stemming from their need to be informed (Lacy 1989) about a specific topic or to confirm their prior beliefs (Mullainathan–Shleifer 2005).

Individual reviews have been conceptualised as noisy product quality signals, and consumers have been shown to learn by attending to multiple such signals (Zhao et al. 2013; Wu et al. 2015). For example, in their study of book reviews, Zhao et al. (2013) show that consumers learn from the body of multiple UGRs more than from their direct product experiences, Wu et al. (2015) show that consumers learn from the UGRs about their restaurant preferences. In a similar vein, a collection of content creator-generated reviews can be conceptualised as a series of quality signals and can be expected to facilitate consumer learning.

Audience members seeking information about a specific product can select content, for example the CCGRs, based on such observable attributes as title or description.

Consumers' desire to learn about the product can drive the demand for content creator-generated reviews. However, the CCGRs are part of social media where consumers may want to read the content for other reasons than just learning about products. Indeed, Shao (2009) distinguishes between information, entertainment, and mood management needs among the consumers of social media content. He links these motivations with the features of social media environment such as interactivity, the creation of virtual communities, the ease of producing own content (e.g., comments) and sharing it, features which are absent from traditional media (Neuberger–Nuernbergk 2010) but are present in the case of the CCGR. Sokolova–Kefi (2020) observe that, on social media, the content is entertaining and that social attractiveness (including e.g., the entertainment value) is associated with parasocial interaction (i.e., fan-celebrity relationship). Examining consumers' purchase intentions and stickiness, Huang et al. (2022) and Silaban et al. (2022) show the presence of social and parasocial interactions between the audience and the content creator in the case of the CCGRs as well. This means that the previous findings on social motives could also apply to the CCGR domain.

Studies on the motivations of YouTube audiences found that, besides information seeking, video viewing is driven by the audience's need for entertainment (Haridakis–Hanson 2009; Khan 2017) and for social interaction (Haridakis–Hanson 2009). While these studies do not focus on product reviews specifically, it is possible that these non-product related motivations are also what drives CCGR audiences.

Over time, YouTube content creators have developed an idiosyncratic content style (Lee–Watkins 2016; Sokolova–Kefi 2020). Thus, the viewers are expected to choose the content based on the content creator's style to satisfy their non-product related needs, such as entertainment or social interaction.

In conclusion, the CCGR audience can have either one motivation or both types of motivations, interest in a product and/or non-product related motivations. The non-product related audience motivations are something that sets the CCGR apart from user-generated reviews. In the case of user-generated reviews, the audience has not been found to develop preferences for particular reviewers. For

example, Banerjee et al. (2017) observed that the feature allowing the audience to follow Yelp reviewers is seldomly used.

Prior marketing literature has not studied the demand for earned media and the CCGR. However, the reviewed literature suggests that the demand for the CCGR can be driven by both the product being reviewed and the creator of the review. Building on these studies, the following hypotheses were formulated:

*H1:* The reviewed product has a significant impact on the CCGR viewership.

*H2:* The content creators' characteristics have a significant impact on the CCGR viewership.

In the next sections, the data collection procedure and the data are described. Then, the random effects regression model of the CCGR views is specified and will be used to verify whether the reviewed product and the content creator contribute to CCGR views.

**Data**

The data about the CCGR comes from YouTube. This platform is an important source of product information for consumers and a popular outlet for CCGR publication.

The study is focused on a specific product category, namely personal computing devices, including smartphones and smartwatches. This is a relevant product category for studying the CCGRs due to high consumer demand and creator supply for product reviews.

The goal was to sample the CCGRs devoted to a product category of interest and posted by YouTube channels specialising in creating CCGRs for the selected product category. To generate the sample, YouTube's channel search feature was utilised to identify YouTube creators in the CCGR space, focusing on personal computing devices in the English language. Then, a list of search phrases was constructed, each phrase comprising one term from each of the following two sets. The first set included product category terms (Technology, Tech, Smartphone, Phone, Smartwatch, etc.). The second set included terms related to the CCGR genre (Product Review, Unboxing, Review). Using these terms, an initial set of creators was identified. Table 1 presents the number of subscribers observed for the creators in this initial set. For this sample, small creators with less than 10 000 subscribers were eliminated.

**Table 1. Frequency of observed subscriber count per content creator**

| Subscriber count | Number of channels |
|---|---|
| 0 – 999 | 985 |
| 1 000 – 9 999 | 334 |
| 10 000 – 99 999 | 189 |
| 100 000 – 999 999 | 101 |
| 1 000 000 – | 33 |

Note: The table includes the initial set of creators before filtering out the creators with less than 10 000 subscribers, who were not publishing in English language and/or did not post at least one video on a new product from the new product list.

*Source:* Own editing

Next, a list of new personal computing devices launched between 1 January 2020 and 1 October 2020 was sourced from a leading consumer information website, www.gsmarena.com, and the creators who had not published any videos about any of the products on the list were eliminated. Finally, the content of the resulting set of creators was reviewed and those not publishing in English were removed. The resulting number of creators included in the sample is 68.

Next, the videos of the creators included in the sample were examined and the videos which did not feature a product from the new personal computing product list or the videos devoted to more than one product were filtered out. The resulting database includes 696 videos.

The data has a panel structure. The time dimension includes 106 days and covers the period between 16 June 2020 and 1 October 2020. The cross section refers to the individual CCGR videos. These videos were launched at different points in time during the data collection period, hence the panel is unbalanced. The sample includes daily data on videos and their creators, including video views, video title, description, date of posting and number of subscribers to the video creator's channel. In total, our data includes 44 015 observations for the 696 videos.

Table 2 presents key descriptive statistics for the data sample. TotalViews refers to the number of views for a given video generated up to a specific day. This data is strongly left skewed with the 75$^{th}$ percentile (94 704 views) being smaller than the mean (150 980 views). The maximum value for the variable, 7 768 909, represents the total views of the most popular video in the sample. The average total views of sample videos is 951 125.5. This value was calculated as

the average of TotalViews in the last period, N=696. The table reports values for all periods and N=44 015.

DailyViews is the number of views a video generates in a single day. Again, the data is strongly left skewed with a mean of 1 484 views, being substantially larger than the 75th percentile (399 views).

CreatorSubscribersVolume refers to the number of viewers who have subscribed to creator channels on YouTube. The data is again left skewed with the mean and the 75th percentile having comparable values of 1 424 399 and 1 230 000, respectively.

**Table 2. Descriptive statistics**

| Statistic | N | Mean | St. Dev. | Min | Pctl(25) | Pctl(75) | Max |
|---|---|---|---|---|---|---|---|
| TotalViews | 44 015 | 150 980 | 493 003 | 21 | 4 743 | 94 704 | 7 768 909 |
| DailyViews | 41 670 | 1 484 | 21 880 | -10 112 | 10 | 399 | 2 641 000 |
| Creator-Subscribers-Volume | 8 320 | 1 424 399 | 2 816 021 | 16 300 | 184 000 | 1 230 000 | 17 200 000 |

Note: The minimum observed value for DailyViews is negative. This is most likely due to YouTube filtering out the views which they deem illegitimate (Google Help).

*Source:* Own editing

**Model development**

The main goal of the analysis is to examine whether the product and the creator are significant drivers of CCGR views. The random effects model of daily video views is described below and will be used to answer these questions.

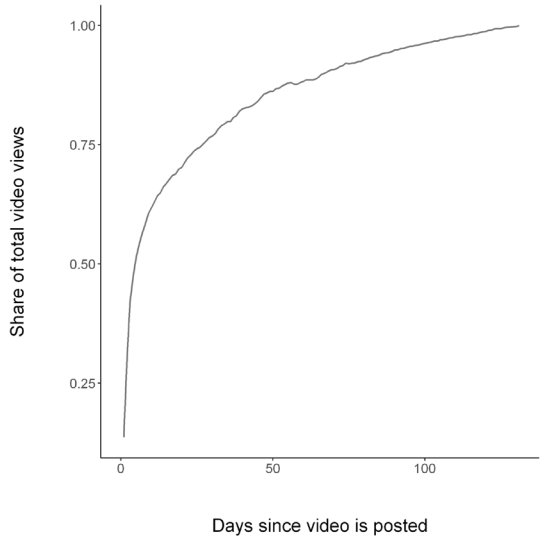
***Control variables***

Before the focal variables are discussed, several other variables are introduced to control for sources of time and cross-sectional variation in the video views data.

*Video age*

The literature on the evolution of online content popularity documents a 'burst' and 'slow' evolution path (Figueiredo et al. 2014; Li et al. 2016) whereby consumption of the content bursts right after publication, and then it slows down.

Indeed, in the collected data, the CCGRs accumulate views at a decreasing rate after posting, and the rate of decrease in views is dropping (Figure 1). On average, the first third of total views is accumulated in 3 days, the second third in 9 days, and 90% of them in 68 days.




Note: To produce the figure, the cumulative daily views for each video in our sample was calculated and divided by the total views of that video at the end of the sample period. Then, the resulting values were averaged across all sample videos.

*Source:* Own editing

**Figure 1. Cumulative video views per day**

To control for this dynamic, a parsimonious approach is taken, resulting in a continuous function. Two terms are introduced, $STVideoAge_{it}$ and $LTVideoAge_{it}$, representing the video age at short (ST) and long (LT) term for video $i$ at time $t$, to capture the initial, fast, and subsequent, slow accumulation of views. Model fit comparison is used to select the day after the CCGR publication in which the switch between $STVideoAge_{it}$ and $LTVideoAge_{it}$ takes place.

$STVideoAge_{it}$ and $LTVideoAge_{it}$ are defined as follows:

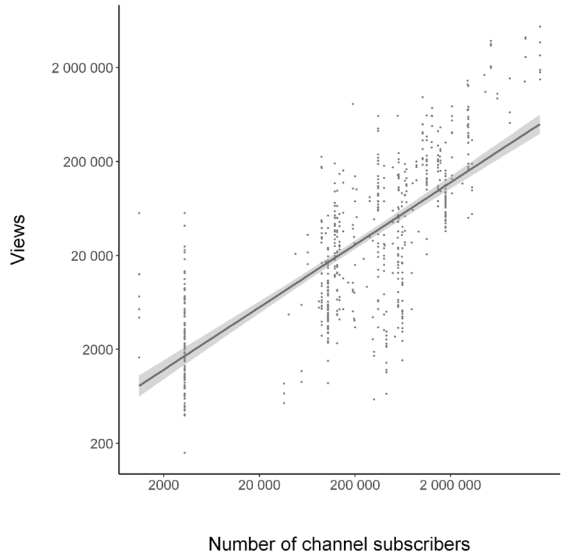
$$STVideoAge_{it} = \begin{cases} VideoAge_{it} & \text{if } VideoAge_{it} < \gamma \\ \gamma & \text{if } VideoAge_{it} \geq \gamma \end{cases}$$
$$LTVideoAge_{it} = \begin{cases} \gamma & \text{if } VideoAge_{it} < \gamma \\ VideoAge_{it} & \text{if } VideoAge_{it} \geq \gamma \end{cases} \quad (1)$$

where γ is the number of days after video $i$ is published.

Given the assumed nonlinear nature of the variable, logarithmic transformations of the VideoAge variables are also taken while representing them in the regression.

*Channel Subscribers Volume*

Prior studies have shown that channel size is positively associated with viewership of the videos (Welbourne–Grant 2016; Hoiles et al. 2017). In the data, the CCGR views are positively correlated with the number of subscribers to the YouTube channel posting them (Figure 2).




Note: The line is fitted using OLS and the grey area indicates the standard error. The figure illustrates a positive correlation between channel subscribers and the number of views its videos attract (Correlation: 0.744).

*Source:* Own editing

**Figure 2. Video views and the number of subscribers to the channel posting it**

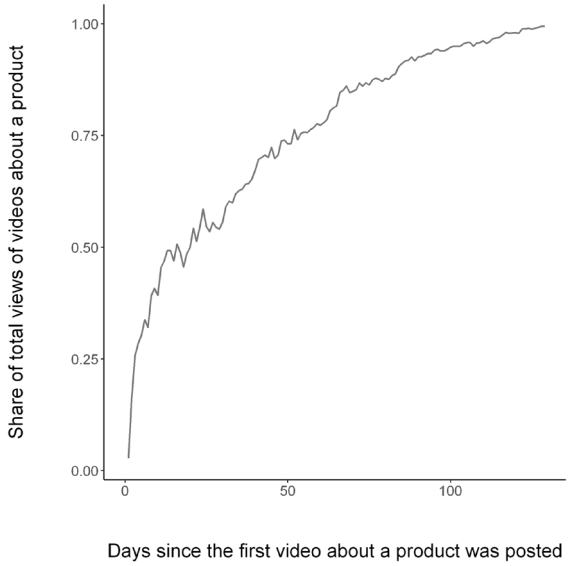
Thus, channels with more subscribers are expected to attain more views on average, and this relationship is expected to be nonlinear. This effect will be captured by the variable $ln\ Subscribers_{jt}$, denoting the natural logarithm of channel *j*'s subscriber count at time *t*.

*Weekend effect*

The potential weekend effect is also controlled. However, there is not a clear expectation of which direction this effect will lean. Consumers may spend more time watching YouTube during weekends due to more leisure time available, however, they can also tend to spend weekends away from YouTube and/or the CCGRs. $Weekend_t$ variable is included to capture this effect.

*Product Age*

It has been observed that, on social media, the audience's attention to content can be short-lived (Zadeh–Sharda 2014). In the data, the views of the CCGRs about a given product display a similar pattern as the views of a single video over time, albeit the decrease in views per unit of time is smaller (Figure 3).




To generate the values represented in the figure, daily views for all videos about a given product are summed. Then, cumulative daily views are computed and divided by the cumulative daily views at the end of the sample period, i.e., total cumulative daily views. Finally, the resulting values were averaged across the sample products.

*Source:* Own editing

**Figure 3. Views of reviews of a product per day**

On average, the first third of total review views for a product is accumulated in 5 days, the second third in 34 days, and 90% of them in 84 days. Given its

nonlinear nature, the variation in product interest over time is modelled with *ln ProductAge*$_{kt}$ variable, denoting the natural logarithm of product *k*'s age at time *t*.

***Focal variables***

The literature review discussed the possible motives why the audience watches the CCGRs and distinguished between product information and non-product related motivations.

*Featured Product*

To gauge the product interest-driven demand for the CCGRs, the Featured Product variable is introduced. This variable will capture the temporarily fixed demand for the CCGRs associated with each of the sample products. Thus, it will verify whether the products featured in the CCGRs are an important driver of viewership. Such evidence would be consistent with the notion that consumers watch the CCGRs to learn about products.

In addition, combining the Featured Product with the Product Age described above, the topic popularity over time is modelled, showing the level of popularity for a given product and the speed at which this level decreases over time.

*CCGR creator*

To model the non-product related demand for the CCGRs, the CCGR Creator variable is introduced. It captures the time-invariant demand for the CCGRs made by a specific creator. The variable will provide evidence of creators' idiosyncratic characteristics drawing audiences to their content. This finding would set the CCGRs apart from user-generated reviews.

Using the control and focal variables listed above, the following regression model is specified:

$$\begin{aligned} ln\ DailyViews_{it} &= \beta_{0jk} + \beta_1\ ln\ STVideoAge_{it} + \beta_2\ ln\ LTVideoAge_{it} + \\ &+ \beta_3\ ln\ CreatorSubscribersVolume_{jt} + \beta_4\ Weekend_t + \beta_5\ ln\ ProductAge_{kt} + \varepsilon_{it} \end{aligned} \quad (2)$$

where *ln DailyViews*$_{it}$ is the dependent variable denoting the natural logarithm of the number of views of the CCGR *i* at time *t* and $\beta_{0jk} = (\beta_{00} + \beta_{0j} + \beta_{0k})$.

$\beta_{00}$, $\beta_{0j}$, $\beta_{0k}$, $\beta_x$ *where* $x = \overline{1, 7}$, $\gamma$ are parameters. Parameters *where* $x = \overline{1, 7}$, *and* $\gamma$ are estimated. Parameters $\beta_{0j}$, $\beta_{0k}$ are assumed to be normally distributed across *K* sample products and *J* sample creators respectively, having a zero mean and $\sigma_{0j}$, $\sigma_{0k}$ variance.

$$\beta_{0j} \sim N(0, \sigma_{0j}^2)\ ;\ \beta_{ok} \sim N(0, \sigma_{0k}^2)$$

where $\sigma_{0j}^2$ and $\sigma_{0k}^2$ are estimated parameters.

The parameters of control variables include $\beta_1$, $\beta_2$, $\beta_3$, $\beta_4$, $\beta_5$. The parameters which are focal to our study include $\beta_{0j}$, $\beta_{ok}$, $\gamma$, $\sigma^2_{0j}$ and $\sigma^2_{0k}$.

$\beta_{ok}$ shows the distribution of the featured products' effect on the daily views of the videos. Parameter $\sigma^2_{0k}$ shows the variance of this effect. An estimate of this coefficient that is greater than zero would imply that the products featured in the CCGRs are an important driver of viewership and will be consistent with the notion that consumers watch the CCGRs to learn about products.

$\beta_{oj}$ shows the distribution of the creators' effect on the daily views of the videos. Parameter $\sigma^2_{0j}$ shows the variance of this effect. An estimate greater than zero would imply that the creators of the CCGRs are a significant driver of demand for the CCGRs. This would be consistent with the notion that the CCGR demand is driven not only by the audience's product interest but also by other more entertainment-related motivations.

**Results**

Table 3 presents the results from the dynamic, random effects regression model presented in Eq. 2. Since most of the variables have log-log specifications in the model, these parameters can be interpreted as elasticities.

***Model fit***

The proposed model as well as several other setups are estimated for model selection and robustness checks. First, to test the random effect model selection, a Hausman test was conducted against the fixed effects model. Given the p-value of 0.08444, the test shows that the random effects model should be preferred.

Then, several models are estimated for robustness checks. The robustness check models progressively exclude variables. Robustness check 1 excludes product heterogeneity, robustness check 2 removes channel heterogeneity and finally, robustness check 3 includes one slope coefficient (instead of two) accounting for video age.

As evidenced by the Log-likelihood, AIC and BIC, the proposed model fits the data significantly better than the robustness check models, even when accounting for the larger number of parameters it includes.

***Results for control variables***

*Video age*

The video age is expected to be negatively associated with daily views. Based on prior literature (Figueiredo et al. 2014; Li et al. 2016), the slope of the video age effect is also expected to be different in the short term and the long term.

Therefore, the video age variable is split into two variables: $ln\ STVideoAge_{kt}$ and $ln\ LTVideoAge_{kt}$. In order to determine the value for the split parameter between long term and short term, the model fit along various $\gamma$ values is examined. The best fit can be found with splitting the video age at 8 days after posting.

$\beta_1$, the coefficient for the short-term effect, is -0.528 (p-value < .01), while $\beta_2$, the coefficient for the long-term effect, is -0.022 (p-value < .01). As expected, both coefficients are significantly negative.

This finding means that the daily video views of the CCGRs reach the highest level right after video publication and fall sharply up to day 8. After day 8, the daily views still decrease but at a rate which is an order of magnitude slower than before day 8.

Our estimates imply that, on average, CCGR views drop on the first day and on the seventh day since publication by 30% and 8%, respectively. In the second week since publication, the drops in daily views decrease between 2.5% and 1.4% each day.

To test if two separate coefficients are needed for video age, fit of robustness check model 4 (RCM4) and robustness check model 3 (RCM3) are compared. Both models are the same, except RCM3 includes two Video Age variables and it estimates a separate slope coefficient for each of them. The fit of RCM4 is much worse than the fit of RCM 3 validating our approach to modelling video age.

*Subscription volume*

The number of viewers subscribed to the creator channel was expected to be positively associated with CCGR views. Indeed, the estimate of $\beta_3$ is 0.031 (p-value < .01). This coefficient value implies that, on average, a 1% increase in subscribed audience is associated with 0.031% more views for each of the channel's CCGRs every day.

*Weekend*

The difference in CCGR view numbers between weekends and weekdays are found to be not significant. As a robustness check, a model with day dummies instead of a weekend dummy was tested, but the differences between weekdays were also insignificant.

*Product Age*

Product Age refers to the time since the posting of the first CCGR about a particular product. $\beta_5$, coefficient of $ProductAge_{it}$ is not significantly different from zero. Apparently $ProductAge_{it}$ has no effect on CCGR views once other variables are accounted for.

