Quantifying public value creation by public service media using big programming data

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Abstract

In recent years a renewed interest has emerged in how public service media (PSM) generate public value, putting emphasis on how such value may express itself in multidimensional and non-linear ways. Yet, little has been achieved in systematically studying these ways and providing evidence to policymakers. In this paper, we propose that content diversity in TV programmes and the extent to which PSM collaborate with external partners could serve as quantifiable markers enabling the measurement of multidimensional public value creation. We also propose the utilization of a yet untapped resource for this purpose – data from broadcasters' broadcast management systems (BMSs). Based on a comprehensive case study – Estonia's public broadcaster ERR – we demonstrate a set of approaches to facilitate such analysis. These tools enabled us to show how a small PSM struggles with sustainable public value creation.

Introduction

In recent years there has been a renewed interest in how public service media (PSM) generate public value (Cañedo et al., 2022; Lowe and Martin, 2013; Mazzucato et al., 2020). Yet, much of this work has been conceptual, with no practical alternatives emerging to the much-critiqued 'public value test' (Donders and Raats, 2012) for measuring public value creation. In this paper, we propose a new approach: inferring public value creation and media content diversity dynamics using data from broadcasters' *broadcast management systems* (BMSs).

BMSs are designed to enable the coordination of information and tasks in time-critical production, programming, and airing workflows. The data in BMSs may also be used for internal accounting and to disseminate programme information to the public, for example as part of content framing on *video-on-demand* (VOD) platforms. These databases are extensive: they typically list granular metadata on all shows, including content descriptions, airing times, data on rights and technical formats, information about the production teams and budgets, etc. The granularity of BMS databases enables research into various aspects of broadcasters' activities: the nature and sources of aired content, programme foci and biases, the producer networks, etc. The public provision and analysis of BMS data could in itself become an additional way PSM could create public value – by ascertaining their public accountability through insight into operations, including how public value is being created.

In this paper, we demonstrate how BMS data can be used for such analysis using a decades-spanning television programming dataset acquired from the Estonian Public Broadcasting (*Eesti Rahvusringhääling*, ERR). We first analyze how ERR is creating value for society by broadcasting content that enhances discursive and semantic diversity in the public sphere. Second, we examine how ERR collaborates with the independent production sector to co-create public value. For comparative purposes, we acquired an additional, smaller dataset from Kanal2 – a commercial channel in Estonia. We also purchased a dataset of TV audience data to compare the exposure and consumption diversity of ERR programmes.

We investigate the broadcasting dynamics of a PSM institution on a scope and scale rarely afforded in media studies. While there have been attempts to study programme evolution and value creation using TV schedules (Hellman, 2001; Navarro et al., 2022) or small-sample-based content analysis (von Feilitzen et al., 1989), the granular BMS data have remained an untapped resource. While we only focus on television programming data in this contribution, the approach employed here could be extended to other content delivery channels, to study the creation of public value within and across them.

Theory

Contemporary discussion on how public agencies could generate 'public value' started with the work by Mark H. Moore within public administration studies – with his proposed alternative to the New Public Management approach. According to Moore and his colleagues (Benington and Moore, 2011; Moore, 1995), public agencies act not only as rule setters, service providers, and providers of social safety nets, but also as value creators and active shapers of the public sphere. Yet, what is of value should be defined by the broader public – public value is, first, something that is most valued by the public and, second, something that adds new qualities to the public sphere (Benington and Moore, 2011: 14-31). These two aspects should be seen as interdependent: what is most valuable is identified in a well-functioning public sphere. The latter is often seen as constituted by the PSM and other mainstream media channels. However, today's public sphere involves multiple actors and different types of institutions, including international digital platforms. In this context, Benington and Moore (2011: 15) have suggested that thinking about public value involves analysing the interactions, interdependencies, and co-creation between complex sets of actors.

It is, however, important, that the public sphere is inherently diverse, rich in meaning and in alternative viewpoints, to enable grounded dialogue and deliberation on values. Diversity in the public sphere is seen as important for facilitating societal resilience: a discursively diverse public sphere supports citizens' ability to make sense of the dynamic lives around them and to develop the skills needed to operate in complex ecosystems of meaning (Hartley et al., 2021). This is why McQuail (1992: 142) highlighted that diversity in media content has come to acquire the status of an end in itself for mass media, but especially for public broadcasters.

Yet, for the creation of discursive diversity, institutional diversity is a precondition. Media systems need institutions with alternative and complementary goals. Therefore, we propose that for understanding the role of PSM in public value creation, the concept of 'innovation systems' is useful. Innovation systems are typically understood as systems of institutions that interact regularly and exchange knowledge but also other resources (Freeman, 1995; Lundvall, 1992). Broader, national innovation systems are seen to include institutions such as private firms, universities, libraries, incubators, government regulators, investment banks, etc. If knowledge and resource exchange in such systems is well coordinated, they start generating innovative companies, growth in productivity, and, ultimately, general wellbeing (Dopfer and Potts, 2008). Public institutions need to be included in these systems because they are willing to invest in coordination activities that are specifically aimed at producing public value. For instance by developing knowledge resources (e.g. research and its results) for use by multiple actors. Public institutions often bring alternative objectives to market-based systems because of their differing missions (Gregersen, 2010: 136). By creating new markets and shaping existing markets, public agencies stimulate additional investment that would not otherwise have been made (Mazzucato, 2018: 266). They broaden the range of possible directions for innovation, and this increase in diversity of alternatives, in turn, enhances the resilience of societies in the face of crises.

Regarding media and culture, PSM are often seen as important coordinators of media innovation systems: by commissioning different types of content, they provide novel challenges and quality requirements to the independent production sector (Bennett et al., 2012; Ibrus, 2015). They also take risks – by investing, for instance, in new content formats without prior known commercial value. However, all kinds of other actors can benefit once PSM have developed new functional formats, created recognition for specific content or cultural formats, or driven a popular discourse (Ibrus et al., 2019).

Based on the discussion above, we focus on diversity as a marker for public value. Therein we build on the work by Mazzucato et al. (2020), which addresses the need to study how PSM generate 'dynamic value'. This means creating value for different beneficiaries – individuals, industry, and society – and co-creating it in a changing environment with multiple partners. In the context of this paper, available data allows us to focus on two types of diversity relevant to public value creation. First, we study whether content diversity in PSM output can support broader societal learning capabilities as citizens are potentially exposed to a more diverse range of topics, perspectives, and ideas. Second, we study the diversity of institutional systems and how PSM link to, collaborate with, and commission content from a variety of independent production companies to include their alternative ideas and, in this way, broaden the discursive output of PSM.

Diversity can be measured across the dimensions of variety, balance, and disparity (as well as a combination of the three; Stirling, 2007). In this paper, we focus on measuring different varieties (Bello and Garcia, 2021) and assessing their balance. With 'variety', we refer to 'the number of categories into which system elements are apportioned' (Stirling, 2007: 709); this could be, for instance, the number of independent origins from which content is imported. Our suggestion is that the diversity a PSM can create should not be measured simply as a variety of inputs or outputs, but also as their relative balance. Current affairs, drama content, and other genres need motivated balancedness within a programme, for example.

When studying diversity in content output, we build on Hellman (2001), who showed that TV content diversities are multidimensional – and hence a multi-measure method could provide a more versatile picture (see also Coate et al., 2017). Therefore, we employ different concepts such as source, content, and exposure diversity (Napoli, 1999; 2011). Source diversity refers to 'the extent to which a media system is populated by a diverse array of content providers' (Napoli, 2011: 247). This is the off-screen diversity: by whom or how a programme is produced or from where it is imported. Exposure diversity, according to Napoli (2011: 248), is 'the extent to which audiences consume a diverse array of content'. This would mean measuring viewership numbers in order to understand how many different types of content have actually been viewed. We suggest distinguishing between actual exposure diversity and consumed diversity (Moreau and Peltier, 2004). According to our proposition, 'exposure diversity' refers to how much and how effectively different programme types are exposed to audiences: are they screened during prime or non-prime time, and do they get repeat airings? Conversely, 'consumed diversity' measures what content is actually consumed – that is, how diverse is the resulting set of popular programmes.

