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ONLINE COPYRIGHT INFRINGEMENT IN THE EUROPEAN UNION

MUSIC, FILMS AND TV (2017-2020), TRENDS AND DRIVERS

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CONTENTS

Acronyms and Abbreviations

AVOD	ad-based video on demand
BVOD	broadcaster video on demand
CJEU	Court of Justice of the European Union
DVD	digital versatile disc
EU	European Union
EU27	European Union excluding the United Kingdom
EU28	European Union including the United Kingdom
FOD	free on-demand service
GDP	gross domestic product
GNI	gross national income
HDI	household disposable income
IFPI	International Federation of the Phonographic Industry
IIPA	International Intellectual Property Alliance
LD	laserdisc
OECD	Organisation for Economic Cooperation and Development
PPS	purchasing power standard
SBMS	subscription-based music services
SVOD	subscription video on demand
TVOD	transactional video on demand
UGC	user-generated content
VCD	video compact disc
VOD	video on demand
VSP	video sharing platforms

INTRODUCTION

Online copyright infringement is a serious problem for rights owners and for society as a whole. It deprives artists and creators of compensation for their work and, in the long term, may reduce the range of choices available to consumers. Recognising this, the European Commission identified fighting this type of copyright infringement as one of its priorities in its IP Action Plan and is supporting Member States in their implementation of the new directives on the modernisation of the EU's copyright framework [1].

In 2019, the EUIPO published its first study of online copyright infringement, using data on access to websites providing pirated films, TV programmes and music, in all European Union (EU) Member States. That report covered from January 2017 to September 2018. The main finding was that piracy was declining, but remained a serious problem, with a wide variation among the Member States.

The present report is an update of the 2019 study. It is based on data from January 2017 to December 2020. This longer data series enabled an improved statistical analysis of the data, and the inclusion of data for 2020 also meant that the effect of the COVID-19 pandemic on consumption of pirated content could be examined. The main findings are that the declining trend seen in the earlier study continued in 2019 and 2020 and that the lockdowns in the spring of 2020 only had a temporary effect on such consumption.

The remainder of this report is organised as follows: following the Executive Summary, Section 2 provides an overview of copyright in the EU and discusses the ways in which film, TV and music are offered to consumers in the EU, both licitly and illicitly. Section 3 describes the data used in the study, while Section 4 presents descriptive statistics. Section 5 uses econometric analysis to explain the differences among the Member States as regards consumption of pirated content. Section 6 summarises the conclusions and suggestions for further research.

This study was included in the Observatory's 2021 Work Programme. The study's terms of reference were not on the agenda of the Working Group meetings in 2020 since the study is an update of an

[1] Directive (EU) 2019/790 on copyright and related rights in the digital single market.

earlier study, which had been discussed in the Economics and Statistics Working Group meeting held in Brussels in November 2019.

1 Executive Summary

This report examines the consumption of copyright-infringing content in the EU Member States and the United Kingdom (UK)[2] for TV programmes, music and film, using a variety of desktop and mobile access methods, including streaming, downloading, torrents and ripping software. The report has two parts, a descriptive analysis of the trends in the consumption of infringing content and an econometric analysis of the factors that influence differences in piracy rates among the EU Member States.

The analysis is based on a rich set of data on access to websites offering pirated music, film and TV programmes in all 28 Member States, between January 2017 and December 2020. The dataset includes over 240 thousand aggregates[3] for a total of 133 billion accesses.

The report's main conclusion is that digital piracy is declining for all types of content, as shown in Figure 1 and Table 1 below. Except for a temporary increase in film piracy in the spring of 2020, the decline continued during the COVID pandemic: piracy decreased by 20 % in 2018, by 6 % in 2019 and by 34 % in 2020[4].

[2] The UK is included in this study because it was a member state of the European Union during most of the period covered by the report and was included in the previous report covering 2017 to 2018.

[3] Exactly 241 920 aggregates.

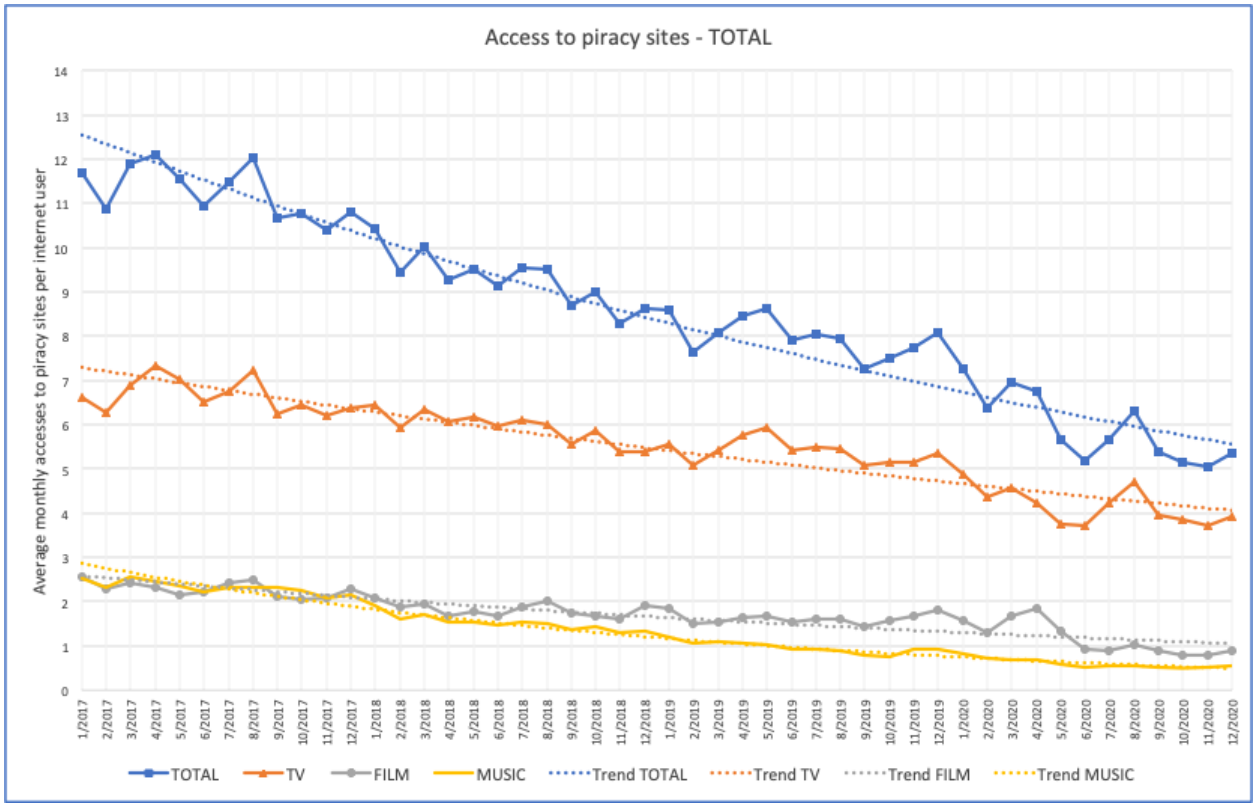
[4] The rates of change were calculated by comparing the December figures of each year with the corresponding figures from the previous year. Since no data was available for December 2016, the 2017 rate of change was calculated by comparing January 2018 with January 2017.

Table 1. Annual growth rates in access to pirated content, 2017-2020

	TOTAL	TV	FILM	MUSIC
2017*	-10.9 %	-2.9 %	-18.9 %	-23.5 %
2018	-20.1 %	-15.2 %	-16.4 %	-38.4 %
2019	-6.3 %	-1.0 %	-4.7 %	-30.2 %
2020	-33.8 %	-26.9 %	-50.6 %	-40.9 %

*January 2018 v January 2017

Figure 1. Piracy trends EU28, 2017-2020



Access to pirated content in the EU halved between 2017 and 2020. This decline was particularly pronounced in music, with piracy accesses reduced by 81 %. Film piracy fell by 68 % and TV piracy by 41 % during the period.

There were significant differences among the Member States. The average internet user in the EU accessed copyright-infringing content 5.9 times per month during 2020. Latvian users accessed these sites approximately twice as often, whilst Polish users did so only 3.8 times per month. Overall, Austria, Finland, France, Germany, Italy, the Netherlands, Poland, Romania, Spain and the UK, were below the EU average.

The econometric analysis in Section 5 seeks to explain these differences among the Member States and over time. Based on a review of the existing literature and available data sources, a number of factors that could influence the consumption of pirated content in a given country were examined ([5]).

Among the socio-economic factors, the extent of **inequality** and the level of **income per capita** seem to have the greatest impact on the consumption of pirated content: high per capita income and low degree of income inequality are associated with lower levels of illicit consumption, holding other factors constant.

A higher **acceptance of digital piracy**, as evidenced by responses to the relevant questions in the IP Perception study, is also associated with a higher level of consumption of pirated content. In countries with similar levels of income and inequality, piracy is higher in countries where a high proportion of citizens consider piracy as an acceptable option when there is no legal offer (as reported in the IP Perception study), especially in the case of music piracy.

The **awareness of legal offers** (as reported in the IP Perception study) appears to reduce consumption of pirated content. Furthermore, the **number of legal platforms** for films and TV channels reduces the consumption of pirated content (this effect cannot be tested in the case of music because the number of platforms has remained stable during the period in almost all of the countries).

([5]) The results of the econometric analysis are significantly more robust in this study than in the previous (2019) study because of the additional data available, which has enabled the use of more advanced statistical techniques than in the earlier study.

In addition, there is a positive association between the **proportion of young people** (aged 15 to 24) in a country's population and the extent of film piracy.

2 Copyright and piracy

The purpose of this study is to quantify the extent of digital piracy ([6]) in the EU Member States and to perform an econometric analysis of the factors that make consumers in some countries more likely than others to engage in this practice. This study is an update of a similar study published in November 2019, with numerous improvements made possible by greater data availability. The inclusion of data from 2020 has made it possible to examine the impact of the COVID-19 pandemic on piracy.

Following this introductory section, which defines copyright infringement and briefly describes the various legal and illegal business models, Section 3 describes the data used for the subsequent analysis. Section 4 presents descriptive statistics and piracy trends, while Section 5 contains the econometric analysis. The final section sets out the conclusions and discusses the possibilities for further research.

2.1 Copyright in the EU

Copyright law provides authors with exclusive rights that enable them to control the use of their works and to gain income from that use. Authors and/or right(s) holders may authorise or prohibit certain uses of their works, such as reproduction and distribution of copies of their works, as well as communication and making the works available to the public ([7]).

([6]) Strictly speaking, 'digital piracy' refers to the act of making copyright-infringing content available to consumers. However, this study focuses on the consumption of this content by internet users in the EU. The correct term is therefore 'consumption of pirated content' or 'consumption of copyright-infringing digital content'. However, as a shorthand, 'piracy' is used interchangeably with these expressions.

([7]) At EU level, the main 'economic rights' have been harmonised by the Information Society Directive, D 2001/29/EC of the European Parliament and of the Council of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society, OJ L 167, 22/06/2001, pp. 10-19, Articles 2-4.

In addition to author's rights, copyright law creates 'related' (or 'neighbouring') rights, which are designed to reward and/or incentivise creative endeavour and the investments of those who make creative works accessible to the public: music and audiovisual performers, record producers, radio and TV broadcasters, etc. In the EU, the producers of the first fixation (recording) of a film are also protected by related rights ([8]).

Independently of the economic rights, authors also have moral rights, which include, as a minimum, the right of authorship and the right of integrity of the work. Other moral rights that national laws may provide for are the right of divulgation or the right of withdrawal. These rights can usually be asserted by the author even if the copyright has been transferred to a third party ([9]).

Copyright protection is applicable only to the expression of ideas, not to the ideas themselves. Copyright registration (at both EU and national levels) is not required for copyright protection ([10]). Protection arises automatically from the moment a work is created. In this respect, copyright differs significantly from other IP rights.

Copyright law is governed by the principle of territoriality, which means that each country has a separate system of rules, although international agreements from the end of the 19th century and the 1990s, and European legislation since the early 1990s, have significantly harmonised these rules. Eleven directives have been adopted to harmonise important aspects of the copyright laws in the EU Member States. In addition, two regulations and provisions of several other legal instruments are relevant to the exercise and enforcement of copyright ([11]).

([8]) See Articles 2-3 of the Information Society Directive; see also the 'Rental Rights Directive', D 2006/115/EC of the European Parliament and of the Council of 12 December 2006 on rental right and lending right and on certain rights related to copyright in the field of intellectual property (codified version), OJ L 376, 27/12/2006, p. 28-35, Article 7 et seq.

([9]) On national approaches to waivers of moral rights, see (e.g. the Frequently Asked Questions on Copyright, published by EUIPO).

([10]) Voluntary registration is, however, possible in many countries.

([11]) For an overview of EU legislation on copyright law, see the Commission's websites:
https://ec.europa.eu/digital-single-market/en/eu-copyright-legislation
https://ec.europa.eu/digital-single-market/en/copyright

In the EU, the rights of authors are protected for their lifetime and an additional 70 years after their death [12]. The protection conferred by related rights lasts for 50 years after the performance, film or broadcast was published or communicated to the public and 70 years for phonograms or performances fixed in phonograms [13].

The economic aspects of copyright are complex, reflecting trade-offs between the interests of creators, distributors, performers and consumers, and the short-run versus long-run effects. The general objective of the system is to ensure adequate compensation for creators and other rights holders (so that a socially optimal level of creative activity takes place), while also providing broad public access to the creative works and making it possible for other creators to build upon prior works [14].

2.2 Exploiting creative content online

The music, TV and film entertainment industry is undergoing rapid changes as the increase in internet-based streaming services is fundamentally changing the way creative content is produced, sold and distributed. Some of the new business models are described below.

Video on demand (VOD) is a form of video media distribution that allows users to consume TV and film content whenever they choose, instead of having to watch shows at a scheduled broadcast time. When discussing VOD models, music-only streaming is sometimes included [15]; for the sake of simplicity and completeness. This is also the case in this report.

FOD, or free on demand, is a streaming service that is free for the user either because the provider is public (e.g. Arte Europe, BBC iPlayer or RTVE play), or they are BVOD (broadcaster video on

[12] On the term of protection in EU law, see also Derivative Use of Public Domain Content — Film Industry Focus, EUIPO, May 2017, p. 35 et seq.

[13] See Directive 2011/77/EU of the European Parliament and of the Council of 27 September 2011 amending Directive 2006/116/EC on the term of protection of copyright and certain related rights, OJ L 265, 11/10/2011, p. 1-5.

[14] From IPR-intensive industries and economic performance in the European Union Industry-Level Analysis Report, September 2019.

[15] SBMS, subscription-based music services.

demand) making content available online and on demand from the traditional TV broadcast stations, which includes advertising (ATRES player or MYTF1) or because the user must also watch occasional advertisements (e.g. Popcornflix, Discovery.film, Joyn+ or VEVO), in which case it is called AVOD or ad-based VOD. The AVOD model is similar to the television model, but is enhanced with demographic targeting and automated advertising.

The pay-on-demand markets comprise two main segments, transactional video on demand (TVOD) and subscription video on demand (SVOD).

In SVOD, a consumer agrees to a subscription service that provides access until cancelled by the consumer or the contract runs out. Netflix, Amazon Prime Video, YouTube Premium, MUBI or HBO are examples of SVOD services. Typically, SVOD services are based on monthly subscriptions with no limit on the amount of content consumed.

TVOD offers a free sign-up or free profile for the consumer and charges are based on the volume of content or type of content consumed. This is the model for FilmDoo, Rakuten TV, Apple iTunes, Google Play, MUBI or YouTube Movies. Customers are charged on a pay-per-view basis while rights holders receive a commission on transactions. TVOD services focus mostly on films and music, but this model has also been used for live events, including sports. Some TVOD services offer a pay-what-you-want model ([16]).

Some platforms have attempted to combine subscription-based and advertising-based content services. Typically, these hybrid models (e.g. Spotify or Joyn+) take the form of increased payment for fewer adverts or use the 'freemium' model, where the basic model is free, but desirable upgrades such as an ad-free experience, access without internet connection, or higher quality, require a subscription.

Video Sharing Platforms (VSP), such as Dailymotion, Facebook, Instagram or YouTube ([17]), are

([16]) For more precise definitions of these terms and their business models, see the study Trends in the VOD market in EU28, European Audiovisual Observatory, January 2021.

([17]) These services are included in the MAVISE database (see below).

platforms that distribute user-generated content (UGC), that is, any form of content that has been posted by users on the online platforms. The VSPs are attempting to develop new business models, including hybrid models. The new Directive (EU) 2019/790, under Article 17, has established a specific liability regime applicable to online content-sharing service providers in relation to the acts of their users ([18]).

The European Audiovisual Observatory maintains information on the different audiovisual services and licences in Europe in the MAVISE database ([19]). The following tables show a summary (excluding traditional TV channels) of the availability of the various types of offers across the EU in September 2021.

