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Economic study on the impact of publicly funded PSM activities on commercial online news services in Lithuania

A report for the European Broadcasting Union (EBU) by
Oliver & Ohlbaum Associates Ltd

O&O
Economics

Contents

Table of Figures

Tables:

Figures:

1 Executive Summary

The European Broadcasting Union (EBU) has commissioned Oliver & Ohlbaum Associates (O&O) to conduct an independent economic study to test the hypothesis that publicly funded public service media (PSM) online news reduces or "crowds out" commercial online news services in Lithuania. Overall, across all hypotheses examined, our analysis found no evidence of LRT "crowding out" commercial online news services and found multiple indications of the presence of "crowding in" effects from LRT's online news services.

Hypotheses

This analysis is situated within an ongoing policy debate in Lithuania, where commercial news providers have raised concerns that LRT's online news activities may undermine their revenues, audience reach, and incentives to invest. These concerns reflect a broader theoretical argument that publicly funded services can substitute for private provision, thereby weakening market outcomes.

To test these concerns rigorously, the study examines four hypotheses:

- ***Hypothesis 1 (H1)**: Higher weekly reach of LRT's online news services is negatively associated with the weekly reach of commercial online news services*
- ***Hypothesis 2 (H2)**: Higher weekly page views of LRT's online news services are negatively associated with the weekly page views of commercial online news services*
- ***Hypothesis 3 (H3)**: Higher number of weekly visits to LRT's online news services is negatively associated with the number of weekly visits to commercial online news services*
- ***Hypothesis 4 (H4)**: Higher weekly total time spent on LRT's online news services is negatively associated with the weekly total time spent on commercial online news services*

This research uses publicly available, online consumption data from Gemius to examine H1-H4.[1]

This study builds on and extends earlier research on "crowding out" by examining Lithuania in more detail. Most previous studies have either had a pan-European remit or have focused on other individual markets. Our analysis also uses a methodology that tracks changes over time and takes account of long-term differences between news outlets, as well as wider events affecting all outlets at once. This helps us to isolate the relationship between how public service news use and commercial news use move together in Lithuania.

Key Findings

Across our analysis of all of the hypotheses (H1-H4), we found no evidence to suggest the "crowding out" hypothesis in Lithuania. Rather, our findings consistently indicate positive and significant associations between the use of LRT and commercial online news services.

Our analysis of H1, which examines reach, found that higher reach for LRT's online news services was associated with higher reach for commercial online news services.

Our analysis of page views, visits, and time spent all yielded similar results – that greater consumption of online news services from LRT was associated with greater consumption of commercial online news services.

[1] Gemius, 2026. Public dataset [online]. Accessed 9th February 2026. Available at: https://e-public.gemius.com/lt/rankings/9791

As such, our analysis found no evidence of "crowding out", meaning no evidence that the consumption of LRT's online news services reduces the consumption of commercial online news services. Rather, the results indicate the presence of potential "crowding in" effects, whereby the provision of LRT's online news services is associated with higher, rather than lower, levels of engagement with commercial online news services.

Overall, the findings support the conclusion that LRT's online news services are complementary to commercial online news services in Lithuania.

Methodology

The original Gemius dataset included 188 weeks for 7 prominent commercial online news services, including LRT, across both mobile and PC devices spanning from July 2022 to February 2026. Of this original dataset, we excluded data that did not meet Gemius' 'real user' threshold for data quality, which flags unreliable observations where the data is drawn from a smaller number of events.

We extracted the following metrics from Gemius at an aggregate level, as well at a device-type level, split by PC and mobile:

1. **Reach:**[2] the total number of unique individuals accessing each media title per week
2. **Page views:** the total number of pages viewed per media title per week
3. **Visits:** the total number of times users view a series of pages in a week, with no more than 30 minutes between consecutive page views
4. **Time spent:** the total time spent by users on the site per week[3]

Our modelling approach consists of two phases. First, Pearson correlations are used to test the basic direction and strength of the relationship between the consumption of LRT's online news services and commercial online news services. Second, we estimated a statistical (two-way fixed effects) model using observations for PC and Mobile devices, to further examine the relationship between the consumption of LRT online news services and commercial online news services. Our statistical model accounts for market-wide demand shocks, such as increases in news interest during political elections, and persistent differences in consumption patterns across commercial online news outlets through the inclusion of two controls (namely, weekly and commercial outlet-by-device fixed effects). Further detail on our methodology and data sources is provided in the main report.

[2] For clarity and readability, we have adjusted the names of 'Real users' to 'Reach'. This change was purely terminological: we have not altered the underlying definitions, scope, or measurement approach

[3] Gemius reports average time spent. We use total time spent, defined as the product of average time spent and reach, to align with our other metrics, which are all total metrics

2 This research has been externally reviewed by a leading media economist

This analysis has been subject to independent peer review by Vardges Levonyan to ensure analytical and methodological accuracy.

Vardges Levonyan is a Senior Research Associate at the University of Zurich. He earned his PhD from Harvard University and specialises in media economics. His work has examined, among other topics: the influence of BBC coverage on the Brexit referendum outcome, measuring media bias in Public Service Broadcasters, and understanding the drivers of agenda-setting within contemporary news outlets. Vardges Levonyan has stated:

"The project examines whether "crowding out" occurs in the media landscape, specifically, whether consumption of public service medias' online news displaces consumption of commercial online news outlets. While "crowding out" has been studied extensively in prior work, the present analysis contributes to the existing studies by exploiting an aggregate-level analysis tracking visits to commercial and public service media websites over time. This approach extends earlier cross-country, multi-year analysis and, crucially, allows for explicit testing of potential confounders that have received limited attention in prior work.

Across a range of metrics: reach, page views, visits, and total time spent, public service media consumption is positively and significantly associated with commercial media use. A two-way fixed effects specification accounts for potential confounders such as common demand shocks and outlet-specific factors, lending the estimates additional credibility.

Taken together, the evidence provides no support for "crowding out" in online news consumption and instead suggests complementarity between public service and commercial media use."

3 Introduction

This report is a follow-up to a previous study commissioned by the EBU, which examined the "crowding out" hypothesis regarding the impact of publicly funded Public Service Media (PSM) online news activity on commercial online news publisher activity.[4] That study used regression analysis at a multi-year, pan-European level. The results suggested there is no evidence that the PSM's online news activities negatively impact publishers' online news services.

The focus of this report is to test whether the provision of online news by publicly funded PSM "crowds out" or negatively impacts the provision of online news by commercial online news services in a single Member State, Lithuania. It does so by analysing the Gemius dataset, which measures online consumption in Lithuania. The empirical specification accounts for the most salient confounding factors through the inclusion of fixed effects.

In this report, "commercial online news services" (also referred to as "commercial outlets") refers to online news services provided by outlets with roots in print journalism, digitally native publishers, and commercial broadcasters. "PSM" refers to media organisations primarily financed through public sources such as licence fees, state grants, or taxes – in the case of Lithuania, the relevant PSM is the Lithuanian National Radio and Television (LRT). We have defined "online news" to mean online news services (websites or apps) and online news items from PSM or commercial online news services. We exclude linear TV channels, radio stations, podcasts or on-demand media services, which may contain news items. According to PSMs' remit and/or strategy, PSM online news items may contain elements of video and/or audio and text or may contain one or two of these elements only.