Case study and data

With 1.3 million inhabitants, Estonia is one of the smallest countries in Europe and hence also its national broadcaster has limited resources. To highlight some structural limitations, its annual budget (which it receives from the national budget) in 2022 was €48 million, which is approximately 10% of the budget of the public broadcaster of neighbouring Finland, YLE. ERR currently operates three TV channels (two in Estonian language, one in Russian), five radio channels, and several mobile applications and websites, including a VOD platform.

Our analysis focuses on three TV channels: ETV, ETV2, and ETV+. ETV is ERR's flagship Estonian-language channel and has operated continuously since 1955. ETV2 was launched in 2008, originally to serve multiple purposes: to provide children's content, some

Russian language content, and 'high' cultural value content – art house cinema, documentaries, and older classics. Its Russian language content was moved to the new channel ETV+ in 2015. The latter was created as a reaction to the start of the war in Ukraine in 2014, with the aim of providing alternatives to TV channels from Russia. The latter have been popular among Russian-speaking Estonian inhabitants, but Estonian authorities see these as channelling Russian propaganda.

This study builds on ERR's current BMS database, in use since 2004. Developed by the Czech vendor Provys, it is used mainly for programme airing. It includes all the TV content files to be aired, along with the relevant technical metadata, content descriptions, genres, synopses, import origins, target groups, production teams and budgets. The data provided to us by the ERR consists of static snapshots exported from the original relational database in early 2021.[1] The 2004-2020 subset we focus on contains 201,027 total screen time hours across 408,444 programme-at-time entries across the three channels, representing the airing times of 144,912 unique content items, which include 5,249 unique multi-part series. When it comes to time series, our approach is analytic rather than inferential in the statistical sense, describing the entirety of ERR TV programming in that period.

For simplicity, we use full years as the primary unit of time when constructing time series for diachronic comparison. An average year in the recent end of the dataset amounts to about 18,600h of airtime, or 51h per day (~17h per channel). For perspective: a change of 1% in airtime of a given content type or import category between two years amounts to about 186h, or in daily programming terms, about a 10-minute difference per channel per day.

When it comes to aggregating screened content within a unit of time, we use three measures, each providing complementary insights into the previously discussed concept of *exposure diversity* or the extent to which audiences are exposed to diverse content: *hours*,

[1] We also publish the data, allowing for reproduction of our analyses; see Data and Code Availability section below.

titles, and *new titles*. The primary metric, *screen time in hours* based on scheduling data, gives an idea of how much a specific genre or foreign content was screened by a given channel in a given year. The dataset uses a unique identifier system to mark programmes, with IDs assigned to every content item. Based on this, the *number of titles* is derived as counts of unique programme IDs within a year, to provide insight into the repetitiveness of programming. Content freshness is explored using the fourth metric, the *number of new titles* per year, where only programme IDs previously unseen in the programme archive are counted.

To facilitate meaningful comparisons of the dynamics of content type, import source, and production type prevalence, we aggregated the original categories describing the aired content to reduce unnecessary detail and cross-category inconsistencies. First, we simplified the original content type variable (58 unique values) into 10 categories:

- series, films, and theatre recordings
- entertainment, games, and lifestyle shows
- music
- sport
- news and political commentary
- informative and documentary shows and series
- infotainment (including breakfast TV)
- culture and religion
- science and education
- kids and animation.

The last category was amended by an additional criterion: we tagged all programmes which had kids or youth as the intended audience (in the relevant variable) as "kids and animation" in order to match the reporting categories used by the European Broadcasting Union (Cimino, 2020).

The 124 countries of origin in the database, relevant in the context of content import sources, were categorised into the following seven groups:

- Estonia (i.e. domestic production)
- Russia and the former USSR
- the Nordics (Finland, Norway, Sweden, Denmark, Iceland, and the Faroe Islands)
- the United Kingdom
- the United States and Canada
- other European Union countries
- rest of the world.

This grouping is driven by our interests, as well as Estonia's geopolitical positioning. Content produced in Russia is separated as often targeting the Russian-speaking residents of Estonia. The Nordic market is adjacent to Estonia both culturally and geographically. The UK is one of the largest television production markets and an effective exporter in Europe, no longer part of the EU. The US and Canada function as a globally dominant joint production market. The EU is relevant to look at separately as it is governed by a distinct set of regulations aimed at developing a single content market of which Estonia is part.

Information on the production type of each piece of content, originally in a partially hierarchical taxonomy of 11 categories, was reduced to three main types: own production (in-house by ERR); co-produced and commissioned content (i.e. produced outside but with ERR involved); and acquired content, including bought and exchanged programme items.

We also distinguished between prime and non-prime time screening. Prime time is defined as programmes starting between 7 pm and 11 pm, and ending no later than 11.30 pm; everything else is considered non-prime time.

The dataset that we acquired from the commercial channel Kanal2 (includes data since 2007) was processed the same way as the data from ERR, with one exception: the Kanal2 content type taxonomy lacks types corresponding to 'science and education' and 'culture and religion'. Hence, even if they do have some such content, it is not visible in the data. We also acquired an ERR audience viewership ratings dataset from the market research firm Kantar Emor, covering 2018-2020, and aligned it with the ERR BMS data. It is based on their panel-based (N=765…930) audience measuring survey; the composition of the panel is changed by10-12% every year.

Analysis

Domestic/foreign balance

PSM creates value for society by creating diverse content on national culture and current affairs, as well as curating the inflow of foreign content on other cultures and societies. It is a cultural policy discussion which of these functions is more important, and hence the measure of diversity here is about an appropriate balance.

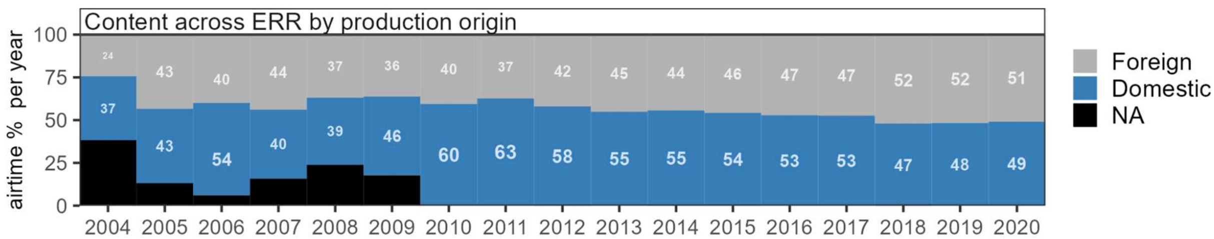

Figure 1. Share of **airtime** between domestic and foreign productions across ERR.

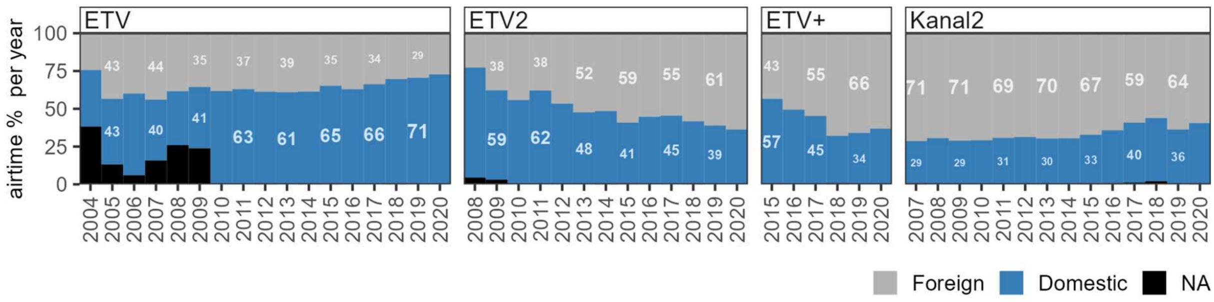

Figure 2. Share of **airtime** between domestic and foreign productions, split by channel (three ERR channels and Kanal2, an independent commercial channel).