([18]) Directive (EU) 2019/790 of the European Parliament and of the Council of 17 April 2019 on copyright and related rights in the Digital Single Market and amending Directives 96/9/EC and 2001/29/EC (Text with EEA relevance.), OJ L 130, 17/05/2019, pp. 92-125, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0790&from=EN. An online content-sharing service provider is defined as an information society service provider of which the main or one of the main purposes is to store and give the public access to a large amount of copyright-protected works or other protected subject matter uploaded by its users, which it organises and promotes for profit-making purposes. Article 2(6) of the Directive.

([19]) MAVISE is a free-access database of television channels and on-demand services and licences in 41 European countries and Morocco, providing information about the audiovisual services available in Europe, including the licensing country and the owners and registries of licences issued by European audiovisual regulatory authorities. The MAVISE database, managed by the European Audiovisual Observatory, is supported by the EU's CREATIVE EUROPE programme. See http://mavise.obs.coe.int/.

Table 2. Number of online video platforms in the EU

	Country	2018	2020	Change
AT	Austria	46	140	94
BE	Belgium	51	130	79
BG	Bulgaria	21	128	107
CY	Cyprus	15	110	95
CZ	Czechia	25	127	102
DE	Germany	70	164	94
DK	Denmark	46	142	96
EE	Estonia	17	124	107
EL	Greece	17	114	97
ES	Spain	57	141	84
FI	Finland	38	144	106
FR	France	96	282	186
HR	Croatia	23	117	94
HU	Hungary	29	124	95
IE	Ireland	33	127	94
IT	Italy	33	126	93
LT	Lithuania	22	134	112
LU	Luxembourg	18	116	98
LV	Latvia	20	120	100
MT	Malta	11	106	95
NL	Netherlands	43	130	87
PL	Poland	63	145	82
PT	Portugal	31	125	94
RO	Romania	22	118	96
SE	Sweden	49	186	137
SI	Slovenia	19	121	102
SK	Slovakia	22	116	94
UK	United Kingdom	111	165	54

Source: European Audiovisual Observatory/MAVISE

The total number of video platforms in the EU almost quadrupled from 937 to 3 657 between 2018 and 2020. In 2018, the average number of platforms in the European Union was 35, but with great differences among Member States, for example, Malta had 11 while France had 96. By 2020, the average number was 135, while the differences between the countries had decreased.

Table 3. Number of TV channels in the EU

	Country	2018	2020	Change
AT	Austria	1 288	1 420	132
BE	Belgium	1 299	1 328	29
BG	Bulgaria	1 311	1 386	75
CY	Cyprus	1 172	1 234	62
CZ	Czechia	1 310	1 521	211
DE	Germany	1 585	1 662	77
DK	Denmark	1 259	1 335	76
EE	Estonia	1 212	1 255	43
EL	Greece	1 289	1 382	93
ES	Spain	1 760	1 660	-100
FI	Finland	1 246	1 256	10
FR	France	1 510	1 556	46
HR	Croatia	1 300	1 380	80
HU	Hungary	1 636	1 676	40
IE	Ireland	1 195	1 307	112
IT	Italy	2 701	2 874	173
LT	Lithuania	1 217	1 280	63
LU	Luxembourg	1 158	1 215	57
LV	Latvia	1 216	1 282	66
MT	Malta	1 150	1 216	66
NL	Netherlands	1 480	1 573	93
PL	Poland	1 331	1 401	70
PT	Portugal	1 206	1 278	72
RO	Romania	1 495	1 551	56
SE	Sweden	1 269	1 316	47
SI	Slovenia	1 294	1 376	82
SK	Slovakia	1 342	1 440	98
UK	United Kingdom	1 619	1 603	-16

Source: European Audiovisual Observatory/MAVISE

The total number of TV channels in the EU increased by 5 % between 2018 and 2020, from 37 231 to 39 160, despite a decrease of 100 in Spain. The number went up in all the other countries, notably by 173 in Italy and 221 in Czechia. The average number of TV channels per country was 1 450 in 2020, with few differences among countries, except for Italy, where the number was 2 874.

Table 4. Number of online music platforms in the EU

	Country	2018	2020	Change
AT	Austria	22	23	+1
BE	Belgium	19	20	+1
BG	Bulgaria	13	13	=
CY	Cyprus	8	8	=
CZ	Czechia	17	15	−2
DE	Germany	33	22	−11
DK	Denmark	13	14	+1
EE	Estonia	9	9	=
EL	Greece	15	15	=
ES	Spain	22	25	+3
FI	Finland	12	12	=
FR	France	31	30	−1
HR	Croatia	4	9	+5
HU	Hungary	14	14	=
IE	Ireland	19	19	=
IT	Italy	18	18	=
LT	Lithuania	9	9	=
LU	Luxembourg	12	12	=
LV	Latvia	9	9	=
MT	Malta	9	9	=
NL	Netherlands	25	24	−1
PL	Poland	23	19	−4
PT	Portugal	16	16	=
RO	Romania	11	7	−4
SE	Sweden	12	14	+2
SI	Slovenia	7	8	+1
SK	Slovakia	11	10	−1
UK	United Kingdom	29	25	−4

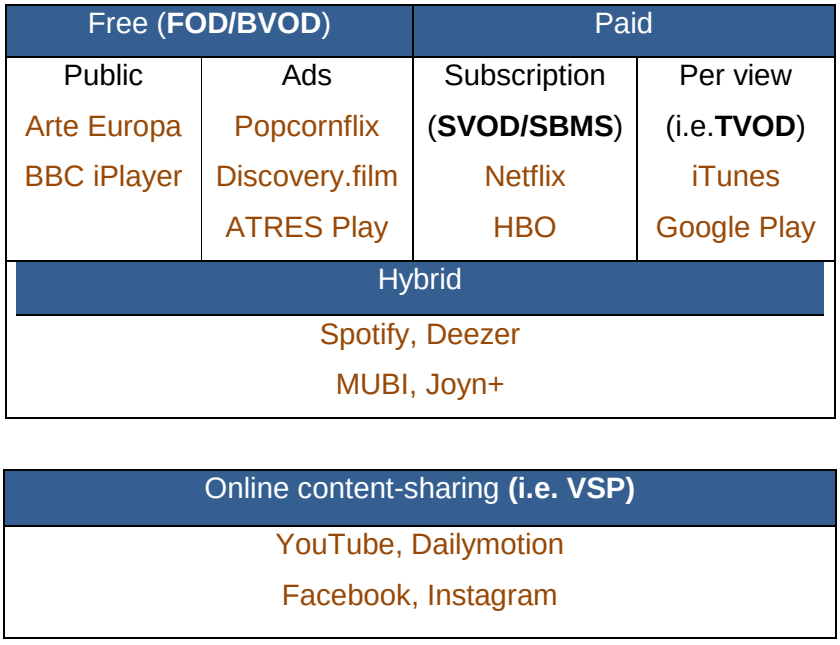
Source: International Federation of the Phonographic Industry / Pro-Music https://pro-music.org/

The total number of music platforms in the EU decreased slightly between 2018 and 2020.

To summarise, over the past 3 years, there has been a strong increase in online video platforms, a slight rise in the already high number of television channels with a stable situation for music platforms, where the business model seems more consolidated.

Some prominent examples of the different types of platforms are shown below.

Figure 2. Types of creative content internet platforms (music and video)



2.3 Copyright infringement on the internet

Copyright infringement arises whenever a protected work is used without the authorisation of the copyright holder and when this activity cannot be regarded as permitted use under one of the applicable exceptions or limitations to copyright.

The law creates exceptions and limitations in order to balance copyright protection with competing interests, such as freedom of expression and communication or privacy ([20]). One of the exceptions to copyright that the EU Member States may introduce into their national law is the private copying exception ([21]), which refers to making copies of copyright-protected works for strictly personal and non-commercial use. According to case-law from the Court of Justice of the EU (CJEU), the private copying exception is reserved for the user who has accessed or acquired a copy of the work in a legitimate manner (i.e. with the authorisation or licence of the copyright owners) ([22]).

In the internet era, copyright infringement has become easier, and can even be committed on a vast scale, for example, unauthorised large-scale file-sharing on peer-to-peer or torrent sites. The technology used to download copyright-protected content, and whether the work was downloaded in its entirety or in part, is irrelevant([23]).

Downloading a work from the internet constitutes an act of reproduction. During the streaming process, no fixed copy or file is created on the end-user's computer. The question of whether the transient copy (created while streaming an audiovisual work from an unlawful source) amounts to copyright infringement has not yet been answered unanimously at EU level. In a case that concerned

([20]) Article 5 of the Information Society Directive provides a long, exhaustive list of exceptions that Member States may implement. The recently adopted 'Copyright in the Digital Single Market Directive' provides for three additional mandatory exceptions. Directive (EU) 2019/790 of the European Parliament and of the Council of 17 April 2019 on copyright and related rights in the Digital Single Market and amending Directives 96/9/EC and 2001/29/EC (Text with EEA relevance.), OJ L 130, 17/05/2019, pp. 92-125, Articles 3-5.

([21]) Article 5(2)(b) of the Information Society Directive.

([22]) 10/04/2014, C-435/12, ACI Adam BV and Others v Stichting de Thuiskopie, Stichting Onderhandelingen Thuiskopie vergoeding, EU:C:2014:254.

([23]) The CJEU recently confirmed the uploading of pieces of a media file containing a protected work previously downloaded by a user of peer -to-peer network, constitutes making available to the public under Article 3 Directive 2001/29/EC, even if those pieces are as such unusable. The Court further contented that when the relevant user has subscribed to the BitTorrent software by giving his or her consent to its application after having been duly informed of its characteristics, the fact that the uploading is automatically generated by that software is irrelevant, i.e., it does not negate the deliberative nature of his or her conduct. 17/06/2021, C-597/19, Mircom International Content Management & Consulting (M.I.C.M.) Limited. v Telenet, ECLI:EU:C:2021:492.

the sale of a multimedia player with pre-installed add-ons that helped users find infringing content online, the CJEU held that the acts of streaming by end-users of that kind of player are not covered by copyright exceptions ([24]).

Under EU law, rights holders may also apply for an injunction against an intermediary whose services are being used by a third party to infringe intellectual property rights (IPRs), including copyright. The CJEU has given guidance on the criteria for liability in cases of alleged online infringements of copyright and related rights ([25]). It has also clarified, to a certain extent, if and under what circumstances different types of online platforms can be considered to have made a 'communication to the public' ([26]). According to the most recent Directive on Copyright in the Digital Single Market, certain platforms can perform a communication to the public ([27]).

([24]) 26/04/2017, C-527/15 Stichting Brein v. Jack Frederik Wullems, EU:C:2017:300. Considering, notably, the way in which the features of the multimedia player are advertised, end-users would buy the player deliberately and in full knowledge that they would access a free and unauthorised offer of protected works. In addition, the temporary acts of reproduction created by streaming this way would, 'as a rule', adversely affect the normal exploitation of the works and cause unreasonable prejudice to the legitimate interests of the rights holder; this practice 'would usually result in a diminution of lawful transactions relating to the protected works […]' (§ 69, 70).

([25]) It mainly clarified relevant provisions of the Information Society Directive, the e-commerce Directive (D 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market, OJ L 178, 17/07/2000, pp.1-16, and the Enforcement Directive (D 2004/48/EC of the European Parliament and of the Council of 29 April 2004 on the enforcement of intellectual property rights (Text with EEA relevance), OJ L 157, 30/04/2004, pp. 45-86). See also Study on Dynamic Blocking Injunctions in the European Union, EUIPO (2021).

([26]) For an overview of recent case-law from the CJEU and national courts in 14 EU Member States on the role of online intermediaries in the enforcement of IPR infringement, see the IPR Enforcement Case-law Collection: the Liability and Obligations of Intermediary Service Providers in the European Union, European Union Intellectual Property Office, 2019.

([27]) D 2019/790/EU of the European Parliament and of the Council of 17 April 2019 on copyright and related rights in the Digital Single Market and amending Directives 96/9/EC and 2001/29/EC (Text with EEA relevance.), OJ L 130, 17/05/2019, pp. 92-125, Article 17 et seq., which set out a specific liability regime for certain 'online content-sharing service providers'.

Table 5. Types of copyright infringement ([28])

Type of infringement	Description
Physical infringement	Illegal copies of optical discs, including laserdiscs (LD), video compact discs (VCD) and digital versatile discs (DVD). Inexpensive to copy using optical media and decryption software.
Internet infringement	Illegal use on the internet. Piracy through the use of downloadable media formats to distribute films or music to other internet users.
Signal theft	Receiving cable TV or radio system or satellite signals without authorisation. Piracy through the supply to consumers of illegal cable decoders or satellite descramblers.
Broadcast piracy	On-air broadcasting of a programme, from a legitimate or pirate copy, without permission from the copyright holder.
Unauthorised public performance	An institution or commercial entity showing a programme to its members or customers without permission from the copyright owner.

Four methods of online copyright infringement can be described depending on the process used in the sites that are providing access to the unauthorised content: streaming, downloading, stream ripping and torrent ([29]).

Streaming: includes any sites that primarily allow access to unauthorised content via online streaming directly from an end-user's web browser. Sites typically offer a wide range of content, directly searchable from within the site. Some sites host infringing content directly, but the majority provide links to external hosts.

Download: includes any sites that primarily allow use of unauthorised content via a direct download in the user's web browser. Sites typically offer a wide range of content, directly searchable from

([28]) Based on 'Walls, 2008, Introduction'.

([29]) Based on 'Muso Methodology 2017, Markets Insight Reports Market Analytics'.

within the site and downloadable in their entirety. The sites rarely host the content themselves instead linking to other sites that host the content.

Stream ripping: includes any sites that allow the ripping ([30]), mainly of audio into downloadable MP3 files. This process takes place directly on a user's web browser. Typically, the user simply needs to enter a URL to instantly start the download of the MP3 file. Stream ripping is typically used to rip the audio from music videos, often from legitimate sources. Some sites allow users to rip video content and save it as a video file, but most sites in this category focus on ripping audio content only.

Torrent: a torrent ([31]) download portal allows visitors to search for any content and then download a small file that initiates the process of downloading the full product. Users of torrent sites must have a separate piece of software, called a torrent client, installed on their device. This is a peer-to-peer (P2P) download process, so the content is not received directly from the site and instead comes from other torrent users who are sharing the same content. There is usually also an act of communication to the public involved regarding the copies that end-users make available for others to download. Torrenting can be public, where all torrent download portals are open for anyone to use, or private, where only members of the site can log in and access the site's content. Most private torrent sites operate an invitation-only membership policy.

([30]) Ripping is extracting all or parts of the digital content from a container. Originally it meant extracting WAV or MP3 format files from digital audio CDs. However, it can also be applied to extracting the contents of any media, most notably DVD and Blu-ray discs. Stream ripping refers to saving streamed content as files.

([31]) From BitTorrent, a communication protocol for file sharing.

3 Data

The basic data for this study comes from tracking traffic to piracy websites, sourced from MUSO and further described in Section 3.1. Additional data was used to put the traffic into context and to analyse it, including:

- number of internet users in each country;
- socio-economic variables such as per capita income and measures of income inequality;
- legal digital offer: internet and broadcast platforms;
- perception, awareness and behaviour in respect of piracy.

The data was sourced mainly from Eurostat, from the European Audiovisual Observatory and, for data on consumer perception and attitudes, from the EUIPO IP Perception Study([32]).

3.1 MUSO: tracking piracy

MUSO is a London-based company that provides statistics on piracy activity, by tracking online consumption of copyrighted content such as music, films, television, publications or software. It also provides information about the audiences of piracy websites([33]) and their behaviour.

MUSO provided the EUIPO with data on the illegal consumption of digitally pirated films, TV shows and music gathered over a 48-month period, between January 2017 and December 2020 in all 27 EU Member States and the UK. The MUSO figures represent absolute 'activity' values; visits to

([32]) EUIPO (2020): European citizens and Intellectual Property. Perception, awareness and behaviour.

([33]) MUSO has developed a database of more than 100 000 piracy sites that are actively monitored. Shutdowns, moves and domain changes are tracked and the sites are classified by piracy category and the type of content on offer. A combination of automation, machine learning and human verification is used to identify new sites and to detect redirects, mirror sites and proxies.

piracy sites that represent individual accesses that could be associated with the consumption of a creative work.

This 'activity' is used as the basic data unit in this report. Specifically, the consumption of pirated digital content is defined as the average number of 'activities' per internet user per month in each country and period.

The MUSO information is detailed by geographical location, (i.e. the country of residence of the consumer of copyright-infringing content), for the 27 EU Member States and the UK, by the method of access (streaming, torrent([34]), download and stream ripping) and by the type of creative work (music, film or TV content) accessed. The data also shows whether access was requested from a computer or from a mobile client (browser, torrent client or other).

For accesses after 2017, the data also shows the origin of the traffic to piracy sites, indicating how audiences are discovering piracy content. A visit can come from one of the following 'traffic sources'.