3.1 Setting the context of "crowding out"

As set out in our previous study, we can summarise the theory and arguments around "crowding out" as follows:

The "crowding out" hypothesis originates from macroeconomic theories that certain government expenditures can suppress private sector spending. The hypothesis can also be applied to the media sector, where it has been used to examine whether PSM "crowds out" commercial media – with economist Ronald Coase being the first to do so in 1947.[5]

3.1.1 Arguments for the theory of "crowding out"

Some commercial media providers have argued that adverse "crowding out" effects from PSM manifest primarily in three ways – in reducing readers' willingness to pay, reducing tolerance towards advertisements, or through a standard substitution effect:

1. It is suggested that the presence of online news from PSM that is free at the point of use may reduce readers' willingness to pay for commercially provided news, which can apply downward pressure on subscription prices for outlets and lead to fewer subscribers, both of which may result in lower reach and reduced subscription revenues[6]

[4] Oliver & Ohlbaum Associates, 2025. Economic study on the impact of publicly funded PSM activities on commercial online news publishers. [online], EBU. Available at: https://www.ebu.ch/research/open/debunking-crowding-out-study

[5] Coase, RH, 1947. The origin of the monopoly on broadcasting in Great Britain. *Economica* 14(55), pp. 189–210; for further discussion on the previous academic literature on "crowding out" in the media market, please refer to our pan-European report

[6] Sehl, A., Fletcher, R. and Picard, R.G., 2020. Crowding out: Is there evidence that public service media harm markets? A cross-national comparative analysis of commercial television and online news providers. European Journal of Communication, 35(4), pp.389-409

2. Secondly, in instances where commercial online news is funded through advertising revenues, it is suggested that the presence of advert-free online news from PSM may reduce tolerance towards advertisements. Consequently, PSM presence in the online news space may attract readers away from commercial online news services, reducing reach and therefore advertising revenues[7]

3. Thirdly, even if audiences do not actively avoid commercial news due to paid subscriptions or advertising intensity, the presence of PSM online news services might still reduce consumption of commercial outlets through a standard substitution effect, given that audiences have finite time and attention for news[8]

As a consequence of these alleged "crowding out" effects, the theory is that commercial online news services may be less inclined to invest in new services or to improve the quality of existing ones. Potential entrants might be deterred from entering the market, or existing firms may exit due to lack of profitability. This could undermine a diverse and plural online news environment, and reduce innovation and the choice and quality of content and services available to consumers.

3.1.2 Arguments against the theory of "crowding out"

There have also been challenges to the theory of "crowding out" in the context of PSM online news.

Firstly, a key argument is that PSM online news offerings meet a different use case, i.e. they are *complementary* to, and not substitutional for, commercial online news services[9,10]. For example, PSM have a mandate to provide impartial news while online news services may have a political affiliation. Also, PSM are required to provide accurate news, which means they may serve a complementary purpose as a point of reference for audiences to verify "what is happening". In addition, it is argued that publicly funded PSM services may in fact lead to an increase in commercial online news service activity through "crowding in" effects – by stimulating consumer demand or growing the size of the online news market, which could benefit commercial online news services by expanding the total audience for news, increasing reach and subscription and advertising opportunities.

Another argument is that some of the challenges facing commercial online news services are more influenced by factors other than by PSMs' online news offerings. Examples of such challenges include the decline in classified advertising revenues, driven by the rise of online marketplaces; the increasing reliance on third-party online platforms, such as social media, to reach audiences; reduced disposable income, which makes it harder for commercial online news services to maintain or grow subscriber bases; and increased usage of large language model platforms (LLMs) for online news consumption, which provide summaries of online articles, reducing consumer click-through rates, affecting newspapers' abilities to build direct consumer relationships, attribution, and renumeration. For example, when individuals are not particularly interested in news (driven by factors such as a lack of confidence in their ability to find and evaluate news information, or the perception that news lacks relevance[11]), they are less likely to visit news websites or engage with content, regardless of the source of the news. When audiences are unwilling to pay for news – often due to demographic factors such as age or income, or lack of perceived value compared to other subscriptions[12] e.g. TV subscriptions – this may limit the ability of commercial online news

[7] Ibid

[8] Delfi, 2020. Commercial media files complaint to Brussels over LRT financing. [online]. Delfi. Available at: https://www.delfi.lt/en/politics/commercial-media-files-complaint-to-brussels-over-lrt-financing-84594725; see also: General Court of the European Union, 2023. All Media Lithuania UAB and Others v European Commission (Case T-72/22)

[9] Oslo Economics, 2021. Competitive effects of NRK services in selected media markets

[10] Udris, L., Fürst, S., & Eisenegger, M., 2024. Verdrängung privater Informationsmedien durch Nachrichtenangebote öffentlicher Medien? Nutzung und Zahlungsbereitschaft in der Schweiz. Jahrbuch Qualität der Medien, pp. 33-48

[11] Edgerly, S., 2022. The head and heart of news avoidance: How attitudes about the news media relate to levels of news consumption. Journalism, 23(9), pp.1828-1845

[12] Goyanes, M., 2014. An empirical study of factors that influence the willingness to pay for online news. Journalism practice, 8(6), pp.742-757

services to grow their subscription revenue. It could be argued that these kinds of behavioural factors can have a larger impact on commercial online news services' performance than publicly funded PSM activities.

4 Lithuanian news media landscape overview and literature review

This section presents a general overview of the Lithuanian news media landscape. We then review previous research on the "crowding out" theory.

4.1 Overview of the Lithuanian news media landscape

The Lithuanian news media landscape comprises a single public service media provider, commercial broadcasters, national, regional, and local traditional news publishers, and digital-only news outlets. Consumers also use global social media, messaging and video-sharing platforms for news.

Lithuanian National Radio and Television (LRT) is the Lithuanian PSM, wholly publicly owned, which provides news across television, radio, and online services. Across December 2025, LRT's online news services reached 57 per cent of online audiences.[13] LRT operates under a statutory public service remit and is publicly funded from taxation.[14]

The commercial online news in scope of this study are:

- *Delfi* is a news website that operates portals for Lithuania, Estonia and Latvia. Delfi is a digitally native service, founded in 1999 and acquired by the Estonian media group Ekspress Grupp in 2007. Delfi is funded through a mix of subscriptions and advertising and had a monthly reach of 69 per cent in December 2025[15]
- *TV3* is the online news service of the free-to-air broadcaster of the same name. *TV3*'s news portal TV3.lt was originally launched in 2015 and, alongside the rest of the TV3 group, was acquired by Providence Equity Partners. The *TV3* online news service is free at the point of use, funded by advertising, and does not offer a subscription plan. TV3 had a monthly reach of 66 per cent in December 2025[16]
- *15min* (alongside *Lrytas*) is one of Lithuania's two largest traditional publisher online news websites. Originally founded as a print newspaper, the printed publication ceased in 2013 and *15min* has remained as an online news website, reaching 67 per cent of online readers across December 2025.[17] *15min* is owned by 4 Bees, a Lithuanian-based company, and is funded through a mix of subscriptions and advertising
- *Lrytas* was originally founded as the online counterpart of *Lietuvos rytas,* the leading daily newspaper in Lithuania. *Lrytas* has since split from *Lietuvos rytas*, when it was acquired by the Estonia-based media group Ekspress Grupp. (Ekspress Grupp also owns *Delfi,* a digital-born online news website in Lithuania, as well as the news agency *Elta*). In 2025, Ekspress Grupp agreed to sell *Lrytas* to UAB Admisa, a Lithuanian company, following a decision by the Competition Council.[18] *Lrytas* had a monthly online reach of 58 per cent across December 2025, and is funded through a mix of subscription and advertising revenues[19]

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[13] Gemius, 2026. Public dataset [online]. Accessed 9th February 2026. Available at: https://e-public.gemius.com/lt/rankings/9791; Reach calculated as LRT's real users divided by the total number of observed real users

[14] LRT (2024). LRT biudžetą 2025-aisiais koreguoja saugumo situacija regione [online]. Available at: https://www.lrt.lt/naujienos/tavo-lrt/15/2422822/lrt-biudzeta-2025-aisiais-koreguoja-saugumo-situacija-regione

[15] Gemius, 2026. Public dataset [online]. Accessed 26th March 2026. Available at: https://e-public.gemius.com/lt/rankings/9791; Reach calculated as Delfi's real users divided by the total number of observed real users

[16] Gemius, 2026. Reach calculated as TV3's real users divided by the total number of observed real users

[17] Gemius, 2026. Reach calculated as 15min's real users divided by the total number of observed real users

[18] Ekspress Grupp Sells Lithuanian News Portal Lrytas, January 2026. https://www.egrupp.ee/en/ekspress-grupp-sells-lithuanian-news-portal-lrytas/

[19] Ibid; Reach calculated as Lrytas' real users divided by the total number of observed real users

- *Diena* is the online publication of the daily newspaper *Kauno Diena*, a widely read newspaper first published in 1945 in Kaunas, the second-largest city in Lithuania. Diena operates through a hybrid subscription and advertising funding model, and had a monthly online reach of 39 per cent across December 2025[20]
- *Vakarų ekspresas* (ve.lt) is the largest regional newspaper of Lithuania Minor and Samogitia. Founded in 1990, *Vakarų ekspresas* publishes daily editions (except on Sundays), and is distributed in several major cities in Lithuania, including Vilnius and Klaipėda. *Vakarų ekspresas* generates revenue through a mix of advertising and subscriptions. Across December 2025, *Vakarų ekspresas* had a monthly online reach of 33 per cent[21]

4.2 Literature review

While the literature on potential crowding-out effects in online news has been examined in several pan-European studies, including our previous report commissioned by the EBU,[22] there is little to no published empirical work examining this question in Lithuania. This review focuses on the most relevant literature to the Lithuanian market. For a more extensive literature review, please refer to our pan-European report.[23]

In this sub-section, we survey the existing research, outlining the methodology and findings of the relevant studies. Collectively, these studies concluded that PSM does not only coexist with, but can stimulate commercial providers, creating a more competitive and innovative media landscape. We survey the three most relevant studies below.

The first study, conducted by Sehl et al.,[24] applied OLS regression to Reuters Digital News Report (DNR) data to examine the relationship between PSM online weekly news reach and commercial broadcasters' online weekly news reach across 20 countries in 2018. Using a single-year, cross-country sample, the authors found no statistically significant association between PSM online news reach and commercial broadcasters' online news reach. While this cross-country, cross-sectional approach offers a broad response to the "crowding out" argument, it cannot capture changes over time within individual markets and may obscure country-specific dynamics.

The second study, conducted by Oslo Economics on behalf of the Norwegian Media Authority (Medietilsynet),[25] assessed competitive dynamics in online news in Norway using survey data and internet web-traffic data from NRK, Amedia, Kantar TNS listen and Medietall, alongside broader market indicators. The study found through survey and descriptive analysis that NRK exerts strong competitive pressure on national newspapers, but that these national newspapers nonetheless experienced growth in usage, revenues and profitability over the period examined, suggesting that intensified competition had not translated into adverse outcomes for the leading national titles. That is, the study found no evidence of "crowding out". Though this study focuses on a single market, it does not use regression techniques and thus does not estimate marginal relationships between the consumption of PSM and commercial news.

[20] Ibid; Reach calculated as Diena's real users divided by the total number of observed real users
[21] Ibid; Reach calculated as *Vakarų ekspresas*' real users divided by the total number of observed real users
[22] Oliver & Ohlbaum Associates, 2025, Economic study on the impact of publicly funded PSM activities on commercial online news publishers. [online], EBU. Available at: https://www.ebu.ch/research/open/debunking-crowding-out-study; See also: Oslo Economics, 2015. Displaces or Amplifies Public Services Broadcasters. An Analysis of Covariation between Public Broadcasters and Other Media Online
[23] Oliver & Ohlbaum Associates, 2025
[24] Sehl, A., Fletcher, R. and Picard, R.G., 2020. Crowding out: Is there evidence that public service media harm markets? A cross-national comparative analysis of commercial television and online news providers. European Journal of Communication, 35(4), pp.389-409
[25] Oslo Economics, 2021. Competitive effects of NRK services in selected media markets. Oslo Economics. Available at: https://osloeconomics.no/wp-content/uploads/2021/12/Konkurransemessige-virkninger-av-NRK-19-oktober.pdf

Third, KPMG's study for the BBC,[26] applied OLS regression techniques to examine the extent to which BBC activity may crowd out commercial operators across three markets between 2001 and 2014: entertainment television broadcasting, news television broadcasting, and local print newspapers. The study found no evidence of negative associations between the level of BBC activity and commercial operator activity. As it focused on the PSM's impacts on television and print markets, it did not examine the PSM's impact on online news consumption.

Building on the existing literature, this study applies two-way fixed effects panel regression analysis to consumption data within a single online news market, extending prior approaches in two important ways. First, we focus specifically on Lithuania. Existing research has largely been conducted either at a pan-European level or, where single-market analyses exist, has focused on markets other than Lithuania. Second, we estimate within-market relationships in a panel framework with fixed effects that absorb persistent outlet heterogeneity and common time shocks. This approach allows us to more credibly isolate changes in the co-movement between public service and commercial news consumption in Lithuania.

[26] KPMG [BBC commissioned]., 2015. An economic review of the extent to which the BBC crowds out private sector activity. KPMG. Available at: https://assets.kpmg.com/content/dam/kpmgsites/uk/pdf/2017/02/bbccrowdingwebaccess.pdf

5 Methodology and hypotheses

This section introduces four hypotheses we formulated to examine whether there is evidence of "crowding out" in Lithuania. More specifically, our analysis used Gemius consumption data in Lithuania to compare the usage of LRT's online news services with that of commercial online news services. This section also describes our approach to modelling, which starts with correlation analysis, then expands to two-way fixed effects regression.