The cumulative ERR programming (Figure 1) has reached close to a perfect balance between domestic and foreign content over the 17-year period via the introduction of two specialised channels. The cross-channel analysis (Figure 2) shows that the more recent ETV2 and ETV+ have become increasingly focused towards foreign content, while ETV leaned towards domestic programming over the years. The increasing prevalence of foreign dramas and documentaries on ETV2 aligns with its intended profile as the ‘culture channel’. Yet, the amount of foreign content on ETV+ is surprising since the channel’s original purpose was to better introduce the ethnic Russian population to Estonian society and culture.

A comparison between source and exposure diversity reveals that foreign programming has been disproportionately favoured across ERR – it is repeated more than domestic content (but mostly during non-prime time). For instance, ETV purchased 19% of its programmes from abroad in 2020, but dedicated 27% of airtime to it. Greater foreign content repetition may not be due to value perceptions, however, but due to differences in content. In 2020, ETV imports comprised 65% of fiction content typically more suitable for repeats than, for example, evening news.

ERR’s editorial decisions regarding the balance between domestic and foreign content are contextualised by the Kanal2 programme. Figure 2 shows that Kanal2 airtime is dominated by foreign programming, suggesting that ERR is adding value to the media system by showing more domestic content.

Public service media as a curator of incoming cultural flows

An important cultural function of the public broadcaster is to provide audiences with access to culturally diverse programming by curating the incoming cultural flows. Hence we analysed the origins of imported content and their change over time.

The *variety of production countries* has been decreasing across all ERR channels over the years (Figure 3), more so on ETV2 and ETV+, where the variety has shrunk by more than four times between their inception and 2020 (fewer than five countries represented for 1000 aired programmes).

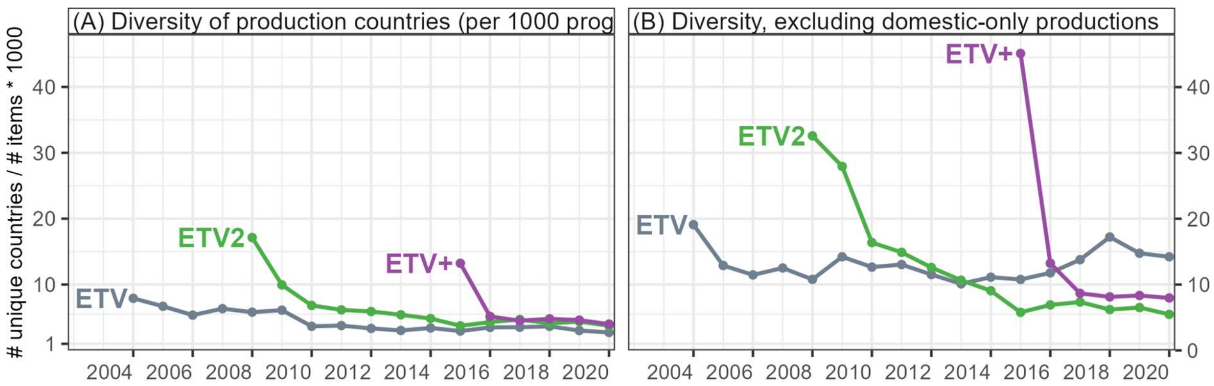

Figure 3. The diversity of content in terms of countries of production, expressed as the number of unique production country listings (including co-productions) in a year in a given channel, normalised by the total number of programme items in a given year and channel, and scaled by a factor of 1000 (e.g. a value of 10 can be interpreted as follows: if 1000 TV shows were randomly sampled from a channel's schedule, an average 10 countries would be among the production countries listed). Panel B displays the same data but for imports only.

The growth of the UK prominence

The objective of the European media policy – at least since the 1989 Council of Europe's *Television Without Frontiers* convention – has been to limit the US TV exports to Europe in order to enable more European content to be produced and distributed across the continent. The convention and the subsequent related EU directives have forced European TV channels to have at least 50% of their programmes produced in Europe. This has, in general, been seen as a successful policy, creating a demand for European content. But the policy has favoured some countries – particularly the UK and its producers – over others (Donders and Van den Bulck, 2016; Steemers, 2016). In recent years, the international distribution of UK content has become increasingly effective. To the extent that, as Donders and Van der Bulk (2016) put it, especially the BBC's aggressive exporting strategies could be seen as undermining the public service values in their destination countries.

Our study confirmed this tendency. What we found somewhat surprising, but indicative of the ERR's editorial decisions, was the relatively low share of US content. At the same time, the share of the UK content was very high, with British programmes given close to 2:1 airtime when compared to American productions (Figure 4, panel A). The share of the UK content of foreign imports has been gradually growing and has been becoming especially dominant on ETV's main channel: 44% of new import content items (excluding repeats) was from the UK in 2016-2020. On ETV2, the share of new showings of UK programmes among imports has been growing again since 2015, reaching 30% by 2020 (Figure 4.E; this is 15% of all new programme items on ETV2). UK content is also the most repeated import category across ERR channels (Figure 7A).