- **Direct**: traffic sent from users via a direct URL address entered into a browser, saved bookmark or a link from outside the browser (e.g. Microsoft Word, Popup ads, Autofill).
- **Search**: traffic sent via the results on search engines such as Google or Bing and search partners. This section includes both organic and paid search traffic.
- **Referral**: traffic sent via links from other domains such as affiliates, partners, news coverage, review sites and direct media buying (not through advertising networks).
- **Social**: traffic sent from social media sites such as Facebook or Reddit.
- **Mail**: traffic sent from web-based mail clients.
- **Display ads**([35]): traffic sent from other domains via a known ad-serving platform or banner or content suggestion ads (e.g. Doubleclick, Taboola).

([34]) MUSO distinguishes between public and private Torrent, however the data has been aggregated in this study since this division does not provide any relevant information.

([35]) The accesses originated by 'Mail' and 'Display ads' have been aggregated in this study since the figures are very small.

Altogether, the total number of accesses (activities) reported by MUSO during the 48 months amounts to more than 131 billion connections grouped into 241 920 aggregates (broken down by months, countries, content type, method of piracy, source and type of device). Table 6 shows a summary by content type.

Table 6. Total accesses by year (billions)

YEAR	TOTAL	TV	FILM	MUSIC
2017	41 434	24 469	8 410	8 556
2018	35 110	22 456	6 893	5 761
2019	31 039	20 981	6 304	3 753
2020	23 511	16 511	4 619	2 380
Total	**131 094**	**84 417**	**26 226**	**20 450**

Source: own calculations based on MUSO data

3.2 EUROSTAT: internet usage, income, population

In order to compare data among countries, the number of accesses to copyright-infringing websites has to be normalised to take the different population sizes into account. For this normalisation, the number of 'regular internet users' from January 2020, as reported by Eurostat, was used. There were 284 million internet users in the European Union (86 % of the population aged 16 to 74) ([36]). Table 7 shows the number of users in each Member State and in the UK.

([36]) Data is based on annual questionnaires on ICT (information and communication technologies) of individuals aged 16 to 74. The size of the sample framework was calculated based on Eurostat table demo_pjan (population on 1 January by age and sex), adding up the population aged 16 to 74. The UK population and ICT for France in 2020 were not available: 2019 was used instead.

Table 7. Individuals regularly using([37]) the internet in 2020 (thousands)

Country	Pop. 16-74	%	Internet users
AT	6 680	86	5 744
BE	8 418	90	7 576
BG	5 263	69	3 631
CY	675	91	614
CZ	8 035	86	6 910
DE	61 461	93	57 159
DK	4 290	97	4 161
EE	971	88	854
EL	7 875	77	6 064
ES	35 352	91	32 170
FI	4 069	95	3 866
FR*	48 084	87	41 833
HR	3 055	78	2 383
HU	7 437	84	6 247
IE	3 590	89	3 195
IT	44 278	76	33 651
LT	2 071	82	1 698
LU	478	96	459
LV	1 393	87	1 212
MT	403	86	347
NL	13 028	93	12 116
PL	29 022	81	23 508
PT	7 686	76	5 842
RO	14 526	76	11 040
SE	7 411	95	7 040
SI	1 568	85	1 333
SK	4 196	88	3 692
EU27*	**331 313**	**86**	**284 345**
UK*	48 381	96	46 446

Source: Eurostat, tables tin00091 (25-05-2021) and (*) Estimations, see footnote

([37]) Regular use: at least once a week on average within the last 3 months before the survey. Use includes all locations and methods of access and any purpose (private or work/business-related). See ICT usage in households and by individuals (isoc_i).

Table 8. Individuals (aged 16 to 74) regularly using the internet in Europe, evolution (thousands)

YEAR	EU27		EU28	
2017	261 835	79%	306 505	81%
2018	269 704	81%	315 037	83%
2019	277 886	84%	323 848	85%
2020	284 345	86%	330 791	87%

Source: own estimations based on Eurostat data

To compare the data between countries, the intensity of the piracy was calculated by dividing the accesses by the number of internet users, more precisely the population aged between 16 and 74 who accessed the internet at least once a week([38]).

The number of internet users grew by 8 % between 2017 and 2020 in the EU27, reflecting population growth and the increasing intensity of internet use.

In addition to the data on internet use, Eurostat was also the source of the socio-economic data used in the econometric analysis, including the proportion of young people, per capita income and income inequality. These data sources are discussed in Section 5.

3.3 European Audiovisual Observatory: online legal offer, TV offer

The European Audiovisual Observatory provides statistical and analytical information on film, television, video/DVD, new audiovisual media services and public policy related to film and television.

([38]) This is the age group used in Eurostat's ICT survey.

The European Audiovisual Observatory, supported by the EU's CREATIVE EUROPE programme, created the MAVISE database of TV and on-demand audiovisual services and companies across Europe. As of November 2021, MAVISE contained information from 41 European countries and Morocco.

3.4 IP Perception Study: legal offer awareness, receptivity to piracy, awareness of risk

Several variables from the IP Perception Study([39]) were used in the econometric analysis. These variables can be grouped into three groups, shown in Table 9.

Table 9. IP perception questions

IP Perception – attitudes to piracy

Question	Label
q3_5	**It is acceptable to obtain content illegally from the internet when there is no immediately available legal alternative.**
q3_6	It is acceptable to obtain content illegally from the internet when it is for my personal use.
q4b_1	Accessed, downloaded or streamed illegal content intentionally (during the past 12 months).

([39]) EUIPO (2020).

IP Perception – awareness of legal offer

Question	Label
q4b_2	**Paid to access, download or stream copyright-protected content from a lawful source (during the past 12 months).**
q6.1	**Are you aware of lawful MUSIC services accessible in your country to access, download or stream?**
q6.2	**Are you aware of lawful FILM services accessible in your country to access, download or stream?**
q6.3	**Are you aware of lawful TV SERIES services accessible in your country to access, download or stream?**
q6.4	Are you aware of lawful LIVE SPORTS EVENTS services accessible in your country to access, download or stream?

IP Perception – 'piracy reducers'

Question	Label
q9.1	What would stop you from using illegal sources: risk of punishment.
q9.2	**What would stop you from using illegal sources: personal bad experience with illegal sources.**
q9.3	What would stop you from using illegal sources: bad experience of others with illegal sources.
q9.4	What would stop you from using illegal sources: availability of affordable content from legal sources.

Source: EUIPO: IP Perception study 2020

Because these variables are correlated, they cannot be used simultaneously in a regression analysis. Therefore, additional statistical analysis was carried out to determine which of the variables within each group had the greatest explanatory power. In the table above, the variables that were used in the regressions are shown in bold.

4 Findings

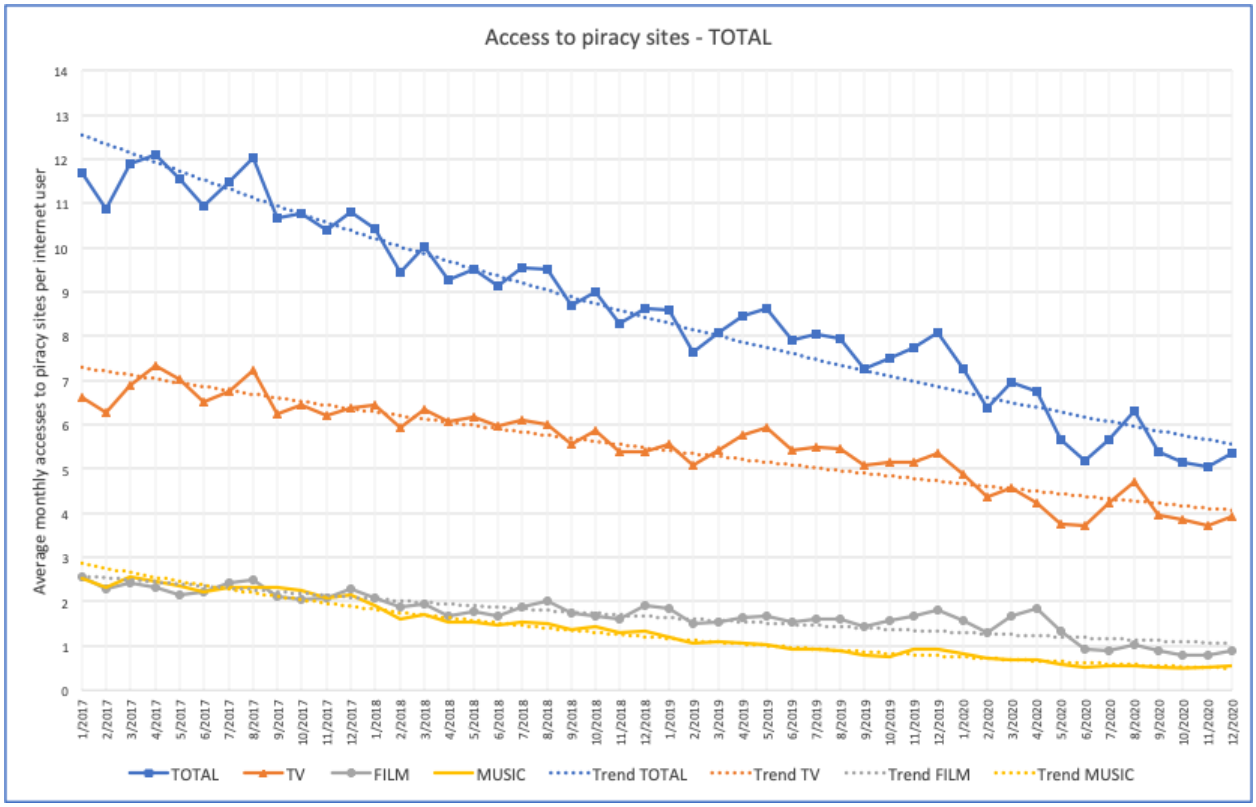
This section presents descriptive statistics for the consumption of pirated content between January 2017 and December 2020. The trend during the period is shown for total piracy and for the three content types separately (film, music, TV), as well as access methods and consumption rates per country. The basic unit of analysis is the number of activities (accesses) per internet user per month.

The data is presented graphically; however, the data underlying the graphs in this section is shown in the Annex.

4.1 Total piracy

Figure 3 shows that piracy continually dropped from 2017 in all three types of content. However, as can be seen in Table 9, the pace of the decline varied among the content types.

Figure 3. Access to pirated content in EU28 by content type, 2017-2020.



Overall, piracy declined from 11.7 accesses per internet user per month in January 2017 to 5.3 in December 2020. During the same period, TV piracy declined from approximately 6.6 to just under 4 accesses per user per month. Film piracy declined from 2.6 accesses per user in January 2017 to 0.9 accesses per user in December 2020, while music piracy fell from 2.5 to 0.5 accesses per user per month.

Table 10 shows the annual rates of decline and the overall decline during the entire 4-year period.

Table 10. Inter-annual [40] evolution of piracy (%)

YEAR	TOTAL	TV	FILM	MUSIC
2017 [41]	−10.8	−2.9	−18.9	−23.5
2018	−20.1	−15.2	−16.4	−38.4
2019	−6.3	−1.0	−4.7	−30.2
2020	−33.8	−26.9	−50.6	−40.9
Total 2017-2020 [42]	**−55.8**	**−40.4**	**−68.1**	**−80.6**

Source: own calculations based on MUSO data

Music piracy has shown a steady pattern of decline while TV and film piracy has shown a more variable pattern alternating between years of minor drops and years of major drops. In 2019, TV and film piracy were almost level, but both declined in 2020.

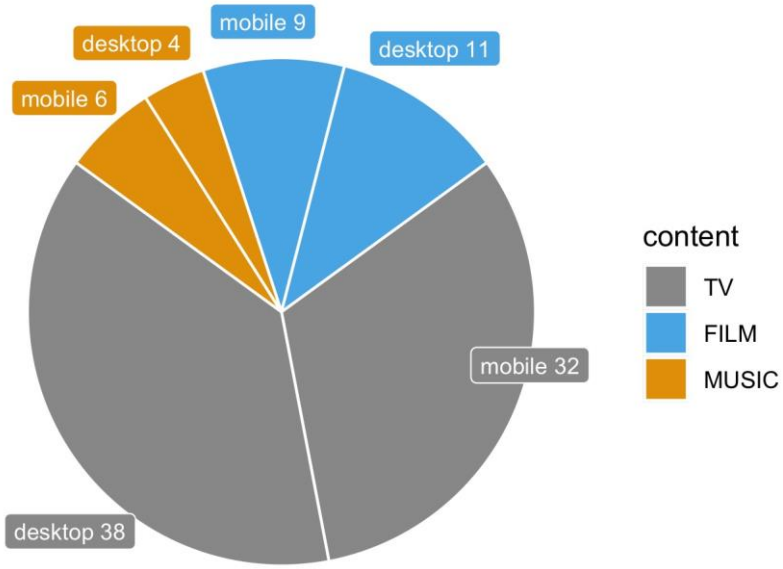
Figure 4 shows the distribution of access to pirated content in 2020 across the three content types and the desktop/mobile dimension.

([40]) The inter-annual value is calculated by taking the value in December and comparing it to the December value of the previous year.

([41]) The year-on-year value for December 2017 could not be calculated because the December 2016 value was not available. As a proxy, the year-on-year value for January 2018 was used instead; in the complete series, December and January have shown similar values.

([42]) The base of the inter-annual growth changes. Therefore, the total cannot be calculated by adding the different inter-annual growth indices, g_i, but by using the formula $1 - \prod(1 + g_i)$.

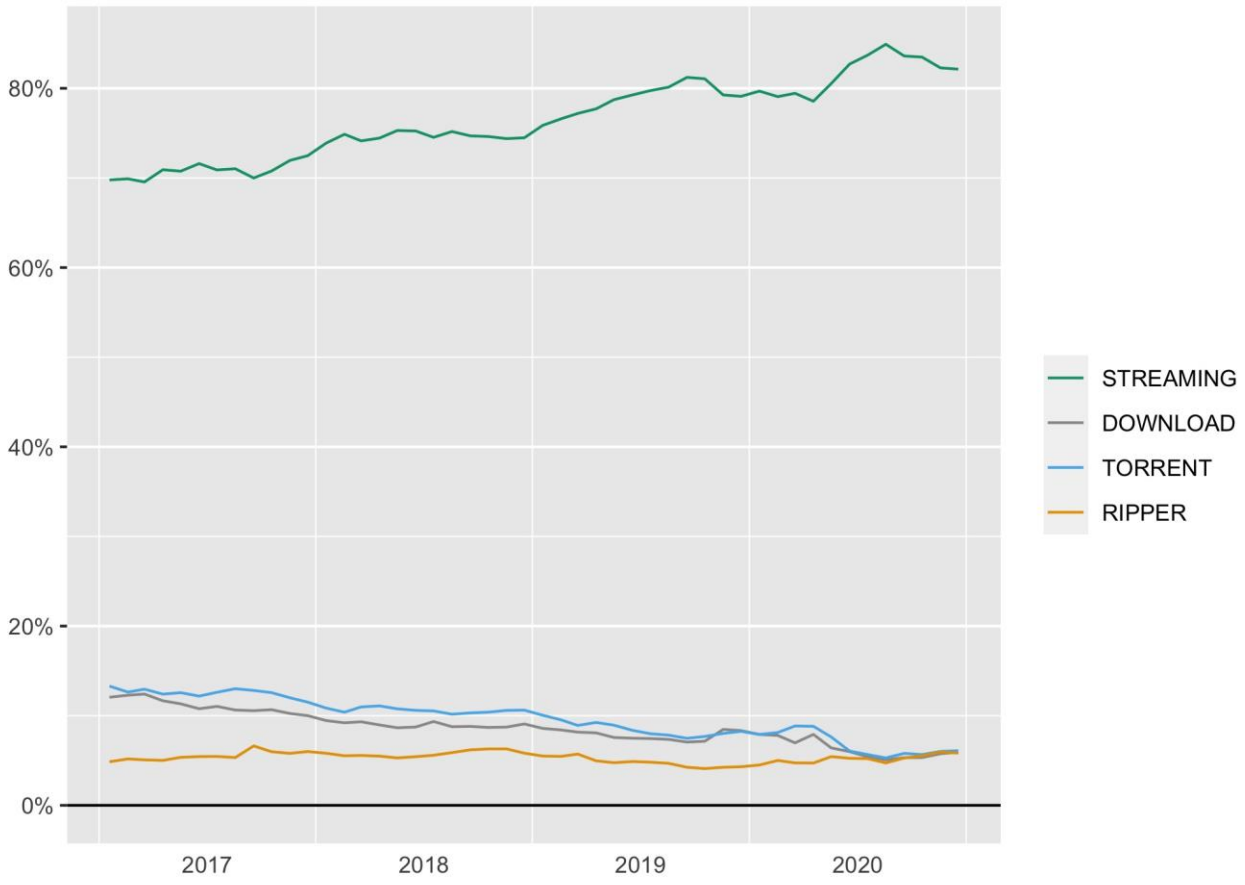
Figure 4. Access to pirated content by content type and device, 2020



TV copyright infringement represented 70 % of the total, followed by film at 20 % and music at 10 %. The use of desktop devices to access illicit TV and film content is greater (about +20 %) than the use of mobile devices, while in the case of music, mobile devices are predominant.