5.1 Variables

Data for this report was sourced from Gemius, a digital-audience measurement provider, by LRT. Gemius collects detailed audience metrics across participating online services and provides industry-standard coverage of the Lithuanian online news market.

We extracted the following metrics from Gemius at an aggregate level, as well at a device-type level, split by PC and mobile:

5. **Reach:**[27] the total number of unique individuals accessing each media title per week
6. **Page views:** the total number of pages viewed per media title per week
7. **Visits:** the total number of times users view a series of pages in a week, with no more than 30 minutes between consecutive page views
8. **Time spent:** the total time spent by users on the site per week[28]

These metrics were extracted or calculated for LRT and commercial online news services using the Gemius 'News Website' category at an aggregate and device type level, from July 2022 to February 2026.

5.2 We developed four hypotheses to test the "crowding out" theory

This study examines the "crowding out" hypothesis using audience consumption data from Gemius to assess the relationship between the use of LRT and commercial online news services.

We tested the following hypotheses. In each case, the LRT variable serves as the independent variable, while the dependent variable is the performance metric of commercial online news services, observed at the outlet-week-device level and assembled into a panel framework covering multiple outlets. Each hypothesis reflects a different potential channel through which "crowding out" by LRT may occur:

- ***Hypothesis 1 (H1)**: Higher weekly reach of LRT's online news services is negatively associated with the weekly reach of commercial online news services*
- ***Hypothesis 2 (H2)**: Higher weekly page views of LRT's online news services are negatively associated with the weekly page views of commercial online news services*
- ***Hypothesis 3 (H3)**: Higher number of weekly visits to LRT's online news services is negatively associated with the number of weekly visits to commercial online news services*
- ***Hypothesis 4 (H4)**: Higher weekly total time spent on LRT's online news services is negatively associated with the weekly total time spent on commercial online news services*

[27] For clarity and readability, we have adjusted the names of 'Real users' to 'Reach'. This change was purely terminological: we have not altered the underlying definitions, scope, or measurement approach

[28] Gemius reports average time spent. We use total time spent, defined as the product of average time spent and reach, to align with our other metrics, which are all total metrics

The aim of these hypotheses is to test whether individuals who use LRT's online news services in Lithuania exhibit lower levels of use of commercial online news services across four consumption metrics.

Though each metric tested is distinct, the underlying rationale for each hypothesis is the same: audiences already well served by LRT's free and widely available online news offering may have a reduced need to access commercial online news services. If this kind of "crowding out" effect is happening, individuals who report using LRT's online news would demonstrate a lower frequency of use of commercial online news services than those who do not use LRT. When taken together, the set of hypotheses provides a comprehensive assessment of whether a "crowding out" effect is present in Lithuania.

5.3 Methodology and modelling approach

This section outlines the data cleaning and transformation steps taken to prepare the dataset used for analysis. It also outlines our modelling approach, which begins with correlation analysis, and then proceeds to a two-way fixed effects regression with week fixed effects and outlet-by-device fixed effects.

5.3.1 Data preparation and transformation

The original Gemius dataset included 188 weeks for 7 prominent commercial online news service, including LRT across both mobile and PC devices. Of these online news outlets, we excluded some outlet-device-week combinations that did not meet Gemius' 'real user' threshold for data quality, which flags unreliable observations where the data is drawn from a smaller number of events.

This filtering resulted in an 'unbalanced panel', in the sense that observations were removed for certain outlet-week combinations, and in some cases for specific outlet-device-week combinations, where the 'real user' threshold was not met. An unbalanced panel is not problematic and does not impact our findings but rather maximises the number of datapoints available for our analysis, enabling our findings to be as robust as possible.

Following this data preparation, each week in the dataset contained:

- Up to two observations for each commercial online news service in scope (one for each device type: PC and mobile); and
- Up to two observations for LRT (one for each device type)

Taken together, these transformations provide a set of continuous variables for LRT and for each commercial online news service in our dataset. We also log-transformed all variables to improve normality, adjust for skewed data, and allow for interpretation of coefficients in percentage terms. See **Table 1** below for the breakdown of variables included in the analysis. A summary of the data is provided in the Technical Annex.

Table 1: Dependent and independent variables

Hypothesis	Dependent Variable	Independent Variable	Scope	Fixed Effects
1	Each commercial online news services' weekly online reach	LRT's weekly online reach	PC and Mobile devices; 2022 week 27 – 2026 week 6	Weekly fixed effects; commercial outlet by device fixed effects
2	Each commercial online news services' weekly online page views	LRT's weekly online page views		
3	Each commercial online news services' weekly online visits	LRT's weekly online visits		
4	Weekly total time spent on each commercial online news service	Weekly total time spent on LRT's online news platforms		

5.3.2 Modelling approach

We have used R programming software to conduct the modelling. We adopted a two-step process.

Correlation analysis

We first conducted correlation analysis to identify the direction and strength of the relationship between usage of commercial online news services and usage of LRT's online news services. We examined the correlation between measures of weekly LRT online news consumption and measures of weekly commercial online news consumption aggregated across commercial online news services but split by device.

To conduct our correlation analysis, we computed deviation from mean usage across device types and estimated the correlation using these within-device demeaned values. This was done to absorb the impact that a particular device type has on usage, irrespective of the service being consumed. For example, our dataset observes a higher usage of news via mobile devices compared to PC devices. Demeaning by device type controls for these differences and allows us to assess the correlation more accurately. Pearson correlation was chosen because the variables are continuous and log-transformed, and the observed association between LRT and aggregate commercial metrics was approximately linear in logs, consistent with the log-linear modelling framework used in the subsequent regression analysis.

Two-way fixed effects regression analysis

We then tested for potential "crowding out" at the aggregate level across all commercial online news services. To test each hypothesis, we estimated a two-way fixed effects model using observations for PC and mobile, with week fixed effects and commercial outlet-by-device fixed effects. Week fixed effects control for market-wide demand shocks, such as variation in interest in news during a given week, while outlet-by-device fixed effects account for systematic differences in consumption patterns across commercial online news outlets and devices. The addition of weekly fixed effects is particularly important in the context of news consumption, as there are likely weeks where interest in news is high across all news outlets due to major events, such as the 2022 invasion of Ukraine by Russia.

6 Findings

This section presents the results of the analysis testing the five hypotheses, which examine the relationship between the use of LRT and the use of commercial online news services at the aggregate level. H1 examines the relationship between the weekly reach of LRT and of commercial online news services. H2 assesses the relationship between weekly page views for LRT and commercial online news services. H3 analyses the relationship between the number of weekly visits to LRT and commercial online news services. H4 examines the relationship between total time spent on LRT's online news services and time spent on commercial online news services.

At an aggregate level, we found no evidence that suggests that the provision of online news services by LRT "crowds out" the provision of online news services by commercial outlets. Hypotheses 1, 2, 3, and 4 all found positive and statistically significant relationships between use of LRT's online news services and use of commercial online news services.

In the following subsections we discuss the results of our findings for each hypothesis in turn.