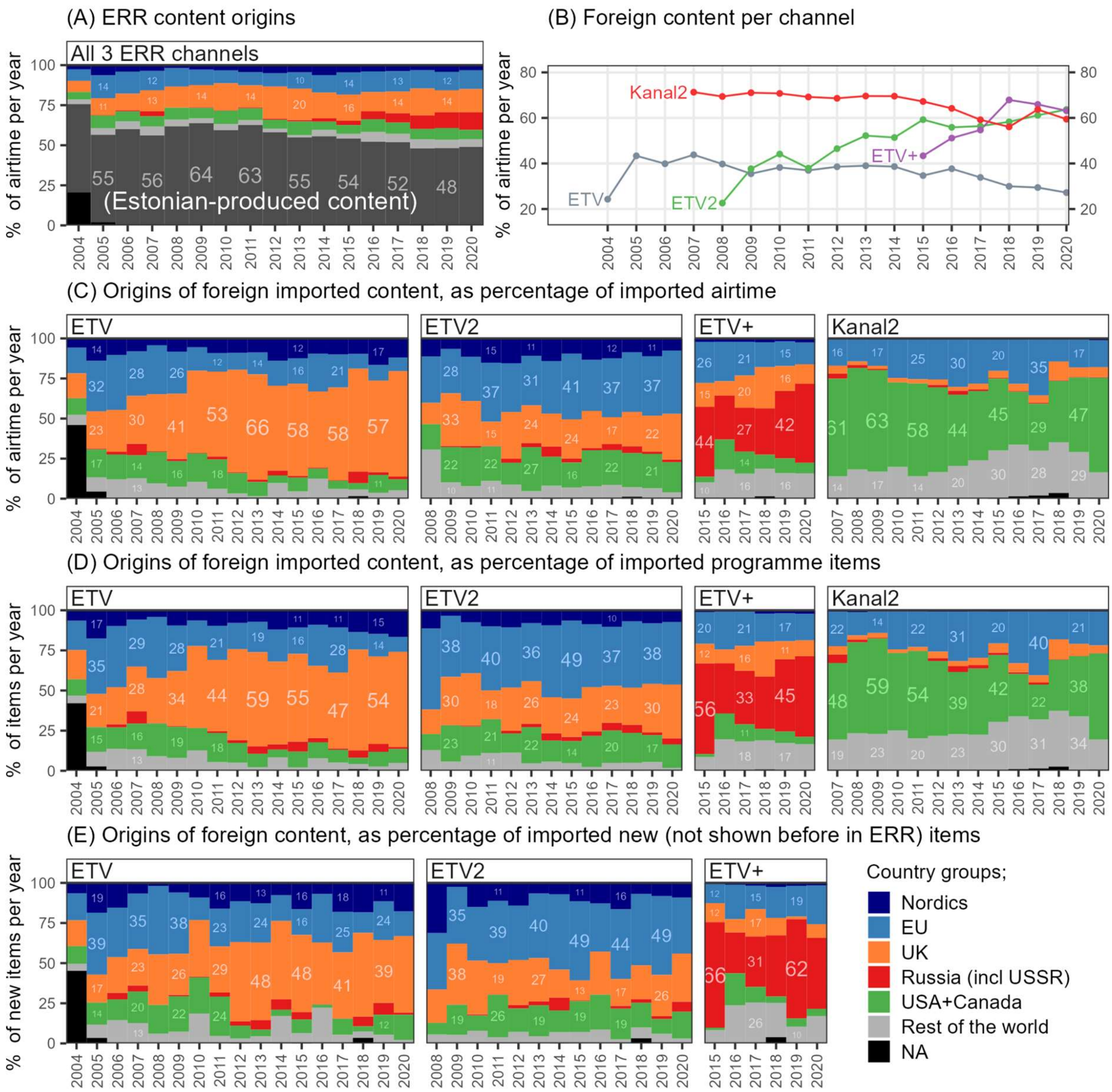

Figure 4. Share of imported content sources across ERR channels, and Kanal2 for comparison. Panel A displays all content sources in ERR as a whole. Panel B shows the share of imported programmes per channel. Panels C-E show the source countries for imported content only, as a percentage of airtime (C), percentage of items (D), and percentage of newly premiered, never-before-shown programme items (E). The percentage values for larger shares are displayed for odd years. Panels C-E should be interpreted in light of Panel B: for example, UK imports dominate in the flagship ETV channel (~60%), but the overall share of imports is relatively lower in ETV than for the other channels (green line in panel B).

The dominance of UK content on ERR channels provoked our interest in exactly what kind of content has been bought from the UK distributors. Figure 5 demonstrates that the dominating UK imports on the ERR channel are mostly fiction content, but there are also significant portions of docuseries and documentaries, as well as animations for children.

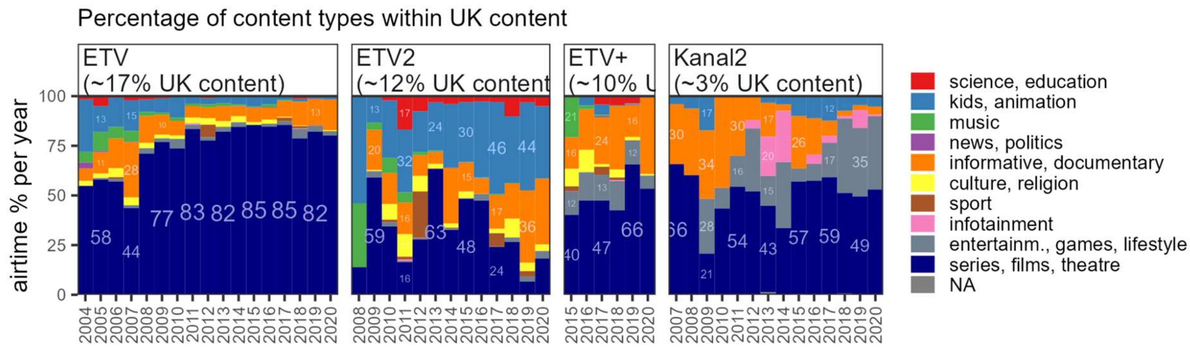

Figure 5. Content types within UK content on ERR channels.

Nordic and Baltic content

Nordic content, similarly to the UK, has recently earned international recognition for its high production quality. With Estonia being geographically and culturally close to the Nordic countries, one would expect to see substantial shares of the ERR's programming dedicated to Nordic content based on the theory of cultural proximity (Straubhaar, 1991). Yet, the share of screened Nordic content is negligible across all ERR channels, especially when compared to the British import volumes (Figure 4.C). This finding could suggest that more favourable content pricing, which larger production markets can offer, beats cultural proximity, or, alternatively, that company and production universals beat potential cultural lacunae (Rohn, 2010; 2011). However, the viewing statistics (Figure 8) show that, despite its limited airtime, the Nordic content is valued among audiences, since its median reach is comparatively high – higher than that of UK content. These statistics suggest that ERR has not been responsive to the particular cultural preferences of its audiences.

Other European content

Content produced in the rest of the European Union also has little prominence on ERR, which raises a concern in terms of granting audiences access to culturally diverse European programming (Figure 4). While the aggregate airtime of EU content across ERR appears almost as high as UK content (Figure 4, panel A), most of it comes from ETV2, which dedicated much of its non-prime hours to EU content, hence attracting smaller audiences (Figure 6). Furthermore, the analysis of genres and target audiences of this content revealed it to consist mostly (53% of content airtime in 2016-2020) of children's animations, a genre which generally carries little cultural specificity (Rohn, 2009; 2011).

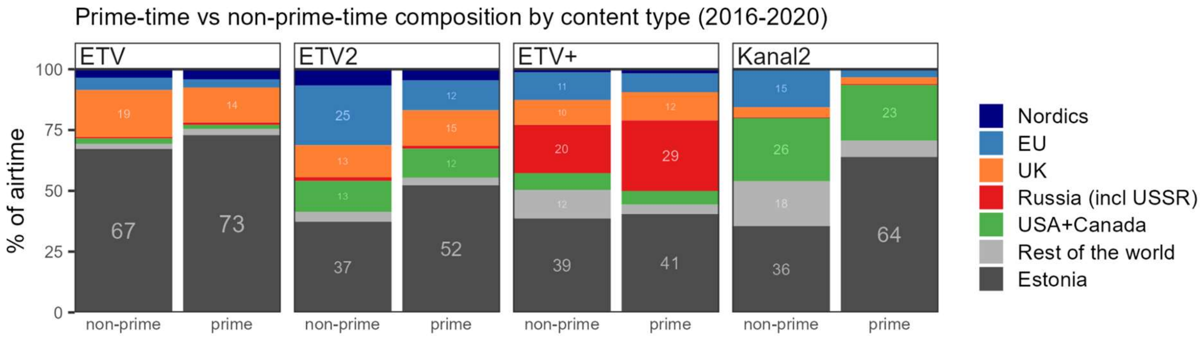

Figure 6. Channel programming split by prime vs non-prime time, showing average over 2016-2020 for origin countries (Estonia here includes content produced by ERR itself).

Russian content

Russia has not been a prominent content supplier to ERR, except for the ETV+ channel geared towards Russian-speaking audiences in Estonia (Figure 4). There, content from Russia has not only increased in its importance overall, but even more so during the peak viewing times (Figure 6). Throughout the years, this growth has come primarily at the expense of Estonian programming. This reduction in domestic airtime on ETV+ is significant given the channel was established primarily to bring content on Estonian realities to Russian-speaking audiences. This trend might not necessarily indicate that the channel has had a pro-Russian agenda, but instead, a problem of constrained supply, given the lack of resources available at ERR to produce sufficient original Russian-language content.

	(A) Average repetitiveness of new content (within same channel and year)				(B) Likelihood of being a repeat, i.e. not a new programme (across ERR, across years)			
	ETV	ETV2	ETV+	Kanal2	ETV	ETV2	ETV+	Kanal2
Estonia	0.76	0.54	1.46	1.52	0.58	0.78	0.66	0.69
UK	0.98	1.21	1.18	0.53	0.79	0.91	0.84	0.57
USA+Canada	0.69	1.18	0.93	0.64	0.74	0.9	0.75	0.73
Nordics	0.94	0.91	0.78	0.79	0.71	0.86	0.74	0.62
EU	0.58	1.24	1.07	0.42	0.71	0.89	0.76	0.63
Russia (incl USSR)	0.81	0.73	1.22	0.51	0.72	0.93	0.76	0.79
Rest of the world	0.72	0.72	1.02	0.39	0.59	0.85	0.74	0.38

Figure 7. Repeated content across ERR channels in 2016-2020, for content origins. Panel A shows how many times a new programme item in a given category gets repeated within the same year in the same channel, on average. A value of 0 would mean new shows are only shown once (in a given channel within the year); 1 would mean new shows are repeated once. Panel B takes into account all programming data (since 1960 for ERR) and displays the likelihood of being a repeat item, i.e. something that has been already shown before, in any of the ERR channels at any point in time (this is calculated separately for Kanal2; its data goes back to 2007). A value of 0 would mean only new shows are aired, while 1 would indicate no new shows are being broadcasted.