Figure 5 shows the percentage evolution in the use of the different methods used to access pirated content. The use of torrent and download is declining (from nearly 12 % each in 2017 to less than 7 % in 2020), while streaming, for TV and film, is increasing and ripping remains stable as a proportion of the total. Ripping has now become dominant in music piracy, accounting for half of these accesses.

Figure 5. Piracy by access method, 2017−2020



On average, in 2020, streaming represented 82 % of total piracy in the EU.

Figure 6 shows the breakdown by traffic source, that is, how the audiences discovered piracy content. Direct traffic (sent to users via a direct URL address entered into a browser) dominates the traffic types, rising from 56 % in 2017 to 65 % in 2020. The share of traffic sent via the results on search engines (both organic and paid search traffic) declined from an average of 31 % in 2017 to an average of 25 % in 2020. Other sources, such as referral (news, review sites), social media, web mail or ads were stable as a proportion, thus declining in absolute terms.

Figure 6. Piracy breakdown by traffic source, 2020

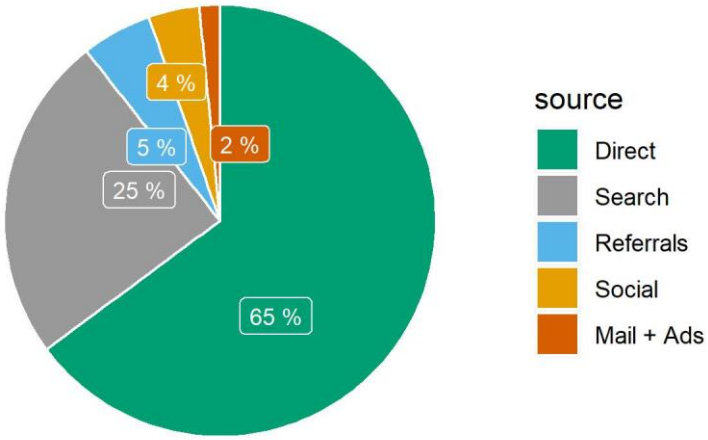
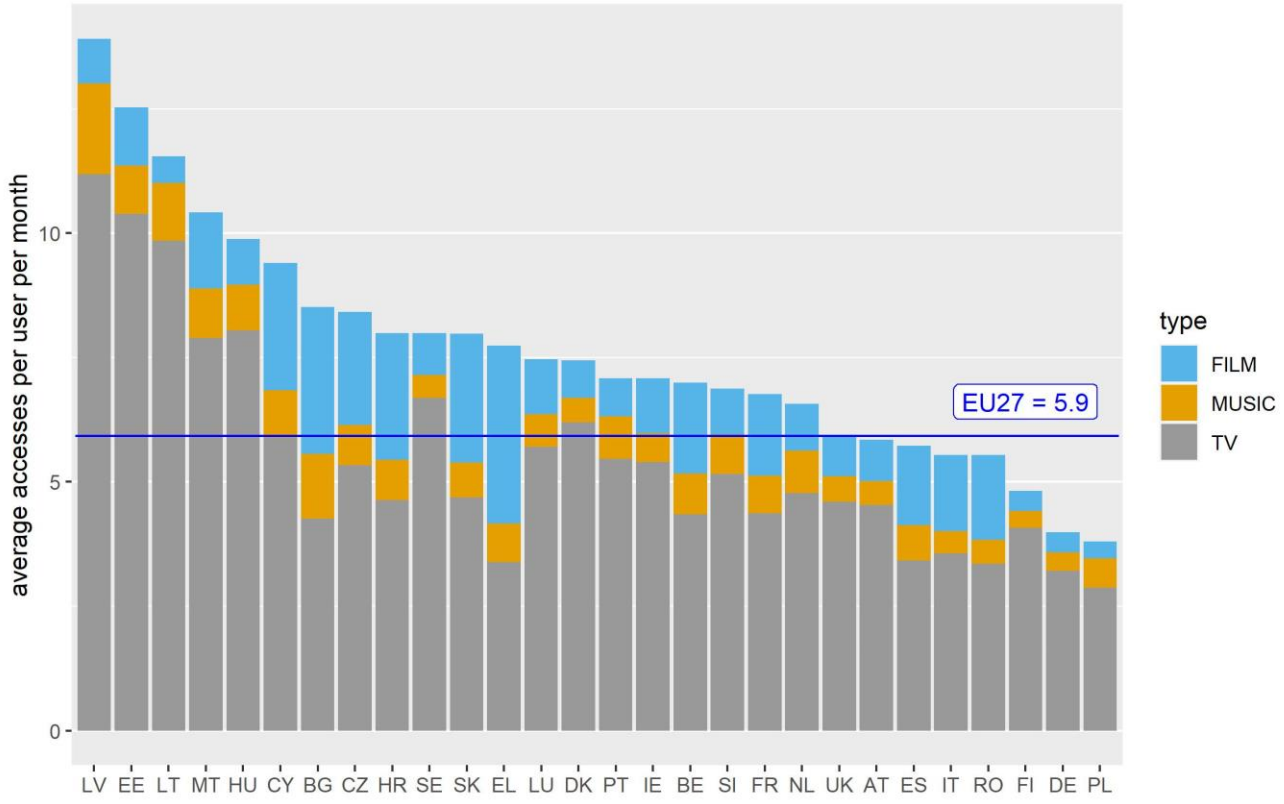


Figure 7 shows the piracy levels for each EU Member State and the UK, broken down by content type accessed. Latvia, Estonia and Lithuania exhibited the highest number of monthly accesses to pirated content per user, at 13.9, 12.5 and 11.5 respectively.

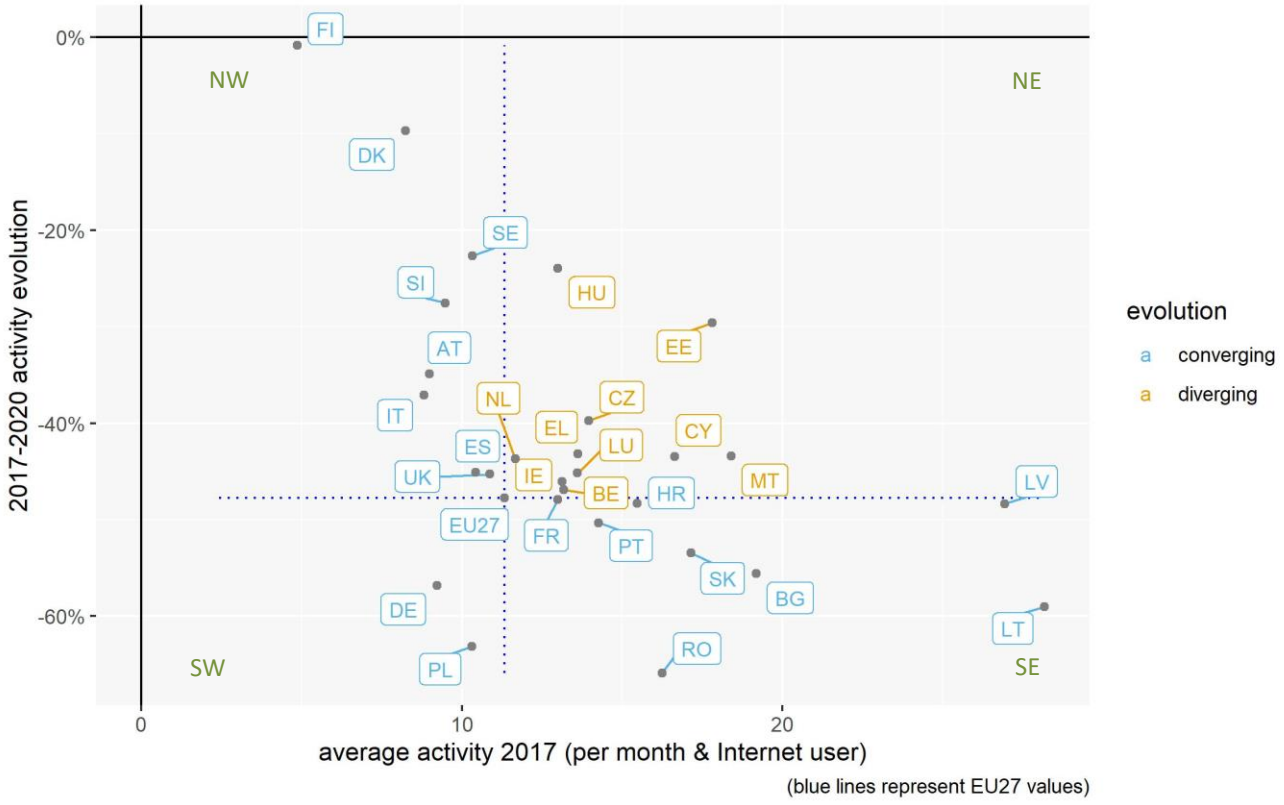
Figure 7. Total piracy by country and content type, mean value in 2020



Poland, Germany and Finland have the lowest rates at 3.8, 4.0 and 4.8 accesses per user per month respectively. Spain, Italy, Austria and Romania are also below the EU average of 5.9.

Figure 8 shows the piracy trend per country. The horizontal axis shows the average piracy level during 2017. The vertical axis shows the rate of growth or decline in piracy from 2017 to 2020.

Figure 8. Total piracy trends by country, 2017−2020



The dotted vertical line represents the EU27 average piracy rate in 2017 (11.3 accesses per internet user per month), while the dotted horizontal line represents the rate of decline from 2017 to 2020. The two dotted lines then divide the diagram into four quadrants with the following characteristics.

- In the SW quadrant are the countries that were below the EU average in 2017 and that declined faster than the EU average during the subsequent 3 years. This group of countries includes Germany and Poland.

- In the SE quadrant are the countries that were above the EU average in 2017 but declined faster than the EU overage during the subsequent 3 years. These countries include Bulgaria, France, Croatia, Latvia, Lithuania, Portugal, Romania and Slovakia.

- In the NW quadrant are the countries that were below the EU average in 2017 and that declined slower than the EU average during the subsequent 3 years. These include Denmark, Spain, Italy, Austria, Slovenia, Finland and Sweden.

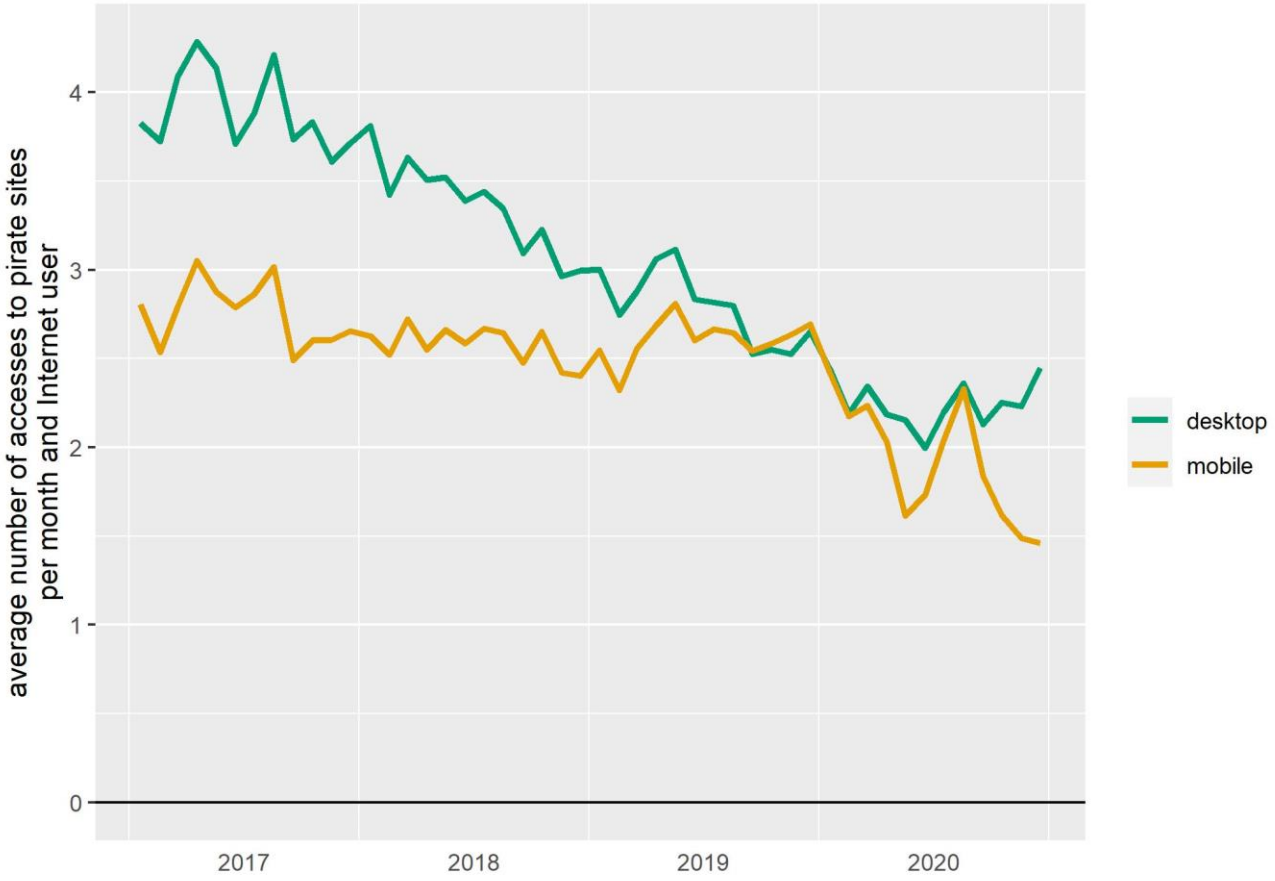
- In the NE quadrant are the countries that were above the EU average in 2017 and that declined slower than the EU average during the subsequent 3 years; this group, called 'diverging' in the figure, includes Belgium, Czechia, Estonia, Ireland, Greece, Cyprus, Luxembourg, Hungary, Malta and the Netherlands.

Consumption of pirated content fell in all countries except for Finland where it remained stable but slightly below the EU average.

The Annex contains graphs showing the evolution of piracy in all 28 countries.

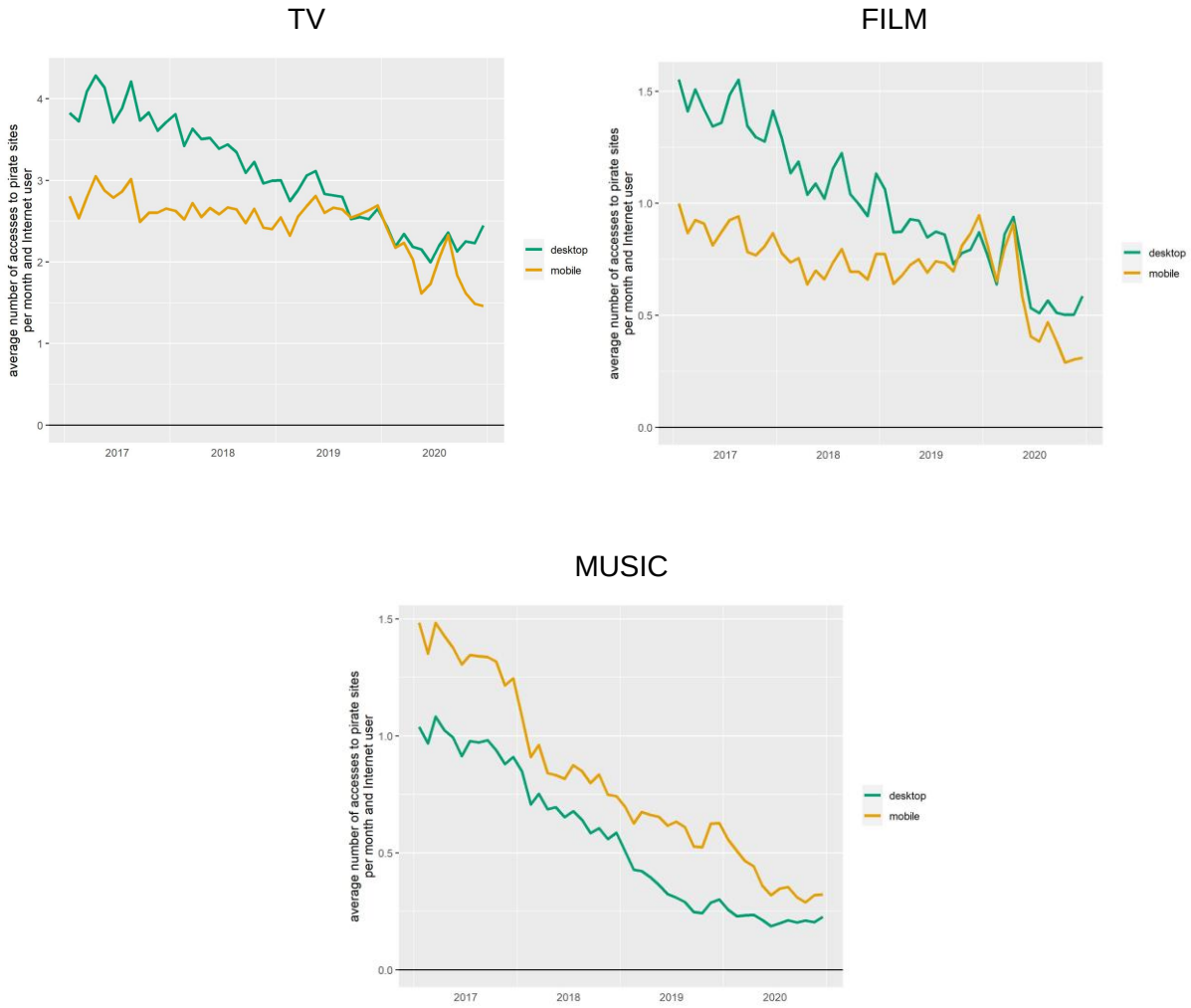
Figure 9 shows the breakdown of total piracy per device, either desktop or mobile.