**Table 3. Regression results**

| | *Dependent variable* ln DailyViews | | | |
|---|---|---|---|---|
| | | *Robustness checks* | | |
| | *Main model* | (1) | (2) | (3) |
| Constant | 10.193*** | 10.206*** | 10.246*** | 9.333*** |
| | (0.040) | (0.034) | (0.019) | (0.011) |
| ln ST VideoAge | -0.531*** | -0.541*** | -0.530*** | |
| | (0.007) | (0.007) | (0.008) | |
| ln LT VideoAge | -0.021*** | -0.023*** | -0.030*** | |
| | (0.001) | (0.001) | (0.001) | |
| ln VideoAge *(Unsplit)* | | | | -0.093*** |
| | | | | (0.001) |
| Weekend | 0.001 | 0.001 | 0.001 | 0.002 |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| ln CreatorSubscribersVolume | 0.031*** | 0.036*** | 0.023*** | 0.024*** |
| | (0.002) | (0.002) | (0.0004) | (0.0004) |
| ln ProductAge | -0.014*** | -0.031*** | -0.010*** | 0.004 |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| SD Across Channels | 0.1503 *** | 0.1485 *** | | |
| SD Across Products | 0.1456 *** | | | |
| Log Likelihood | 14 676.66 | 13 695.84 | 8 346.51 | 6 386.32 |
| Akaike Inf. Crit. | -29 335.33 | -27 375.69 | -16 679.02 | -12 760.63 |
| Bayesian Inf. Crit. | -29 257.59 | -27 306.00 | -16 618.56 | -12 708.81 |

*Note:* *p<0.1; **p<0.05; ***p<0.01

*Source:* Own editing

***Results for focal variables***

*Product intercept*

Product intercepts as random coefficients $\beta_{0k}$ were specified and their variance $\sigma^2_{0k}$ was estimated. The estimate of $\sigma^2_{0k} = 0.1456$ (p-value < .01), supporting the notion that the product featured in a CCGR is a significant determinant of CCGR views.

The coefficient value indicates that, ceteris paribus, the standard deviation of daily CCGR views across products is about 14.56%. To illustrate the effect size of $\sigma^2_{0k}$, the cumulative views per video are computed in the first two weeks since posting for the 25th and the 75th percentiles of the distribution of $\beta_{0k}$. The reviews of products in the 25th percentile of $\beta_{0k}$, gather, on average, 56 589 views in two weeks, while the reviews of products in the fourth quantile gather, on average, 2 217 863 views in two weeks, which is a very sizable difference. Given the significance of the product intercept, I accept Hypothesis 1. The product reviewed in the video has a significant impact on the viewership of the videos.

*Creator intercept*

Creator intercepts as random coefficients were specified and their variance $\sigma^2_{0j}$ was estimated. The estimate of $\sigma^2_{0j} = 0.1503$ (p-value < .01) indicates that the CCGRs of different creators are not homogenous for the audience.

The estimate of the coefficient suggests that, ceteris paribus, the videos posted by different creators generate daily views which are over 15.03% apart. The magnitude of $\sigma^2_{0j}$ can be gleaned from the view numbers corresponding to two examples of values showing the distribution of $\beta_{0j}$. On average, the reviews of creators from the 25th percentile and the 75th percentile of the distribution of $\beta_{0j}$ gathered 209 267 and 1 869 586 views, respectively, over the two-week period. This result shows major differences in popularity for the content posted by different creators. Given the significance of the creator intercept, I accept Hypothesis 2. The creator of the video has a significant impact on the viewership of the product review.

Based on the variance in product and creator intercepts, it can be concluded that both content creators and products reviewed are important drivers of CCGR views, and that standard deviation parameters representing differences between content creators and differences between products have similar values.

**Conclusions**

The growth of social media is accompanied by the increasing importance of earned media. In recent years, a new genre of earned media has emerged on social media platforms, namely the content creator-generated reviews (CCGR). One of the most important contributions of this study is that it offers the first empirical research on this type of media, an already prominent, yet still growing phenomenon, with high relevance to marketing. Prior literature on earned media focused primarily on user-generated content, including the UGR. The phenomena of user-, and content creator-generated reviews are different from one another in several important ways. Most importantly, the generation of the CCGR, in contrast to the UGR, is a profit-seeking enterprise. Moreover, content creators vs. users tend to produce more content, more regularly, and invest more resources per review. This can allow creators to develop a relationship with the audience. Taken together, these differences translate into a different set of incentives underlying the UGR and the CCGR. In this study, I focus on a fundamental aspect of demand for the CCGRs. I seek to establish whether CCGR views are driven by the product being reviewed and by the creator of the review. Based on prior literature, the CCGRs can be conceptualised not only as a source of consumer learning about products but also as an entertainment product. Up to now, the literature has not offered evidence supporting either of these approaches.

I found that the demand for content creator-generated reviews is driven by both the product being reviewed and the creator of the review. This finding has important implications for marketers and content creators.

The finding that the reviewed product featured in a CCGR is a significant driver of its audience size is fundamentally important, because it establishes a clear link between the CCGR and consumers' demand for product information. A prominent stream of research on earned media focuses on the link between earned media and sales (e.g., Chevalier–Mayzlin 2006; Babić Rosario et al. 2016; Moon–Kamakura 2017; Marchand et al. 2017) or purchase intention (Chen–Dermawan 2020; Huang et al. 2022; Silaban et al. 2022; Weinlich–Semerádová 2022). These studies laid the foundation for this field of knowledge by documenting its relevance to marketing. However, these studies did not examine consumers' information consumption , a process which can be expected to mediate the impact of earned media on sales. This study provides evidence regarding earned media consumption, thereby shedding light on what, based

on experimental data (Kostyra et al. 2016), appears to be a causal link between earned media and brand sales.

I also found that CCGR views depend on the creator of the review, underscoring the importance of creators and their characteristics. This finding is consistent with prior survey research (Shao 2009) on YouTube audiences, listing non-product information-related audience motivations like entertainment and mood management. In terms of the relationship between the source and the recipient of the message, the CCGRs turn out to be similar to word-of-mouth (WOM) and celebrity endorsements (CE) but different from user-generated reviews (UGR). In the case of WOM and CE, the source-recipient relationship is a core driver of recipient's trust and message transmission efficacy. On the other hand, the literature on the UGR has not reported message recipients developing relationships with the message source. Instead, audiences have been found to rely on hosting platform credentials such as reviewer badges when forming beliefs about reviewer credibility (e.g., Zhu et al. 2014; Langan et al. 2017).

The finding that both the reviewed product and the creator are significant drivers of the demand for the CCGR implies that audiences approach a review with a pre-existing interest in a particular product but are also attracted by specific content creators. This finding, while intuitive, captures the essence of the CCGRs. Marketers eager to maximise sales by venturing to influence content creators or blur the lines between the paid medium of influencer marketing and the earned medium of the CCGR can damage the pillars on which the CCGR seem to rely, namely the relationship between the audience and the creators. This notion is consistent with the findings of Gerrath–Usrey (2021) that reviews by bloggers which are incentivised by brands can harm reviewer's credibility and authenticity.

Finally, an additional novel aspect of the study is the focus on a "visual" social network, i.e., YouTube. Prior research has mostly focused on text-based social networks, such as Twitter. Meanwhile, in recent years, visual social networks, such as TikTok, Instagram and YouTube, have been growing in prominence (Babić Rosario et al. 2020).

**Limitations and future research**

This study has several limitations that set the stage for new research. First, the data is aggregated across consumers, which allows us to include a

broad set of creators, products, and a long sample period. However, it does not look at the video-watching histories and click streams of individual audience members. While individual data on what people watch on YouTube is not in the public domain, future research should seek to access such data to produce a more granular picture of demand drivers for the CCGRs. Second, the data does not include information about the (YouTube) platform behaviour, in particular, the platform's content choices. Such choices are driven by the platform's recommender system. Future research should seek to include additional data capturing the key aspects of the platform's behaviour in order to shed light on how CCGR demand drivers emerge from an interaction of viewer preferences, social interaction and platform behaviour. Third, prior research explored the direct link between the properties of earned media, such as the valence of the UGR, and sales, while this study documents that the demand for earned media can also be associated with other motives than product interest. Altogether, this implies that the relationship between earned media consumption and sales is complex, hence, future research should study earned media, information consumption and sales jointly.

**References**

Babić Rosario, A.–de Valck, K.–Sotgiu, F. 2020. Conceptualizing the electronic word-of-mouth process: What we know and need to know about eWOM creation, exposure, and evaluation. *Journal of the Academy of Marketing Science* 48(3), 422–448.

Babić Rosario, A.–Sotgiu, F.–De Valck, K.–Bijmolt, T. H. 2016. The effect of electronic word of mouth on sales: A meta-analytic review of platform, product, and metric factors. *Journal of Marketing Research* 53(3), 297–318.

Banerjee, S.–Bhattacharyya, S.–Bose, I. 2017. Whose online reviews to trust? Understanding reviewer trustworthiness and its impact on business. *Decision Support Systems* 96, 17–26.

Chen, J. L.–Dermawan, A. 2020. The influence of YouTube beauty vloggers on Indonesian consumers' purchase intention of local cosmetic products. *International Journal of Business and Management* 15(5), 100–116.

Chen, Y.–Liu, Y.–Zhang, J. 2012. When do third-party product reviews affect firm value and what can firms do? The case of media critics and professional movie reviews. *Journal of Marketing* 76(2), 116–134.

Chen, Y.–Xie, J. 2005. Third-party product review and firm marketing strategy. *Marketing Science* 24(2), 218–240.

Chevalier, J. A.–Mayzlin, D. 2006. The effect of word of mouth on sales: Online book reviews. *Journal of Marketing Research* 43(3), 345–354.

Colicev, A.–Malshe, A.–Pauwels, K.–O'Connor, P. 2018. Improving consumer mindset metrics and shareholder value through social media: The different roles of owned and earned media. *Journal of Marketing* 82(1), 37–56.

Decker, R.–Trusov, M. 2010. Estimating aggregate consumer preferences from online product reviews. *International Journal of Research in Marketing* 27(4), 293–307.

Figueiredo, F.–Almeida, J. M.–Gonçalves, M. A.–Benevenuto, F. 2014. On the dynamics of social media popularity: A YouTube case study. *ACM Transactions on Internet Technology (TOIT)* 14(4), 1–23.

Gerrath, M. H.–Usrey, B. 2021. The impact of influencer motives and commonness perceptions on follower reactions toward incentivized reviews. *International Journal of Research in Marketing* 38(3), 531–548.

Google Help, https://support.google.com/youtube/answer/3399767?hl=en, downloaded: 09.02.2022.

Haridakis, P.–Hanson, G. 2009. Social interaction and co-viewing with YouTube: Blending mass communication reception and social connection. *Journal of Broadcasting & Electronic Media* 53(2), 317–335.

Hoiles, W.–Aprem, A.–Krishnamurthy, V. 2017. Engagement and popularity dynamics of YouTube videos and sensitivity to meta-data. *IEEE Transactions on Knowledge and Data Engineering* 29(7), 1426–1437.

Hu, N.–Bose, I.–Koh, N. S.–Liu, L. 2012. Manipulation of online reviews: An analysis of ratings, readability, and sentiments. *Decision Support Systems* 52(3), 674–684.

Huang, T. Y.–Chen, W. K.–Chen, C. W.–Silalahi, A. D. K. 2022. Understanding how product reviews on YouTube affect consumers' purchase behaviors in Indonesia: an exploration using the stimulus-organism-response paradigm. *Human Behavior and Emerging Technologies* 2022, 1–19.

Khan, M. L. 2017. Social media engagement: What motivates user participation and consumption on YouTube? *Computers in Human Behavior* 66, 236–247.

Kostyra, D. S.–Reiner, J.–Natter, M.–Klapper, D. 2016. Decomposing the effects of online customer reviews on brand, price, and product attributes. *International Journal of Research in Marketing* 33(1), 11–26.

Lacy, S. 1989. A model of demand for news: Impact of competition on newspaper content. *Journalism Quarterly* 66(1), 40–48.

Langan, R.–Besharat, A.–Varki, S. 2017. The effect of review valence and variance on product evaluations: An examination of intrinsic and extrinsic cues. *International Journal of Research in Marketing* 34(2), 414–429.

Lee, J. E.–Watkins, B. 2016. YouTube vloggers' influence on consumer luxury brand perceptions and intentions. *Journal of Business Research* 69(12), 5753–5760.

Li, C.–Liu, J.–Ouyang, S. 2016. Characterizing and predicting the popularity of online videos. *IEEE Access* 4, 1630–1641.

Lovett, M. J.–Staelin, R. 2016. The role of paid, earned, and owned media in building entertainment brands: Reminding, informing, and enhancing enjoyment. *Marketing Science* 35(1), 142–157.

Marchand, A.–Hennig-Thurau, T.–Wiertz, C. 2017. Not all digital word of mouth is created equal: Understanding the respective impact of consumer reviews and microblogs on new product success. *International Journal of Research in Marketing* 34(2), 336–354.

McCracken, G. 1989. Who is the Celebrity Endorser? Cultural Foundations of the Endorsement Process. *Journal of Consumer Research* 16(3), 310–321.

Moon, S.–Kamakura, W. A. 2017. A picture is worth a thousand words: Translating product reviews into a product positioning map. *International Journal of Research in Marketing* 34(1), 265–285.

Mullainathan, S.–Shleifer, A. 2005. The market for news. *American Economic Review* 95(4), 1031–1053.

Neuberger, C.–Nuernbergk, C. 2010. Competition, complementarity or integration? The relationship between professional and participatory media. *Journalism Practice* 4(3), 319–332.

Pfeuffer, A.–Lu, X.–Zhang, Y.–Huh, J. (2021). The effect of sponsorship disclosure in YouTube product reviews. *Journal of Current Issues & Research in Advertising* 42(4), 391–410.

Shao, G. 2009. Understanding the appeal of user-generated media: a uses and gratification perspective. *Internet Research* 19(1), 7–25.

Silaban, P. H.–Silalahi, A. D. K.–Octoyuda, E.–Sitanggang, Y. K.–Hutabarat, L.–Sitorus, A. I. S. (2022). Understanding hedonic and utilitarian responses to product reviews on YouTube and purchase intention. *Cogent Business & Management* 9(1), 2062910.

Sokolova, K.–Kefi, H. 2020. Instagram and YouTube bloggers promote it, why should I buy? How credibility and parasocial interaction influence purchase intentions. *Journal of Retailing and Consumer Services* 53(C).

Stephen, A. T.–Galak, J. 2012. The effects of traditional and social earned media on sales: A study of a microlending marketplace. *Journal of Marketing Research* 49(5), 624–639.

Tellis, G.–Johnson, J. 2007. The Value of Quality. *Marketing Science* 26(6), 758–773.

Tirunillai, S.–Tellis, G. J. 2012. Does chatter really matter? Dynamics of user-generated content and stock performance. *Marketing Science* 31(2), 198–215.

Weinlich, P.–Semerádová, T. (2022). Product Endorsement by Opinion Leaders: The Case of YouTube Community. In *Achieving Business Competitiveness in a Digital Environment* 207–239. Cham: Springer.

Welbourne, D. J.–Grant, W. J. 2016. Science communication on YouTube: Factors that affect channel and video popularity. *Public understanding of science* 25(6), 706–718.

Wu, C.–Che, H.–Chan, T. Y.–Lu, X. 2015. The economic value of online reviews. *Marketing Science* 34(5), 739–754.

Zadeh, A. H.–Sharda, R. 2014. Modeling brand post popularity dynamics in online social networks. *Decision Support Systems* 65, 59–68.

Zhao, Y.–Yang, S.–Narayan, V.–Zhao, Y. 2013. Modeling consumer learning from online product reviews. *Marketing Science* 32(1), 153–169.

Zhu, L.–Yin, G.–He, W. 2014. Is this opinion leader's review useful? Peripheral cues for online review helpfulness. *Journal of Electronic Commerce Research* 15(4), 267–280.

# Features of technology development in the industrial transformation

**LETICIA PEKK[1] – ANDRÁS HARY[2]**

Based on research on the evolution of technologies, it is apparent that technology development is more and more diversified as well as much more dynamic than ever before. The relevance of the topic is given by the rapid development of technology and the uncertainty of its effects. The current paper builds on earlier research and conclusions made in relation to technology forecasting. Along with processing literature sources and drawing conclusions, the authors examine the development of technology forecasting methods in line with technological developments. Beside analysing the development-related features of technologies in the emerging industries, the paper evaluates the trends of the related scientific research. The authors attempt to find correlations among technology trends, methodology trends and the related scientific research. As a result of the analysis presented in this paper, key technology areas and related methodological consequences can be identified in the emerging industries.

**Keywords:** technology development, technology forecasting, emerging industries, technology transition, technology transformation.

**JEL code:** O32.

## Introduction

The current times bring changes in many areas of life. Newer technologies pose challenges both for the industry and for researchers. The changes are often derived from megatrends or disruptors which are pinpointed by the research. Typically, megatrends are longer-term changes, while disruptors are quicker changes with a high impact. Megatrends and disruptions are usually challenging for actors because they need to change their usual processes, business models and methods. This is a challenge for many organisations, especially with short deadlines and cost-effectiveness, which is, however, necessary for long-term competitiveness.

On the one hand, this paper analyses the development-related features of technologies in the emerging industries. On the other hand, it evaluates the trends of the related scientific research from time horizon and methodology perspectives. The authors attempt to find correlations among technology trends, methodology

[1] R&D Programme Manager, Technology Centre at Zalaegerszeg, e-mail: leticia.pekk@tc.org.hu.

[2] PhD, CEO, ZalaZONE Scientific Park Ltd., e-mail: andras.hary@apnb.hu.

trends and the related scientific research. As a result of the analysis presented in this paper, key technology areas and related key methodological consequences can be identified in the emerging industries.

**Literature review and theoretical framework**

Organisations with greater flexibility and adaptability to changing circumstances are better able to deal with these megatrends and disruptions (de Waal–Goedegebuure 2017). One of the contradictions of this assumption, however, is that all this is true for short-term challenges and situations that require agile action when an organisation can adapt quickly to emerging problems and opportunities. However, this adaptability is not necessarily suitable for dealing with changes that occur only gradually and over a longer period of time like megatrends (Cozzolino et al. 2017). According to the majority of researchers, megatrends are more significant in volume, they are long lasting and have profound effects, usually with a trend-like impact (Mittelstaedt et al. 2014).

Naisbitt was one of the first researchers in the literature to use the term megatrend. He defined this as a socio-economic or structural process that develops slowly but, when it occurs, it has a significant impact on many areas of life for a long time to come. Subsequent research has extended the definition to include the understanding of comprehensive social, economic, and technological changes that are slow to develop and have an impact for decades to come (Naisbitt 1982).

Of course, researchers describe megatrends differently, and one of the key differences is the time horizon. Naisbitt and Urdene (1990) point to a decade-long horizon, Utikal and Wothe (2015) refer to several decades, Galinska (2018) mentions a period of even half a century.

Some researchers (Vielmetter–Sell 2014; Groddeck–Schwarz 2013) point out that a megatrend may also result from the superimposition of smaller short-term phenomena. There is also a difference of opinion among researchers regarding the nature of the megatrend event. Some of them (Toops 2014; Hajkowicz 2015) argue that a megatrend is a relatively large phenomenon that develops slowly but ultimately leads to major changes. Others say the megatrend is not the result of a single major event, but rather a series of events. Thus, long-term trends actually result from the projections of change trajectories or the summation of interrelated trends (Rohner 2018; Malik–Janowska 2018).

In contrast to megatrends, there is far less research on disruptors. These can also be seen as factors that prevent a system from continuing to function as usual. Some people also call disruptors a “game changer” because their effects are

faster, and their outcome is usually uncertain. Compared to megatrends, which are generally global in nature, disruptors can in some cases be industry dependent. This includes the kind of change in which a new product (as a "disruptive innovation") significantly transforms a particular market in a given industry (O'Reilly–Binns 2019).

Based on the provided description, megatrends are slow-evolving, long-lasting socio-economic shifts with widespread impacts, while disruptors are rapid, immediate changes that can lead to uncertain outcomes and may be industry-specific. Organisations need agility to respond to both, but this adaptability is more crucial for handling short-term disruptions than long-term megatrends. Linthorst and de Waal (2020) point out not only prominent megatrends but also some context-specific features and identifiable features of megatrends and disruptors:

- Geographical aspect,
- Industry specificity,
- Multidisciplinarity,
- Impact on organisations.

This paper approaches changes from the perspective of technology. The authors follow the definition of Pataki (2014. 17) as "the technology is a system of expertise and tools that enables one to meet the required needs." Following this definition, three aspects can be used to outline the interpretation of a technology. Technologies can be divided into two groups based on their professional content, namely product technology and process/manufacturing technology (Steele 1989). In connection to the essence of a product (physical product or service), technologies can be grouped as core technologies, complementary technologies, peripheral technology (Trott 1998). In terms of market competitiveness, technologies can be divided into base technologies, key technologies, and pacing technology (Little 1998).

New technologies have a certain connection to the market or society needs and potential. This relationship can act as a "pull" from the user side, so some demand emerges in the market that requires some technological innovation. On the other hand, from the science side, new technology development directions are emerging and act as a "push", thus generating new market demands. As technological change usually involves a great deal of uncertainty, the field of technology forecasting is given a prominent role. It allows for the continuous recognition of how a particular technology will affect certain areas in the future. As technologies play a major role in planning the growth of business, industry, government, and society, their shrinking life cycle makes their forecasting even more necessary in every planning process.