Content from the rest of the world

Content produced in the rest of the world is thinly represented in ERR TV programmes, with even a slight decrease in 2018-2020 on ETV and ETV2. Upon being founded in 2008, ETV2 World content constituted 31% of imported airtime, but this number was down to 4% in 2020 – relating to the broader decline in source country variety seen in Figure 3. World content mainly reaches audiences via the ETV+ channel, where it constituted 17% of imported airtime and 19% of new import titles in 2016-2020. Imported content constitutes 10% of total ETV+ airtime, and of that, 44% was from Ukraine, 23% from Turkey, and 7% from South Korea. However, world content primarily fills non-prime time on ETV+ (Figure

6), which has very low median reach compared to ETV, hence the world content there reaches very small audiences (Figure 12).

Foreign content on Kanal2

To fully understand the extent to which content diversity on ERR channels translates into public value, the data from the public broadcaster needs to be interpreted in the context of the larger cultural and media system, particularly in contrast to commercial television. Unlike ERR, Kanal2's foreign imports are dominated by content from the United States (25% of airtime in 2016-2020; 42% of all import content), followed by the World group with 17% (28% of imported airtime), which in this particular case means mostly content from Turkey and Australia, known for daytime series production. Notably, UK content gets only 4% screen time.

Consumed variety

Figure 8 compares the exposure (BMS data, Panel B) and consumption of content in 2018-2020 (audience reach data from Kantar Emor, panel A). We learn that the exposure variety may not have any direct relationship with consumed variety. For instance, while UK content enjoys significant exposure, the median reach of Nordic content is higher (1.1 vs 0.9). This could suggested that cultural proximity theory still has relevance.

The relationship between ERR's editorial decisions and consumption becomes evident as we compare the most popular (highest reach) UK and US/Canadian content items. In the first case these are well-known fictional series with focus on detective content (Shetland, Vera, Midsomer Murders, Doc Martin), and in the second case mostly documentaries, historical films ("On the basis of sex", a 2018 legal biographical drama on the life of Ruth Bader Ginsburg, had highest reach - 16.9%), or Canadian public service TV productions (“Anne with an E” [2017-2019], “Épidémie” [2020]) that address a variety of social issues. That is, the editorial strategy to avoid US entertainment content and highlight the value of documentaries or fiction content with public service ethos from Northern America has been accepted by audiences. That most EU content comprises animations for kids is confirmed by audience statistics – the median audience age is 37 (56 for domestic Estonian content).

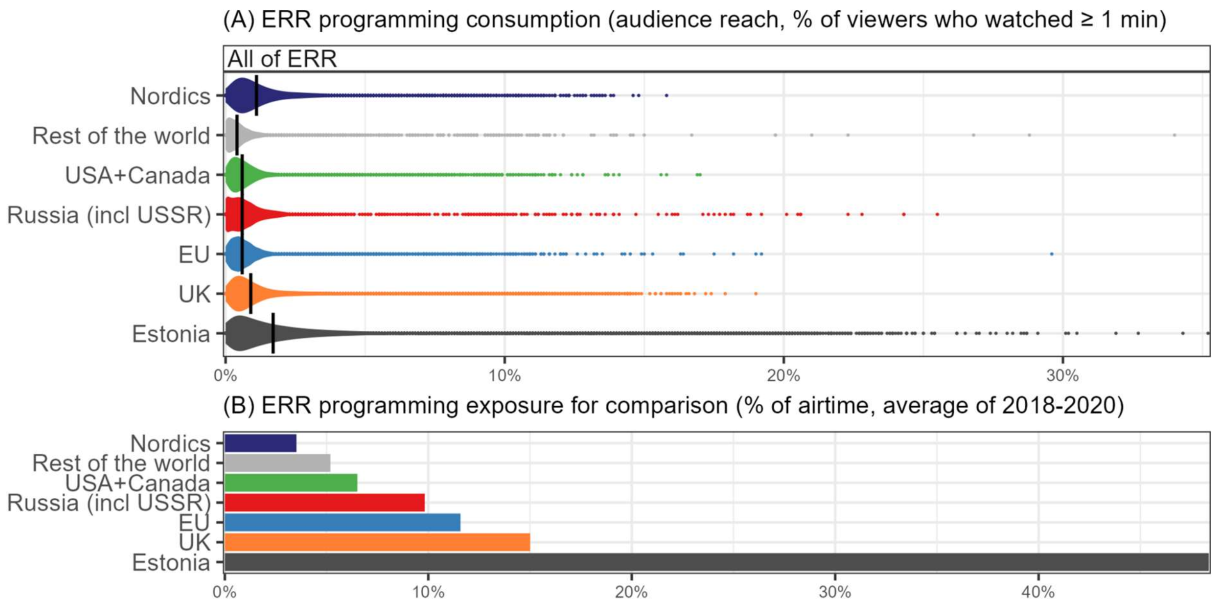

Figure 8. (A) Consumption variety of ERR programmes in 2018-2020, operationalised as average reach per programme – the percentage of viewers who viewed a given programme for at least 1 minute. Each import category is displayed as a distribution of its programme items over reach values (horizontal axis), with outlying popular shows visible as individual points, and medians displayed as black bars.

(B) Exposure variety (airtime share) for comparison.

Summary on the curation of incoming cultural flows

The analysis suggests that, as a curator of international cultural flows into Estonia, ERR adds value to the public sphere as it increases its diversity by showing considerably more European rather than American content compared to a commercial competitor. Yet, much of that content originates from the UK, and its share has been gradually growing. This brings about the dominance of Anglo-American content, as on commercial competitor Kanal2, content from the US and Australia prevails.

There is very little content from EU countries – or from the rest of the world, the share of which has been in decline. From this, we conclude that ERR TV programming may not be explicitly oriented towards increasing the diversity of cultural flows to Estonian audiences. It can be suggested that ERR is one of the small PSM negatively affected by the aggressive strategies of the UK content distributors, as discussed by Donders and Van der Bulk (2016).

Public service media curating thematic content diversity

We also examined BMS data to explore the thematic/discursive diversity of content. In Estonia, private media institutions have recently criticised ERR for providing entertainment content online (Viirmaa-Treifeldt, 2020), while the broader culture and arts sector has condemned ERR for featuring too little arts programming (Michelson et al., 2021). Relating to this discussion, we discovered that while culture, arts, and current affairs were in relative decline over the years (Figure 9), entertainment content has experienced the largest boost in airtime at ERR. The addition of ETV2 and ETV+ channels and an increased focus on entertainment within ETV have driven this increase (Figure 10). On the main ETV channel, infotainment airtime share has also increased from 17% to 20% in 2016-2020.

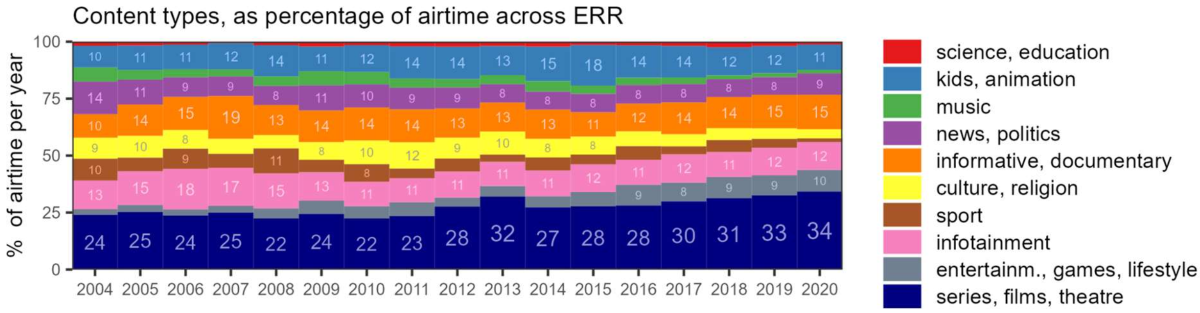

Figure 9. Share of airtime per year by content category (takes into account repeats and differences in running time).