Figure 9. Total piracy by device, 2017-2020



A continued decline in desktop use can be observed, a decline that stops around the second quarter of 2020, possibly as a result of the COVID-related confinement in various countries. The decline in mobile use stalled at the beginning of 2019 but then began to fall again in 2020, again falling below desktop use. With minor differences, this pattern is similar for all three types of content. It could be that the shift in preference to mobile devices noted in 2019 was halted by the pandemic in 2020. In the case of music, however, mobile access is greater than desktop access throughout the period.

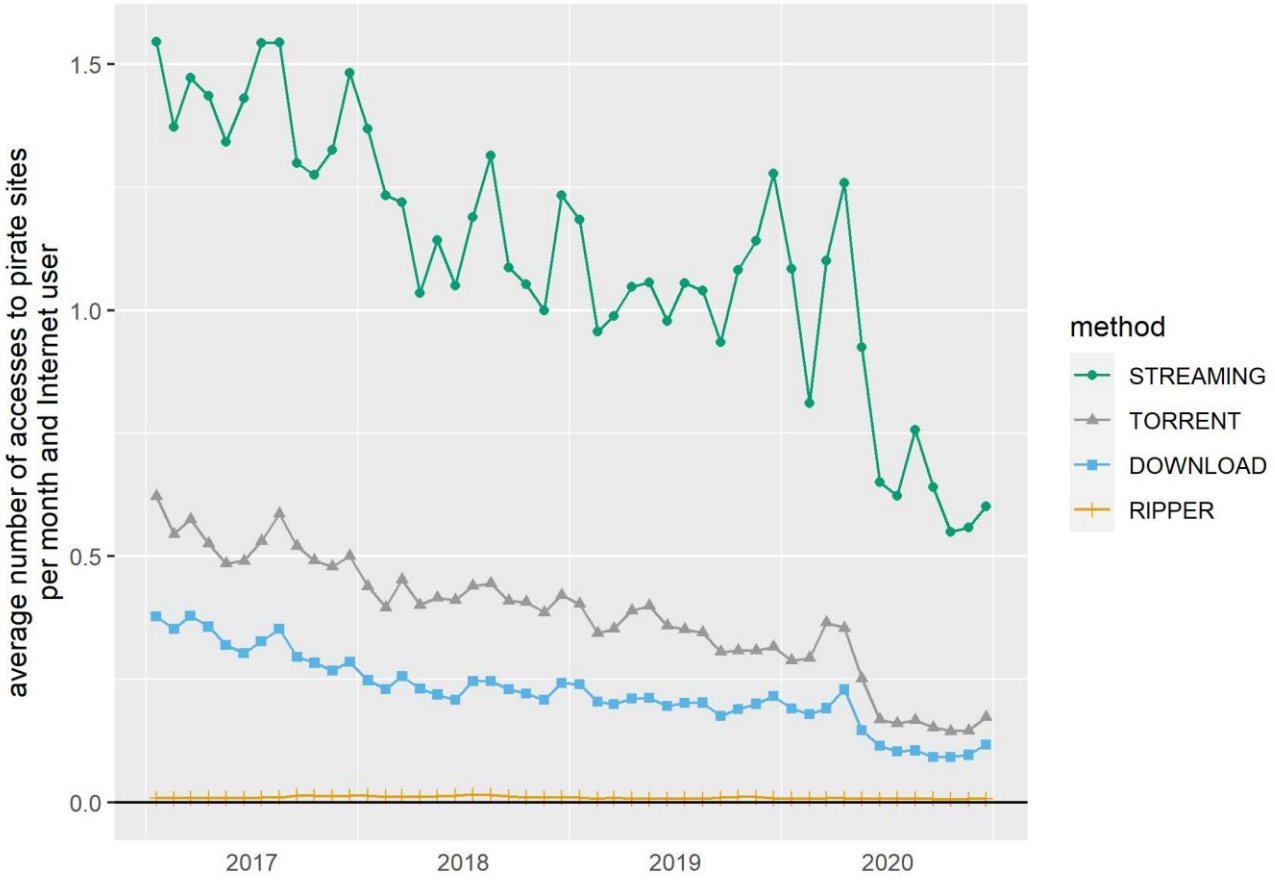
Figure 10. Piracy by device and content type, 2017-2020



4.2 Film

Figure 11 shows the evolution of piracy in the EU28 broken down by access method. Film piracy is concentrated in streaming (68 % in 2020), but there is also considerable activity in torrent (20 %) and download. Ripper activity for films is negligible.

Figure 11. Film piracy by month, 2017-2020



Film piracy shows a notable decline since 2017, however, the decline has not been constant. This can be better appreciated in Table 11, which shows inter-annual piracy growth rates (year-on-year) for December of every year.

Table 11. Inter-annual ([43]) evolution, film piracy (%)

	STREAMING	DOWNLOAD	TORRENT
2017 ([44])	–11.4	–34.2	–29.3
2018	–16.8	–15.0	–16.0
2019	+3.6	–10.9	–24.9
2020	–52.9	–45.9	–45.3

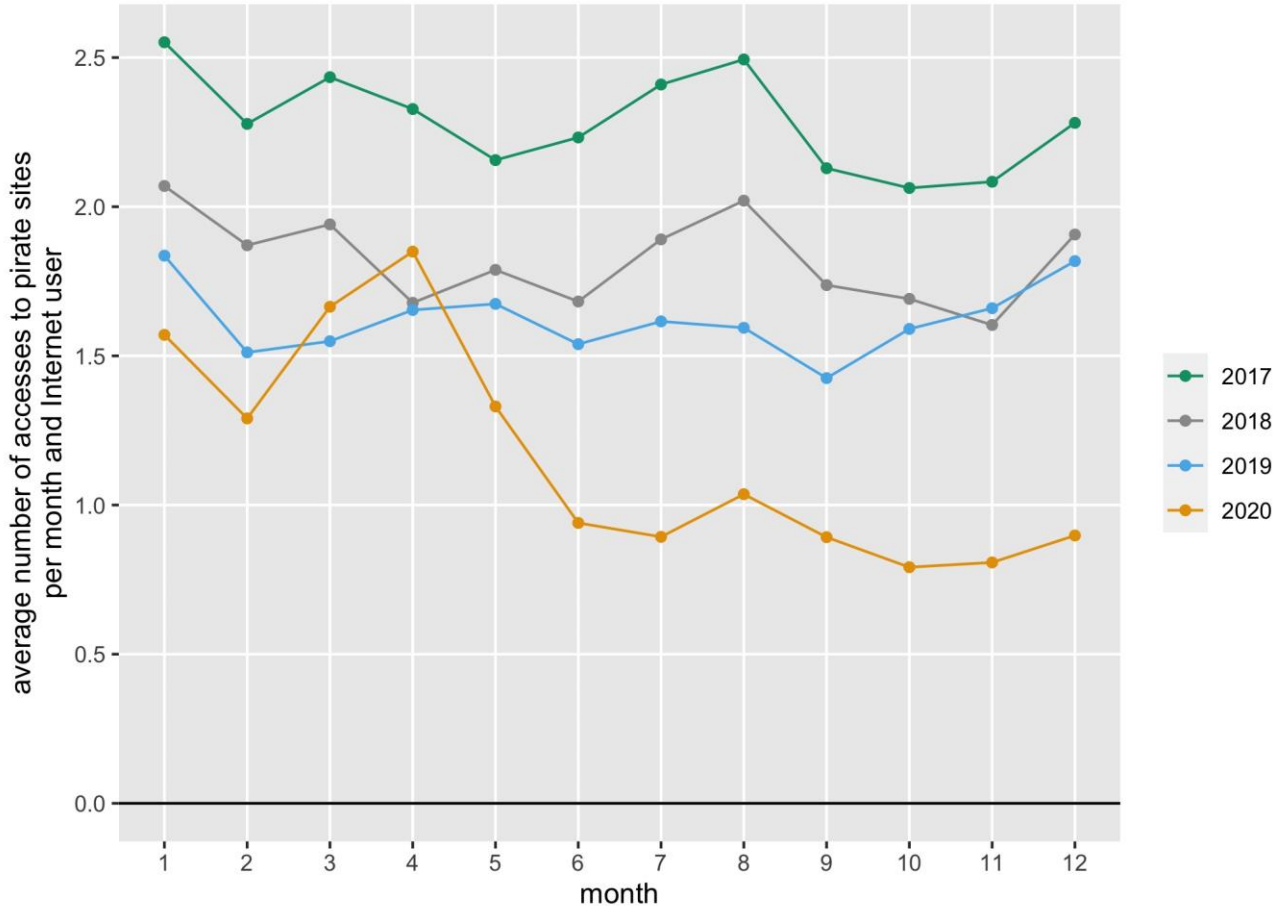
A small increase in streaming piracy can be observed in 2019.

Figure 12 shows the evolution of film piracy in another way. Each line represents one of the four years 2017 to 2020 with the months on the horizontal axis. A seasonal pattern can be observed in film piracy (it is likely that a similar pattern holds for legal consumption as well). December, January and August each year tend to have more piracy than the adjacent months. This may be because in those months there are holiday periods and, although winter holidays (December and January) are shorter than summer (August), people spend more time at home and therefore more films are watched.

([43]) The inter-annual value is calculated by taking the value in December and comparing it to the December value of the previous year.

([44]) The inter-annual value for January 2017 to January 2018 was used as a proxy for the 2017 evolution since the December 2016 observation was not available.

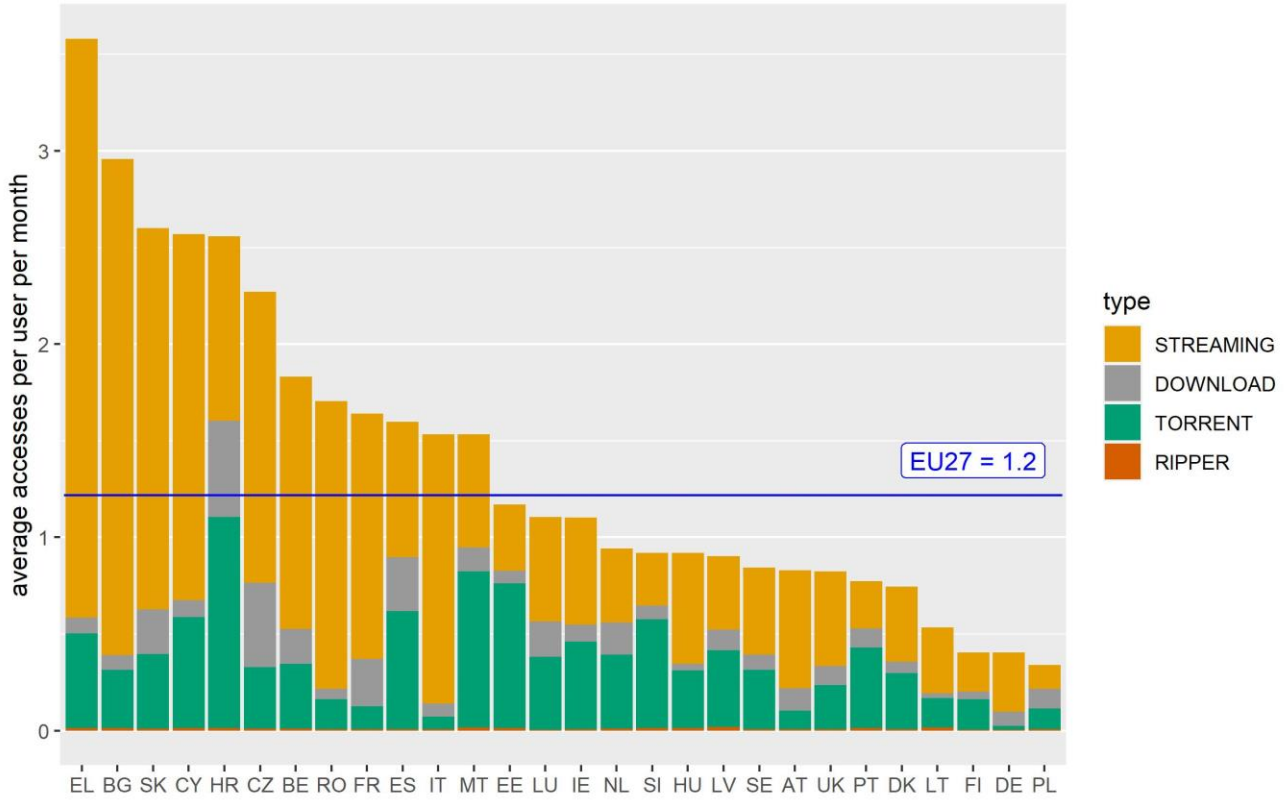
Figure 12. Film piracy by month, EU28



This graph makes it easier to compare the evolution of piracy in different years. The difference between December of one year and December of the previous year, is the change from one year to the next, labelled 'inter-annual evolution' above. The graph also illustrates the abnormal behaviour in March and April 2020, at the time of the lockdowns, when film piracy spiked upwards temporarily.

Figure 13 shows film piracy by country in 2020. The EU average is 1.2 accesses to film piracy sites per internet user per month. In Greece, this figure is 3.6 accesses; at the other extreme is Poland with 0.3 accesses. Belgium, Bulgaria, Czechia, Greece, Spain, France, Croatia, Cyprus, Malta, Romania and Slovakia are above the EU average in film piracy.

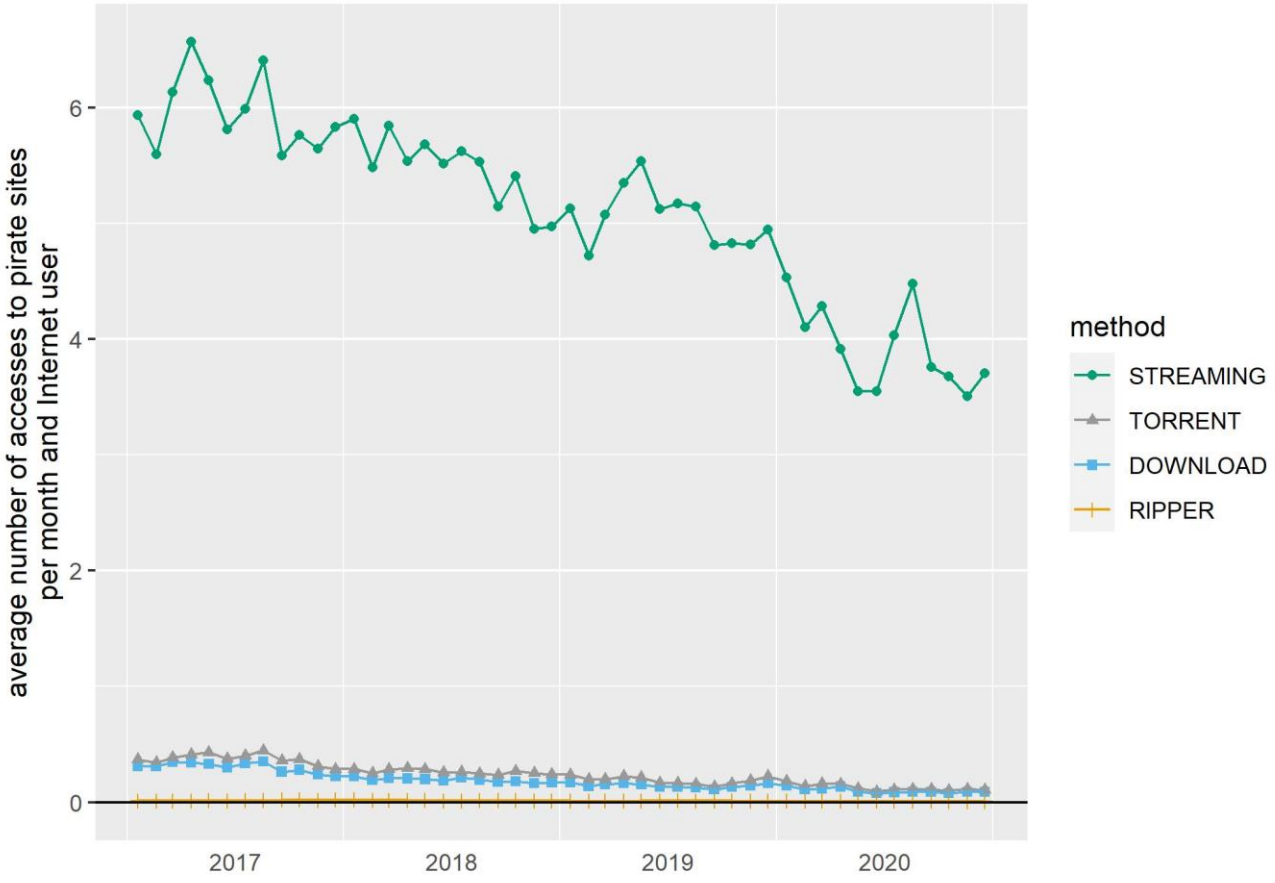
Figure 13. Film Piracy by country and by access type, 2020



4.3 TV content

Figure 14 shows the evolution of TV piracy in the EU28 broken down by access method. Pirated TV content is mainly accessed through streaming, which accounted for 69 % of illicit TV consumption in 2020.