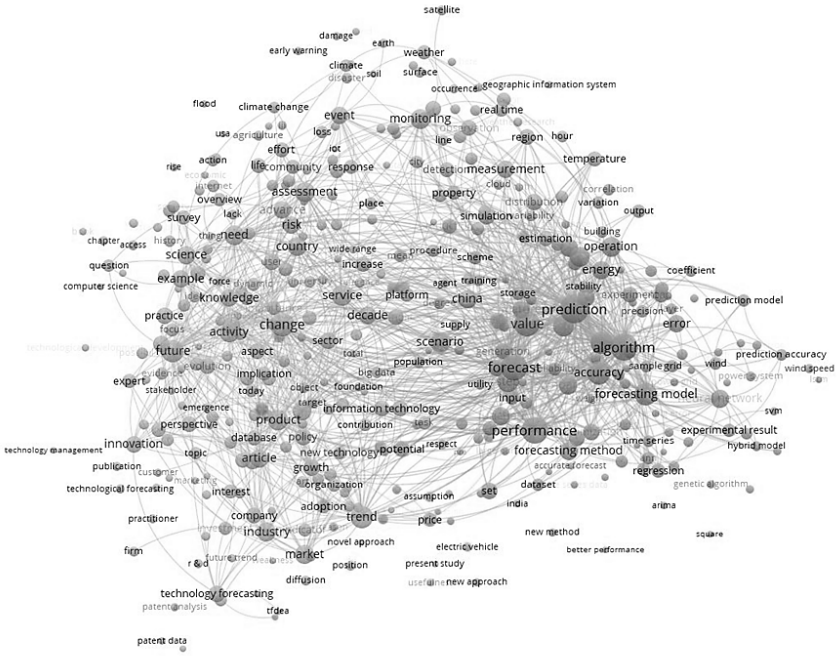
**Methodology**

Based on the discussion above, technological change was defined in the frame of megatrends versus disruptors. As it can be seen, technology-level changes are mainly interpreted on the disruptor level having been in relation to certain long-term megatrends.

The purpose of this paper is to show technology development-related features from three aspects:

- Trends of the related scientific research;
- Development of technology forecasting methods;
- Development of technologies.

The current paper highlights selected references to demonstrate the sequence of conclusions related to industrial-focused technology developments. The sources of the results shown here are selected from highly cited papers, with many of them being review-type research papers, so as to offer state-of-the-art conclusions.



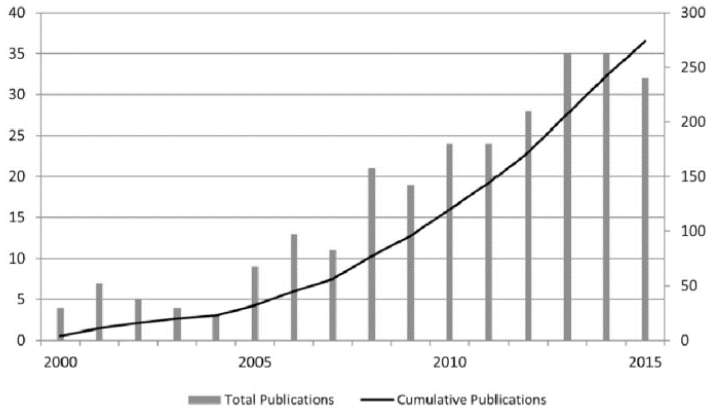

*Source:* Own editing

**Figure 1. 'Technology forecasting' keyword search**

As a general introductory overview, we reviewed around 1,000 papers between 2011 and 2021, using the VOSviewer tool. Figure 1 provides an overview of the results based on the keyword "technology forecasting". Based on the analysis shown in Figure 1, in the field of technology, research is both intensive and interrelated. The sub-clusters are close to each other and there is limited dominance of few keywords, which reflects the intensity and openness of the research field.

**Results and discussion**

One of the key journals in the field of technologies is *Technological Forecasting & Social Change* (see Gordon et al. 2020). Figure 2 illustrates the intensive development of technology-related research, most probably in line with the intense changes of the recent years (Bildosola et al. 2017).




Number of papers which combine bibliometrics and technology forecasting research field methods for the period 2000–2015.

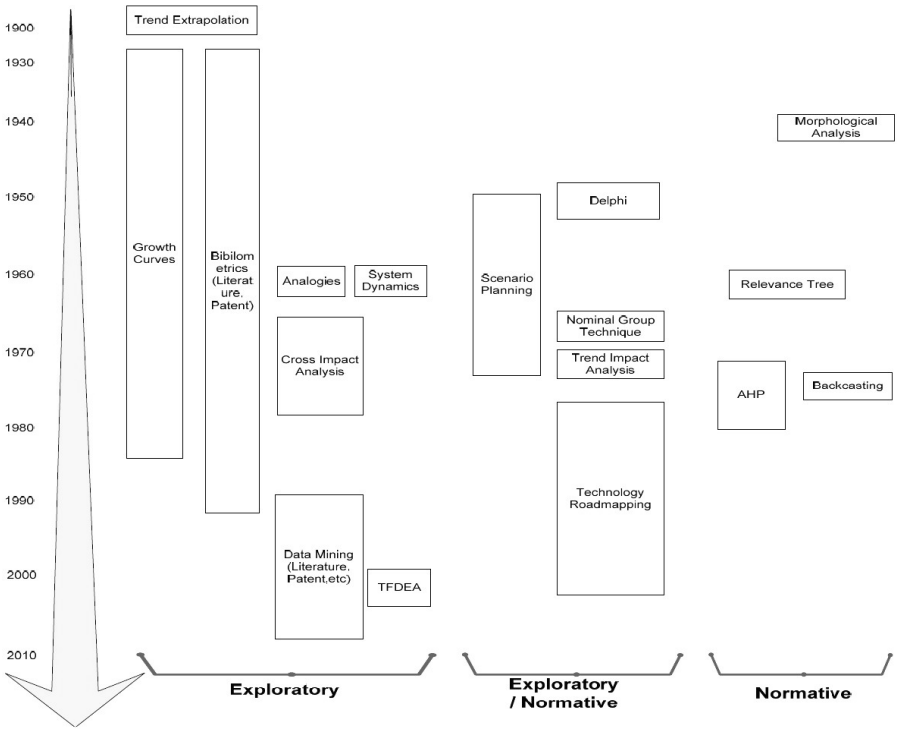
*Source:* Bildosola et al. (2017. 3)

**Figure 2. Trend of papers which combine bibliometrics and technology forecasting research**

Singh et al. (2020) shows the evolution of the technological field over time. The study analysed the development of the *Technological Forecasting and Social Change* (TF&SC) journal from 1970 to 2018 and highlights 'technology' as the predominant theme of the journal, comprising 19.7% of all articles, followed by 'innovation' at 12.5%. The themes 'energy,' 'resources,' and 'climate' contribute less, making up 4.4%, 2.1%, and 1.1% of publications, respectively. Also, between

1970 and 2009, 'technology forecasting' dominated the field, but from 2010 to 2018, the focus shifted to 'innovation', with a growing interest in 'technological development'. The recent era has seen emerging trends like 'big data', 'smart cities', and new methodological approaches. In conclusion, since 2006, there has been an increase in the number of articles related to technological fields like innovation and resources, as well as those addressing complex technological challenges.

Saritas and Burmaoglu (2015) conducted a scientometric analysis of 2,659 publications related to foresight, resulting in the identification of 4,424 keywords. The study revealed a substantial increase and diversification in foresight methods from 1991 to present, identifying 68 key foresight methods. This not only reflects the expansion of the technology foresight methodology toolbox but also, quite likely, the improved alignment of this toolbox with real-world technologies. In other words, acknowledging that new technologies are the primary drivers




*Source:* Cho (2013. 2089)

**Figure 3. Changes in the nature of technology forecasting methods over the years**

of research and that they influence research topics, this trend demonstrates the increasing complexity of technologies. This aligns clearly with the greater emergence of disruptive technologies related to the megatrends introduced at the beginning of this paper.

It is also apparent that the features of technology forecasting methods are also changing. While the classic quantitative-type methods were available as early as the beginning of the last century, nowadays the softer and more comprehensive tools and methods are arising. Cho (2013) categorised technology forecasting methods into exploratory, exploratory/normative, and normative groups (see Figure 3), emphasising that no single method is dominant and that hybrid approaches are often more effective. Also, Cho (2013) suggests that the selection of technology forecasting techniques must be informed by the nature of the technology and expertise in various forecasting models.

There is also research available on linking the relevant technology forecasting methods and the potential industries. According to Kang et al. (2013), in the realms of information technology and materials, trends and descriptive methods dominate, while monitoring is prevalent in telecommunications. Other industries generally favour a mix of monitoring, trends, and descriptive techniques, with the financial sector not applying any standard forecasting methods (Kang et al. 2013). This perspective indicates that researchers of disruptive technologies tend to concentrate their efforts on specific fields rather than addressing these technologies in a broader context. Even though disruptive technologies might be independent from industries, it is highly recommended to direct research methodologies toward defined sectors when delving into specific technology features. This sector-specific approach helps navigate the challenges presented by the growing complexity of technologies and their interconnectedness with overarching trends. Thus, tailoring research to particular industry sectors is crucial for gaining an in-depth understanding of technology-related characteristics in diverse studies.

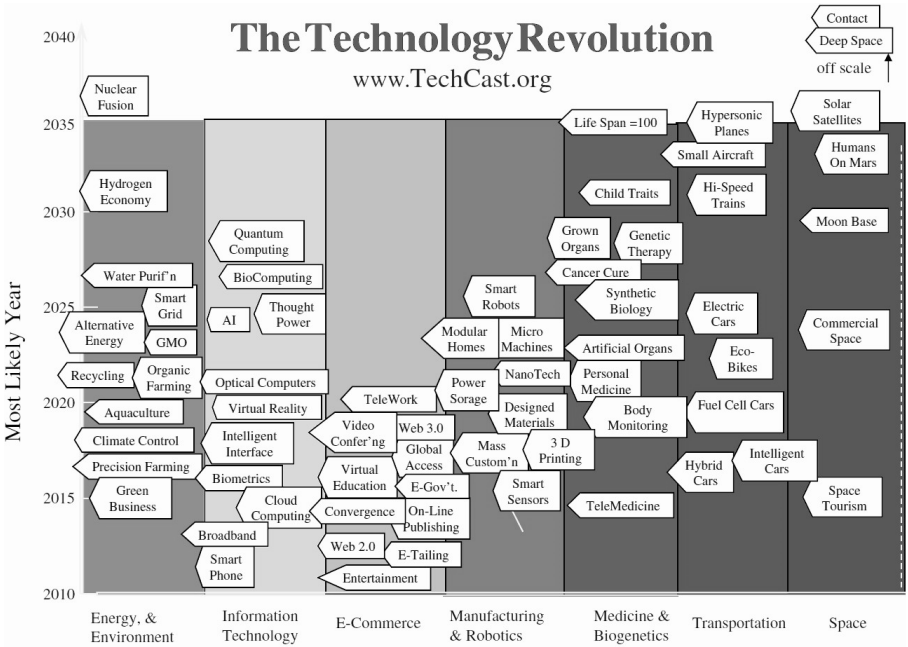
Table 1, which is based on the research conducted by Bildosola et al. (2020), gives an overview of disruptive technologies in emerging industries. It also illustrates the evolution of technology research from broad to specific focus, with ‘security’ consistently at the forefront. Initial broad terms like ‘distributed computing’ gradually gave way to specific ones like ‘fine-grained access control’, reflecting the field’s thematic specialisation and maturity (Bildosola et al. 2020).

**Table 1. Most frequent keywords in the emerging industries**

| 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|
| Distributed computing (5.6) | Grid computing (2.8) | CC security (2.4) | CC security (2.9) |
| Virtual computing (5.6) | Service-oriented architecture (2.8) | Virtualisation 2.4 | Virtualisation (1.9) |
| CC security (5.6) | Virtualisation (2.6) | Privacy (1.9) | Software as a service (1.5) |
| | Software as a service (2.3) | Distributed computing (1.8) | Infrastructure as a service (1) |
| | Distributed computing (2.3) | Software as a service (1.5) | Service level agreement (1) |
| | CC security (1.8) | Service-oriented architecture (1.3) | Privacy (1) |
| | Data centre (1.5) | Infrastructure as a service (1.2) | Distributed computing (0.9) |
| | Web services management (1.5) | Platform as a service (1) | Platform as a service (0.9) |
| | Privacy (1.3) | Data centre (1) | Mobile CC (0.8) |
| | Utility computing (1.3) | Grid computing (1) | Access control (0.7) |
| **2012** | **2013** | **2014** | **2015** |
| CC security (2.6) | CC security (8.8) | Mobile CC (2.3) | Big Data (0.9) |
| Virtualisation (1.7) | Virtual machine (4.9) | CC security (1.2) | Mobile CC (0.7) |
| Virtual machine (1.3) | Mobile CC (4.7) | Virtualisation (1) | Digital storage (0.7) |
| Privacy (1.3) | Privacy (4.5) | Load balancing (1) | Quality of service (0.5) |
| Service level agreement (1.2) | Distributed computing (4.3) | Quality of service (0.8) | Virtual machine (0.5) |
| Infrastructure as a service (1.1) | Virtualisation (4.2) | Resource allocation (0.8) | Web services (0.5) |
| Software as a service (1) | Quality of service (3.3) | Access control (0.7) | Energy efficient (0.5) |
| Energy saving (0.9) | Energy saving (3.3) | Software as a service (0.7) | Task scheduling 0.5 |
| Distributed computing (0.9) | Software as a service (3.2) | Task scheduling (0.7) | Cryptography (0.4) |
| Quality of service (0.9) | Infrastructure as a service (2.9) | Fine-grained access control (0.6) | Customer relationship manager (0.4) |

*Source:* Bildosola et.al. (2017. 11)

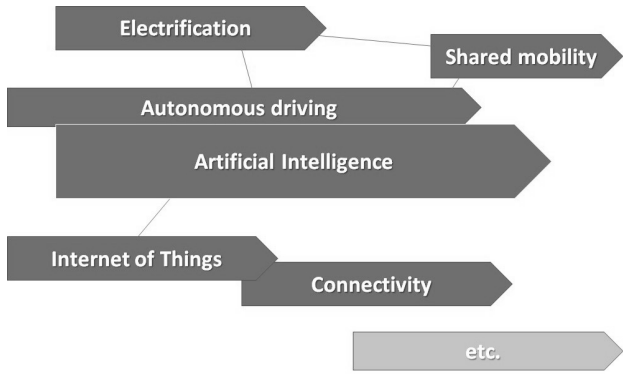
At this point of the discussion, the dilemma of the sectoral focus and the specific technology development trends need to be interpreted. Halal (2013) presents a thorough overview of developing technologies in a chronological way, with a classification into the related sectors (see Figure 4). It highlights the anticipated milestones for 70 emerging technologies across seven sectors, detailing their journey to reaching a 30% adoption rate, which is indicative of mainstream usage. This method ('TechCast') contrasts with traditional forecasting by incorporating empirical data to inform expert judgment, thus striving for scientific rigor and reducing forecasting uncertainty significantly. From the aforementioned details, it becomes evident that analysing and understanding the interrelationships among technologies is essential. Considering the definitions of megatrends and the nature of disruptive behaviours, especially in the context of today's significant changes, it is clear that the complexity of technological shifts necessitates research approaches that address technologies both individually and as a whole.




*Source*: Halal (2013. 1637)

**Figure 4. The technology revolution and the affected industries**

Both the trends of technology-related research explained above and the definition of megatrends clearly emphasise the importance of increasing the diversity and complexity of the technological field. Therefore, as a conclusive direction, it can be pointed out that the one-to-one linkage of the specific technologies is most probably a less appropriate way to approach the research. Consequently, the authors propose to focus on the interrelations of the various disruptive technologies. Figure 5 illustrates this concept, which includes technology-to-technology linear relations and the content-wise relation. The latter one is probably more challenging, as it shows the need to understand the sub-levels of various technologies from a competence, discipline point of view.



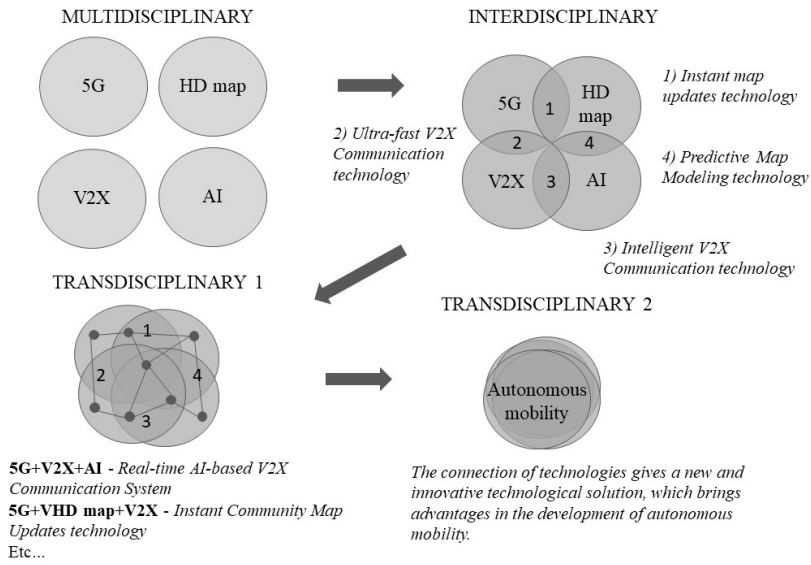

Source: Own editing

**Figure 5. Relations of various technologies to be researched (example)**

A single technological trajectory often necessitates the convergence of multiple technologies. Furthermore, their interplay may give rise to novel technological innovations. In light of this, a fresh interpretative approach is warranted. Currently, there is no definitive method for predicting the outcomes of technological convergences and their cumulative impacts.

This approach can be built on a disciplinary-based analysis, surveying the multidisciplinarity of the new technologies (see Figure 6). When multiple technological sectors intersect and merge, they often give birth to new and defining technologies that can radically transform the industry landscape. For instance, we can observe this phenomenon in the field of autonomous mobility. In the development of autonomous vehicles, four technological pillars stand out

for illustration: 5G, HD maps, V2X communication, and Artificial Intelligence (AI). These foundational technologies are revolutionary in their own right, but when intertwined, they open up new possibilities. The diagram illustrates the new technologies emerging from the intersection of various technologies. In this case, by combining different technologies, we can achieve a new level of autonomous mobility, where vehicles rely not only on their own sensors but on all available data sources, ensuring maximum safety and efficiency. Drawing on the analogy of studying various disciplines, we can interpret aspects related not only to multidisciplinarity but also to interdisciplinarity and transdisciplinarity when examining the relationships of disruptive technologies. This subject is an active research area for the authors and warrants further investigation. Traditional forecasting methods often overlook the evolution of technological relationships and their combined potential impact. Moreover, these methods struggle to track the diffusion of technologies. Current forecasting methods often overlook the evolution of technological relationships and their cumulative potential impact. Moreover, these methods struggle to accurately track the diffusion of technologies.




*Source:* Own editing

**Figure 6. An analogue conceptual approach proposed for researching the interrelations of new technologies**

**Conclusions**

The paper introduces the concept of megatrends and, in relation to this, it explores the nature of disruptors. Further interpretations derived the technology changes into the context of disruptors, emphasising the importance of understanding the intricate interconnections of technological changes. Based on the research of relevant literature review results, the authors illustrate the deployment of disruptor logic to specific technology level view, according to referenced trends. The growing complexity of related research and technology forecasting methods reflect the correspondence with the changing nature of technology systems or industries instead of focusing on single technologies. In conclusion, the research underscores the necessity for more in-depth studies to grasp the interplay of specific technologies within a sector. Additionally, there is a pressing need to devise a method for assessing these effects.

**References**

Bildosola, I.–Rio-Belver, R. M.–Garechana, G.–Cilleruelo, E. 2017. TeknoRoadmap, an approach for depicting emerging technologies. *Technological Forecasting & Social Change* 115, 25–37.

Biswas, A. K.–Tortajada, C.–Rohner, P. 2018. A megatrends perspective. In: *Assessing Global Water Megatrends.* Singapore: SpringerLink (online), 27–39.

Cozzolino, A.–Rothaermel, F. T.–Verona, G. 2017. Business Model Innovation after Disruptions: A Process Study of an Incumbent Media Organization. *Academy of Management Proc*eedings 1, 1–6.

Cho, Y. 2013. Investigating the merge of exploratory and normative technology forecasting methods. *Proceedings of PICMET '13 Conference.*

Galinska, B. 2018. Logistics megatrends and their influence on supply chains. In: *Proceedings of the 18th International Scientific Conference Business Logistics in Modern Management*, *Osijek, Croatia, 11–12 October*, 583–602.

Gordon, A. V.–Ramic, M.–Rohrbeck, R.–Spaniol, M. 2020. 50 Years of corporate and organizational foresight: Looking back and going forward. *Technological Forecasting & Social Change* 154, 119966.

Groddeck, von V.–Schwarz, J. O. 2013. Perceiving megatrends as empty signifiers: A discourse-theoretical interpretation of trend management. *Futures* 13, 28–37.

Hajkowicz, S. 2015. *Global Megatrends Seven Patterns of Change Shaping our Future.* Melbourne: CSIRO Publishing.

Halal, W. E. 2013. Forecasting the Technology Revolution: Results and learnings from the TechCast Project. *Technological Forecasting & Social Change* 80, 1635–1643.

Kang, D.–Jang, W.–Lee, H.-Joung, H. N. 2013. A Review on Technology Forecasting

Methods and Their Application Area. W*orld Academy of Science, Engineering and Technology International Journal of Industrial and Manufacturing Engineering* 7(4), 591–595.

Linthorst, J.–de Waal, A. 2020. Megatrends and Disruptors and Their Postulated Impact on Organizations. *Sustainability* 12, 8740.

Little, A. D. 1981. *The Strategic Management of Technology*. Cambridge, MA: Arthur D. Little, Inc.

Malik, R.–Janowska, A. A. 2018. Megatrends and their use in economic analyses of contemporary challenges in the world economy. *Research Paper, Wroclaw University of Economics* 523, 209–220.