Various kinds of current affairs and informational content, and also documentaries, however, received only a moderate increase, partially due to the addition of ETV+. Separately, politics and news has been one of the stable categories in terms of airtime over the years (Figure 10). Yet, with the addition of ETV+ emerged the repetitiveness of this typically least-repeated category (Figure 13), which signals the reutilisation of news shows across multiple channels.

The added channels (in 2008 and 2015), on the other hand, had little impact on screen hours dedicated to arts and culture (religion is also in this category, though its share is marginal). Hence, perhaps paradoxically, with the increase in the screen time available within the ERR ecosystem, arts and culture programming has become less prominent (Figure 9, yellow). While it has received slightly more prime than non-prime airtime on ETV2 (13% of prime airtime, compared to 5% on ETV; see Figure 11) and a stable 4-6% of airtime on ETV in 2016-2020, arts and culture programming was barely aired on ETV+, decreasing from a similar share to just 1% in 2019-2020.

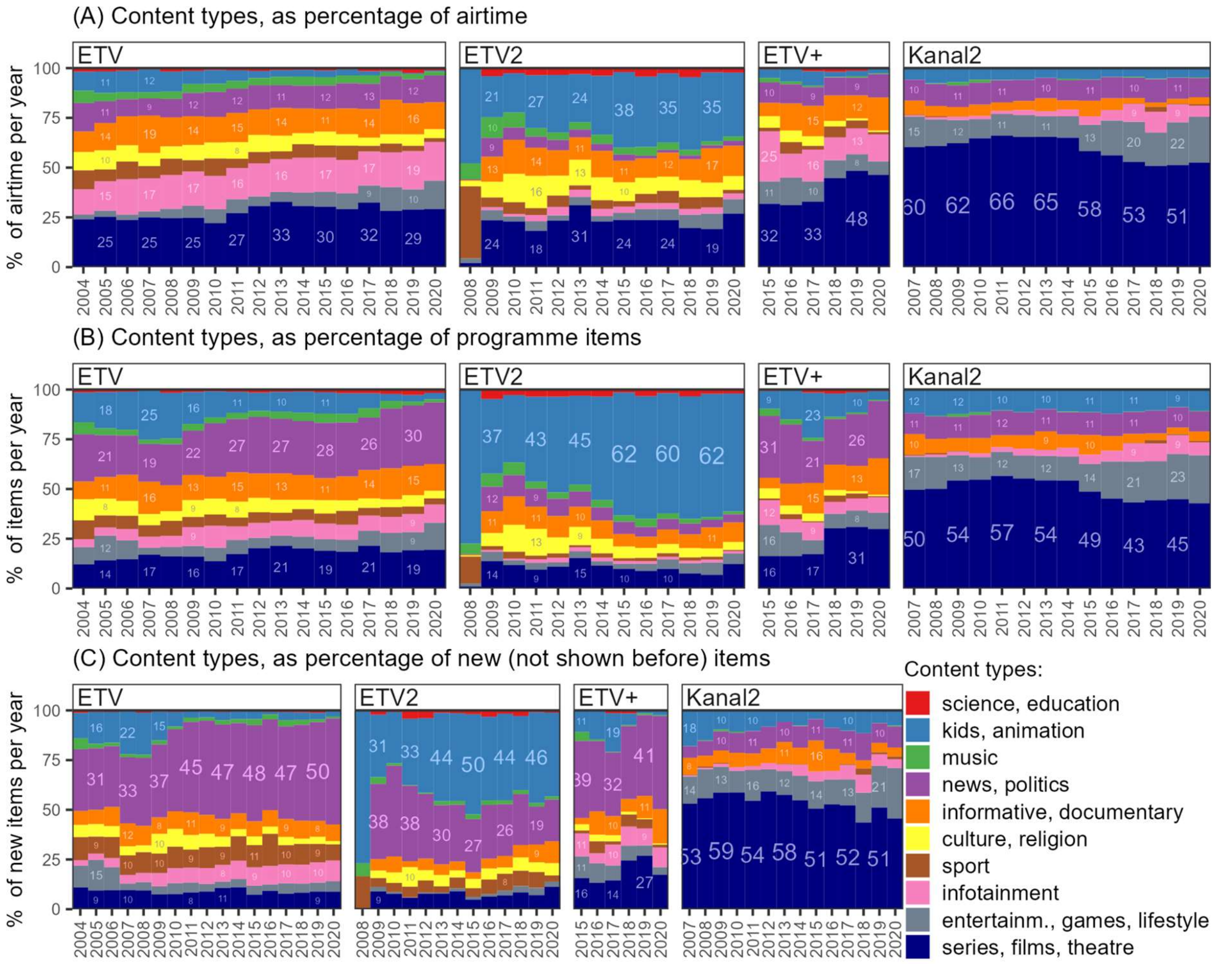

Figure 10. Analyses of exposure of content categories on different channels.

Our analysis of sports content was driven by the question of how much local/regional sports coverage there is and whether ERR is contributing to the diversity of sports coverage. We discovered a reduction in hours dedicated to sports across ERR, with bi-yearly airtime fluctuations around significant international events such as the Summer/Winter Olympics or World Cup in men's football (Figure 9, brown). This suggests that ERR focuses mainly on high-level international sporting events, and while it has started to lose these events to private channels, this gap has not been filled with coverage of local sports, such as local leagues and national sporting events.

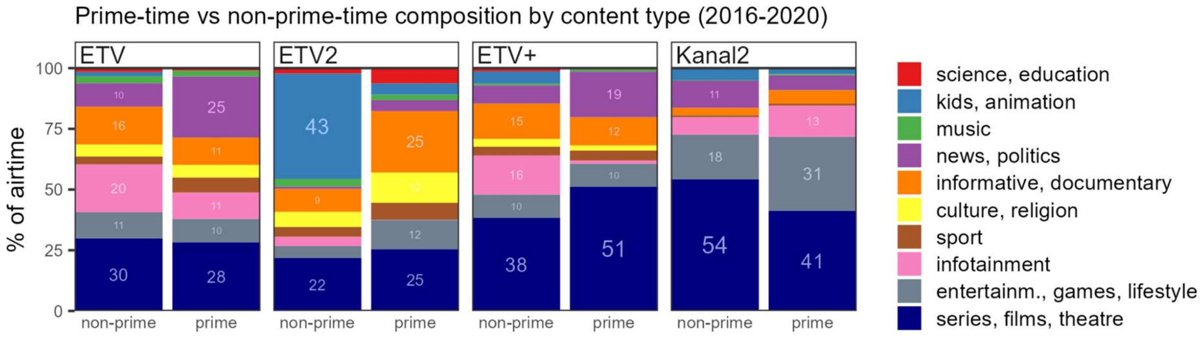

Figure 11. Share of airtime per year by content category and channel split into prime/non-prime time in 2016-2020 (enables discussion of exposure diversity and takes into account repeats and differences in running time).

If we compare ERR channels with Kanal2 (Figure 10), we see that the latter airs notably more fiction content and has also experienced growth in domestic non-fiction entertainment and infotainment in 2010-2020. The growth in both of these content types is an interesting trend given its decreasing viewership and revenues (Jõesaar and Kõuts-Klemm, 2019). Yet, the commercial channel contributes little to the public sphere when it comes to content on arts and culture or informative and documentary content. Against this backdrop, ERR could be seen as a provider of public value to society.