Figure 14. TV Piracy trends, 2017−2018



Of the three main content types studied in this report, TV has experienced the slowest decline in piracy, with the average number of monthly accesses per user falling by 37.5 % from 2017 to 2020.

Similarly to film, the pace of descent for TV was not uniform throughout the period, as shown in Table 12.

Table 12. Inter-annual ([45]) evolution, TV piracy (%)

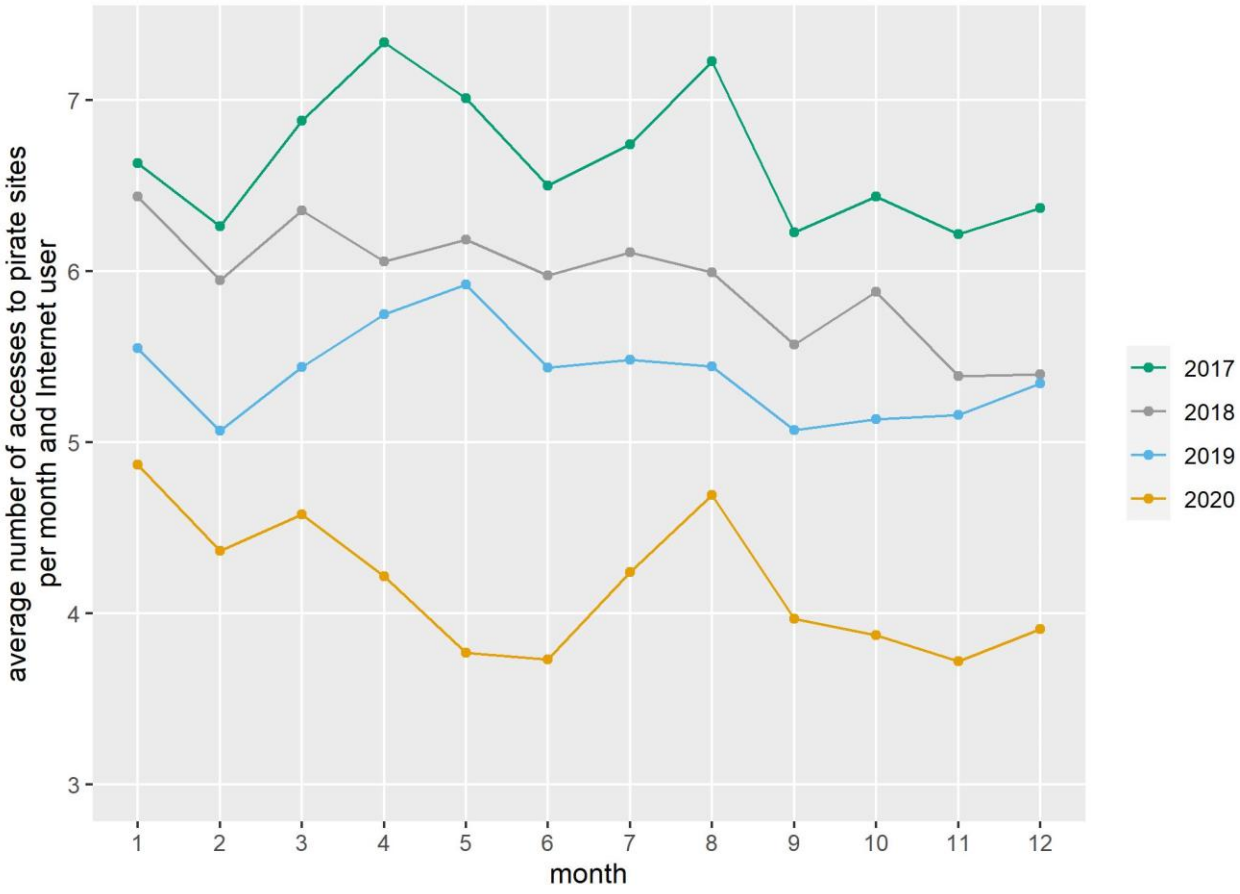
	STREAMING	DOWNLOAD	TORRENT
2017 ([46])	−0.5	−22.8	−28.0
2018	−14.7	−16.2	−25.0
2019	−0.6	−6.4	−3.6
2020	−25.1	−53.1	−45.9

Television piracy dropped slightly in 2017, followed by a significant drop in 2018. 2019 was a stable year, while the biggest drop registered in the study was during 2020.

([45]) The inter-annual value is calculated by taking the value in December and comparing it to the December value of the previous year.

([46]) The inter-annual value for January 2017 to January 2018 was used as a proxy for the 2017 evolution since the December 2016 observation was not available.

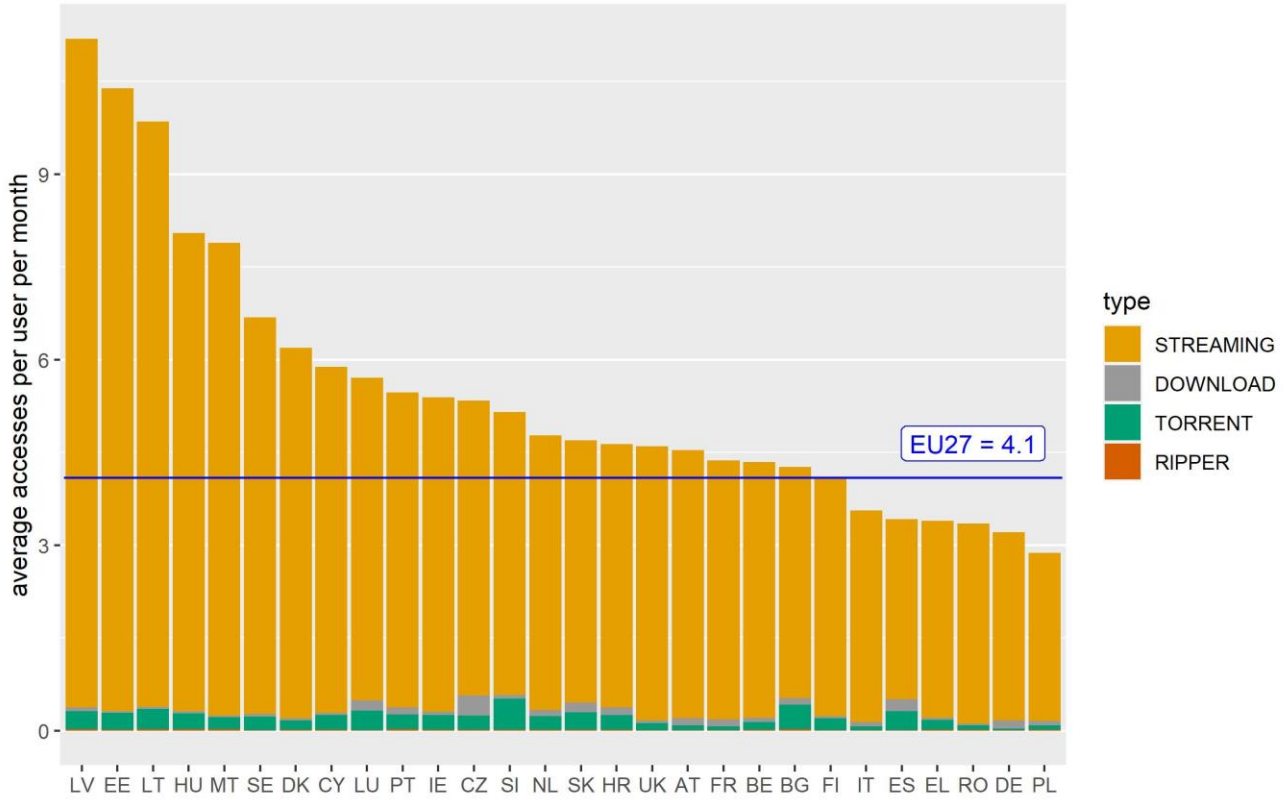
Figure 15. TV piracy by month, EU28



Analogously to Figure 12 for film, Figure 15 shows each of the 4 years of the period as a separate line. TV piracy exhibits a weaker seasonal pattern than film. The confinement in the spring of 2020 did not produce a clear uptick in TV piracy as it did for film piracy. Indeed, 2020 showed the greatest decrease in TV piracy during the study.

As shown in Figure 16, TV piracy is particularly common in the three Baltic Member States. Latvian internet users access pirated TV content on average 11.2 times per month, with Estonian and Lithuanian users not far behind. At the other extreme, Polish internet users access this illicit content 2.9 times per month. Only six countries (Germany, Italy, Greece, Spain, Poland and Romania) have TV piracy levels below the EU average of 4.1 accesses per internet user per month.

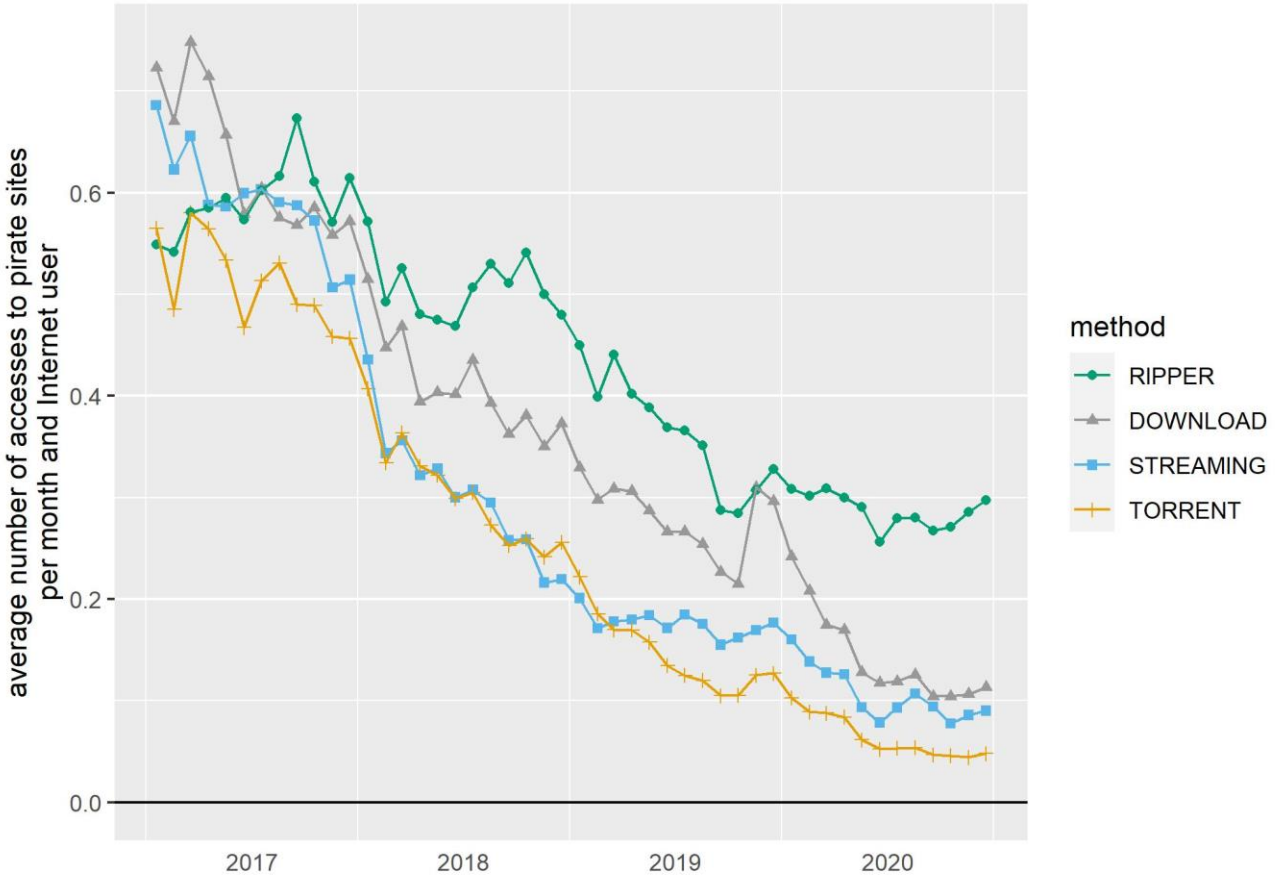
Figure 16. TV piracy by country and by access type, 2020



4.4 Music

As noted above, music has been experiencing lower levels of piracy than the other two content types in recent years. Figure 17 shows the evolution of music piracy in the EU28 broken down by access method. While in 2017, music piracy was carried out using the four access methods equally, in 2020 ripper had become the dominant method, accounting for half of all activities, as shown in Figure 18.

Figure 17. Music piracy trends, 2017−2020



Consumption of pirated music decreased by 74 %([47]) during the period. As shown in Figure 17, the reduction was in all types of access, although the fall in ripper activity was modest. In 2020, the average internet user in the EU accessed pirated music 0.6 times per month, compared to 2.3 in 2017.

([47]) Comparing the average of 2017 to the average of 2020.

Figure 18. Music piracy by access type, EU28, 2020

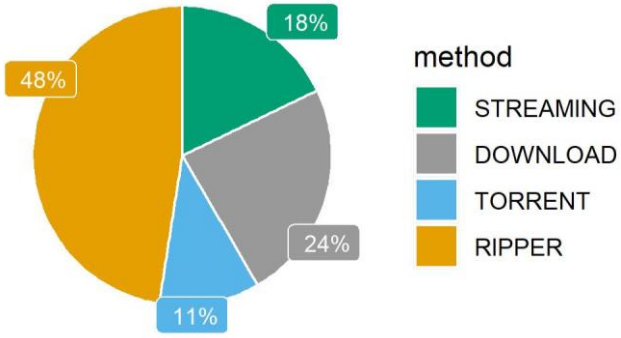
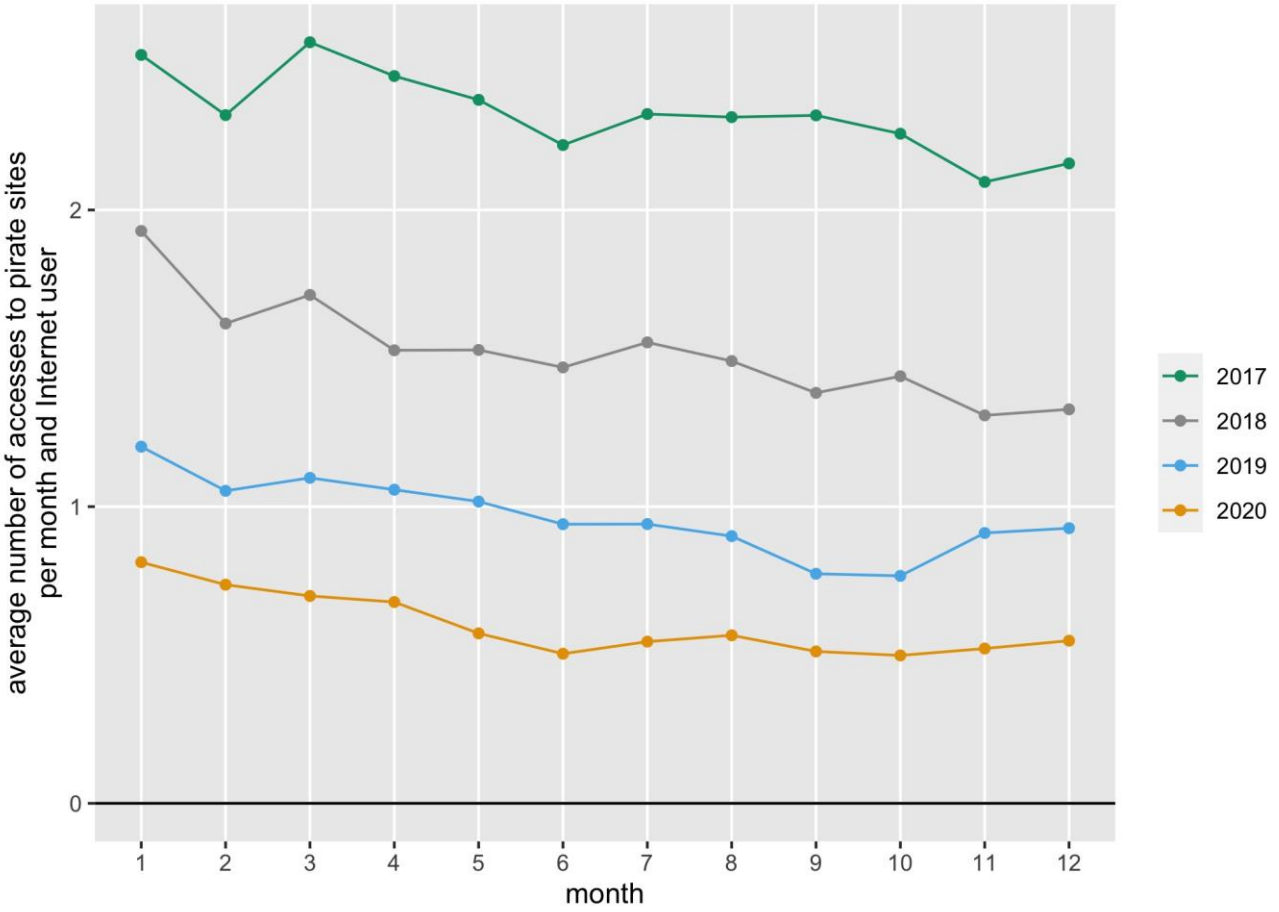