Mittelstaedt, J. D.–Shultz, C. J.–Kilbourne, W. E.–Peterson, M. 2014. Sustainability as Megatrend: Two Schools of Macromarketing Thought. *Journal of Macromarketing* 34(3), 253–264.

Naisbitt, J. 1982. Megatrends. *Ten New Directions Transforming Our Lives*. New York, NY: Warner Books.

Naisbitt, J.–Urdene, P. 1990. *Megatrends 2000: Ten New Directions for the 1990's*. New York, NY: Morrow.

O'Reilly, C.–Binns, A. J. M. 2019. The Three Stages of Disruptive Innovation: Idea Generation, Incubation, and Scaling. *California Management Review* 61, 49–71.

Pataki, B. 2014. *A technológia menedzselése*. Budapest: Typotex Kiadó.

Saritas O.–Burmaoglu, S. 2015. *The evolution of the use of Foresight methods: a scientometric analysis of global FTA research output.* Budapest*:* Akadémiai Kiadó.

Singh, S.–Dhir, S.–Das, V. M.–Sharmab, A. 2020. Bibliometric overview of the Technological Forecasting and Social Change journal: Analysis from 1970 to 2018. *Technological Forecasting and Social Change* 154, 119963.

Steele, L. W. 1989. *Managing Technology: The Strategic View*. New York, NY: McGraw-Hill.

Toops, L. M. 2014. 5 Megatrends That Will Revolutionize Insurance: Will You Be Prepared? *National Underwriter,* 20–21.

Trott, P. 1998. *Innovation Management and New Product Development.* London: Pitman Publishing.

Utikal, H.–Wothe, J. 2015. From megatrends to business excellence: Managing change in the German chemical and pharmaceutical industry. *Journal of Business Chemistry* 2, 41–47.

Vielmetter, G.–Sell, Y. 2014. *Leadership 2030: The Six Megatrends You Need to Understand to Lead Your Company into the Future*. New York, NY: AMACOM.

Waal de, A. A.–Goedegebuure, R. 2017. Investigating the causal link between a management improvement technique and organizational performance: The case of the HPO framework. *Management Research Review* 40(4), 429–450.

# Travel habits and active tourism in 2020[1]

**MÓNIKA HOSCHEK[2] – NIKOLETTA NÉMETH[3] – KATALIN MÉSZÁROS[4]**

The COVID-19 pandemic emerged in Hungary in March 2020, when the first coronavirus patient was reported. The government declared a state of emergency, borders were closed and exit restrictions were introduced in the country. The epidemic and the restrictions had a significant impact on the travel habits of Hungarian tourists in the summer of 2020. In our study, we examined Hungarian tourists' annual travel frequency, the duration of their trips, the means of transportation used to travel, as well as their attitudes towards active tourism products. We also assessed vacation and relaxation opportunities for Hungarian tourists in the summer of 2020.

**Keywords:** tourism, travel habits, tourism supply, active tourism, COVID-19.

**JEL codes:** L83, Q01, Z30, Z32.

## Introduction

Before COVID-19, pandemics were much smaller in geographical scope, rate of spread, and time course and had fewer negative impacts on the tourism, aviation, and retail sectors. COVID-19 triggered a global health, social, and economic crisis in 2020, which radically affected the travel and tourism sectors in all countries of the world.

A report made by the consulting firm Avasant (2020) examined the impacts of COVID-19 on 11 economic industries and stated that the travel sector (tourism) and the industrial sector were impacted the most in terms of employees, operations, supply chain, and revenue.

[1] This article was written within the framework of *EFOP-3.6.1-16-2016-00018 – Improving the role of research+development+innovation in higher education through institutional developments assisting smart specialisation in Sopron and Szombathely*.

[2] PhD, Associate Professor, University of Sopron, Alexandre Lamfalussy Faculty of Economics, Institute of Economics and International Relations, hoschek.monika@uni-sopron.hu.

[3] PhD, Assistant Professor, University of Sopron, Alexandre Lamfalussy Faculty of Economics, Institute of Business Studies, nemeth.nikoletta@uni-sopron.hu.

[4] PhD, Associate Professor, University of Sopron, Alexandre Lamfalussy Faculty of Economics, Institute of Business Studies, meszaros.katalin@uni-sopron.hu.

Global travel restrictions and the complete closure of borders have exacerbated the anxiety and insecurity of potential travellers, which is still reflected in the declining tourism demand. Tourism safety as a travel consumer demand has been further strengthened as an effect of the COVID-19 epidemic. The main dimensions of tourism safety are the following: health safety, public safety, technical safety, navigation safety, and consumer safety (Michalkó 2020). Mazilu et al. (2019) ranked the role of health crises on the same level as terrorism and economic, political, technological, sociocultural crises.

In addition to assessing the interest in each type of active tourism and the forms of tourism planned and used, our research also aimed to test hypotheses such as: tourists in younger age groups would love to experiment with active, more challenging forms of tourism; the financial situation strongly influences interest; and those who usually travel domestically choose cheaper forms of tourism.

## Literature review

### *Active tourism*

Whether we are talking about domestic or international travel, there are opportunities for active recreation everywhere. According to the Hungarian Tourism Private Limited Company (Magyar Turizmus Zrt. 2013), active tourism is a form of tourism in which the tourist's motivation for travelling is to take part in a leisure or sporting activity that requires some physical activity. Michalkó (2002) considers that active tourism means all tourism activities in which the non-routine movement of an individual for the purpose of gaining experience takes place in a space outside his or her everyday space. The types of active tourism are hiking, camping, fishing, hunting, adventure and extreme tourism, skiing, cycling, horse riding, golf, running tourism. The types of active tourism can be expanded with activities related to any tourism product. In Hungary, hiking and cycling are the two most prominent active tourism trends, but water sports as well as horse riding and golf should also be mentioned. The target group of horse riding and golf is much narrower in Hungary due to the high cost of these activities. In the case of water sports, weather is the most influential factor. Hiking, as an active tourism product, includes excursions, visits to national parks and protected areas, trekking, Nordic walking, performance hiking, climbing, and caving. Cycling includes individual and group cycling, mountain biking, cycling competitions, performance touring, and cross-country cycling (Gonda 2016). Health awareness,

which influences sport consumption habits, is becoming increasingly important in Hungary (Törőcsik–Jakopanecz 2019; Csóka–Törőcsik 2019).

Comprehensive motivational research on the active holiday habits of the Hungarian adult population was last conducted in December 2006 by M.Á.S.T. Market and Public Opinion Researcher Ltd. on behalf of Hungarian Tourism Private Limited Company. In the period November-December 2017, the Hungarian Tourism Agency mapped the social attitudes towards active and ecotourism through a questionnaire survey. The questionnaires collected data on 17 sub-products (rowing, extreme sports, rural hospitality/experiences, running tourism, golf, boating, fishing, adventure camping, cycling, horse riding, ecotourism, skiing, slow tourism, hiking, hunting, and sailing). For five key sub-products (rowing, horse riding, cycling, hiking, sailing), besides the general attitude toward these activities, the satisfaction and travel management practices of the target group were also surveyed. The following are the most important findings of the research conducted in 2017 (Mártonné Máthé–Császár 2019):

• Among the active tourism products, 89.5% of the respondents indicated hiking in nature.

• In addition to hiking, cycling was the most popular form of active tourism among Hungarians in 2017.

• Horse riding, rowing, adventure hiking, skiing, sailing appealed to less than half of the population.

• Regarding horse riding, it should be emphasised that many people have tried this form of active tourism, but only once.

• The share of eco-tours, adventure tours, winter sports, slow tourism will grow in the future.

• Fewer people were motivated by rowing, hunting, golf in 2017 than in the past.

• Cruising, rowing, cycling, sailing and horse riding were not the sole purpose of travelling.

• Respondents are also willing to plan an independent trip for hiking, rural tourism, camping, skiing, eco-tours and adventure tours.

• Among the active tourism products, traditional, society-wide activities available at relatively low prices were the dominant products in 2017.

• Adventure tours, eco-tours, and extreme sports are special forms of tourism, but people are willing to organise trips just for the sake of these activities.

• There has been no significant increase in the popularity of particularly costly activities – such as golf, sailing, horse riding.

***Tourism in Hungary in 2020***

According to data from the Hungarian Statistical Office (KSH 2020), in 2020, the gross value added of accommodation and food services decreased by 32% compared to 2019, the number of commercial guest nights was 58% lower and commercial accommodation revenue was 60% lower than in 2019.

In Hungary, the structure of the travel market completely changed in 2020. One of the most important conclusions was that "home" became the new abroad for Hungarian travellers, as they prioritised safety when choosing their travel destinations.

In 2019, 43 million guest nights were reported in Hungary, which means that the tourism sector closed a record year. Although, at the beginning of 2020, it seemed that Hungarian tourism could surpass 2019 data, from March 2020, the turnover of the tourism sector dropped to virtually zero due to the restrictive COVID-19 measures. The Tourism Trend Report of the Hungarian Tourism Agency (MTÜ 2020) examined the willingness of the Hungarian population to travel from the beginning of April 2020 until the end of the year. According to MTÜ data (2020), 8 million tourists spent 22.7 million guest nights in Hungary. Out of the 8 million tourists, 1.2 million spent 3.8 million guest nights in Budapest, while 6.8 million spent 18.9 million guest nights in the countryside. In Budapest, the proportion of domestic tourists was 32% and the proportion of foreigners was 68%, while in rural areas, these proportions were 87% and 13%, respectively. Out of the 22.7 million guest nights spent by the 8 million guests, 41% were spent in hotels, 39% in private and other types of accommodation, 7% in boarding houses, 5% in campsites and communal accommodation, and 3% in holiday homes. In 2020, the number of domestic guest nights reached 78% of the 2019 data, the number of domestic guests 73%, the number of foreign guest nights 27%, and the number of foreign guests 22%.

The number of domestic trips in Hungary increased with the lifting of restrictions in the summer of 2020. The reason for the increase in domestic travel numbers was the decreasing demand for uncertain foreign destinations. When visiting foreign destinations, tourists considered the current number and rate of illnesses in the given destination.

Regarding travel motivations, research data show that, in 2020, travellers preferred active leisure activities, spa experiences, and city visits. In selecting the travel destination, travellers' income, the experience, and the weather were the most important factors.

Within the framework of a nationally representative research study, the NaturMed Hotel Carbona (2020) examined the travel habits of Hungarians. The research results revealed that, in 2020, 15% fewer trips were planned than in the previous period due to the coronavirus epidemic. The share of respondents who, when planning their trips, considered domestic destinations, individual organisation, the surroundings of the accommodation, and the possibility of keeping a safe distance at the accommodation increased in 2020 by 22%, 24%, 53% and 60%, respectively. All these factors were more important than in 2019. The most important preferences when choosing accommodation were safety, hygienic environment, comfort, friendly services, quality wellness services, outdoor adventure pools and recreation.

In 2020, the Lounge Group also prepared a research report for the Hungarian Tourism Agency concerning changing travel habits. Based on these research results, more than half of the respondents spent their holidays with their families, 55% of respondents chose domestic travel destinations they never visited before, and the majority used a hotel service. Travel motivations included city visits, excursion experience points, spas, and active recreational opportunities. Those who preferred to travel abroad mainly visited Croatia and Greece (Lounge Group 2020).

**Methodology**

We conducted a questionnaire survey to get an overview of people's knowledge and attitudes regarding the different types of active tourism. A total of 717 respondents took part in the survey. As demographic indicators, we considered the gender, age, education, family status and financial situation of the respondents.

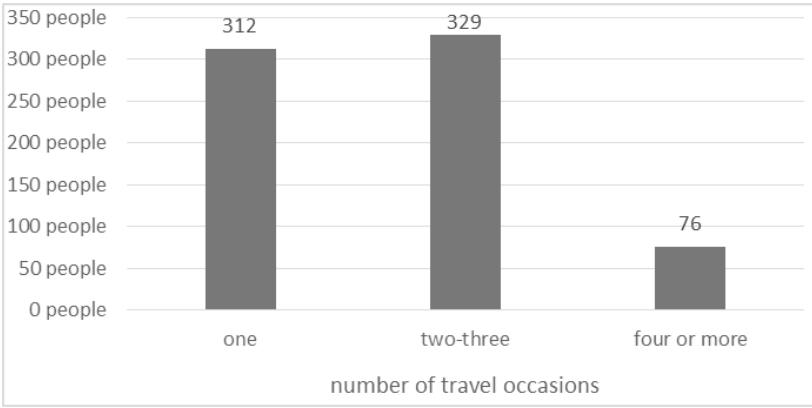
The surveyed individuals were randomly selected using a quantitative research method. Only closed questions were used in the questionnaire. Frequency tables and ANOVA were employed to analyse the data obtained and to draw conclusions.

**Data and results**

The research was conducted between 18 September and 4 October 2020, surveying 717 individuals. Respondents included 274 men and 443 women. Based

on their age, we formed three groups: there were 335 people in the 18-30 age group (young people), 247 people in the 31-59 age group (middle-aged), and 135 people were aged 61 and over (the elderly). There were 23 respondents with primary education, 499 with secondary education, and 199 with tertiary education among those who completed the questionnaire. In terms of marital status, 190 people were single, 57 people were divorced or widowed, and 470 people were in some kind of relationship. Twenty-seven respondents rated their personal financial situation as bad, 521 as adequate, and 169 regarded their personal finances as good.

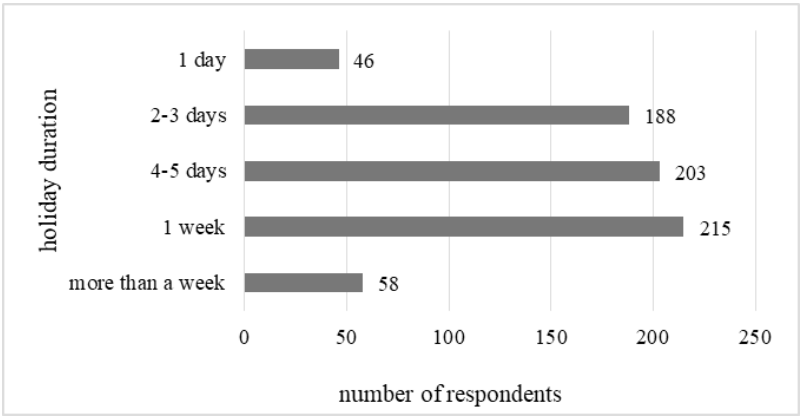
In terms of travel habits, the first question focused on the number of times people travel per year. Responses started at one and went up to seven or more, but each response option was aggregated for analysis purposes, so we looked at the aggregated categories below, namely one, two-three, and four or more. In general, more than four-tenths of respondents (43.5%) can only travel once a year, nearly the same proportion (45.9%) two or three times a year, while the remaining ten percent (10.6%) can go on holiday four or more times a year (Figure 1).




*Source:* Own editing

**Figure 1. Number of annual travels**

Respondents' average holiday length also showed significant differences. Of all respondents, 6.5% go on holiday for just one day, nearly a third (30.3%) for a week, and 8.2% for more than a week. Most respondents (55.1%) go on holiday for less than a week. There are almost similar proportions (26.5% and 28.6%) of tourists travelling for two-three and four or more days (Figure 2).

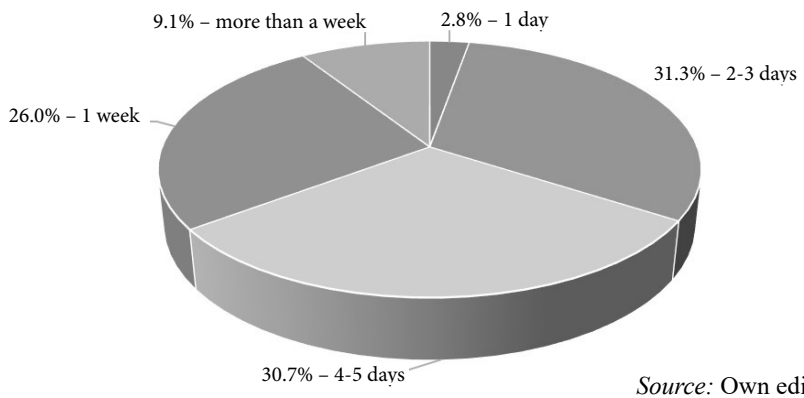



*Source:* Own editing

**Figure 2. Respondents' average holiday length (per capita)**

In general, three-quarters of respondents (74.6%) travel to their tourist destination by car. Interestingly, the same number of people (67 people, 9.3%) travel by plane and by train. It is also particularly interesting that two-thirds (67.9%) of respondents tend to spend their holidays in their own country and one-third (32.1%) abroad.

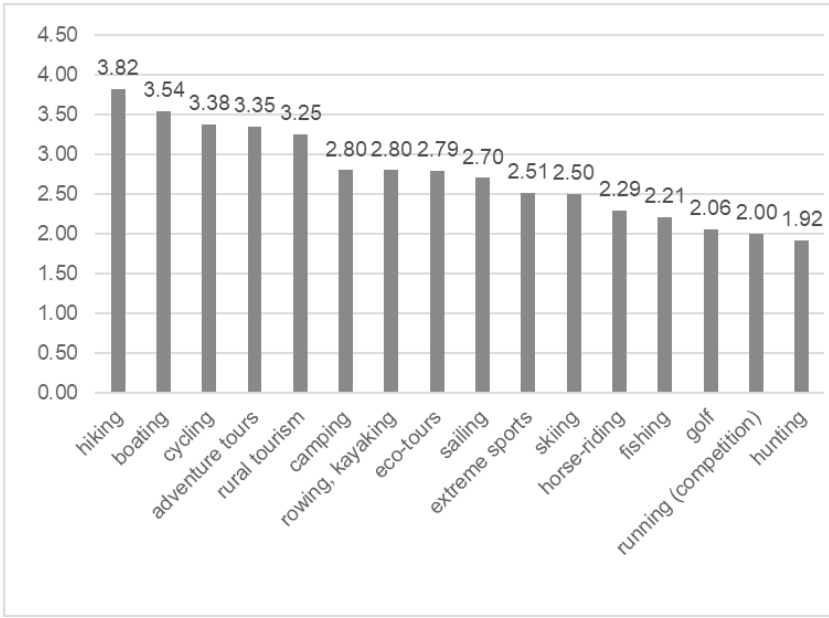
In 2020, slightly more than half (50.3%) of those surveyed were able to travel on their holidays. Four-fifths (81.4%) of all trips were domestic trips made by car (82.0%). In 2020, the distribution of trips by duration (Figure 3) was similar to the usual travel habits.




*Source:* Own editing

**Figure 3. Distribution of travellers based on trip duration in 2020**

There were three questions in the questionnaire that specifically asked about the forms of active tourism included in each leisure activity. For the first question (Which of the following leisure activities are you interested in?), respondents had to indicate their level of interest on a scale of 1 to 5. Hiking (3.82) and boating (3.54) reached outstandingly high values (Figure 4). Cycling, adventure tours, and rural tourism reached almost the same values (3.38-3.25), while the interest in golf, running, and hunting barely reached the value of 2 (1.92-2.06).

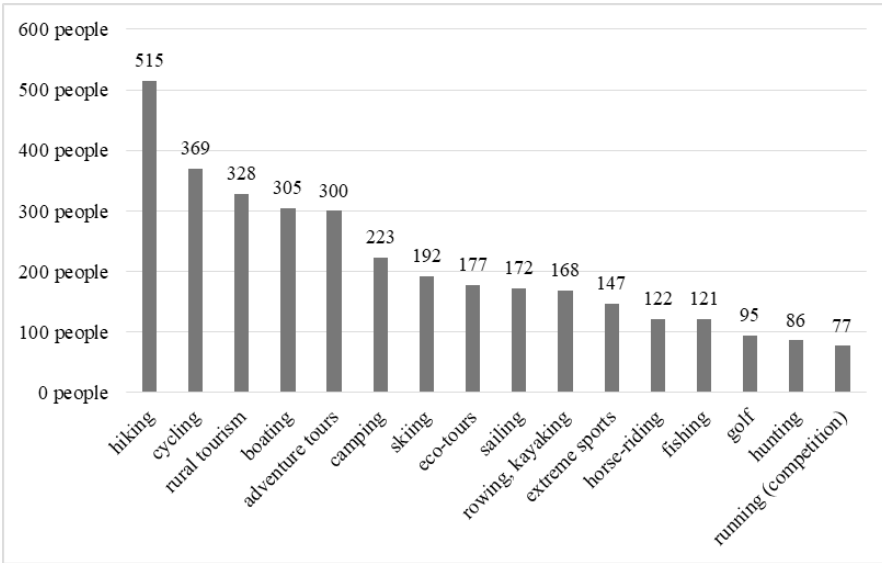



*Source:* Own editing

**Figure 4. Level of interest in different forms of active tourism**

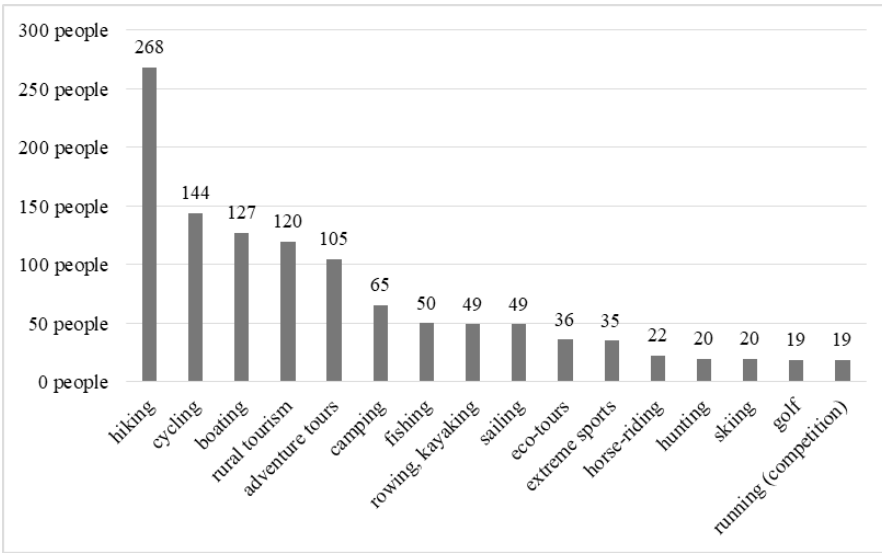
With the second question (In the last year, how did you spend your leisure time during your holiday/vacation?), respondents indicated what they actually did in 2020. At the top and bottom of the list, the same types of active tourism are listed in a slightly different order, but hiking is still quite prominent (Figure 5).