6.1 We found no evidence to suggest that increased weekly reach of LRT "crowds out" commercial online news services

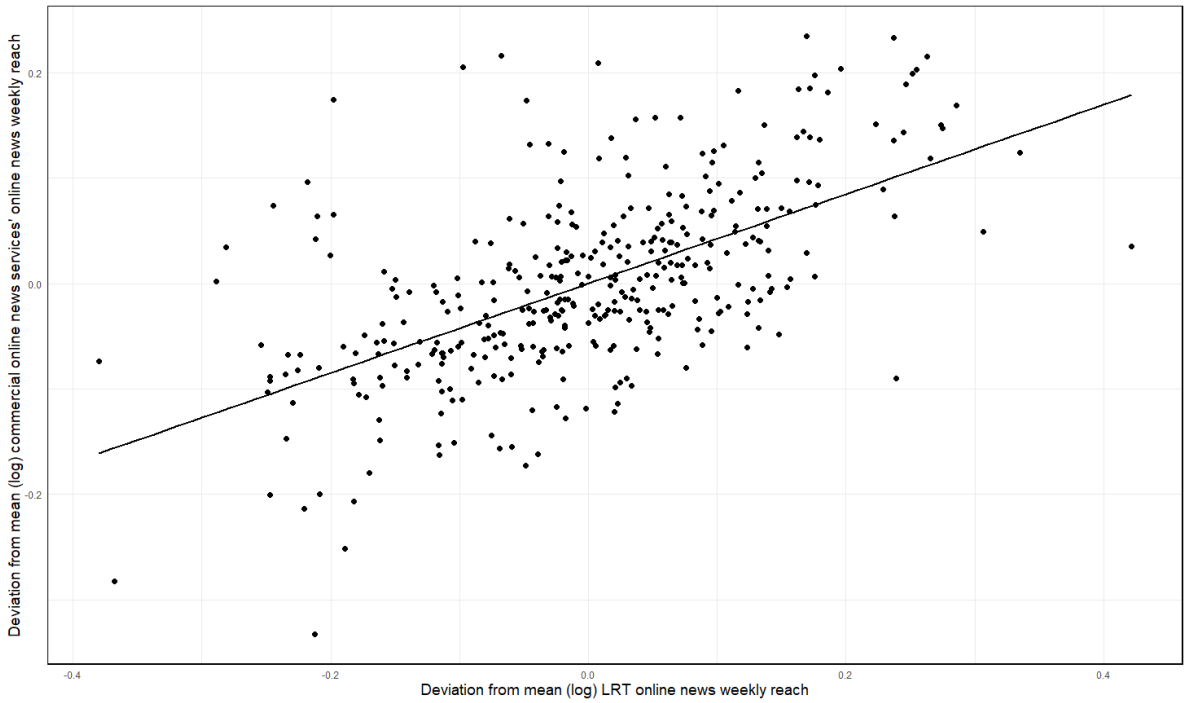
This subsection presents the findings of H1, which tests whether greater weekly reach of LRT is associated with lower reach for commercial online news services.

Hypothesis 1 (H1): Higher weekly reach of LRT's online news services is negatively associated with the weekly reach of commercial online news services

Conclusion: We found no evidence to support H1

A Pearson correlation analysis between the weekly reach of LRT and the weekly reach of commercial online news services indicated a **positive and significant relationship** between the two variables ($r = .60$, $p < .001$). This relationship, depicted below in **Figure 1**, suggests that higher reach for LRT is associated with higher reach for commercial online news services.

Figure 1: Weekly reach – LRT vs commercial online news services



It is important to note that the initial finding reflects correlation only and does not account for other factors that may influence the relationship. To better understand the relationship between the reach of LRT and commercial online news services – and to assess whether this association persists after controlling for variation in weekly news coverage, outlets, and device types – we estimated a two-way fixed effects regression.

This model suggested **a statistically significant positive relationship** between the reach of LRT and commercial online news services ($\beta = .19$, $p < .001$, Adjusted $R^2 = 99\%$, Within $R^2 = 0.9\%$), indicating that increased reach for LRT does not "crowd out" the reach of commercial online news services.

The high Adjusted R^2 value of 99% indicates that the model explains a large proportion of the variation in the reach of commercial online news services, likely due to the inclusion of weekly and outlet-by-device fixed effects. The low Within R^2 value suggests that the reach of LRT's online news services explains very little of the variation in the reach of commercial online news services after accounting for fixed effects.

H1 proposed that a higher weekly reach for LRT's online news services is negatively associated with the reach of commercial online news services. However, at an aggregate level, this effect was not observed across either our correlation or regression analysis. Both analyses indicate a positive and statistically significant relationship: increases in LRT's online news reach are associated with increases commercial online news services' reach. The regression

results suggest that a 1 per cent increase in LRT's online news reach corresponds to an increase of approximately 0.19 per cent in commercial online news services' reach – an indication of potential "crowding in" effects.

Table 2 below summarises the findings of our aggregate-level analysis for H1.

Table 2: Output summary – Hypothesis 1

	Dependent variable				
	Weekly reach of commercial online news services				
Independent variable	**B coefficient**	**Standard Error**	**Adjusted R^2**	**Within R^2**	**Statistical significance**
Weekly reach of LRT's online news platforms	0.19	0.05	99%	0.9%	**Positive and significant*** **

****p<0.001, **p<0.01, *p<0.05*

See the Technical Annex in Section 8 for more detail on interpreting OLS regression outputs

6.2 We found no evidence to suggest that higher LRT page views "crowds out" commercial online news services' page views

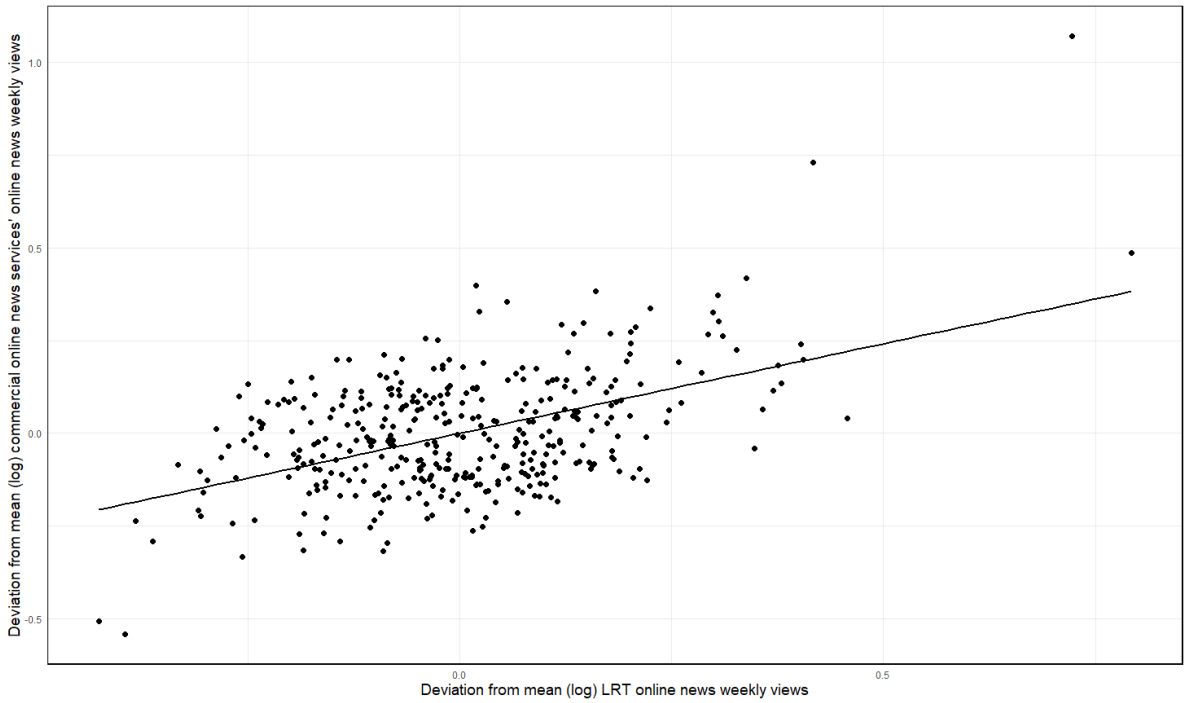
This subsection presents the findings of our analysis of H2, which tests whether higher weekly page views of LRT's online news services negatively impact the total number of weekly page views commercial online news services.