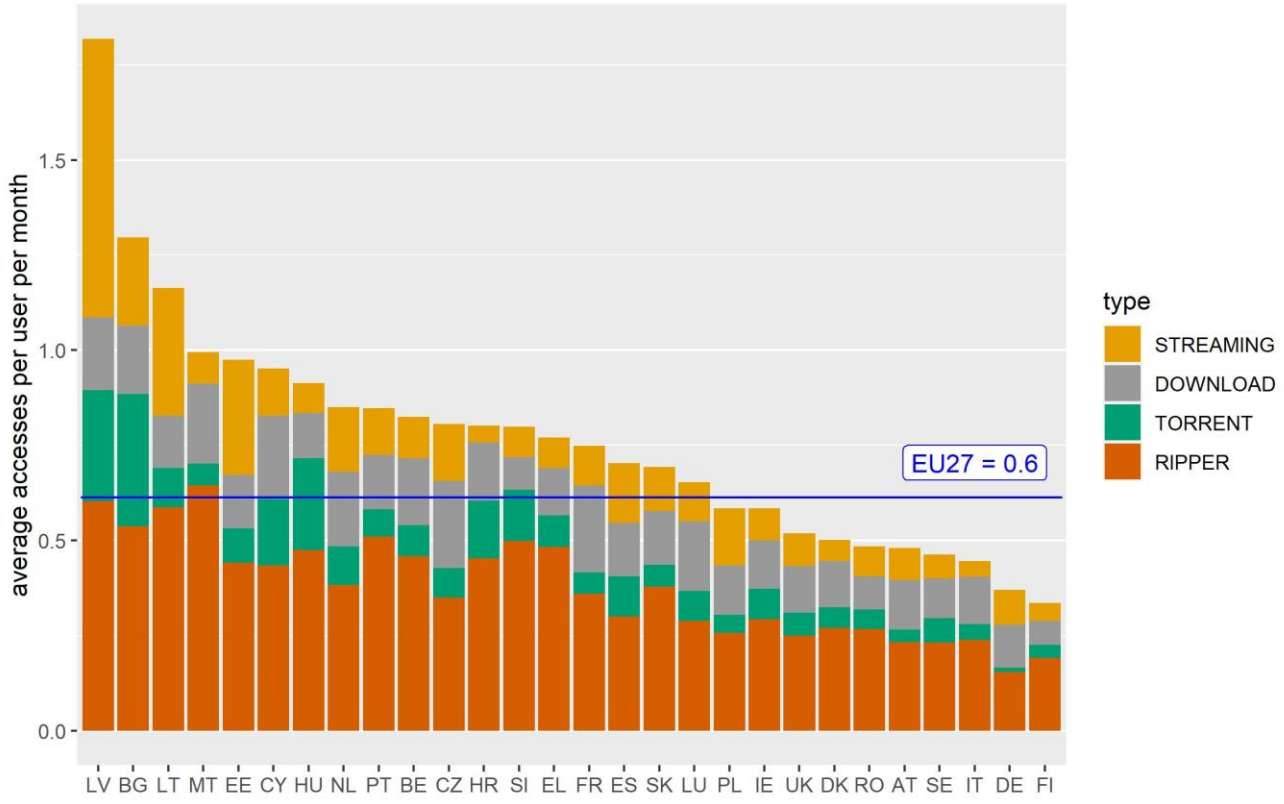
Figure 19 shows each of the 4 years on a separate line, analogous to Figures 12 and 15. There is no indication of any COVID impact on music piracy.

Figure 19. Music piracy by month, EU28



Finally, Figure 20 shows music piracy for each Member State and the UK in 2020. Latvian internet users access sites providing pirated music on average 1.8 times per month, followed closely by users in Bulgaria (1.3) and Lithuania (1.2). At the other extreme lies Finland with 0.3 accesses to pirated music per internet user per month. The EU average is 0.6 and nine Member States lie below that average: Denmark, Germany, Ireland, Italy, Austria, Poland, Romania, Finland and Sweden.

Figure 20. Music piracy by country and by access type, 2020



The figure also illustrates the importance of ripping in music piracy. The differences in the level of ripping between countries are smaller than the differences in total music piracy. There seems to be a group of internet users in each country who habitually engage in this practice.

5 Econometric Analysis

The previous section showed that while piracy of all three types of content has declined from 2017 to 2020 in all countries, it remains significant. In addition, there are large differences from one country to another. In this section, those differences are analysed statistically, with the objective of uncovering the socio-economic, market and other factors affecting piracy levels in a country.

5.1 Drivers of consumption of pirated content

This part of the study aims to analyse the country-level data on the online piracy of creative works from the 28 countries to reveal the factors that drive the differences at country level, shown in the preceding section. This approach was first proposed for physical music piracy in 58 countries by Ki et al.(2006) and later by Walls (2008) for all kind of piracy in films in 26 countries. However, unlike Ki, whose study was based on local surveys, individual research and seizure statistics by affiliate national groups, or Walls, who used International Intellectual Property Alliance (IIPA) estimates, the current study is based on more than 133 billion individual observations of access to illegal sites over a 48-month period, aggregated to country level. This extension allows for the use of specialised data panel methods.

In this section, the average activities (monthly accesses to illicit content per internet user) per country are regressed on a series of variables that, according to the literature, could have an influence on the level of consumption of pirated content in a given country.

This subsection sets out the factors that are thought to influence consumers' propensity to access pirated content. These factors can be grouped into socio-economic, demographic, market characteristics and attitude variables.

This work is a continuation and extension of the analysis done in the 2019 report that covered the 21 months from January 2017 to September 2018. In that report, 19 variables were investigated,

relating to seven hypotheses that were formulated after reviewing the previous literature on piracy drivers.

In the present study, building on the insights from the earlier study, the number of variables has been reduced to the variables discussed below.

5.1.1 Income

At the individual level, consumption of pirated content is often thought to be related to household income, since wealthier households can better afford to pay for legitimate content (Husted, 2000); (Rapp and Rozek,1990). Ki et al. (2006) argues that a country's income influences piracy in two ways:

(1) richer countries tend to have stronger intellectual property protection systems,
(2) consumers in those countries have more available income for the consumption of all goods, including legitimate digital content.

Therefore, the first hypothesis is:

H1: the higher per capita income, the lower the consumption of pirated content per capita.

The variable used was **GDP per capita**. This variable, along with gross national income (GNI) per capita, is the variable most often used in previous studies on piracy. The rationale for choosing GDP per capita was that, unlike GNI per capita data, it was available for the entire period of the analysis, including 2020.

Other income measures could have been used; for example, household disposable income (HDI) measures the income of households (wages and salaries, self-employment income, social benefits, etc.) after considering net interest and dividends received and the payment of taxes and social

contributions. An even better measure would have been household discretionary income([48]). However, no authoritative sources for these income concepts were available for all 28 Member States.

5.1.2 Income inequality

Income inequality can affect the consumption of pirated content. This is because music, film and television programmes that are consumed by higher-income individuals in a given country are also of interest to lower-income individuals, since knowledge of this content is a factor in social interaction([49]). At the same time, low-income individuals, having a reduced ability to pay for legitimate content, may be more likely to use illicit content instead. Ki et al. (2006) examined the impact of income inequality on music piracy rates at the country level and discovered that piracy was significantly related to income inequality.

Therefore, the second hypothesis was formulated as follows:

H2: the higher the income inequality, the higher the consumption of pirated content per capita.

Two variables are often used to reflect social inequality: the Gini coefficient and the youth unemployment rate.

The **Gini coefficient** measures the extent to which the distribution of income within a country deviates from a perfectly equal distribution. A Gini coefficient of 0 would mean perfect equality with everyone having the same income, while a coefficient of 1 corresponds to complete inequality, with all income accruing to only one individual. The values of the Gini coefficient were obtained from the indicator 'ilc_di12' in Eurostat for 2017 to 2020. The average value of the coefficient for the 28 EU

([48]) Discretionary income is disposable income, minus all payments necessary to meet current bills. It is total personal income after subtracting taxes and basic expenses (such as food, medicine, rent or mortgage, utilities, insurance, transportation, property maintenance, child support, etc.) required to maintain a certain standard of living.

([49]) Consumers downloading music illegally are motivated by three basic utilities: economic (saving money), collection (musical enjoyment) and social (increasing interaction and connectivity with others) (Sheehan et al., 2012).

Member States was 0.3, ranging from 0.21 in Slovakia in 2018 and 2020 to 0.41 in Bulgaria in 2019. The 2019 data for the UK and 2020 data for Czechia, Ireland, Italy, Latvia and the United Kingdom was not available at Eurostat.

Youth unemployment rate is the percentage of unemployed individuals in the 15-24 age group compared to the total labour force in that age group (excluding those in education). The values were obtained from the indicator 'une_rt_a' in Eurostat for 2017 to 2020. The value of youth unemployment indicator was not available for the UK for any of the years in the panel ([50]). As an alternative, youth unemployment data for the UK has been sourced from the statistics compiled by the OECD ([51]).

5.1.3 Population structure

The EUIPO IP Perception study (2020) found that while younger consumers are more likely to have paid to access content, they are also more likely to have intentionally accessed content using illegal sources.

Hence, the third hypothesis is:

H3: the higher the proportion of young people in a country, the higher the consumption of pirated content per capita.

The variable **proportion of population aged 15-24** for 2017 to 2020 was sourced from the Eurostat table demo_pjangroup.

5.1.4 Attitude and behaviour

Cesareo & Pastore (2014) found that the 'moral intensity' of the individual negatively influences their intention to participate in digital piracy. In other words, independently of the level of income or other

([50]) See https://ec.europa.eu/eurostat/cache/metadata/en/lfsi_esms.htm.

([51]) https://data.oecd.org/unemp/youth-unemployment-rate.htm.

socio-economic variables, in some countries, consumers have a more permissive attitude towards IPR infringement than in others. This is also one of the findings in the IP Perception studies (EUIPO, 2017; EUIPO, 2020).

Therefore, the fourth hypothesis was:

H4: the more permissive the attitude towards piracy in a country, the higher the consumption of pirated content per capita.

Two questions in the IP Perception studies, q3.5 and q9.2, were considered as measures of attitude.

In **q3.5**, the respondents were asked to indicate the degree of agreement with the statement: 'It is acceptable to obtain content illegally from the internet when there is no immediately available legal alternative'.

The second question, **q9.2** was 'What reason would stop you from using illegal sources: personal bad experience with illegal sources.' Wolfe and Marcum (2008) found that fear of computer viruses affects respondents' intentions to engage in digital piracy. The IP Perception study also indicated that this could be a deterrent to accessing sites providing pirated content.

For each of these two questions, the variable used in the regression was the proportion of respondents who answered either 'Totally agree' or 'Tend to agree'.

As the data for the IP perception studies is only available for 2017 and 2020, the data for 2018 and 2019 was imputted. The values for each country in 2018 have been imputted with the corresponding values of 2017 and the values for 2019 with the corresponding values from the 2020 study.

5.1.5 Digital development and awareness of legal offers

Walls (2008) argues that countries with higher levels of IT infrastructure have lower levels of film piracy. The study found that piracy decreased with the level of overall internet use.

Therefore, the fifth hypothesis was:

H5: the higher the level of digital development, the lower the consumption of pirated content per capita.

Arguably, the quality of the internet infrastructure could also **increase** the consumption of pirated content. After all, the same bandwidth that is used to stream a film from a legal source can also be used to stream content from an illicit source. Therefore, a priori, this hypothesis was not considered particularly strong.

The following variables were considered as proxies for the degree of digital development:

- question **q4b.2** in the IP Perception study: 'paid to access, download or stream copyright-protected content from a lawful source' (proportion of respondents answering affirmatively);
- question **q6.1-4** in the IP Perception study, indicating awareness of legal offers for the various types of content.

Similarly to other data from the IP perception studies, both variables were only available for 2017 and 2020. Data for 2018 and 2019 were inputted using the same procedure as described in subsection 5.1.4.

5.1.6 Market size

Studies of software piracy (Gopal & Sanders, 1998) and music (Ki et al., 2006) have found a negative relationship between the size of a market and the level of piracy, regardless of income levels in the country. The exact nature of the mechanism at work is not clear. Ki et al. (2006) stated that in countries with a large music market, people tended to recognise music as a social value, leading to greater respect for copyright to protect against music piracy. The study found that the size of the music market was significantly and negatively associated with music piracy rates, taking other factors into account.

Therefore, the sixth hypothesis in the present study was:

H6: the bigger the market, the lower the consumption of pirated content per capita.

The **number of internet users in the country**, derived from Eurostat table tin00091, was used as a proxy for the relevant market size.

5.1.7 Legal offer

It has been widely argued that the availability of legal offers reduces piracy and, as seen in the responses to the IP Perception study in 2020, 28 % of respondents across the EU declared it acceptable to obtain online content illegally when there is no immediately available legal alternative.

Therefore, the seventh hypothesis was:

H7: the more extensive the legal offer, the lower the consumption of pirated content per capita.

Three variables were used as proxies for legal offer availability: the **number of online video platforms**, the **number of TV channels** and the **number of music platforms** available in each Member State.

The first two variables were obtained from the MAVISE database of the European Audiovisual Observatory, counting the platforms or channels targeting the market of each country, regardless of the origin of the platform or channel. The data on the number of music platforms was sourced via the International Federation of the Phonographic Industry (IFPI) from the website https://www.promusic.org/.

The 2018 data was sourced from the previous report, published in 2019 (EUIPO, 2019). The number of platforms for 2020 was derived from the statistics available in the MAVISE database and on the IFPI website as of October 2021. Neither database contained time dimension information. Therefore, values for 2017 were imputed using 2018 data and values for 2019 using 2020 data.

5.2 Regression models

5.2.1 Econometric specification

The dataset used in this study has a panel structure, where the values of the dependent variable and control variables are observed for the same countries over the maximum of 4 years. It facilitates the proper handling of the unobserved heterogeneity among the EU Member States. An additional advantage of panel data is that through the combination of variations between countries and over time, it has more variability than simple cross-sectional data. This creates an opportunity for a more robust analysis of various covariates of piracy.

To analyse panel data, two types of models are often employed: fixed effects models or random effects models.

Fixed effects models allow for implicit control of time invariant, country specific features that may bias the analysis of the relationship of the key variables of interest with piracy. However, the biggest limitation of the dataset is imperfect measurement of key control variables such as attitude towards IPRs and the number of platforms available in the country. Those variables are available at most for 2 years only and two observations per country. As fixed effects models use only the within countries variability, their use can lead to less efficient estimation, especially when the time dimension is small.

Given those limitations, the specification chosen for the econometric estimation in this study is the random effects model. This model also allows for individual intercepts for each country; however, it makes an additional assumption, namely that those intercepts are not correlated with explanatory variables in the model. A random effects model uses both the variation between and within the individual countries to estimate coefficients of the independent variables, so the estimation is more efficient than the fixed effects model.

5.2.2 Results

Table 13 summarises the hypotheses and the associated variables. Since the number of variables is high, especially in relation to the number of observations, several methods of variable selection were used([52]), with the aim of obtaining a single variable per hypothesis. The variables finally used in the models are shown in bold.

([52]) Including factor analysis (a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables) and stepwise regression.