In the third question (What kind of leisure activities do you plan to do in the future?), we asked the respondents about their future plans. The results are similar to those of the previous question (Figure 6).




Source: Own editing

**Figure 5. Active tourism activities in 2020**




*Source:* Own editing

**Figure 6. Planned active tourism activities in the future**

In our analysis, we examined whether the interest in each form of active tourism depended on demographics or, perhaps, on general tourism habits.

In the case of hiking, as the most popular form of active tourism, we found that people with only primary school education were the least interested (on average, 3.304). Respondents with high school education (3.800) and those with tertiary education (3.938) showed the greatest interest. However, based on our study, a significant difference can only be detected in the case of primary school educated respondents, while the average interest of respondents with secondary and tertiary education is statistically equal ($F = 3.617$; $p = 0.027$). In the case of personal financial situation, we would expect that those with poor financial circumstances would be more interested in hiking because it is not an expensive way of spending one's free time. Based on the statistics, this can also be proved ($F = 7.812$; $p = 0.000$). Those with adequate (3.896) and good (3.538) financial circumstances are less interested in hiking. The level of interest in hiking decreased with the length of the vacation. The expected value of vacations of over a week is significantly lower (3.500) than the expected values of shorter-term vacations (3.957; 3.995; 3.754; 3.800). Respondents who spend their holidays domestically (3.889) are more interested in hiking than those who usually travel abroad (3.678) ($F = 5.541$; $p = 0.019$).

The second most popular type of active tourism is boating. Young people (3.627) and middle-aged people (3.599) were almost equally interested in the activity, while the older generation showed a significantly ($F = 7.769$, $p = 0.001$) lower interest (3.207). Single people (3.551) and respondents who were in a relationship (3.585) showed a higher interest, while divorced/widowed people declared a significantly ($F = 3.856$; $p = 0.022$) lower interest (2.958) in boating. When we examined the correlation with the number of holidays per year, we found that the greatest interest was shown by those travelling two or three times (3.687). The interest of the respondents who travelled once a year (3.407) and those who travelled four or more times a year (3.434) was lower ($F = 5.611$; $p = 0.004$). Domestic travellers showed lower (3.417) interest in boating than those travelling abroad (3.796) ($F = 18.907$; $p = 0.000$).

In the case of cycling, there are three factors where differences were statistically important. Young people (3.564) and middle-aged people (3.405) showed similar interest, while older people showed lower interest (2.881) ($F = 14.238$; $p = 0.000$) in cycling. Cycling can be enjoyed alone. In the survey, singles

(3.525) and people in a relationship (3.408) showed greater interest in cycling than widowed/divorced people (2.667) ($F = 4.992$; $p = 0.007$). If a person can only go on holiday once a year, he or she is less likely (3.189) to choose cycling than the people who go on holiday two to three (3.495) or even more times (3.671) a year ($F = 6.872$; $p = 0.001$).

Young people are the age group most interested in adventure tours (3.875), while middle-aged people are less interested in that (3.263), and older people are least interested (2.200) ($F = 101.561$; $p = 0.000$). There is a significant difference between the interests of the three groups we formed based on marital status ($F = 13.244$; $p = 0.000$). Singles (3.729) are leading when it comes to those who are eager to participate in adventure tours, the ratio is still quite high for people in a relationship (3.357), while the divorced/widowed is the group least interested in adventure tours. These tours are the most interesting for people who travel at least four times a year (3.592). Less interest, but still quite high (3.538), is shown by the respondents who go on holiday two or three times a year. However, those who can travel only once a year rarely (3.090) choose this type of active tourism ($F = 11.130$; $p = 0.000$). Those who usually travel for one day (2.979) or for two or three days (3.160) have similarly little interest in adventure tourism. Those vacationing for more than a week (3.359), for four to five days (3.458) or for a week (3.488) were similarly interested ($F = 2.909$; $p = 0.021$). It should also be noted that ($F = 12.645$; $p = 0.000$) those going on holiday domestically are less (3.230) interested in adventure travel than those vacationing abroad (3.600).

Age groups show different interest in rural tourism ($F = 13.825$; $p = 0.000$). People in the older age group (3.644) prefer it the most, the middle-aged (3.352) a bit less, and the young generation (3.012) shows the least interest in rural tourism. This is perhaps not surprising. However, in terms of personal financial situation, we would expect that people with poor financial circumstances would be more interested in rural tourism, which seems to be a cheaper type of active tourism. Our calculations supported this assumption ($F = 6.509$; $p = 0.002$). People with weak financial circumstances are the most interested in rural tourism (3.815), those with stable personal finances are less interested (3.299), while respondents with a good financial situation are the least (3.000) likely to holiday in rural areas. Regarding the number of annual vacations, we found the following: the rate of people going on holiday once (3.359) is quite similar to that of those going on holiday four or more times (3.487). The interest of respondents with two or three

holidays a year is lower (3.088) ($F = 5.262$; $p = 0.005$). The interest of respondents based on the groups formed according to average vacation length can be divided into three separate groups ($F = 7.510$; $p = 0.000$). Interest is high (3.809) among one-day vacationers, slightly lower (3.537) among people spending two to three days away, and equally lower among those vacationing for four to five days (3.059), one week (3.144), or for more than one week (2.938). The difference is also significant when we look at the direction of travel ($F = 16.327$; $p = 0.000$). Domestic holidaymakers are more interested in rural hospitality (3.378), while those traveling abroad are less interested in it (2.974).

As we have already seen, among the different forms of active tourism, there are four types that belong to the fourth category: camping, rowing/boating, ecotourism, and sailing. Let us examine the factors influencing the interest in these types of active tourism.

Interest in camping decreases with age ($F = 25.341$; $p = 0.000$). Young people were only moderately interested (3.066), middle-aged people were less interested (2.789), and the elderly were only slightly (2.156) interested in camping. Based on educational attainment, two groups can be distinguished ($F = 4.420$; $p = 0.012$): those with primary education (2.609) and those with tertiary education (2.579), which showed a similarly low interest, while those with secondary education are slightly more interested (2.894) in this form of active tourism. Regarding marital status, single respondents showed the greatest interest (3.102), followed by those who were in a relationship (2.743), while divorced/widowed people (2.250) came in last ($F = 6.076$; $p = 0.003$). Those with poor financial circumstances showed a significantly higher (3.407) interest in camping than those who declared they had adequate financial circumstances (2.797).

Interest in rowing/kayaking decreases with age ($F = 60.649$; $p = 0.000$). Young people exhibit moderate interest (3.260), the middle-aged, slightly lower (2.672), while the older age group barely shows any interest (1.889) in these forms of active tourism. The preferences of the three groups also differ according to marital status ($F = 15.769$; $p = 0.000$): singles showed more interest (3.347), those in a relationship, significantly less (2.647), and divorced/widowed people showed the least (2.250) interest in rowing. When examining the personal financial situation, the respondents were divided into two groups ($F = 6.865$; $p = 0.001$): those with a good financial situation (3.130) are more interested; those with an average (2.695) and poor (2.741) financial situation are less interested. The more times people

can go on holiday in a year, the more interested they are in rowing/kayaking (F = 8.236; p = 0.000). Once-a-year vacationers were a little interested (2.587), two-or three-times-a-year vacationers were slightly more interested (2.915), while those who go on holiday four or more times a year were moderately (3.171) interested. In general, those who vacationed domestically were less (2.618) interested in rowing/kayaking than those who usually go abroad (3.183) (F = 28.771, p = 0.000).

The higher the level of education, the higher the interest in ecotourism (F = 4.523; p = 0.011). People with primary education show less interest in ecotourism (2.304) than those with secondary education (2.745), while people with tertiary education have the highest interest (2.979), but even this hardly reaches the average level. If we look at the number of trips per year, we see that those who can go on vacation four or more times a year are more interested (3.118) than those who can only go once (2.708) or two, three times a year (2.802).

The three age groups already have complete preferences for sailing (F = 39.396; p = 0.000). Young people are moderately interested (3.093), middle-aged people, even less (2.575), and older people are just slightly (1.963) interested in sailing. The interest in sailing also varies by marital status (F = 8.957; 0.000). The order is the following one: single people (3.110), people in a relationship (2.632), and divorced/widowed people (2.083). Those with poor (2.407) and adequate (2.599) material conditions were less interested, while those with good material conditions (3.065) were more interested in sailing (F = 8.507; p = 0.000). If someone can only go on holiday once a year, they hardly ever choose sailing (2.481). If they can travel two or three times a year (2.851) or four or more times a year (2.961), they show greater interest in sailing (F = 7.785; p = 0.000). Three levels of interest were also observed based on the average length of trips (F = 7.387; p = 0.000). Those vacationing for one day (2.255) and for two to three days (2.447) have a low interest, people who holiday for three to four days (2.700) and a week (2.833) are slightly more interested, and those vacationing for more than a week are slightly above average (3.344). Although there are good sailing opportunities in Hungary, those who usually spend their holidays domestically have a low (2.476) interest, while those who travel abroad show much more (3.178) interest (F = 45,133; p = 0.000) in this activity.

The interest in extreme sports and skiing is almost identical and is affected by the same factors. Basically, young people (3.110) are interested in extreme sports,

middle-aged people are less interested (2.190), and the older age group (1.630) is totally uninterested in extreme sports (F = 79.577; p = 0.000). In terms of marital status, the interests of the three groups are completely different (F = 16.135; p = 0.000). Singles have a moderate interest (3.076), people in a relationship show less interest (2.349), while the divorced/widowed category has almost no (1.8875) interest in extreme sports. Extreme sports tend to be rather expensive, so the findings of our study are not surprising (F = 7.345; p = 0.001). According to this, those with poor financial circumstances are rarely interested (2.111), those with average financial circumstances are slightly more interested (2.426), and those with good financial circumstances are most interested (2.852) in this type of active tourism. If one vacations four or even more times a year, their interest is moderate (2.934), if they holiday twice or three times a year, it is even smaller (2.696), while those who only take one holiday a year have little (2.221) interest in extreme sports (F = 1.773; p = 0.000). Three groups emerged based on the level of interest, considering the average vacation length (F = 5.156; p = 0.000): the least interested, one-day vacationers (2.021); the slightly more interested, two- to three-day vacationers (2.266); and the most interested, those who go on holiday for four to five days (2.571) and for one week (2.670) or longer (2.906). As far as extreme sports are concerned, Hungary perhaps offers fewer opportunities, so domestic holidaymakers are generally less interested in them (2.308) than those who go abroad (2.952) (F = 35.373; p = 0.000).

Interest in skiing, on the other hand, is affected by all factors, except for one. All three age groups of respondents are interested in it to varying degrees (F = 50.805; p = 0.000): young people are the most interested (3.000), middle-aged people a little less so (2.223), and the elderly are only slightly interested (1.756) in skiing. The interest of the divorced/widowed group is similarly low (1.833). Those who are in a relationship are slightly more interested in skiing (2.379), and single people are most interested (2.831) (F = 7.798; p = 0.000). As is the case with extreme sports, skiing can be quite expensive. In addition to the equipment, the season pass and travel costs must also be counted. This is why we hypothesised that those with better material conditions may be more interested in skiing (2.917) than the other two categories (both 2.370). This hypothesis was also confirmed (F = 10.008; p = 0.000). Those who holiday only once a year do not prefer skiing (2.221). Those who holiday twice or three times a year (2.669) or four or more times a year (2.895) are more interested (F = 11.762; p = 0.000). The

longer the vacation, the greater the interest in skiing (F = 4.566; p = 0.001). Those vacationing for one day (1.936) showed little interest, those vacationing for two to three days (2.351), for four to five days (2.522) and for one week (2.581) were a bit more interested, while those vacationing for a minimum of one week (2.984) were moderately interested in skiing. As far as skiing is concerned, the smallest surprise was caused by the difference between those travelling domestically (2.251) and those travelling abroad (3.022) (F = 49.865; p = 0.000).

Horse riding and fishing are the next on the list in terms of interest. Interest in horse riding decreases significantly with age (F = 14.198; p = 0.000). Young people are somewhat interested (2.519), middle-aged people are less interested (2.243), and older people are barely interested in horse riding (1.830). Interest in horse riding increases with the number of times a person can go on holiday (F = 4.280; p = 0.014): people who go on holiday only once a year (2.160), or two to three times a year (2.347) or four or more times (2.618). Domestic holidaymakers are (2.201) less interested in horse riding than holidaymakers who go abroad (2.491) (F = 7.769; p = 0.005).

In the case of fishing, we did not find any factors that might have influenced the level of interest.

Respondents were least interested in golf, running, and hunting. Young people are most interested in golf (2.248), middle-aged people are less interested (1.964), and the elderly are almost uninterested (1.756) (F = 9.877; p = 0.000). As respondents' financial situation improved, so did their level of interest in golf (F = 6.461; p = 0.002). Since golf is considered a relatively expensive sport, those with poor (1.889) or average living conditions (1.975) show a similarly low level of interest in it, while those with good financial circumstances display a slightly higher level of interest (2.337). Those who usually travel abroad were more interested (2.213) in playing golf than those who travel domestically (1.984) (F = 6,011; p = 0.014).

It was our expectation that running would be independent of age, but according to our study, this statement is false (F = 17.225; p = 0.000). Young people had little interest (2.203), middle-aged people had even less interest (1.968), while older people had almost no interest (1.541) in running as a tourism activity. Single respondents are less interested in running than the average (2.347), while those who are in a relationship (1.941) have less interest. Those in the divorced/widowed group show almost no interest (1.500) in running. If someone can only

go on holiday once a year, they hardly choose this type (1.862) of active tourism. If they travel twice or three times a year, their interest is a bit higher (2.067), and in the case of those who take at least four holidays a year (2.250), the interest in running is even lower ($F = 4.754$; $p = 0.009$).

Those who can take holidays four or more times a year show little (2.303) interest in hunting. On the other hand, those who go on holiday once (1.878) or twice or three times a year (1.869) have almost no interest ($F = 4.285$; $p = 0.014$) in hunting.

**Conclusions**

Based on the research conducted, we can say that the travel and holiday habits of the respondents are greatly influenced by demographic factors. As age increases, interest in most forms of tourism declines. Education plays an influential role in only a few cases. Single vacationers tend to be more interested in active tourism than those who are in a relationship. People with a good personal financial situation are more interested in the types of active tourism that require more financial resources.

Tourists are more conscious of how they spend their holiday time. People who can travel several times a year or can vacation for longer periods of time choose many different forms of active tourism, unlike those who only travel once a year or only vacation for short periods of time. There are also significant differences in whether someone spends their holiday at home or abroad.

This research study could be extended by examining people's travel and holiday habits, their preferences, and their interest in active tourism products. Tourism is expected to change, and we would like to highlight the growing importance of active tourism, as an increasing number of people seem interested in spending more time getting to know their own countries.

**References**

Avasant 2020. *Coronavirus Impact Index by Industry: A RadarView Assessment*. https://avasant.com/report/coronavirus-impact-index-by-industry/, downloaded: 20.07.2021.

Buhalis, D.–Costa, C. (eds.) 2006. *Tourism Management Dynamics: Trends, management and tools.* Oxford: Elsevier Butterworth-Heinemann.

Csóka, L.–Törőcsik, M. 2019. A sportfogyasztás és a sportmotivációt mérő skálák. *Marketing & Menedzsment* 53(Special Issue), 77–86.

Gonda, G. 2016. *A turisztikai termékfejlesztés elméleti alapjai*. Pécs: PTE KPVK.

KSH 2020. *Helyzetkép a turizmus, vendéglátás ágazatról, 2020*. https://www.ksh.

hu/docs/hun/xftp/idoszaki/jeltur/2020/helyzetkep_turizmus_2020.pdf, downloaded: 05.09.2021.

Lounge Group 2020. *Felforgatta a magyarok utazási szokásait a pandémia.* https://turizmus.com/cikk/archiv/felforgatta-a-magyarok-utazasi-szokasait-a-pandemia, downloaded: 10.09.2021.

Magyar Turizmus Zrt. 2013. *Aktív turizmus szakmai segédlet*. https://mtu.gov.hu/documents/prod/Aktiv-turizmus-szakmai-segedlet.pdf, downloaded: 20.07.2021.

Mártonné Máthé, K.–Császár, Zs. 2019. Valóban aktív a magyar lakosság? Aktív és ökoturisztikai keresletet és motivációt felmérő kutatás. *Turizmus Bulletin* 19(1), 45–57.

Mazilu, M.–Marinescu, R.–Bălă, D.–Dragomir, L. 2019. Crisis management in tourism. *Quaestus Multidisciplinary Research Journal* 14, 289–298.

Michalkó, G.–Németh, J.–Ritecz, Gy. 2020. *Turizmusbiztonság*. Budapest: Dialóg Campus.

MTÜ 2020. *NTAK 2020: az MTÜ turisztikai trendriportja az átalakuló piacról*. https://turizmus.com/cikk/archiv/ntak-2020-az-mtu-turisztikai-trendriportja-az-atalakulo-piacrol, downloaded: 10.09.2021.

NaturMed Hotel Carbona 2020. *Így alakultak át a magyarok utazási szokásai a koronavírus miatt.* https://roadster.hu/igy-alakultak-at-a-magyarok-utazasi-szokasai-a-koronavirus-miatt/, downloaded: 20.07.2021.

Törőcsik, M.–Jakopánecz, E. 2019. *A fogyasztói ellenállást kiváltó termékek. Marketing & Menedzsment* 44(2), 4–12.

# The unintended effects of the Cohesion Policy: The wealthiest regions attract more EU funds

**RÉKA HORVÁTH[1] – TÜNDE PETRA SZABÓ[2]**

This study explores a new research direction for the European Union's (EU) Cohesion Policy. Our hypothesis is that regions with a higher GDP per capita are more successful in attracting funding under the EU's Cohesion Policy than their poorer counterparts. We test our hypothesis based on a new dataset from Romania including all those who have received EU grants. Our research was carried out using three samples. For each sample, we estimated an OLS and an IV regression. The estimations support our hypothesis: GDP per capita has a statistically significant positive effect on the EU funds secured in all three cases.

**Keywords**: Structural and Cohesion Funds, Cohesion Policy, European Union, Romania, Central and Eastern Europe.

**JEL codes**: R11, C30.

## Introduction

The Cohesion Policy of the European Union (EU) has generated a considerable number of scientific studies. A simple search for "EU Structural and Cohesion Funds" (hereinafter referred to as EU funds) in the search engine of the Free University of Brussels Library returns 5,802 results for the last five years. This is not surprising since the EU's Cohesion Policy has become the second most financially supported EU policy. In 2007-2013, the new Member States (those that joined the EU in 2004 and 2007) were allocated 50.51 percent of the EU funds (excluding the European Territorial Cooperation allocation). However, despite this substantial allocation, the scientific analysis of the new Member States in relation to the Cohesion Policy seems limited, leaving room for further analysis. Romania, which became a member of the EU in 2007 and was allocated close to €19 billion under the Cohesion Policy between 2007 and 2013, is even less analysed in well-established scientific journals.

According to the EU treaties, the objective of the Cohesion Policy is to reduce disparities between regions. The allocation rule of the Cohesion Policy is based on the

[1] PhD, Assistant Professor, Babeş-Bolyai University, Faculty of Economics and Business Administration, reka.horvath@econ.ubbcluj.ro.

[2] PhD, Associate Professor, Babeş-Bolyai University, Faculty of Economics and Business Administration, petra.szabo@econ.ubbcluj.ro.

GDP per capita of the regions. The ratio between GDP per capita in purchasing power parity rates and the EU's GDP is used to differentiate between "the poorer" and "the richer" regions. The former will receive "the highest transfers relative to GDP" (Mohl 2016. 18). Several studies support the idea that richer regions benefit more from EU funds (for example, Surubaru 2021; Crescenzi–Giua 2016; Rodríguez-Pose–Garcilazo 2015; Pinho et al. 2015; Crescenzi 2009). The results of these research studies are also supported by what we have seen in practice in Romania.

After the first years of implementation of the EU's Cohesion Policy in Romania, one can note that the municipalities, companies, and NGOs (beneficiaries of the EU funds) that are in a better economic situation have a better capacity to attract funds and to allocate the necessary co-financing amounts. Since the outcomes of a region's economic sector are reflected in its GDP, we assume that the counties with a higher GDP per capita can get a higher share of EU funds. In our opinion, this can be observed not only in Romania but also in other Central and Eastern European countries.