Hypothesis 2 (H2): Higher weekly page views of LRT's online news services are negatively associated with the weekly page views of commercial online news services

Conclusion: We found no evidence to support H2

A Pearson correlation analysis found **a positive and statistically significant** relationship between the number of page views for LRT and commercial online news services ($r = 0.49$, $p < 0.001$). **Figure 2** below shows the associated correlation plot.

Figure 2: Weekly page views – LRT vs commercial online news services



We then estimated a two-way fixed effects regression. This model suggested **a statistically significant positive relationship** between the weekly page views of LRT and commercial online news services ($\beta = .70$, $p < .001$, Adjusted $R^2 = 98\%$, Within $R^2 = 5\%$), indicating that increased page views for LRT does not "crowd out" the page views of commercial online news services.

The high Adjusted R^2 value of 98% indicates that the model explains a large proportion of the variation in the views of commercial online news services, likely due to the inclusion of weekly and outlet-by-device fixed effects. The low Within R^2 value suggests that the number of views of LRT's online news services explains very little of the variation in the number of views of commercial online news services after accounting for the included fixed effects.

H2 proposed that higher weekly page views for LRT's online news services is negatively associated with the weekly page views of commercial online news services. However, at an aggregate level, this effect was not observed across either our correlation or regression analysis. Both analyses indicate a positive and statistically significant relationship: increases in LRT's online news page views are associated with increases in commercial online news services' page views. The regression results suggest that a 1 per cent increase in LRT's online news page views corresponds to an increase of approximately 0.70 per cent in commercial online news services' page views – an indication of potential "crowding in".

Table 3 below summarises the findings of our aggregate-level analysis for H2.

Table 3: Output summary – Hypothesis 2

	Dependent variable				
	Weekly page views of commercial online news services				
Independent variable	**B coefficient**	**Standard Error**	**Adjusted R^2**	**Within R^2**	**Statistical significance**
Weekly page views of LRT's online news platforms	0.70	0.04	98%	5%	**Positive and significant*** **

****p<0.001, **p<0.01, *p<0.05*

See the Technical Annex in Section 8 for more detail on interpreting OLS regression outputs

6.3 We found no evidence to suggest that a higher number of visits per week to LRT's online news services "crowds out" weekly visits to commercial online news services

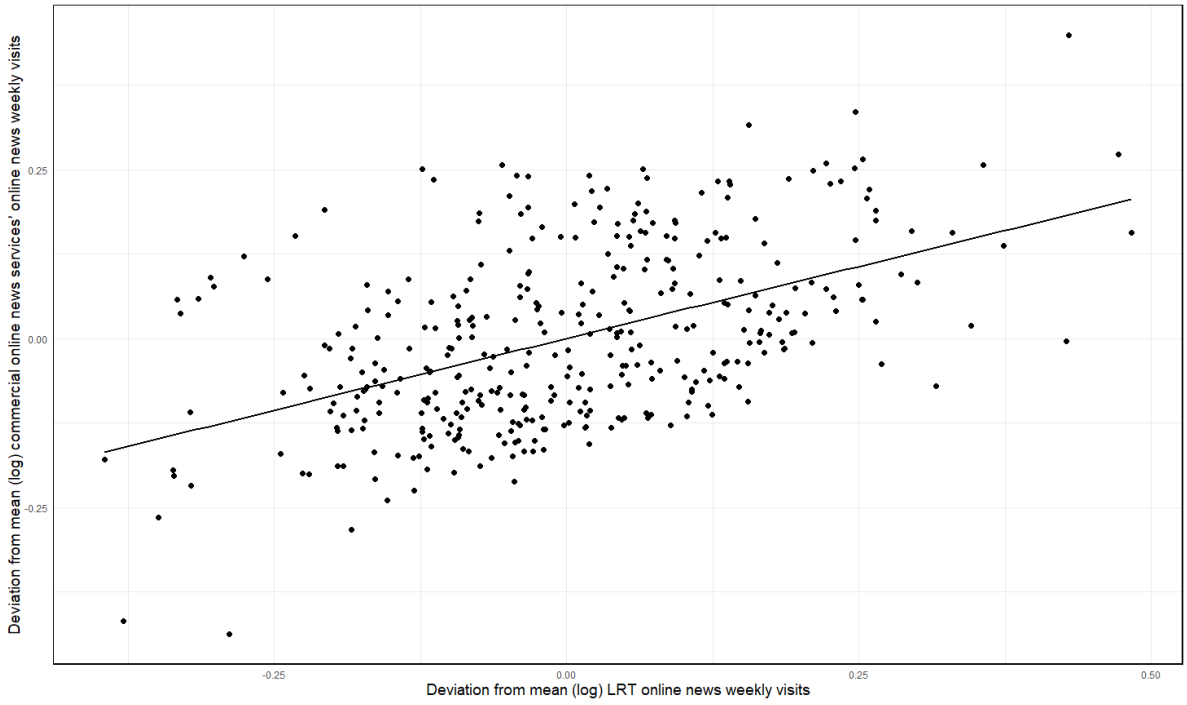
This subsection presents the findings of H3, which tests whether a higher number of weekly visits to LRT's online news services is associated with fewer weekly visits to commercial online news services.

Hypothesis 3 (H3): A higher number of weekly visits to LRT's online news services is negatively associated with the number of weekly visits to commercial online news services

Conclusion: We found no evidence to support H3

A Pearson correlation test found a **positive and statistically significant** relationship between the number of weekly visits to LRT and commercial online news services ($r = .50$, $p < .001$). This suggests that higher weekly visits to LRT are associated with a higher number of visits to commercial online news services, as displayed in **Figure 3** below.