Consumed variety

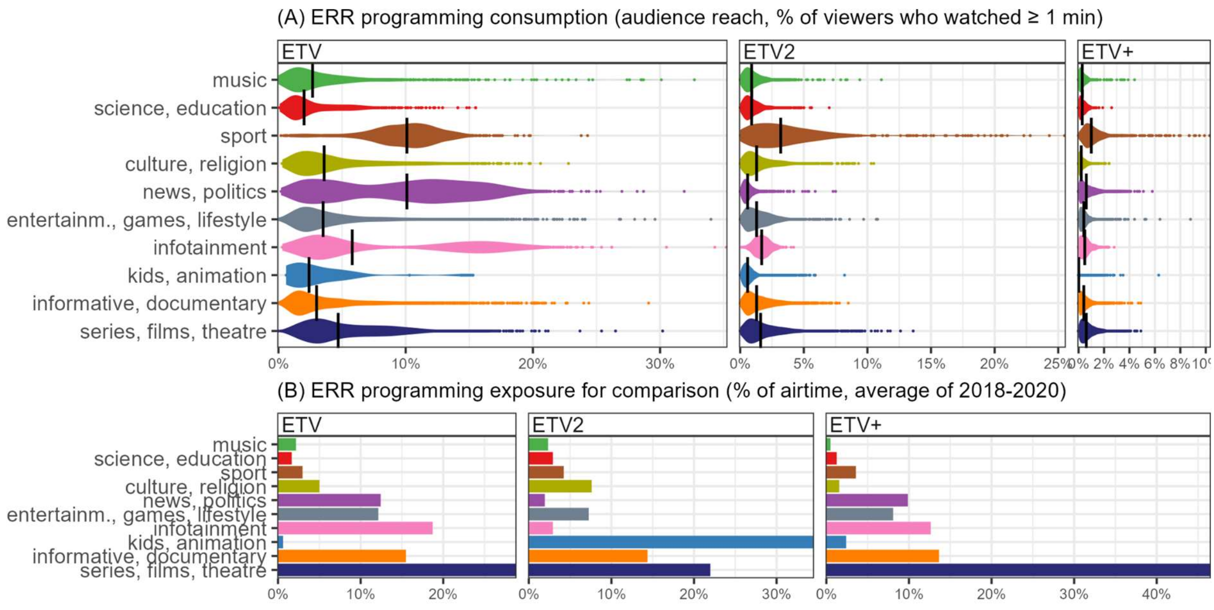

Figure 12. (A) Consumption variety of ERR programmes, operationalised as average reach per programme. Each content category is displayed as a distribution of its programme items over reach values (horizontal axis), with outlying popular shows visible as individual points. Medians are displayed as black bars.
(B) Exposure variety (airtime share) for comparison.

To interpret how exposure variety affects consumption, let us explore the average reach of programme types split between ERR's channels (Figure 12). We learn that ERR reaches most of its audience mainly via its flagship channel, ETV. We also learn that it is the large sporting events, infotainment, and news and political talk shows that increase ERR's average reach. Figure 12 highlights that in the case of news and politics, as well as infotainment shows, non-prime time repetitions also drive this reach (there are two peaks in the distributions of these categories in Figure 12). We also learn that the median reach of ETV entertainment shows does not exceed that of arts and culture programming. This finding suggests that there could be a greater demand for the latter than is currently supplied.

	(A) Average repetitiveness of new content (within same channel and year)			(B) Likelihood of being a repeat, i.e. not a new programme (across ERR, all years)			(C) Production type repetitiveness in ERR		
	ETV	ETV2	ETV+	ETV	ETV2	ETV+	Bought	Com.	Own
science, education	2.07	1.61	1.66	0.85	0.89	0.84	1.3	2.3	2.7
entertainm., games, lifestyle	1.54	1.3	1.73	0.81	0.92	0.76	1.5	2.6	1.8
informative, documentary	1.31	0.94	1.48	0.77	0.87	0.77	1.4	2.7	1.8
culture, religion	0.91	1.15	1.6	0.75	0.83	0.79	1.4	1.4	1.8
kids, animation	0.78	1.35	1.06	0.79	0.9	0.8	1.4	1.4	1.6
series, films, theatre	1.16	0.89	1.12	0.83	0.87	0.78	1.3	2.2	0.9
infotainment	1.2	0.01	1.8	0.55	1	0.65	2.9	1.5	1.7
music	0.83	0.63	0.88	0.75	0.88	0.87	1.5	0.7	1
news, politics	0.56	0	1.3	0.36	0.27	0.57	1.1	2.1	0.8
sport	0.05	0.31	0.46	0.09	0.3	0.36	0.4	1.2	0.1

Figure 13. Repetitiveness of new content across ERR channels in 2016-2020, for content types (similarly to Figure 7). Panel A: how many times a new programme item in a given category gets repeated within the same year in the same channel, on average. Panel B: the likelihood of being a repeat item (takes into account all of ERR's programming history). A value of 0 would mean only new shows are aired, while 1 means only old

content is repeated (see infotainment on ETV2). Panel C: repetitiveness of new content by production type, similarly to A.

Summary on curating thematic content diversity

Our approach enabled us to demonstrate that while entertainment and fictional content has been on a rise on ERR channels, arts and culture content has been on a relative decline. However, as the median reach of entertainment and culture categories was similar, it questions whether this growing disbalance has been justified. In the case of sports content, we learned that its share in exposure variety has been low and decreasing, but its median reach is high. This means that ERR sports programming focuses on high-profile international events and its actual inherent variety has been low. This finding suggests that in the future, the method development needs to be focused on genre-specific content disparity research.

Public value in terms of industry collaboration

As argued in the theory section, PSM do not only create public value for society in terms of content offers but also in terms of the coordination of broader cultural innovation systems. Therefore, we analysed how ERR interacted with independent producers or other cultural institutions, either via commissioned content or by collaborating with them on production. For that purpose, instead of studying aggregate screen hours or all titles shown (including repeats), we focused on the showings of new titles – as these refer most directly to production or acquisition processes within a given time frame. Our first finding was that over the studied period, the balance of production types has fluctuated somewhat; however, the general trend has been that own productions have always dominated the aggregate output and especially the main ETV channel. Since 2016, the self-produced content has been steadily gaining ground, reaching 80% on ETV. Since 2012, ERR has commissioned gradually less content from independent producers (Figure 14).

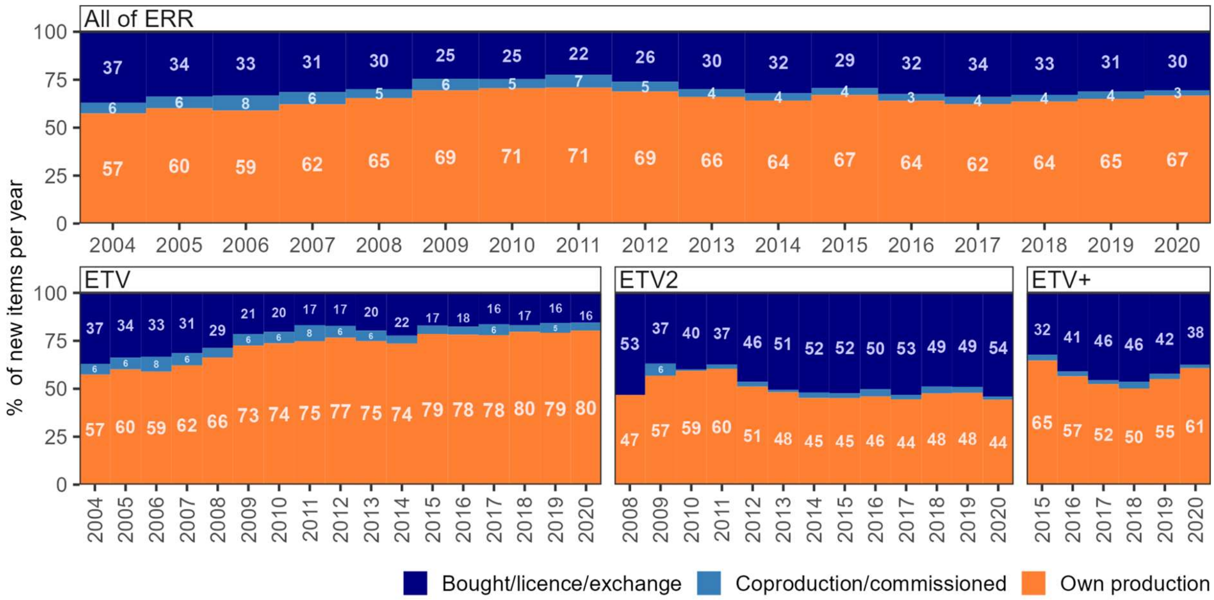

Figure 14. Production mode of first-time showings of titles on ERR, as a percentage of new, non-repeat titles.