The need to analyse whether the impact of the Cohesion Policy is different in richer and poorer regions is also highlighted by Bachtrögler et al. (2020). Regarding the impact of the Cohesion Policy on companies, they conclude that "supporting firms tends to be more effective in poorer countries and in poorer regions within countries" (Bachtrögler et al. 2020. 32).

Between the allocation at the EU level and the funds received by beneficiaries in different regions, we have the Member States' spending strategies. The influence of politics and administrative capacity on the implementation of the Cohesion Policy at Member State level has already been extensively studied (see, for example, Incaltaru et al. 2020; Hagemann 2019; Banaszewska–Bischoff 2017; Bachtler et al. 2017; Medve-Bálint 2018; Surubaru 2017; Dotti 2016; Bachtler et al. 2014; Dotti 2013; Dellmuth et al. 2017; Bouvet–Dall'Erba 2010). The characteristics of the regions and their territorial capital have also been widely researched (see Fratesi–Perucca 2019; Bachtrögler et al. 2020; Percoco 2017; Fratesi–Wishlade 2017; Fratesi–Perucca 2014; Perucca 2014). Some authors point to the need for country-specific insights (Crescenzi–Giua 2019) into the effects of the Cohesion Policy. This type of research can only be carried out now, as data of sufficient quality have only recently become available in Romania.

The implementation of the EU's Cohesion Policy at the level of Member States, including Romania, is based on a call for projects system managed by the

state authorities. An important feature of this system is that applicants are required to provide co-financing for their projects. At the same time, the assessment and verification of the way in which the money was spent often leads to delays in reimbursement requests. Therefore, due to the nature of the application system, the beneficiary must have enough money to implement the project as described in the application, then wait for the money to be refunded. The objectives of the application, the payment process, the co-financing amount, and the entire application system are determined jointly by the Member States and various EU institutions (e.g., the Parliament and the Council for the legislative part, the Commission for partnerships agreements and each operational programme).

In reviewing the scientific literature, we found that only a few studies focused on the county (NUTS-3) level distribution of EU funding beneficiaries (Bachtrögler et al. 2019), as not many suitable databases were available. For the first time in Romania, there is a database for the period 2007-2013, containing the list of all the beneficiaries at the NUTS-3 level and the amounts of actual payments. We therefore believe that the conditions are now in place to analyse the distribution of the EU funds used in Romania. In our view, the case of Romania may also be of interest to other former communist states that joined the EU in 2004 or later.

Within this context, in our study, we tested the assumption that the counties (NUTS 3 level) with a higher GDP/capita were more successful in mobilising European funds than their counterparts with a lower GDP/capita.

The aim of our study is twofold. On the one hand, we exploit the potential offered by a completely new dataset since no data was previously available for Romania, with the actual EU funds spent broken down by specific participants. On the other hand, we analyse a country that has not been one of the frequently researched Member States, despite its relative size and its share of EU funds.

Our analysis contributes to the scientific literature on the Cohesion Policy in two ways. First, we consider the actual implementation of the Cohesion Policy in Romania, which will help to understand not only one of the Union's net beneficiaries but also the issues raised by the Cohesion Policy in the Central and Eastern European (CEE) region. Second, we seek to understand the factors that explain the amount of EU funding received.

This paper is organised as follows. First, we briefly review the relevant scientific literature, highlighting the pieces related to new Member States. Second, we highlight some of the main characteristics of EU funds in Romania. Third,

we present the variables and research methodology used in our analysis and our empirical results. Finally, we summarise our conclusions, practical implications, research limitations, and future research directions.

**Literature review**

As Bachtrögler et al. (2020) emphasised, the literature on the effectiveness of the EU's Cohesion Policy is immense. However, studies have not reached a consensus on the effectiveness of this policy in terms of GDP per capita growth (Bachtrögler et al. 2020; Bouvet–Dall'Erba 2010; Medeiros 2017; Gagliardi–Percoco 2017; Mohl–Hagen 2010). In their meta-analysis, Dall'Erba and Fang (2017) concluded that the heterogeneity observed in the impact of EU funds on growth is due to the publication status, the period analysed, the control for endogeneity, and the different regressors.

In their 2017 editorial, Fratesi and Wishlade stress the new research direction which seeks to explain the factors influencing the impact of the Cohesion Policy. These factors are the quality of the government's absorptive capacity and the territorial capital of regions (Fratesi–Wishlade 2017). Two years later, Bachtrögler et al. (2019) emphasised the importance of the territorial assets/capital of regions for the impact of the Cohesion Policy. Caro and Fratesi's findings (2021. 319) suggest that "national and regional contextual factors" influence the outcomes of the Cohesion Policy. As for research on the new Member States, using the example of CEE NUTS-3 regions for the period 2004-2006, Fratesi and Perucca (2014) demonstrate that the impact of the Cohesion Policy depends on regions' territorial capital. Their analysis also showed "that different policy axes are facilitated by different endowments of territorial capital" (Fratesi–Perucca 2014. 187).

Reviewing the existing literature, we found that GDP per capita plays a central role in analysing the impact of the Cohesion Policy. Dotti (2016. 539) notes that "according to the policy rationale, the amount of funding is expected to be inversely proportional to the level of per capita GDP". Nonetheless, we did not find any research explaining the relationship between the amount of EU funds collected in a region and the region's GDP per capita.

As for the new Member States, they are included in the research presented in only a small part of this large body of literature on the Cohesion Policy. Therefore, we identified a good research opportunity. Since the new Member States joined the

EU in 2004, 2007, and 2014 and the first full Multiannual Financial Framework period was 2007-2013, we conducted a systematic review of the scientific literature, focusing on journals published after 2010. The search engine of the Free University of Brussels Library was used, giving access to multiple databases. Using these tools, we prepared Table 1, which lists major articles concerning CEE that are relevant to our topic.

Looking at the above-mentioned articles, we can see that only a few analyses in the top journals focus on Romania (Surubaru 2017) and even those are about administrative capacity or governance (Incaltarau et al. 2020), not about the territorial distribution of EU funds.

Clearly, EU funds have been the subject of many studies. However, no research has asked the following question: Does a region's GDP per capita explain the amount of EU funds received by the beneficiaries of that region? This is a gap that we identified in the literature. In addition, there is no research on the distribution of EU funds in Romania in general, despite it being an important beneficiary of the European Cohesion Policy, with a novel dataset for 2007-2013.

Since the rule of eligibility for Objective 1 regions (NUTS-2 level, with a GDP that is less than 75 percent of the EU average) has not changed over the programming periods, our hypothesis is the following: a region's GDP per capita explains at least part of the total amount of EU funds received by the different beneficiaries in that region. Based on the eligibility criterion, it would be ideal to find that a higher GDP means less EU funding. However, based on the scientific literature (Fratesi−Perucca 2014; Fabrizi et al. 2016; Bachtrögler et al. 2019; Medve-Bálint 2017; Bakucs−Fertő 2019; Bourdin 2019; Dyba et al. 2018; Aiello−Pupo 2017), we expect to see the opposite, namely that a higher GDP means more EU funds. Given that our dependent variable is the amount of EU funds absorbed by a region, we will test our hypothesis with regressions. Drawing on the literature (Novosák et al. 2017; Fabrizi et al. 2016; Pellegrini et al. 2013; Gagliardi−Percoco 2017), we will use the GDP per capita and several other control variables to predict the dependent variable. The control variables were chosen based on the literature (see, for example, Medve-Bálint 2017) and their availability for Romania.

**Table 1. Articles in top journals regarding the Cohesion Policy in new Member States**

| Authors | Focus | Country/countries |
|---|---|---|
| Incaltarau et al., 2020 | Impact of administrative capacity and political governance on the absorption rate | EU 27 |
| Bachtrögler et al., 2018 | Impact of the Cohesion Policy on firm growth | EU 25 |
| Hagemann, 2019 | Role of politics in the absorption process | New Member States |
| Dyba et al., 2018 | Impact of the Cohesion Policy on regional development | Albania, Bulgaria, Croatia, Czechia, Hungary, Poland, Romania, Slovakia, Slovenia, Estonia, Latvia, and Lithuania |
| Loewen, 2018 | Cohesion Policy and institutional changes | Hungary and Estonia |
| Medve-Bálint, 2018 | States' spending strategies | Greece, Italy, Ireland, Spain and Portugal, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia |
| Banaszewska‒Bischoff, 2017 | Impact of political factors on EU fund allocation | Poland |
| Gagliardi‒Percoco, 2017 | Impact of CP on economic performance | Objective 1 regions |
| Novosák et al., 2017 | Spatial distribution of EU funds | Czechia |
| Percoco, 2017 | Influence of local economic structure on policy outcomes | Objective 1 regions |
| Surubaru, 2017 | Impact of political factors on the management and implementation of structural funds | Bulgaria and Romania |
| Bachtler et al., 2014 | Role of administrative capacity in the performance of structural funds | Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia |
| Dabrowski, 2014 | Partnerships | Poland, Czechia, and Hungary |
| Fratesi‒Perucca, 2014 | Impact of the structural characteristics of the region on economic growth | Central and Eastern Europe |

*Source:* Own editing

**Structural and Cohesion Funds in Romania**

Currently, the international scientific literature includes no articles dealing with the territorial distribution of EU funds in Romania. Therefore, to make meaningful regressions and to explain our findings, we first describe the characteristics of the operational programmes implemented in 2007-2013, the first period when Romania fully benefited from EU funds.

Romania joined the EU in 2007 and, during the period 2007-2013, all NUTS-2 (and NUTS-3) regions of Romania were funded under the Convergence objective (Commission Decision 2007/191/EC). Romania was also supported under the European Territorial Cooperation objective. In the case of transnational projects, all NUTS-2 regions were eligible for funding. The indicative allocations were as follows (based on 2004 prices): €16,870,209,691 for the Convergence objective (€5,754,788,708 from the Cohesion Fund) and €308,930,782 for the European Territorial Cooperation (European Commission 2007a, 2007b, 2007c).

Following the Cohesion Policy rules presented by the government and after intense negotiations, the Commission approved Romania's National Strategic Reference Framework (NSRF) for 2007-2013. The NSRF established the objectives and the financial envelope for each objective (see Table 2). The approval of the NSRF was followed by the development of operational programmes, which also had to be approved by the Commission. The calls for proposals were prepared based on these programming documents. The NSRF identified the following operational programmes (OPs): transport, environment, competitiveness, regional operational programme, human resource development, administrative capacity building, and technical assistance (Government of Romania 2007). Notably, the Romanian NSRF for 2007-2013 is based on the National Development Plan and is agreed upon by the representatives of the development regions (NUTS-2 level) and by the representatives of the counties (NUTS-3 level).

Regarding the European Territorial Cooperation objective, Romania participated in 12 programmes between 2007 and 2013: Romania–Bulgaria, Hungary–Romania, Southeastern Europe, INTERREG IVC, Urbact II, Romania–Serbia, Black Sea, Romania–Ukraine–Republic of Moldova, Hungary–Slovakia–Romania–Ukraine, Interact, ESPON, and Central Europe (MDRAP 2012).

**Table 2. Operational programmes in Romania under the Convergence objective, 2007-2013**

| Operational programme | Total funds 2007-13 euro current amounts | Percentage of total funding for Romania under the Convergence objective % |
|---|---|---|
| Increase of economic competitiveness | 2,554,222,109 | 13.29 |
| Transport | 4,565,937,295 | 23.76 |
| Environment | 4,512,470,138 | 23.49 |
| Regional | 3,726,021,762 | 19.39 |
| Technical assistance | 170,237,790 | 0.89 |
| Human resource development | 3,476,144,996 | 18.09 |
| Administrative capacity building | 208,002,622 | 1.08 |
| Total | 19,213,036,712 | 100 |

*Source:* Own editing based on the *National Strategic Reference Framework 2007-13* (Government of Romania 2007)

In our analysis, we only use data on the Convergence objective, which accounts for 98.2 percent of the total indicative allocations for Romania from Structural and Cohesion Funds. We do not analyse the European Territorial Cooperation objective, as currently no database allows for linking the exact funding received to the respective Romanian counties (NUTS-3 regions).

According to the literature, at least three main programming characteristics influence the spatial distribution of EU funds. The first is the allocation of resources among operational programmes. In Table 2, the Environment and Transport operational programmes are the two main infrastructure programmes, and they each receive about 23 percent of EU funding. If we also include the funds allocated to the Regional Operational Programme, which is also mainly focused on infrastructure, we can see that about 67 percent of EU funds are related to infrastructure investments. We can conclude that, there is an uneven distribution of allocations for the different types of funding, which is decided by the Romanian government and approved by the European Commission.

The second characteristic is the order of priorities set in the programmes since not all actions receive the same amount of resources. For example, in the Competitiveness OP, Priority Axis 1.1. on productive investments for small- and medium-sized enterprises (SMEs) represents 20.60 percent of the total funding allocated to this OP. However, the 5.2. actions for communicating the operational

programme account for only 0.93 percent of EU funds (authors' calculations based on Ministerul Finanțelor Publice 2011).

The third main characteristic concerns the types of potential beneficiaries. Within each operational programme, each priority axis included a list of potential beneficiary categories. For example, there were priority axes for which only regional water service providers and the Bucharest Mayor's Office were eligible (Environment Operational Programme 1.1), and they represented 61.53 percent of the operational programme budget (own calculations based on Ministerul Mediului și Pădurilor 2012). However, there was also an objective which listed more than eleven categories of applicants although it was allocated only 7.72 percent of the total budget (authors' calculations based on Ministerul Muncii, Familiei, Protecției Sociale și Persoanelor Vârstnice 2013).

All these characteristics of the programmes will fundamentally affect the territorial distribution of funds. For example, if most of the beneficiaries that can apply for funding are public institutions registered in Bucharest (NUTS-3 region), the capital city will be overrepresented in the sample. However, the impact of these funds will also be felt in other counties.

**Research methodology and data**

We downloaded our database from the website of the Romanian Ministry of European Funds in January 2019 (Ministerul Fondurilor Europene 2016). After several e-mails and the Ministry's response, we clarified the issues raised. Thus, we created a database containing 15 930 projects spread across different programmes. For each project, we have the beneficiary's name, the name of the NUTS-3 region, the total amount paid from the EU funds (Cohesion Fund, European Social Fund, European Regional Development Fund), the OP, and the type of beneficiary. In Romania, there are 42 NUTS-3 regions, namely 41 counties and the capital city of Bucharest.

Our hypothesis is that GDP per capita explains the amount of money received by the beneficiaries in each county (NUTS-3 region), and the dependent variable is EU funds per capita. Since the amounts received from EU funds cannot be broken down by year, the variables to be used must cover the whole period analysed. We decided to use the seven-year average value (from 2007 to 2013) of all independent variables included in the regressions. Our explanatory variables were GDP per capita, the number of hospital beds (per 1000 inhabitants), the number

of students enrolled in pre-university education, the number of students registered for the final university exams, the number of retirees, the unemployment rate and state subsidies per capita. All our variables, their abbreviations and sources are shown in Table 3.

**Table 3. Variables used in the research**

| Variable name | Abbreviation | Source |
|---|---|---|
| GDP per capita | GDP per capita | Romanian Statistical Institute database |
| Number of hospital beds per 1,000 inhabitants | HBED | Romanian Statistical Institute database |
| Number of students enrolled in pre-university education | ENROLLEDPREUNIV | Romanian Statistical Institute database |
| Number of students registered for the final university exams | STUDFINALUNIV | Romanian Statistical Institute database |
| Number of retirees | RETIREES | Romanian Statistical Institute database |
| Unemployment rate | UNEMP | Romanian Statistical Institute database |
| EU Structural and Cohesion Funds per capita | EU funds | Our database for EU funds Romanian Statistical Institute database for the number of people |
| State subsidies per capita | SUBSIDIES | Romanian Statistical Institute database |

*Source:* Own editing

Based on our database structure and data, we need to construct multiple regressions to test our hypothesis. Apart from the database characteristics mentioned above, our database contains a total of 28 types of beneficiaries, 13 of which accounted for less than one percent of the amounts paid from EU funds. Altogether, these 13 beneficiaries accounted for 4.075 percent of the total payments received by Romania from EU funds (own calculations). It is worth noting that not all types of beneficiaries received funding under all programmes (see Appendix 1). In fact, central public administration authorities were the only type of beneficiary that received EU funds under all Romanian operational programmes. The data on the beneficiaries also shows us the concentration of funds, and the share of the different types of beneficiaries in the total amount paid is as follows: 22.62 percent, county councils, local councils, and town halls; 16.88 percent, commercial companies with majority or full state ownership; 16.70

percent, businesses (all types); 11.47 percent, regional operators; 10.74 percent, central public administration authorities or units coordinated by them (own calculations).

By analysing the amount of EU funds received by a type of beneficiary, we identified five operational programmes where the first three types of beneficiaries received more than 80 percent of the total amount. These operational programmes are the following: regional, environment, transport, administrative development, and technical assistance (own calculations). Moreover, each of these programmes includes types of beneficiaries accounting for more than 50 percent of the OP's paid amount: 50.68 percent for town halls and local councils in the Regional OP; 53.84 percent for regional operators in the Environment OP; 93.67 percent for commercial companies with majority or full state ownership in the Transport OP; 65.32 percent for central public administration authorities in the Administrative Capacity Building OP, and 81.58 percent in the Technical Assistance OP (own calculations).

All of the above observations support the construction of multiple regressions. First, we must test our hypothesis on the whole sample. Second, since municipalities and companies collected most of the money, they must be examined separately.

We are aware that the issue of endogeneity may arise when constructing a regression. There are three instances where the exogeneity condition is violated, and thus endogeneity is present: errors-in-variables, omitted variables and simultaneous causality. In estimating the impact of Structural and Cohesion Fund payments on economic growth, Mohl and Hagen (2010) attribute endogeneity to four issues: the use of imprecise data, reverse causality, unobserved or omitted variables, and the omission of regional spillover effects. We tried to mitigate these effects in the following way. On the first issue, we looked at actual payments, not at structural fund commitments. Regarding the second issue, in the case of Romania, the period 2007-2013 is the first programming period as a member of the EU, thus all NUTS-3 regions were Objective 1 regions. Consequently, the decision on funding eligibility was made several years before the actual payments and without the country being a member of the EU. On the third issue, we tried to use all the control variables available to us for that period and at that level. Regarding the fourth issue, we can consider it as not existent for that period and for this country,

since in this database we have the actual payments of EU funds for each project and for each county. Additionally, in all cases, we tested for endogeneity using the instrumental variables estimation.

**Empirical results**

We estimated the following three regression models: the first was estimated using the entire sample; the second only analysed the funds received by county councils, city councils and town halls, and the third focused only on the funds received by companies.

***Model 1: The entire Romanian sample***

In this sample, we included the projects funded for all the beneficiaries from all the counties between 2007 and 2013. As we have mentioned, the dependent variable is EU funds per capita, while the independent variables are GDP per capita, the number of hospital beds per 1,000 inhabitants, the number of students enrolled in pre-university education, the number of students registered for final university exams, the number of retirees, and the unemployment rate.

Since the relationship between EU funds per capita and GDP per capita is rather exponential, we will use their natural logarithm. We introduced a dummy variable for Bucharest, as many beneficiaries were registered in Bucharest, to see if there was a significant difference between the capital and the counties.

Appendix 2 shows the correlations between the variables used (both dependent and independent). We ran a multiple regression using the natural logarithm of EU funds per capita as the dependent variable.

We tested for endogeneity using the instrumental variables estimation. First, we tested the relevance of the instrument, namely we examined whether the chosen instrument (income) was indeed sufficiently correlated to the endogenous variable (logGDP/cap), and we tested for exogeneity, that is, if the potentially endogenous variable (logGDP/cap) was indeed endogenous. These diagnostic tests revealed that the instrument used was strong (Wald test: $F(2,39)=113.42$, $p<0.001$), but we could not reject the null hypothesis of the Wu-Hausman test for endogeneity ($F(1,37)=0.364$, $p=0.55$); thus, the variable of concern (logGDP/cap) is uncorrelated with the error term, so the OLS estimator is consistent and therefore the OLS estimator is to be preferred. The OLS regression results and the estimation of the instrumental variable (IV) can be seen in Table 4.