Figure 3: Weekly visits – LRT vs commercial online news services



We then estimated a two-way fixed effects regression. This model suggested **a statistically significant positive relationship** between the weekly visits to LRT and commercial online news services ($\beta = .35$, $p < .001$, Adjusted R^2 = 99%, Within R^2 = 4%), indicating that increased visits to LRT does not "crowd out" the number of weekly visits to commercial online news services.

The high Adjusted R^2 value of 99% indicates that the model explains a large proportion of the variation in the visits to commercial online news services, likely due to the inclusion of weekly and outlet-by-device fixed effects. The low Within R^2 value suggests that the number of visits to LRT's online news services explains very little of the variation in visits to commercial online news services after accounting for the included fixed effects.

H3 proposed that higher number of weekly visits to LRT's online news services is negatively associated with weekly visits to commercial online news services. However, at an aggregate level, this effect was not observed across either our correlation or regression analysis. Both analyses indicate a positive and statistically significant relationship: a higher number of weekly visits to LRT's online news services is associated with higher number of weekly visits to commercial online news services. The regression results suggest that a 1 per cent increase in weekly visits to LRT's online news services corresponds to an increase of approximately 0.35 per cent in weekly visits to commercial online news services – an indication of potential "crowding in" effects.

Table 4 summarises the findings of our aggregate-level analysis for H3.

Table 4: Output summary – Hypothesis 3

	Dependent variable				
	Weekly visits to commercial online news services				
Independent variable	**B coefficient**	**Standard Error**	**Adjusted R^2**	**Within R^2**	**Statistical significance**
Weekly visits to LRT's online news platforms	0.35	0.02	99%	4%	**Positive and significant*** **

****p<0.001, **p<0.01, *p<0.05*

See the Technical Annex in Section 8 for more detail on interpreting OLS regression outputs

6.4 We found no evidence of "crowding out" between total time spent on LRT's online news services and total time spent on commercial online news services

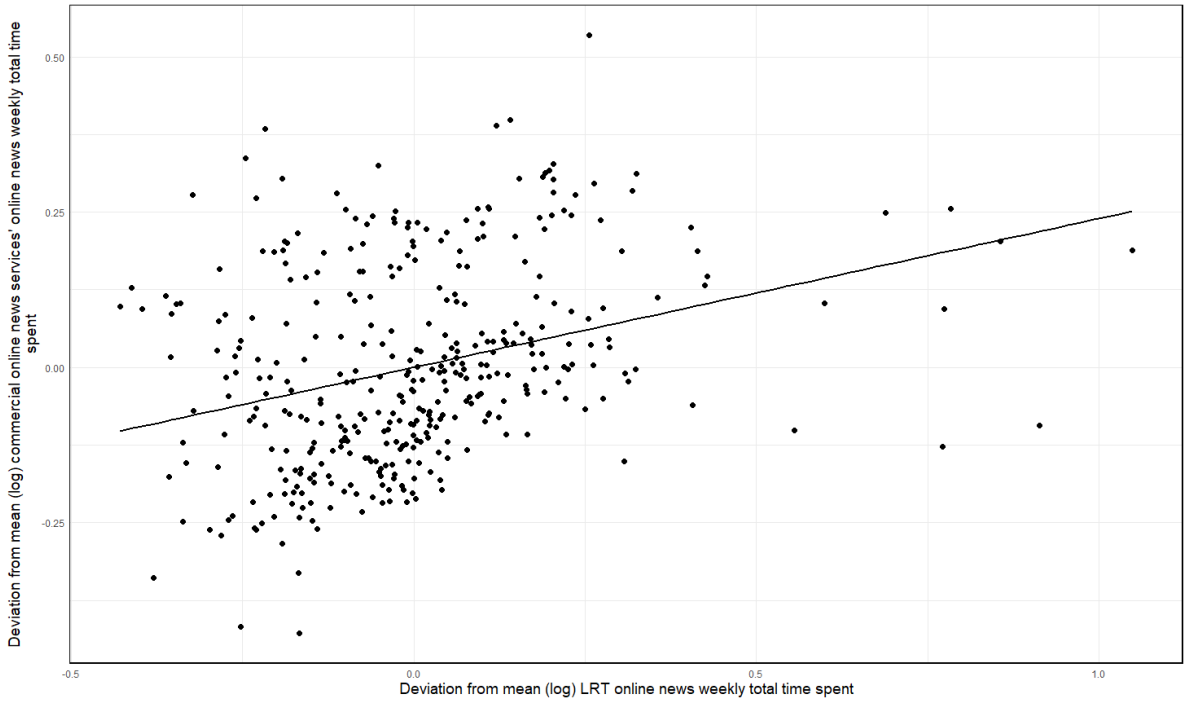
This subsection presents the findings of H4, which seeks to test whether greater total time spent on LRT's online news services is negatively associated with time spent on commercial online news services.

Hypothesis 4 (H4): Higher weekly total time spent on LRT's online news services is negatively associated with the weekly total time spent on commercial online news services

Conclusion: We found no evidence to support H4

A Pearson correlation analysis found **a positive and statistically significant relationship** between the total time spent on LRT and the total time spent on commercial online news services ($r = .31$, $p < .001$). **Figure 5** below shows the outputs of the correlation analysis.

Figure 4: Total time spent – LRT vs commercial online news services



We then estimated a pooled panel OLS regression with fixed effects. This model suggested **a positive and statistically significant relationship** between the total time spent on LRT and commercial online news services ($\beta = .35$, $p < .001$, Adjusted $R^2 = 98\%$, Within $R^2 = 2\%$), indicating a lack of evidence that increased total time spent on LRT "crowds out" the total time spent on commercial online news services. The model suggests that a 1 per cent increase in total time spent on LRT leads to a 0.35 per cent increase in average time spent on commercial online news services – potentially indicating some "crowding in". As with our previous models, this model also exhibited a high Adjusted R^2 and a low Within R^2, indicating that most of the variation in commercial online news services' total time spent was explained by the weekly and outlet-by-device fixed effects.

Table 5 below summarises the results of our analysis of H4.

Table 5: Output summary – Hypothesis 4

	Dependent variable				
	Weekly total time spent on commercial online news services				
Independent variable	**B coefficient**	**Standard Error**	**Adjusted R^2**	**Within R^2**	**Statistical significance**
Weekly total time spent on LRT's online news platforms	0.35	0.04	98%	2%	**Positive and significant*** **

****p<0.001, **p<0.01, *p<0.05*

See the Technical Annex in Section 8 for more detail on interpreting OLS regression outputs

7 Discussion

This peer-reviewed study set out to examine whether weekly use of LRT's online news services was associated with reduced use of commercial online news services in Lithuania, consistent with a "crowding out" effect. Across all metrics studied (reach, views and visits), we found no evidence to support the "crowding out" hypothesis at the aggregate level. Rather, in each specification examined, we found evidence that LRT online news use was positively associated with use of commercial online news services, suggesting a potential "crowding in" effect.

Overall, this study presents robust findings to inform the ongoing debate in Lithuania around whether LRT "crowds out" commercial online news services. The findings support the conclusion that LRT's online news services are complementary to commercial online news services in Lithuania, with indications of "crowding in" at the aggregate level found in our analysis of the reach, page views, visits, and total time spent metrics.