Let us look at some of the programme types in more detail (Figure 15). First, regarding fictional content (films, series, theatre recordings), we can see that ERR purchases most of it (in 2016-2020, 93% of new fiction items) and does so largely from abroad. ERR self-produced >3% of its fiction content in 2008-2010, reduced to 1.3% in 2020. Commissioned fictional content has been decreasing too – from 16% in 2006 to 4% in 2020. This is very little in international comparison (Navarro et al., 2022). Yet, differently from own-produced shows, commissioned fiction content is repeated more (on average 2.2 times across all ERR channels in 2016-2020; Figure 13C), suggesting that the commissioned domestic content is generally valued higher than bought foreign content (repeated 1.3 times). Domestically commissioned fiction content also comprises somewhat shorter formats (median length 28 minutes in 2016-2020) – typically sitcoms rather than longer-format quality dramas. This suggests that the ERR can only afford to commission cheaper forms of content compared to purchased series and films (median length 49 minutes).

Regarding content type ‘informative, documentary’ (includes documentaries, docu-series, shows about history, environment, economy, foreign affairs), the trends have been similar but at different scales: while the share of content produced in Estonia (either own-produced or locally commissioned) is higher, it is getting increasingly replaced by (presumably cheaper) foreign content. With regard to commissioned content, the trend is also down, from a peak of 32% in 2009 to 7% in 2020. But we learned again that ERR repeats these commissioned shows, on average, 2.7 times (Figure 13C) more than own-produced informative content (1.8), suggesting that it values these shows more. Again, generally shorter formats are commissioned (median length 28 minutes) compared to bought content (46 minutes).

We saw above that the share of ‘entertainment, games and lifestyle’ programming has been growing, from 3% in 2007 to 9% in 2020. ERR commissioned more than half of it from independent producers in 2011-2014, while by 2016-2020 it had produced more than half of its entertainment content in-house (similarly to 2004-2007). Hence, we suggest that the general growth of such programming has come from ERR having focused more on entertainment production. This could come at the expense of informative and documentary content – as its share of own-produced shows has come down. Still, also in the case of entertainment content, commissioned content gets repeated more (on average 2.6 times, compared to 1.5 for both bought and 1.8 for produced content) – referring to their perceived higher value by the programme managers.

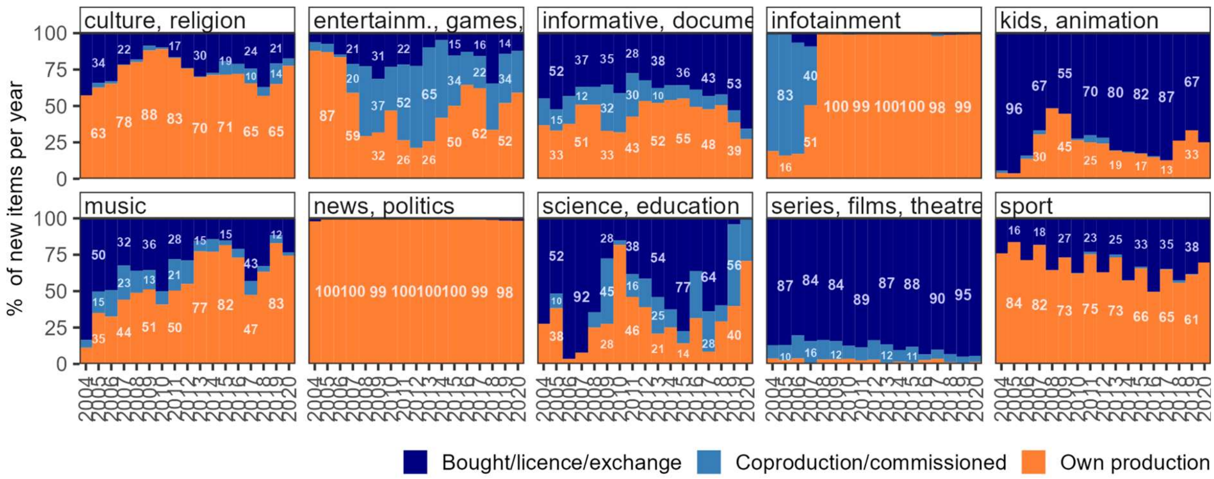

Figure 15. Changes in production modes of different programme types, across all channels – calculated using unique programme titles as units.

Concluding discussion

The main result of this study is that the analysis of data from broadcasters' BMSs could enable novel methods and provide systematic evidence on whether, and how, PSM institutions are generating public value. In this paper, we highlighted two ways in which PSM could create public value: by increasing variety and facilitating balance in the public sphere by content provision and by coordinating the inclusion of a more varied set of independent producers in content production. We also showed how comparing source, exposure, and consumed variety could be a useful way to analyse and understand the varieties and value created. Further, the paper also demonstrates how comparing aggregate screen time (minutes), all screened titles (including repeats), and new screened titles provides insights into how TV programmes are structured, how exposure diversities are built, and what, relatedly, appear to be the value perceptions of programme managers.

Our case study – Estonia's ERR – demonstrated how valuable insights into programme evolution and generated value can be garnered. We demonstrated how ERR's imported content variety has been decreasing and how its imported content has been increasingly dominated by UK production. Comparing exposure variety and consumed variety, we showed how ERR may not service well its audience's interest in culturally proximate Nordic TV content. We also showed how the EU policy goal of widening the circulation of European content is mostly satisfied by ERR by purchasing its animated kids' entertainment from EU countries.

With regard to airing domestic content, we discovered how the share of arts and culture programming has been in relative decline, while entertainment programming has been growing. This disbalancing appeared ungrounded as the audience reach of both categories was similar. When it comes to production modes, we learned that the output share of commissioned programmes has been constantly decreasing: it commissions only shorter and cheaper forms of fiction and informative content and has started to produce more entertainment in-house – leading to the share of entertainment growing. Yet, in both cases of content curation (foreign and domestic content), we demonstrated that in the context of a commercial channel (Kanal2), ERR could still be seen as contributing to the diversity in Estonia's public sphere. This raises the question whether a calculation of balance should be based on data from all major broadcasters and publishers, in order to interpret the diversities within the broader national or regional media system.

The aim of this paper was not to present a full picture of ways in which a PSM could create public value (there are multiple interpretations of that – Cañedo et al., 2022; Mazzucato et al., 2020), but rather, to act as a starting point for discussions on how to analyse public value creation systematically, taking into account all its various dimensions, as well as their interdependences and trade-offs. We demonstrated, for instance, how source diversity does not necessarily translate into exposure diversity and how the latter may not have a direct relationship with consumed diversity. But we also showed how these different dimensions could still be interdependent: for instance, when ERR replaced commissioned entertainment with in-house production (reduction in source diversity), it seems to have led to what could be considered imbalanced overproduction (reduction in exposure diversity).

To better understand such interrelationships and start using BMS data analytics in the service of media policy and programme development, more work needs to be done, especially as more dimensions could be included in such analysis using the existing BMS data systems – for instance, diversity in people or the external firms involved in production. It could also be informative to complement genre categories (standardised by metadata schemas) with topic and sentiment modelling based on either programme synopses or programme content in BMS databases. This could enable content disparity analysis – an important dimension for understanding diversities (Stirling, 2007). We call upon our colleagues to approach their national and regional PSM institutions and invite them to share their BMS data as open data – so as to increase their accountability, as well as develop multidimensional ways of studying, comparing, and improving their public value creation practices.

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Data and code availability

Code and a subset of the data to reproduce the analyses and graphs is available at https://github.com/andreskarjus/quantifying_public_value_creation

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