**Table 4. Results of Model 1 and the IV1 model**

| | Dependent variable logEUFundspercap | |
|---|---|---|
| | OLS | Instrumental variable |
| | (1) | (2) |
| **logGDPpercap** | 0.658*** | 0.660*** |
| | (0.034) | (0.035) |
| **HBED** | 0.095** | 0.093** |
| | (0.036) | (0.037) |
| **SUBSIDIES** | 0.002* | 0.002* |
| | (0.001) | (0.001) |
| **Bucdummy** | 0.832** | 0.832** |
| | (0.337) | (0.337) |
| **Observations** | 42 | 42 |
| **$R^2$** | 0.999 | 0.999 |
| **Adjusted R2** | 0.998 | 0.998 |
| **Residual Std. Error** | 0.297 | 0.297 |
| **F Statistic** | 6,759.058*** | |

Note: * p<0.1; ** p<0.05; *** p<0.01

*Source:* Own calculations in R

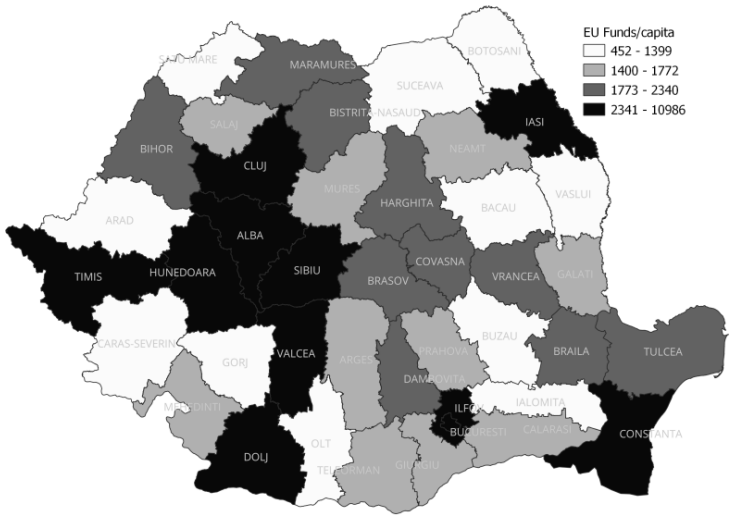
All the classical assumptions of the OLS regression were then tested (Appendix 3). The value of the adjusted R-square shows that log(GDP/cap), the number of hospital beds per 1,000 inhabitants, the state subsidies per capita and the dummy variable Bucdummy explain 99.8 percent of the variance of the log(EUfunds/cap). The regression equation takes the following form:

$$\ln(EUFunds/cap_i) = 0.658 \cdot \ln(GDP/cap_i) + 0.095 \cdot HBED_i + \\ + 0.002 \cdot SUBSIDIES_i + 0.832 \cdot Bucdummy_i + \varepsilon_i,\ i=\overline{1,42}$$

We can see that a 1% change in the GDP per capita implies a 0.658% change in the EU funds per capita. The Bucdummy variable shows a 0.832% increase in the case of EU funds per capita for Bucharest. The previous regression indicates that a county's higher GDP per capita results in a higher amount of EU funds. Therefore, although the counties with a lower GDP should benefit more from European funds, our results showed that the higher the GDP of a county, the more it can benefit from these funds.

According to Scotti et al. (2022), theoretical reasons suggesting the need to consider spatial effects are related to economic integration, trade, capital

mobility, labour migration, technology transfer and knowledge spillovers, which demonstrate that regions cannot be considered as isolated entities. Figure 1 shows the spatial distribution of EU funds per capita in Romania.




*Source:* Own editing in QGIS

**Figure 1. Spatial distribution of EU funds per capita in Romania**

Figure 1 shows that a very large portion of the financial resources were received and spent in the vicinity of the Romanian capital Bucharest. This city acts as a 'managing authority' for all EU funds in Romania, that is, it is responsible for receiving funds from Brussels and redistributing them throughout Romania. That is why we introduced the Bucdummy dummy variable in the estimation (which takes the value 1 in the case of Bucharest). After developing the OLS model, we used Moran's I tool to assess the presence of spatial autocorrelation in the residuals. Based on Moran's I value, we cannot reject the null hypothesis ($p=0.2786$), so there is no spatial autocorrelation. It is quite possible that the spatial distribution of feature values is the result of random spatial processes.

***Model 2: County councils, city councils, and town halls***

In the following section, we will focus only on the funds secured by county councils, city councils, and town halls. Of the total amount paid from EU funds

to Romanian beneficiaries, 22.62 per cent was allocated to county councils, local councils, and town halls. We estimated a new regression model with the logarithm of EU funds per capita as the dependent variable; however, this time we computed only the amount paid to county councils, city councils, and town halls for each county (NUTS-3).

Surprisingly, however, we found that the standard deviation of the amount paid to county councils, city councils, and town halls was lower than expected (Appendix 4). Therefore, the counties managed to get similar amounts regardless of their GDP per capita. This raises the question of political influence on the allocation and design of operational programmes. Appendix 5 includes, among others, the correlation coefficients between the dependent variable and independent variables.

We tested for endogeneity in this case too, using income as an instrumental variable. The diagnostic tests revealed that the instrument used (income) was strong (F(1,40)=5.880, p=0.0199). The Wu-Hausman test for endogeneity was not significant in this case (F(2,36)=1.130, p=0.3341), thus the variable of concern (logGDP/cap) is uncorrelated with the error term. The results of the OLS regression and the instrumental variable estimation can be seen in Table 5.

**Table 5. Results of model 2 (county councils, city councils, and town halls) and the IV2 model**

| | **Dependent variable logEUFundspercap** | |
|---|---|---|
| | OLS | Instrumental variable |
| | (1) | (2) |
| **logGDPpercap** | 0.546*** | 0.565*** |
| | (0.032) | (0.074) |
| **RETIREES** | -0.00001*** | -0.00001* |
| | (0.00000) | (0.00001) |
| **ENROLLEDPREUNIV** | 0.00001** | 0.00001 |
| | (0.00000) | (0.00001) |
| **SUBSIDIES** | 0.005*** | 0.005*** |
| | (0.001) | (0.002) |
| **Observations** | 42 | 42 |
| **$R^2$** | 0.998 | 0.998 |
| **Adjusted $R^2$** | 0.998 | 0.998 |
| **Residual Std. Error** | 0.300 | 0.313 |
| **F Statistic** | 4,917.396*** | |

Note: * p<0.1; ** p<0.05; *** p<0.01

*Source:* Own calculations in R

In the case of this model, each classical assumption of the OLS regression was also tested (Appendix 6), and all the assumptions were satisfied. The regression equation takes the following form:

$$\ln(EUFunds / cap_i) = 0.546 \cdot \ln(GDP / cap_i) - 0.00001 \cdot RETIREES_i + \\ + 0.00001 \cdot ENROLLEDPREUNIV_i + 0.005 \cdot Subsidies_i + \varepsilon_i,\ i=\overline{1,42}$$

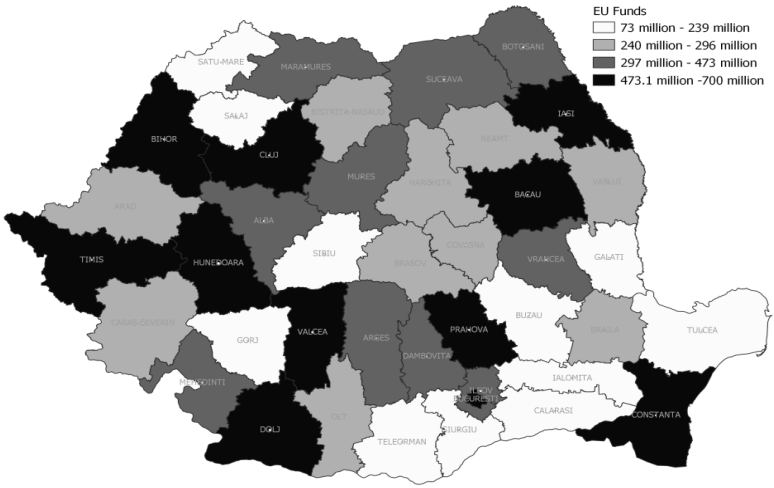
We can see that the number of retirees has a significant negative impact on EU funds, as an increase in the number of retirees can put pressure on public pension systems, which are partly funded by government contributions and taxes. As more people retire and begin to draw on their pensions, there may be less funding available to support other programmes or initiatives that are also funded by the government. An increase in the number of retirees may lead to a decrease in the size of the workforce, which could impact economic growth and tax revenues. This could have an indirect effect on the availability of EU funds, as there may be less funding available for investment in infrastructure, research and development or for other initiatives that require government funding.

The number of students enrolled in pre-university education has a significant positive influence on EU funds. EU structural and cohesion funds are often allocated to support education and training programmes aimed at improving the skills and employability of the workforce. A larger number of students enrolled in pre-university education may increase the demand for such programmes, particularly those aimed at developing technical and vocational skills, as well as programmes focused on entrepreneurship and innovation. EU funds may be used to support investments aimed at meeting the demand for pre-university and higher education, improving the skills and employability of the workforce and promoting economic growth.

Here, if we analyse only the amount of money received by the various types of councils in a NUTS-3 region, the value of the EU funds received per capita increases as the amount of state subsidies per capita increases in a given county.

Geolocalised data on beneficiaries of EU funds for the period 2007-2013 allow us to visualise the geographical distribution of EU development projects across Romania (Figure 2).

To check if the results of the OLS model were acceptable, it was necessary to test for spatial autocorrelation in the model. Moran's I diagnostics of residual for the model was not found to be statistically significant (MI = -0.139631086, p = 0.885). This result confirmed the absence of spatial autocorrelation in the model.




*Source:* Own editing in QGIS

**Figure 2. Spatial distribution of EU funds received exclusively by county councils, city councils, and town halls in Romania**

***Model 3: Companies***

In the previous section, we saw that the share of companies (all types combined) in the total amount paid from EU funds was 16.70 percent. This puts companies in third place among the types of beneficiaries that received the most money from EU funds. Therefore, we examined whether our hypothesis would hold if we only considered the amounts received by firms.

This time, we computed for each county (NUTS-3) the amount of money attracted by companies, so we estimated a multiple regression model, using the natural logarithm of EU funds per capita as dependent variable. The independent variables were the natural logarithm of GDP per capita, the unemployment rate, the number of hospital beds per 1,000 inhabitants, the number of students enrolled in pre-university education, the number of students enrolled in universities, and the number of retirees. In Appendix 7, we can see the correlations between the variables used (both dependent and independent variables).

We tested for endogeneity in this case too, using income as an instrumental variable. Based on the Wald test performed on the instrument in the first stage,

we rejected the null hypothesis ($p<0.001$), thus the instrument used (income) was strong. The Wu-Hausman test for endogeneity was not significant ($F(1,39)=1.171$, $p=0.286$), which indicated that endogeneity did not bias the estimate of the effect of ln(GDP/capita) on ln(EU Funds/capita) in a problematic way. The results of the OLS regression and the instrumental variable estimation can be seen in Table 6.

**Table 6. The results of the OLS regression including only the companies (Model 3) and the IV3 model**

| | **Dependent variable logEUFundspercap** | |
|---|---|---|
| | OLS | Instrumental variable |
| | (1) | (2) |
| **logGDPpercap** | 0.657*** | 0.683*** |
| | (0.025) | (0.035) |
| **UNEMP** | -0.103*** | -0.145** |
| | (0.038) | (0.054) |
| **Observations** | 42 | 42 |
| **$R^2$** | 0.993 | 0.992 |
| **Adjusted $R^2$** | 0.992 | 0.992 |
| **Residual Std. Error** | 0.521 | 0.529 |
| **F Statistic** | 2,648.435*** | |

Note: * p<0.1; ** p<0.05; *** p<0.01

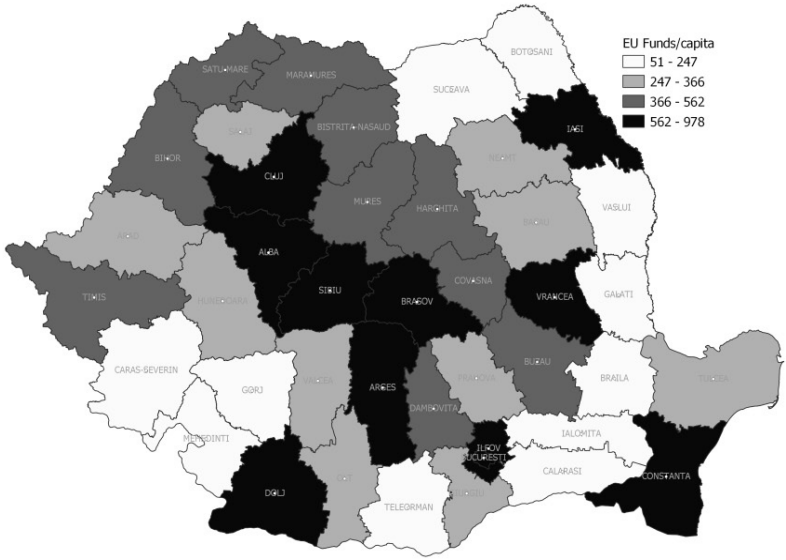
*Source:* Own calculations in R

Each classical assumption of the OLS regression was tested (Appendix 8). The regression equation takes the following form:

$$\ln(EUFunds / cap_i) = 0.657 \cdot \ln(GDP / cap_i) - 0.103 \cdot UNEMP_i + \varepsilon_i,\ i=\overline{1,42}$$

GDP per capita has a statistically significant positive effect on EU funds per capita. Thus, our hypothesis also holds if we consider only the funds received by companies. We can see the statistically significant negative influence of the unemployment rate on the natural logarithm of EU funds per capita. The EU may allocate funds to support economic development and address imbalances in regions that are facing high levels of unemployment, including within individual countries. By addressing these issues at the county level, the EU can help to promote economic growth and reduce disparities in economic development within countries, as well as support the overall functioning of the single market. This can be particularly important for border regions, where the unemployment rate of one

county may be influenced by economic conditions in neighbouring counties. The spatial distribution of the EU funds received exclusively by companies can be seen in Figure 3.




*Source:* Authors' editing in QGIS

**Figure 3. Spatial distribution of per capita EU funds received exclusively by companies in Romania**

In Figure 3, we can see that, in the case of companies, there is a sign of spatial autocorrelation. So, to check that the results of the OLS regression were acceptable, we also examined in this case whether spatial autocorrelation could be found in the model. Moran's I diagnostics of residual for the model was statistically significant (MI = 0.156982615, p = 0.02483). Anselin (2005. 199) provides a decision tree for the Lagrange Multiplier test (LM) statistics to decide upon the nature of the estimated model. First, we should consider the LM-Error and the LM-Lag test statistics. If neither rejects the null hypothesis, then we should stick to the original model. In our case, we failed to reject the null hypothesis in both cases (LMerr = 2.3262, p-value = 0.1272; LMlag = 0.34583, p-value = 0.5565), so we stick to our original OLS estimation.

**Discussion and conclusions**

In our study, we examined a perspective that was previously lacking in the scientific literature on EU funds. We concentrated on the Romanian NUTS-3 regions (the counties in Romania), as this is an understudied country and regional level, filling the gap we found in the literature. Furthermore, there is a novel dataset which contains the actual payments made from EU funds to beneficiaries from Romania. We answered the question of whether the GDP per capita of a given county explains the amount of money received by beneficiaries in the same county (NUTS-3 level). Our analysis concerned all NUTS-3 regions from Romania in the period 2007-2013. During this period, all regions in Romania were Objective 1 regions. Our hypothesis was that the variance in the amount of money paid to beneficiaries in a given county can be explained by the seven-year average value of the GDP per capita (from 2007 to 2013) and other variables.

We tested our hypothesis on three databases and estimated three models that can be seen above in the empirical section.

First, the regression was estimated using the database containing all the projects that benefited from EU funds during this period. We then constructed the following two subsamples containing all winning projects and the actual payments made to them: the first subsample contains only the amounts received by county councils, city councils, and town halls; the second database contains all types of companies. We constructed three linear regression models, using the natural logarithm of EU funds per capita as dependent variable, the natural logarithm of GDP per capita as independent variable, and several other variables.

Our hypothesis was confirmed in each case. More precisely, we confirmed that when counting all the funds received by all beneficiaries in Romania (the sample), by all county councils, city councils and town halls (first subsample) or by all the companies (second subsample), GDP per capita had a statistically significant positive effect on EU funds per capita. However, apart from GDP per capita, we did not find a common influencing factor for all three cases, which seems to confirm the findings of Fratesi and Perucca (2014) for some CEE countries, excluding Romania. This finding also raises another question regarding Romania: Which factor of territorial capital differentiates the impact of EU funds in these regions? We think this is a research path worth exploring when the data for the period 2014-2020 is made public.

We know that EU funds aim to support the economic and social development of the less prosperous regions and countries within the EU. Therefore, regions and countries with lower GDP per capita and higher levels of unemployment and economic disparities may receive a higher share of EU funds. This does not apply to companies, since our results for the company subsample show that the higher the GDP per capita in a county, the higher the EU funds per capita attracted by companies in that region, which raises the question of the effectiveness of EU funds. Especially since Bachtrögler et al. (2019. 32) found that "supporting firms tends to be more effective in poorer countries and in poorer regions within countries." However, even regions and countries with higher GDP per capita may be eligible for EU funding if they face specific economic and social challenges or if they undertake projects that align with the EU's priorities and objectives. For example, a region with a high GDP per capita may receive funding for a research and innovation project that contributes to the EU's goal of promoting sustainable and inclusive growth.

Therefore, our hypothesis is confirmed: for Romania, the GDP per capita of NUTS-3 regions has a statistically significant positive influence on the per capita EU funds received by beneficiaries from the same region over the analysed period. We have also confirmed that if a region has a higher GDP per capita, it will gain more EU funds per capita than a region with a lower GDP per capita. A future study could support this hypothesis based on NUTS-3 data at the EU level. This finding is also consistent with the conclusions of Bouvet and Dall'Erba, who argue that the "lower level of development of [Objective 1 regions] limits their lower capacity to accompany EU monies" (Bouvet–Dall'Erba 2010. 518). Furthermore, Dettmer and Sauer argue that the principle of additionality "tends to favour rich regions that are able to provide additional funds over poor regions that cannot" (Dettmer–Sauer 2019. 171).

The main limitation of this study is that the amounts received from EU funds cannot be broken down by year. We decided to use the seven-year average value (from 2007 to 2013) of all independent variables that were included in the regressions. Therefore, our results highlight the trends valid in the case of average values and are not applicable to each year taken separately over the analysed period. We see two new research directions arising from our methodological choices. On the one hand, the causal link between GDP per capita and EU funds per capita could be examined. On the other hand, when newer data becomes available, we will be able to test our hypothesis over a longer period, 2007-2020.

Two conclusions can be drawn from this research regarding the development of the EU's Cohesion Policy. On the one hand, if we want poorer regions to be able to attract more EU funds, they must be mainstreamed into country-level planning. All the actors involved in the programming of EU funds in the Member States must take public responsibility, from planning the use of funds to implementation. This should include responsibility for prioritisation between regions and objectives. We support the opinion of Crescenzi et al. (2020. 5), who argued that "Member States should take full responsibility and ownership of the Cohesion Policy and its impacts." In cases like Romania, where all the counties (NUTS-3) were covered by Objective 1, it would make sense to determine at Member State level, in a well-communicated and scientifically sound way, how much money can be allocated in total to beneficiaries from one county. Or like Crescenzi already suggested in 2009, a solution could be better targeting and "combining GDP per capita with further information on the socio-economic conditions of the target areas" (Crescenzi 2009. 128). The need for differentiation between the regions is also argued by Medve-Bálint (2017. 220), in whose opinion "the lack of differentiation between the more and the less prosperous regions in terms of fund eligibility has enabled unequal internal competition for the funds, which has primarily benefited the wealthier regions and localities". However, given the importance of spillover effects demonstrated by a considerable amount of research (e.g., Bourdin 2019; Kostov–Gallo 2015), it would be worthwhile to set maximum eligible amounts by region, at the NUTS-2 level. Decision makers may consider, as a partial solution, decreasing the EU co-financing rate in richer regions and increasing it in regions with lower GDP per capita. Regional programmes (NUTS-2 level) that tackle issues that are important to the regions and one or two national programmes with a transregional scope (above the NUTS-2 level) could also help solve this issue.

On the other hand, it should be decided whether the EU's regional convergence or regional development at Member State level is a priority. In the case of Romania, all the regions attracted EU funds and achieved some development with this funding. These regions would have been unable to accomplish this without EU funds. We argue that even if the ultimate goal of the Cohesion Policy – convergence between all EU regions – is not achieved, there are considerable development gains for individual Member States, and this could benefit the EU as a whole.

**References**

Aiello, F.–Pupo, V. 2017. Structural funds and the economic divide in Italy. *Journal of Policy Modeling* 34, 402–418.

Anselin, L. 2005. *Exploring spatial data with GeoDaTM: A workbook*. https://www.geos.ed.ac.uk/gisteac/fspat/geodaworkbook.pdf, downloaded: 10.01.2023.

Bachtler, J.–Berkowitz, P.–Hardy S.–Muravska, T. 2017. *EU Cohesion Policy Reassessing performance and direction*. London: Routledge.

Bachtler, J.–Mendez, C.–Oraže, H. 2014. From Conditionality to Europeanization in Central and Eastern Europe: Administrative Performance and Capacity in Cohesion Policy. *European Planning Studies* 22, 735–757.

Bachtrögler, J.–Fratesi, U.–Perucca, G. 2020. The influence of the local context on the implementation and impact of EU Cohesion Policy. *Regional Studies* 54, 21–34.

Bachtrögler, J.–Hammer, C. 2018. Who Are the Beneficiaries of the Structural Funds and Cohesion Fund and how Does the Cohesion Policy Impact Firm Level Performance. *OECD Economic Department Working Papers, no. 1499*.

Bakucs, Z.–Fertő, I. 2019. Convergence or Divergence? Analysis of Regional Development Convergence in Hungary. *Eastern European Countryside* 26, 121–143.

Banaszewska, M.–Bischoff, I. 2017. The Political Economy of EU-funds: Evidence from Poland. *Journal of Economics and Statistics* 237, 191–224.