8 Technical Annex

This Annex outlines the key statistical methods and diagnostic checks used in our analysis to ensure the robustness and interpretability of the regression model results.

8.1 Variable definitions

The variables listed below were sourced from a Gemius dataset covering July 2022 to February 2026, and were included as variables in our regression models testing hypotheses 2 to 5:

- **Weekly reach:** the total number of unique individuals accessing each media title per week
- **Weekly page views:** the total number of pages viewed per media title per week
- **Weekly visits:** the total number of times users view a *series* of pages in a week, with no more than 30 minutes between consecutive page views
- **Weekly total time spent:** the total time spent across all users in a week, calculated as weekly reach x weekly average time spent

8.2 Summary of data

Tables 6 – 9 below summarise the number of observations, mean, and standard deviation for each metric, split by outlet and device type.

Table 6: Data summary – Delfi and 15min

	Delfi						15min					
	Mobile			PC			Mobile			PC		
Metric	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Reach (m)	188	1.01	0.04	188	0.34	0.03	188	0.94	0.05	188	0.24	0.02
Views (m)	188	21.38	5.45	188	10.93	2.18	188	16.78	3.53	188	5.94	1.10
Visits (m)	188	6.64	1.21	188	1.77	0.24	188	4.71	0.52	188	0.84	0.09
TTS (millions of seconds)	188	1267.77	301.44	188	1002.88	205.12	188	784.71	90.35	188	402.57	76.48

Table 7: Data summary – TV3 and Lrytas

	TV3						Lrytas					
	Mobile			PC			Mobile			PC		
Metric	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Reach (m)	188	0.95	0.05	188	0.14	0.02	188	0.81	0.06	188	0.19	0.03
Views (m)	188	11.84	3.59	188	1.39	0.25	188	17.21	4.38	188	6.86	1.30
Visits (m)	188	4.12	0.76	188	0.31	0.05	188	3.86	0.78	188	0.85	0.18
TTS (millions of seconds)	188	734.24	112.08	188	270.38	110.03	188	683.31	187.50	188	447.30	126.16

Table 8: Data summary – LRT and Vakarų ekspresas

	LRT						Ve.lt					
	Mobile			PC			Mobile			PC		
Metric	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Reach (m)	188	0.79	0.08	188	0.21	0.03	184	0.51	0.08	184	0.03	0.01
Views (m)	188	5.70	1.01	188	1.66	0.29	184	1.52	0.38	184	0.13	0.02
Visits (m)	188	2.48	0.33	188	0.45	0.08	184	1.03	0.26	184	0.05	0.01
TTS (millions of seconds)	188	571.24	97.58	188	598.89	182.65	184	109.01	29.64	184	12.56	1.75

Table 9: Data summary – Diena

	Diena					
	Mobile			PC		
Metric	n	Mean	SD	n	Mean	SD
Reach (m)	188	0.41	0.09	188	0.07	0.02
Views (m)	188	1.92	1.14	188	0.56	0.17
Visits (m)	188	0.74	0.21	188	0.13	0.03
TTS (millions of seconds)	188	84.96	25.43	188	42.09	7.47

8.3 Correlation vs. Regression

Correlation and regression are two commonly used statistical methods, both designed to explore the relationship between variables – but they serve different purposes:

- Correlation measures the strength and direction of an association between two variables. It is symmetric, meaning it does not distinguish between a “dependent” and an “independent” variable. Correlation is especially useful for exploratory analysis, providing a quick way to identify patterns before running more complex models
- Regression models the relationship between a dependent variable and one or more independent variables. It allows us to estimate the size and direction of effects and to control for additional factors. Regression is typically used when testing hypotheses or drawing inferences about potential causal relationships

8.3.1 Correlation analysis: Pearson

In the initial stages of analysis, we assessed the correlation between the LRT variables and commercial online news service variables. We used Pearson correlation analysis, which measures the strength and direction of the linear relationship between two continuous variables. It assumes normally distributed data and is sensitive to outliers. The Pearson correlation coefficient is denoted by the symbol r, and ranges from -1 (perfect negative linear correlation) to +1 (perfect positive linear correlation).

8.3.2 Two-way fixed effects OLS regression

In our analysis, we estimate two-way fixed effects regression. This approach applies OLS to panel data while exploiting variation across outlets and over time. By stacking the data, we combine observations from all commercial online news services into a single estimation framework rather than estimating separate regressions for each outlet. To account for systematic differences across outlets and devices, we include outlet by device fixed effects, alongside weekly fixed effects, thereby controlling for time-invariant differences between each outlet by device pair and factors that affect all outlets in a given week, such as overall demand for news.

8.3.3 Fixed effects: weekly and outlet by device

In testing each of our hypotheses, we used commercial outlets by device and weekly fixed effects to control for unobserved heterogeneity – i.e. unmeasured, systematic differences between devices and weeks which influence user consumption. These fixed effects were demeaned, which is mathematically equivalent to including a full set of dummy variables for:

- Weekly fixed effects, which capture week-specific factors affecting all outlets simultaneously, including changes in aggregate demand for news arising from major political events or other high-salience developments
- Commercial outlet by device fixed effects, which capture time-invariant differences between each outlet x device pair

By including fixed effects, we isolate the impact of our key variables of interest from these unobserved influences.

8.4 Understanding the key outputs

Our regression results include several key statistical measures that help interpret the relationships between variables in each model:

Present in correlation and regression analysis:

- **P values** test whether the estimated relationship is statistically significant, i.e. whether the observed effect is likely to be due to chance. We will evaluate statistical significance using p-value thresholds of 0.05, 0.01, and 0.001, corresponding to confidence levels of 95 per cent, 99 per cent and 99.9 per cent, respectively

Present in regression analysis only:

- **Beta coefficients (β-values)** represent the estimated effect of each independent variable on the dependent variable, holding all other variables constant. For example, a β of 0.2 means a one-unit increase in the independent variable is associated with a 0.2 increase in the dependent variable. If both the independent and dependent variables are logged, a β of 0.2 means that a 1% increase in the independent variable is associated with a 0.2% increase in the dependent variable
- **Standard errors** measure the uncertainty around each beta coefficient. Smaller standard errors indicate more precise estimates. Standard errors are used to calculate confidence intervals
- **Adjusted R-squared (R^2)** shows the proportion of variation in the dependent variable explained by the model, adjusted for the number of predictors. It helps assess model fit, while penalising overfitting due to too many variables
- **Within R-squared** shows the proportion of variation in the dependent variable that is explained by the regressors after accounting for fixed effects

8.5 Regression diagnostic and model checks

Throughout the modelling process, we implemented several diagnostic checks and adjustments to improve model validity.

8.5.1 Heteroskedasticity and Robust Standard Errors (RSE)

Across all specifications, we report cluster-robust standard errors. This approach relaxes the homoskedasticity assumption and is appropriate for web-usage metrics, where error variance plausibly varies over time and with the level of activity. Inference should be interpreted as robust to heteroskedasticity.

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