Bourdin, S. 2019. Does the Cohesion Policy Have the Same Influence on Growth Everywhere? A Geographically Weighted Regression Approach in Central and Eastern Europe. *Economic Geography* 95, 256–287.

Bouvet, F.–Dall'Erba, S. 2010. European Regional Structural Funds: How Large Is the Influence of Politics on the Allocation Process? *Journal of Common Market Studies* 48, 501–528.

Caro, P.D.–Fratesi, U. 2021. One policy, different effects: Estimating the region-specific impacts of EU cohesion policy. *Journal of Regional Science* 62, 303−330.

Crescenzi, R. 2009. Undermining the Principle of Concentration? European Union Regional Policy and the Socio-economic Disadvantage of European Regions. *Regional Studies* 43(1), 111−133.

Crescenzi, R.–Giua, M. 2016. The EU cohesion policy in context: does a bottom- up approach work in all regions? E*nvironment and Planning A: Economy and Space* 48(11), 2340−2357.

Crescenzi, R.–Giua, M. 2019. One or many Cohesion Policies of the European Union? On the differential economic impacts of Cohesion Policy across member states. *Regional Studies* 54, 10–20.

Crescenzi, R.–Fratesi, U.–Monastiriotis, V. 2020. Back to the Member States? Cohesion Policy and the National Challenges to the European Union. *Regional Studies* 54, 5–9.

Dabrowski, M. 2014. EU Cohesion Policy, Horizontal Partnership and the Patterns of Sub-national Governance: Insights from Central and Eastern Europe. *European Urban and Regional Studies* 21, 364–383.

Dall'Erba, S.–Fang, F. 2017. Meta-analysis of the Impact of European Union Structural Funds on Regional Growth. *Regional Studies* 51, 822–832.

Dellmuth, L. M.–Schraff, D.−Stoffel, M. F. 2017. Distributive Politics, Electoral Institutions and European Structural and Investment Funding: Evidence from Italy and France. *Journal of Common Market Studies* 55, 275–293.

Dettmer, B.–Sauer, T. 2019 Implementation of European Cohesion Policy at the Sub-national Level: Evidence from Beneficiary Data in Eastern Germany. *Papers in Regional Science* 98, 167–189.

Dotti, N. F. 2016. Unwritten Factors Affecting Structural Funds: The Influence of Regional Political Behaviours on the Implementation of EU Cohesion Policy. *European Planning Studies* 24, 530–550.

Dotti, N. F. 2013. Unbearable Instability of Structural Funds' Distribution. *European Planning Studies* 21, 596–614.

Dyba, W.–Loewen, B.–Looga, J.–Zdražil, P. 2018. Regional Development in Central-Eastern European Countries at the Beginning of the 21st century: Path Dependence and Effects of EU Cohesion Policy. *Quaestiones Geographicae* 37, 77−92.

European Commission 2007a. Commission Decision of 15 May 2007 Amending Decision 2006/609/EC Fixing an Indicative Allocation by Member State of the Commitment Appropriations for the 'European Territorial Cooperation' Objective for the Period 2007 to 2013 as Concerns Bulgaria and Romania (notified under document number C(2007) 2047). *Official Journal of the European Union*, L. 131/24.

European Commission 2007b. Commission Decision of 26 March 2007 Amending Decision 2006/595/EC Drawing up the List of Regions Eligible for Funding from the Structural Funds under the Convergence Objective for the Period 2007 to 2013 as Concerns Bulgaria and Romania. *Official Journal of the European Union*, L 87/15.

European Commission 2007c. Commission Decision of 26 March 2007 Amending Decision 2006/594/EC Fixing an Indicative Allocation by Member State of the Commitment Appropriations for the Convergence Objective for the Period 2007 to 2013 as Concerns Bulgaria and Romania (notified under document number C(2007) 1290). *Official Journal of the European Union*, L 87/18.

Fabrizi, E.–Guastella, G.–Marta, S.–Timpano, F. 2016. Determinants of Intra-Distribution Dynamics in European Regions: An Empirical Assessment of the Role of Structural Intervention. *Tijdschrift voor Economische en Sociale Geografie* 107, 522−539.

Fratesi, U.–Perucca, G. 2014. Territorial Capital and the Effectiveness of Cohesion Policies: An Assessment for CEE Regions. *Investigaciones Regionales* 29, 165−191.

Fratesi, U.–Perucca, G. 2019. EU Regional Development Policy and Territorial Capital: A Systemic Approach. *Papers in Regional Science* 98, 265−281.

Fratesi, U.–Wishlade, FG. 2017. The impact of European Cohesion Policy in different contexts. *Regional Studies* 51, 817–821.

Gagliardi, L.–Percoco, M. 2017. The Impact of European Cohesion Policy in Urban and Rural Regions. *Regional Studies* 51, 857–868.

Government of Romania 2007. *National Strategic Reference Framework 2007-2013, Final version 2007*. http://old. fonduri-ue. ro/baza-de-date-proiecte-contractate, downloaded: 20.03.2019.

Hagemann, C. 2019. How Politics Matters for EU funds' Absorption Problems – a Fuzzy-Set Analysis. *Journal of European Public Policy* 26, 188–206.

Incaltarau, C.–Pascariu, C. G.–Surubaru, N. C. 2020. Evaluating the Determinants of EU Funds Absorption across Old and New Member States – the Role of Administrative Capacity and Political Governance. *Journal of Common Market Studies* 58, 941–961.

Kostov, P.–Le Gallo, J. 2015. Convergence: A Story of Quantiles and Spillovers. *Kyklos* 68, 552–576.

Loewen, B. 2018. Cohesion Policy and Institutional Change in Hungary and Estonia. *Regional Studies*, *Regional Science* 5(1), 255–262.

Medeiros, E. 2017. European Union Cohesion Policy and Spain: A Territorial Impact Assessment. *Regional Studies* 51, 1259–1269.

Medve-Bálint, G. 2017. Funds for the Wealthy and the Politically Loyal? How EU Funds May Contribute to Increasing Regional Disparities in East Central Europe. In: Bachtler, J.–Berkowitz, P.–Hardy, S.–Muravska, T. (eds.) *EU Cohesion Policy Reassessing Performance and Direction*. London: Routledge, 220–240.

Medve-Bálint, G. 2018. The Cohesion Policy on the EU's Eastern and Southern Periphery: Misallocated Funds? *Studies in Comparative International Development* 53, 218–238.

MDRAP 2012. *Finanțare Europeană pentru proiecte de cooperare teritorială.* http://www.mdrap.ro/pachet-informativ-cte, downloaded: 21.03.2019.

Ministerul Finanțelor Publice 2011. *POS Creșterea Competitivității Economice. Document Cadru de Implementare a Programului Operațional Sectorial Creșterea competitivității economice, versiunea, ianuarie 2011.* http://old.fonduri-ue, downloaded: 11.02.2019.

Ministerul Fondurilor Europene 2016. https://www.fonduri-ue.ro/images/files/transparenta/date-deschise/comm_financing_contracts_oct_2016.xls, downloaded: 21.01.2019.

Ministerul Mediului și Pădurilor 2012. *Documentul Cadru de Implementare a Programului Operațional Sectorial Mediu 2007-2013. Versiunea 6, decembrie 2012.* http://old.fonduri-ue.ro/documente-programare/documente-cadru-de-implementare/posm, downloaded: 22.03.2019.

Ministerul Muncii, Familiei, Protecției Sociale și Persoanelor Vârstnice 2013. *Documentul Cadru de Implementare a Programului Operațional Sectorial Dezvoltarea Resurselor Umane 2007-2013. Versiunea 6.* http://old.fonduri-ue.ro/documente-programare/documente-cadru-de-implementare/posdru, downloaded: 19.03.2019.

Mohl, P.–Hagen, T. 2010. Do EU Structural Funds Promote Regional Growth? New Evidence from Various Panel Data Approaches. *Regional Science and Urban Economics* 40, 353–365.

Mohl, P. 2016. *Empirical Evidence on the Macroeconomic Effects of EU Cohesion Policy*. Wiesbaden: Springer Gabler.

Novosák, J.–Hájek, O.–Novosáková, J.–Lindner, M. 2017. Enterprise Support Policy and Territorial Cohesion: The Czech Republic (2007-2013). *Journal of Urban and Regional Analysis* 9, 141–157.

Pellegrini, G.–Terribile, F.–Tarola, O.–Muccigrosso, T.–Busillo, F. 2013. Measuring the Effects of European Regional Policy on Economic Growth: A Regression Discontinuity Approach. *Papers in Regional Science* 92, 217–233.

Percoco, M. 2017. Impact of European Cohesion Policy on Regional Growth: Does Local Economic Structure Matter? *Regional Studies* 51, 833–843.

Perucca, G. 2014. The Role of Territorial Capital in Local Economic Growth: Evidence from Italy. *European Planning Studies* 22, 537–562.

Pinho, C.–Varum, C.–Antunes, M. 2015. Under what conditions do Structural Funds play a Significant Role in European Regional economic growth? Some evidence from recent panel data. *Journal of Economic Issues* 49, 749–771.

Rodríguez-Pose, A.–Garcilazo, E. 2015. Quality of Government and the Returns of Investment: Examining the Impact of Cohesion Expenditure in European Regions. *Regional Studies* 49, 1274–1290.

Scotti, F.–Flori, A.–Pammolli, F. 2022. The economic impact of structural and Cohesion Funds across sectors: Immediate, medium-to-long term effects and spillovers. *Economic Modelling* 111(1):105833.

Surubaru, N. C. 2017. Administrative Capacity or Quality of Political Governance? EU Cohesion Policy in the New Europe 2007–13. *Regional Studies* 51, 844–856.

## Appendices

### Appendix 1: Distribution of types of beneficiaries across OPs (number of winning projects)

| Type of beneficiary | Regional OP | Environment | Increase of Econ. Comp. | Human Resource Development | Transport | Administrative Capacity Building | Technical Assistance | Total |
|---|---|---|---|---|---|---|---|---|
| Central public administration authority | 36 | 151 | 204 | 206 | 46 | 126 | 96 | 865 |
| Research institute | 0 | 3 | 103 | 34 | 0 | 0 | 0 | 140 |
| Large enterprise | 0 | 0 | 284 | 73 | 5 | 0 | 0 | 362 |
| Small business | 79 | 0 | 2629 | 280 | 0 | 0 | 0 | 2988 |
| Medium enterprise | 27 | 2 | 1090 | 94 | 7 | 0 | 0 | 1220 |
| Microenterprise | 2157 | 0 | 1153 | 165 | 0 | 0 | 0 | 3475 |
| Regional operator | 0 | 81 | 0 | 7 | 0 | 0 | 0 | 88 |
| Non-profit, non-governmental organisation | 160 | 89 | 166 | 681 | 0 | 12 | 0 | 1108 |
| Non-profit, non-governmental body of public utility, with legal personality, operating in the field of regional development | 64 | 2 | 18 | 69 | 0 | 1 | 15 | 169 |
| Legal person of private law and public utility | 23 | 8 | 40 | 876 | 1 | 1 | 0 | 949 |
| Commercial company with majority or full state ownership | 1 | 5 | 0 | 2 | 71 | 0 | 0 | 79 |
| Territorial administrative unit / county council | 317 | 58 | 62 | 24 | 0 | 48 | 2 | 511 |
| Territorial administrative unit / town hall / local council | 1587 | 43 | 42 | 84 | 1 | 134 | 0 | 1891 |
| Unit subordinated to or coordinated by a central public administration authority | 5 | 59 | 104 | 446 | 8 | 53 | 48 | 723 |
| State university | 9 | 12 | 104 | 545 | 0 | 10 | 0 | 680 |

*Source:* Own calculations

## Appendix 2: Means, standard deviations, and correlations with confidence intervals (whole sample)

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| **1. logEUFunds** | 7.52 | 0.49 | | | | | | | |
| **2. logGDPpercap** | 9.89 | 0.34 | 0.71** [.52, .84] | | | | | | |
| **3. HBED** | 5.45 | 1.50 | 0.63** [.41, .79] | 0.58** [.34, .75] | | | | | |
| **4. ENROLLED-PREUNIV** | 64603.77 | 31970.02 | 0.49** [.22, .69] | 0.46** [.18, .67] | 0.52** [.26, .71] | | | | |
| **5. STUDFINAL-UNIV** | 15933.50 | 39259.65 | 0.68** [.48, .82] | 0.65** [.43, .80] | 0.63** [.40, .78] | 0.83** [.71, .91] | | | |
| **6. RETIREES** | 111967.66 | 71143.30 | 0.59** [.35, .76] | 0.59** [.35, .76] | 0.56** [.30, .74] | 0.94** [.88, .97] | 0.91** [.84, .95] | | |
| **7. UNEMP** | 6.3 | 2.03 | -0.52** [-.71,-.26] | -0.63** [-.78,-.40] | -0.27 [-.53, .03] | -0.36* [-.60, -.07] | -0.43** [-.65, -.15] | -0.40** [-.63, -.11] | |
| **8. SUBSIDIES** | 220.47 | 42.91 | -0.00 [-.31, .30] | -0.16 [-.45, .15] | -0.19 [-.47, .12] | -0.35* [-.59, -.05] | -0.29 [-.55, .01] | -0.31* [-.56, -.01] | 0.01 [-.29, .31] |

*Source*: Own calculations

## Appendix 3: Testing the assumptions of the OLS regression for all (Model 1)

| | |
|---|---|
| Linearity | RAMSEY RESET test: F(2,36) = 0.065809, p-value = 0.9364<br>Rainbow test: F(21,17) = 1.4044, , p-value = 0.2407 |
| Homoscedasticity | studentized Breusch-Pagan test: $\chi^2(3) = 6.2587$, p-value = 0.09968<br>Goldfeld-Quandt test: F(17,17) = 1.4741, p-value = 0.216<br>White test: $\chi^2(8)=13.0$, p-value = 0.113 |
| Autocorrelation | Durbin-Watson test: DW = 2.1567, p-value = 0.7175<br>Breusch-Godfrey test for serial correlation of order up to 4: F(4) = 2.474, p-value = 0.6493 |
| Normality of residuals | Shapiro-Wilk normality test: W = 0.94774, p-value = 0.05362<br>Anderson-Darling normality test: A = 0.62609, p-value = 0.09619 |

*Source:* Own calculations in R

## Appendix 4: Descriptive statistics for EU funds/capita received by county councils, city councils and town halls

| | N | Minimum | Maximum | Mean | | Std. Deviation | Skewness | | Kurtosis | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Statistic | Statistic | Statistic | Statistic | Std. Error | Statistic | Statistic | Std. Error | Statistic | Std. Error |
| EU funds/ capita | 42 | 241.126 | 1257.479 | 701.383 | 37.470 | 242.839 | 0.247 | 0.365 | -0.461 | 0.717 |

*Source:* Own calculations

## Appendix 5: Means, standard deviations, and correlations with confidence intervals in the case of funds received exclusively by county councils, city councils and town halls

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| **1. logEUFunds** | 6.49 | 0.38 | | | | | | | |
| **2. logGDPpercap** | 9.89 | 0.34 | -0.08 [-.37, .23] | | | | | | |
| **3. HBED** | 5.45 | 1.50 | 0.13 [-.18, .42] | 0.58** [.34, .75] | | | | | |
| **4. ENROLLED-PREUNIV** | 64603.77 | 31970.02 | -0.32* [-.57, -.02] | 0.46** [.18, .67] | 0.52** [.26, .71] | | | | |
| **5. STUDFINAL-UNIV** | 15933.50 | 39259.65 | -0.35* [-.59, -.05] | 0.65** [.43, .80] | 0.63** [.40, .78] | 0.83** [.71, .91] | | | |
| **6. RETIREES** | 111967.66 | 71143.30 | -0.35* [-.59, .05] | 0.59** [.35, .76] | 0.56** [.30, .74] | 0.94** [.88, .97] | 0.91** [.84, .95] | | |
| **7. UNEMP** | 6.3 | 2.03 | -0.01 [-.31, .30] | -0.63** [-.78,-.40] | -0.27 [-.53, .03] | -0.36* [-.60, -.07] | -0.43** [-.65, -.15] | -0.40** [-.63, -.11] | |
| **8. SUBSIDIES** | 220.47 | 42.91 | 0.61** [.38, .77] | -0.16 [-.45, .15] | -0.19 [-.47, .12] | -0.35* [-.59, -.05] | -0.29 [-.55, .01] | -0.31* [-.56, -.01] | 0.01 [-.29, .31] |

Note: M and SD are used for mean and standard deviations. Values in square brackets indicate the 95% confidence interval. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014).

* p < .05. ** p < .01.

*Source:* Own calculations

## Appendix 6: Testing the assumptions of the OLS regression for county councils, city councils and town halls (Model 2)

| | |
|---|---|
| Linearity | RAMSEY RESET test: F(2,36) = 1.0015, p-value = 0. 3773<br>Rainbow test: F(21,17) = 2.1343, , p-value = 0.0586 |
| Homoscedasticity | studentized Breusch-Pagan test: $\chi^2(3) = 6.0398$, p-value = 0.1097<br>Goldfeld-Quandt test: F(17,17) = 0.53678, p-value = 0.8951<br>White test: $\chi^2(8) = 13.7$, p-value = 0.0890 |
| Autocorrelation | Durbin-Watson test: DW = 1.9724, p-value = 0.4847<br>Breusch-Godfrey test for serial correlation of order up to 4: F(4) = 2.0467, p-value = 0.7272 |
| Normality of residuals | Shapiro-Wilk normality test: W = 0.98609, p-value = 0.8817<br>Anderson-Darling normality test: A = 0.20706, p-value = 0.8586 |

*Source:* Own calculations in R

## Appendix 7: Means, standard deviations, and correlations with confidence intervals in the case of funds received exclusively by companies

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| **1. logEUFunds** | 5.84 | 0.38 | | | | | | |
| **2. logGDPpercap** | 9.89 | 0.34 | 0.60** [.36, .76] | | | | | |
| **3. HBED** | 5.45 | 1.50 | 0.40** [.11, .63] | 0.58** [.34, .75] | | | | |
| **4. ENROLLEDPRE-UNIVper1000** | 122.25 | 10.21 | -0.31* [-.56, -.00] | -0.47** [-.68, -.20] | -0.12** [-.41, .19] | | | |
| **5. STUDFINAL-UNIVper1000** | 18.65 | 25.48 | 0.52* [.26, .71] | 0.71** [.52, .84] | 0.74** [.56, .85] | -0.35* [-.59, -.06] | | |
| **6. RETIREES** | 111967.66 | 71143.30 | 0.37* [.08, .61] | 0.59** [.35, .76] | 0.56** [.30, .74] | -0.35* [-.59, -.05] | 0.76** [.59, .86] | |
| **7. UNEMP** | 6.30 | 2.03 | -0.53** [-.72, -.26] | -0.63** [-.78, -.40] | -0.27 [-.53, .03] | 0.34* [.04, .58] | -0.46** [-.67, -.19] | -0.40* [-.63, -.11] |

Note: M and SD are used for mean and standard deviations. Values in square brackets indicate the 95% confidence interval. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014).

* p < .05. ** p < .01.

*Source:* Own calculations in R

## Appendix 8: Testing the assumptions of the OLS regression for companies (Model 3)

| | |
|---|---|
| Linearity | RAMSEY RESET test: F(2,38) = 2.0004, p-value = 0.1493<br>Rainbow test: F(21,19) = 0.95451, , p-value = 0.5439 |
| Homoscedasticity | studentized Breusch-Pagan test: $\chi^2(1) = 2.5245$, p-value = 0.1121<br>Goldfeld-Quandt test: F(19,19) = 0.73154, p-value = 0.7489<br>White test: $\chi^2(4)=3.47$, p-value = 0.482 |
| Autocorrelation | Durbin-Watson test: DW = 2.1076, p-value = 0.6381<br>Breusch-Godfrey test for serial correlation of order up to 4: F(4)= 2.8963, p-value = 0.5753 |
| Normality of residuals | Shapiro-Wilk normality test: W = 0.96181, p-value = 0.1713<br>Anderson-Darling normality test: A = 0.33915, p-value = 0.4838 |

*Source:* Own calculations in R

# Guidelines for authors

The *Forum on Economics and Business* (in Hungarian: *Közgazdász Fórum*) is a peer-reviewed journal of economic science. It is the joint academic journal of the Hungarian Economists' Society of Romania (RMKT), the Department of Economics and Business Administration in Hungarian Language of the Faculty of Economics and Business Administration at the Babeş-Bolyai University, and the Faculty of Economics and Social Sciences at the Partium Christian University.

It provides a platform for members of the teaching staff, researchers, and practitioners to publish their scientific papers in the fields of economic theory and applied economics. The journal publishes issues in English and in Hungarian, and since 2010 it is indexed in the ProQuest and EBSCO international databases.

The editorial staff of the *Forum on Economics and Business* continuously accepts for publishing original scientific articles and studies that have not been previously published elsewhere, in English or Hungarian language, in the following disciplines: accounting and auditing, applied statistics and econometrics, banking and finance, business information systems, corporate finance, international economics, macro- and microeconomics, management, marketing, regional and rural economics. Each manuscript is reviewed by two referees anonymously (double blind review); the editor-in-chief approves the articles for publication.

Information regarding the publication conditions can be found on the following link: https://www.kozgazdaszforum.ro/.

PRICE: 20 RON

RMKT 2023

ISSN 1582-1986
CNCSIS 755-2010