Table 13. Summary of hypotheses and variables

	Group	Variable	Description	Literature
H1	Income	**l_GDP**	**Log10 of gross domestic product per capita**	(Yang et al., 2009)
H2	Income inequality	**Gini**	**Gini coefficient**	(Banerjee et al., 2005) (Ki et al., 2006) (Gomes et al., 2018)
		you_unemp	Youth unemployment	
H3	Population structure	**p_young**	**Proportion of population aged 15-24**	
H4	Attitude and behaviour	**q3.5**	**It is acceptable to obtain content illegally from the internet when there is no immediately available legal alternative**	(Cesareo & Pastore, 2014)
		q9.2	What reason would stop you from using illegal sources: Personal bad experience with illegal sources	(Thongmak, 2017)
H5	Digital development	**q4b.2**	**Paid to access, download or stream copyright-protected content from a lawful source**	
		q6*	**User awareness of legal offer (four different variables)**	
H6	Market size	**l_Int_us**	**Log10 of the number of total internet users**	(Ki et al., 2006) (Gopal et al., 1998)
H7	Legal offer	**TVch**	**Number of TV channels**	(Briggs, 2013)
		l_plat_vi	**Log 10 of the number of online platforms for video and TV**	
		n_plat_mu	Number of online platforms for music	

In all regressions, the dependent variable is the number of accesses per internet user per month to each of the three types of pirated content.

Table 14 shows the results of the three best models for consumption of pirated music, film and TV, respectively. The detailed results of each of the three models, including significance levels of the estimated coefficients and the goodness of fit statistics, are shown. A number of additional models were evaluated in the course of the study. The results of those models are broadly consistent with those shown below, but the selected models were judged to be the best based on statistical criteria. The additional models are shown in Annex 2.

Overall, the selected models exhibit high goodness of fit measures and the estimated coefficients are generally significant and have the expected signs for the hypotheses being tested. Further discussion of the results can be found in subsection 5.3 below.

Table 14. Summary of main regression results

		Dependent variable		
		EU28 Activity		
		Music	**Film**	**TV**
H1	Income **l_GDP**	-0.047*	-0.098***	
H2	Income inequality **Gini**	0.073***		0.201**
H3	Proportion of youth **p_young**		0.057*	
H4	Inclination to piracy **q3.5** Bad experience with piracy **q9.2**	0.098***	0.004	 -0.048
H5	Paid to legal services **q4b.2** Awareness of legal offer Music - **q6.1** Film – **q6.2**	 -0.078***	 -0.007	-0.140***
H6	Total internet users **l_Int_us**			-0.164
H7	Number of legal platforms Video - **n_plat_vi** TV - **l_n_TVch**		-0.074***	 -0.318***
	Observations:	106	110	106
	R^2	0.436	0.460	0.364
	Variance Inf. Fact.	1.774	1.853	1.572
	Note:	*p<0.1; **p<0.05; ***p<0.01		

Note: constants were included in all regressions but are not shown here. They are shown in the respective tables in Annex 2.

5.3 Econometric analysis – summary

Among the socio-economic factors, the extent of **inequality** and the level of **income per capita** seem to have the greatest impact on consumption of pirated content: high per capita income and a low degree of income inequality are associated with lower levels of illicit consumption. However, there are some exceptions: per capita GDP did not have an influence on TV piracy and income inequality did not influence film piracy. Nevertheless, the results are consistent with the hypotheses H1 and H2, respectively.

H3 is supported in the case of film: the greater the **proportion of youth** (aged 15 to 24) in the population, the more film piracy. However, this effect was not detected for music and TV.

A higher **acceptance of digital piracy**, as evidenced in the IP Perception study, is also associated with a higher level of consumption of pirated content. In countries with similar levels of income and inequality, there will be more piracy in those that consider piracy as an acceptable option when there is no legal offer (as reported in the IP Perception study) especially in the case of music piracy and, to a less extent, film piracy (although in the latter case the coefficient is not statistically significant). Fear of a bad experience only has a detected impact on TV piracy; while the sign is negative as expected, it is not statistically significant. Therefore, H4 is supported, but only partly, by the data.

The **awareness of legal offers** (as reported in the IP Perception study) appears to reduce the consumption of pirated content. In addition, the **number of legal platforms** for films and TV channels reduces the consumption of piracy, although this effect cannot be tested in the case of music because the number of platforms has remained stable in the period for practically all countries. There is, therefore, support for hypotheses H5 and H7: if there is a wide selection of legal offers and citizens are aware of them, piracy will be reduced.

Finally, there is virtually no support for H6, the relationship between market size and piracy.

6 Conclusions

6.1 Main conclusions

This report examines the consumption of copyright-infringing content in the 27 EU Member States and the UK (which was still a member of the EU during the period in question), for TV programmes, music and film, using a variety of desktop and mobile access methods, including streaming, downloads, torrents and stream ripping.

The good news in this report is that digital piracy continued the declining trend first observed in the 2019 study. Between 2017 and 2020, overall access to pirated content in the EU halved. This decline was particularly pronounced in music, with piracy accesses reduced by 81 %. Film piracy fell by 68 % and TV piracy declined by 41 % during the period.

However, piracy remains a significant problem, more so in some Member States than in others. The average internet user in the EU accessed pirated content 5.9 times per month in 2020, ranging from almost 14 times per month in Latvia to less than 4 times per month in Poland. In the case of TV programmes, piracy is particularly common in the 3 Baltic countries, with Estonia, Latvia and Lithuania at more than double the EU average; Latvia and Lithuania are also among the top 3 Member States when it comes to music piracy (together with Bulgaria). In the case of film, internet users in Bulgaria, Greece and Slovakia access pirated content most frequently.

The type of content pirated most often is TV, accounting for 70 % of accesses to infringing websites in 2020. Film accounted for 20 % and music for the remaining 10 % of accesses. The most common type of device used to access pirated film and TV is desktop, while in the case of music, mobile devices are used significantly more often. For all content types, streaming is becoming increasingly important and accounts for the bulk of film and TV piracy. In the case of music, stream ripping accounts for about half of all accesses to pirated content.

The year 2020 was of special interest in the analysis, since the COVID-19 pandemic resulted in lockdowns of varying degrees in many Member States and many citizens chose to stay at home even in countries where no formal lockdown was in place. Other studies, for example, by Hadopi in France, have shown that both licit and illicit consumption of digital content rose during this period ([53]). However, in the present study, this effect is only apparent in the case of film – film piracy increased significantly in March and April 2020 but then resumed its downward trend.

The econometric analysis in Section 5 seeks to explain the differences among the Member States observed in this study. Based on a review of the existing literature and the available data sources. A number of factors that could influence consumption of pirated content in a given country were examined. These factors included socio-economic variables (income levels, education, inequality, unemployment); demographic variables such as the proportion of young people in the population; variables related to the features of the relevant marketplace, including market size, the extent of the internet infrastructure and the number of legal offers for the various types of content; and attitudes towards intellectual property infringement, as reported in the IP Perception study published by the EUIPO.

Among the socio-economic factors, the level of **income per capita** and the extent of **inequality** seem to have the greatest impact on consumption of pirated content: high per capita income and a low degree of income inequality are associated with lower levels of illicit consumption. A higher **acceptance of digital piracy**, as evidenced in the IP Perception study, is also associated with a higher level of consumption of pirated content.

In contrast to the 2019 study, **availability of legal offers and citizens' awareness of those offers** did reduce piracy, *ceteris paribus*, lending support to the EUIPO's agorateka programme and its awareness-raising efforts. However, measures for the uptake of legal offers may still be improved in the future, giving more credibility to these findings.

([53]) *Baromètre de la consummation de biens culturels dématérialisés 2020*. Accessed at: https://hadopi.fr/ressources/etudes/barometre-de-la-consommation-de-biens-culturels-dematerialises-2020.

6.2 Limitations and directions for further research

In general, various studies point to socio-economic variables, consumer awareness and attitudes and **strength of enforcement** as relevant factors for consumption of pirated content (and indeed other types of IPR infringement). Therefore, another factor that merits further examination is an index of the strength of copyright enforcement in the different Member States. This index was not available for the present study, but in future studies efforts should be made to construct this measure based on objective data from reputable sources so that all the relevant factors can be taken into account in the analysis.

This study focuses on the aggregate levels of piracy in the three main content categories: music, film and TV. As such, it has provided insight into the phenomenon. However, if granular data on the consumption of specific types of TV content (such as live sports) were available, an analysis of the impact of this type of piracy on rights owners could be carried out.

Furthermore, while the availability of legal offers is intuitively important, their prices relative to income (indicating affordability to the average consumer) are also relevant. Unfortunately, no data was available for this study. Combining data on availability of legal offers, awareness of those offers and their relative cost could help explain in more detail their impact on the consumption of pirated content.

The relationship between legal supply/consumption and piracy would deserve further study, using (preferably monthly) data on subscriptions to video platforms. Data on access to legal content with a similar granularity to that of the data on piracy would help explain the trends observed during the COVID confinement.

Finally, one important type of content not included in this study is live sport. From other studies ([54]) and according to representatives of the sector, this type of piracy is increasing and leads to large losses for rights owners. The challenge is to locate a reliable and credible source of data to study this phenomenon.

([54]) See, for example, Hadopi's *Baromètre de la consummation de biens culturels dématérialisés 2021*, which found a significant increase in the piracy of live sports in France in 2021.

Annex 1 – Data

Table A1. TV channels by country

Country	Number
EU28 total	**8 529**
Pan-European	1 123
IT	1 578
ES	637
HU	513
UK	496
DE	462
FR	387
RO	372
NL	357
SK	219
PL	208
BG	188
CZ	187
HR	177
BE	176
SI	171
EL	166
AT	165
SE	146
DK	136
FI	123
LT	94
LV	93
EE	89
PT	83
IE	72
CY	49
LU	35
MT	27

Source: MAVISE (Oct. 2019)

Table A2. TOTAL piracy by content EU28

Date	TOTAL	TV	FILM	MUSIC
2017-01	11.705	6.631	2.551	2.523
2017-02	10.858	6.261	2.278	2.320
2017-03	11.880	6.881	2.434	2.565
2017-04	12.114	7.335	2.327	2.451
2017-05	11.540	7.012	2.156	2.371
2017-06	10.949	6.498	2.232	2.219
2017-07	11.476	6.743	2.410	2.323
2017-08	12.032	7.225	2.494	2.313
2017-09	10.673	6.225	2.129	2.319
2017-10	10.756	6.436	2.063	2.257
2017-11	10.394	6.216	2.084	2.094
2017-12	10.806	6.368	2.281	2.157
2018-01	10.435	6.437	2.070	1.929
2018-02	9.434	5.946	1.871	1.617
2018-03	10.007	6.353	1.941	1.714
2018-04	9.260	6.055	1.678	1.527
2018-05	9.500	6.184	1.788	1.528
2018-06	9.126	5.974	1.682	1.469
2018-07	9.554	6.110	1.891	1.554
2018-08	9.502	5.991	2.020	1.491
2018-09	8.691	5.570	1.737	1.384
2018-10	9.009	5.879	1.691	1.440
2018-11	8.296	5.385	1.604	1.308
2018-12	8.632	5.397	1.907	1.328

Table A2. TOTAL piracy by content EU28

Date	TOTAL	TV	FILM	MUSIC
2019-01	8.586	5.548	1.836	1.202
2019-02	7.632	5.067	1.512	1.053
2019-03	8.085	5.439	1.549	1.097
2019-04	8.460	5.749	1.654	1.057
2019-05	8.612	5.921	1.674	1.017
2019-06	7.914	5.434	1.539	0.941
2019-07	8.039	5.482	1.616	0.941
2019-08	7.936	5.442	1.594	0.901
2019-09	7.269	5.070	1.425	0.774
2019-10	7.491	5.134	1.590	0.767
2019-11	7.730	5.159	1.660	0.911
2019-12	8.090	5.345	1.818	0.927
2020-01	7.252	4.868	1.570	0.813
2020-02	6.391	4.363	1.290	0.737
2020-03	6.942	4.578	1.665	0.699
2020-04	6.745	4.217	1.849	0.679
2020-05	5.670	3.767	1.330	0.573
2020-06	5.172	3.728	0.940	0.504
2020-07	5.677	4.239	0.893	0.545
2020-08	6.293	4.691	1.036	0.566
2020-09	5.372	3.968	0.892	0.512
2020-10	5.160	3.870	0.792	0.499
2020-11	5.046	3.717	0.807	0.522
2020-12	5.354	3.908	0.898	0.548

Source: Own calculations based on MUSO data

Table A3. TOTAL piracy by source EU28

Date	Direct	Search	Referrals	Social	Mail + Ads
2017-01	6.473	2.839	2.010	0.273	0.110
2017-02	5.857	2.668	1.969	0.252	0.113
2017-03	6.002	3.235	2.228	0.289	0.127
2017-04	5.660	3.485	2.494	0.321	0.155
2017-05	5.164	3.442	2.465	0.320	0.149
2017-06	4.802	3.396	2.315	0.300	0.137
2017-07	5.018	3.563	2.436	0.315	0.143
2017-08	5.255	3.678	2.614	0.336	0.149
2017-09	4.620	3.344	2.281	0.302	0.125
2017-10	4.628	3.376	2.318	0.306	0.127
2017-11	4.423	3.296	2.257	0.296	0.122
2017-12	4.550	3.511	2.319	0.302	0.123
2018-01	4.523	3.188	2.311	0.290	0.124
2018-02	4.979	3.133	0.839	0.344	0.141
2018-03	5.082	3.265	1.173	0.349	0.137
2018-04	4.853	2.970	0.959	0.346	0.132
2018-05	5.414	2.996	0.525	0.411	0.154
2018-06	5.289	2.828	0.457	0.411	0.140
2018-07	5.550	2.953	0.476	0.444	0.130
2018-08	5.594	2.852	0.466	0.450	0.141
2018-09	5.217	2.516	0.445	0.371	0.141
2018-10	5.452	2.594	0.469	0.364	0.130
2018-11	5.059	2.305	0.447	0.353	0.132
2018-12	5.275	2.373	0.447	0.368	0.169

Table A3. TOTAL piracy by source EU28

Date	Direct	Search	Referrals	Social	Mail + Ads
2019-01	5.278	2.370	0.454	0.342	0.142
2019-02	4.706	2.017	0.404	0.350	0.155
2019-03	5.237	1.999	0.401	0.312	0.137
2019-04	5.423	2.150	0.449	0.314	0.124
2019-05	5.433	2.262	0.436	0.334	0.149
2019-06	4.930	2.134	0.366	0.339	0.145
2019-07	4.935	2.253	0.359	0.356	0.135
2019-08	4.844	2.250	0.362	0.349	0.130
2019-09	4.464	2.033	0.328	0.305	0.139
2019-10	4.652	2.014	0.369	0.312	0.144
2019-11	4.736	2.200	0.368	0.305	0.121
2019-12	4.947	2.308	0.413	0.304	0.118
2020-01	4.492	2.004	0.371	0.269	0.116
2020-02	4.019	1.707	0.332	0.251	0.080
2020-03	4.325	1.903	0.354	0.270	0.090
2020-04	4.175	1.880	0.330	0.265	0.094
2020-05	3.661	1.399	0.258	0.247	0.107
2020-06	3.445	1.125	0.285	0.217	0.101
2020-07	3.821	1.185	0.335	0.241	0.095
2020-08	4.261	1.339	0.327	0.259	0.108
2020-09	3.593	1.190	0.317	0.190	0.082
2020-10	3.405	1.180	0.316	0.171	0.089
2020-11	3.340	1.222	0.247	0.159	0.078
2020-12	3.551	1.306	0.267	0.171	0.058

Source: Own calculations based on MUSO data

Tables A4 and A5 show the values of the variables from the IP Perception studies (2017 and 2020) used for the models. These variables are:

- q3.5 Illegal sources are acceptable if there is no legal alternative
- q4B.2 Paid for legal content during the past 12 months
- q6.x Aware of legal services (x=1 Music, x=2 Film, x=3 TV series, x=4 Live Sports Events)

- q9.2 Bad experience from illegal sources would stop me from accessing them

Table A4. IP Perception study (2017)

% of respondents answering “totally agree” / “tend to agree”

country	q3.5	q4b.2	q6.1	q6.2	q6.3	q6.4	q9.2
AT	27	31	58	50	48	34	59
BE	40	25	69	66	62	54	40
BG	46	18	43	44	37	42	32
CY	38	20	36	36	36	37	25
CZ	40	22	65	59	59	52	62
DE	22	29	57	51	57	50	34
DK	25	47	73	67	68	58	42
EE	37	20	50	46	47	42	26
EL	42	12	43	38	34	28	40
ES	39	24	66	64	59	57	48
FI	28	38	71	64	71	65	43
FR	34	26	67	62	52	41	32
HR	39	14	40	36	28	30	14
HU	25	17	58	55	52	51	39
IE	27	34	70	66	68	57	53
IT	29	16	49	45	34	33	17
LT	39	25	67	68	62	61	16
LU	34	44	59	49	50	40	44
LV	45	19	70	67	63	64	37
MT	29	13	48	49	45	43	15
NL	49	44	85	79	79	69	42
PL	34	28	63	59	54	57	29
PT	35	14	56	47	46	39	50
RO	30	17	46	43	33	37	31
SE	25	44	69	65	67	50	33
SI	40	18	54	50	47	50	17
SK	43	20	43	41	31	31	20

Source: EUIPO (2020)

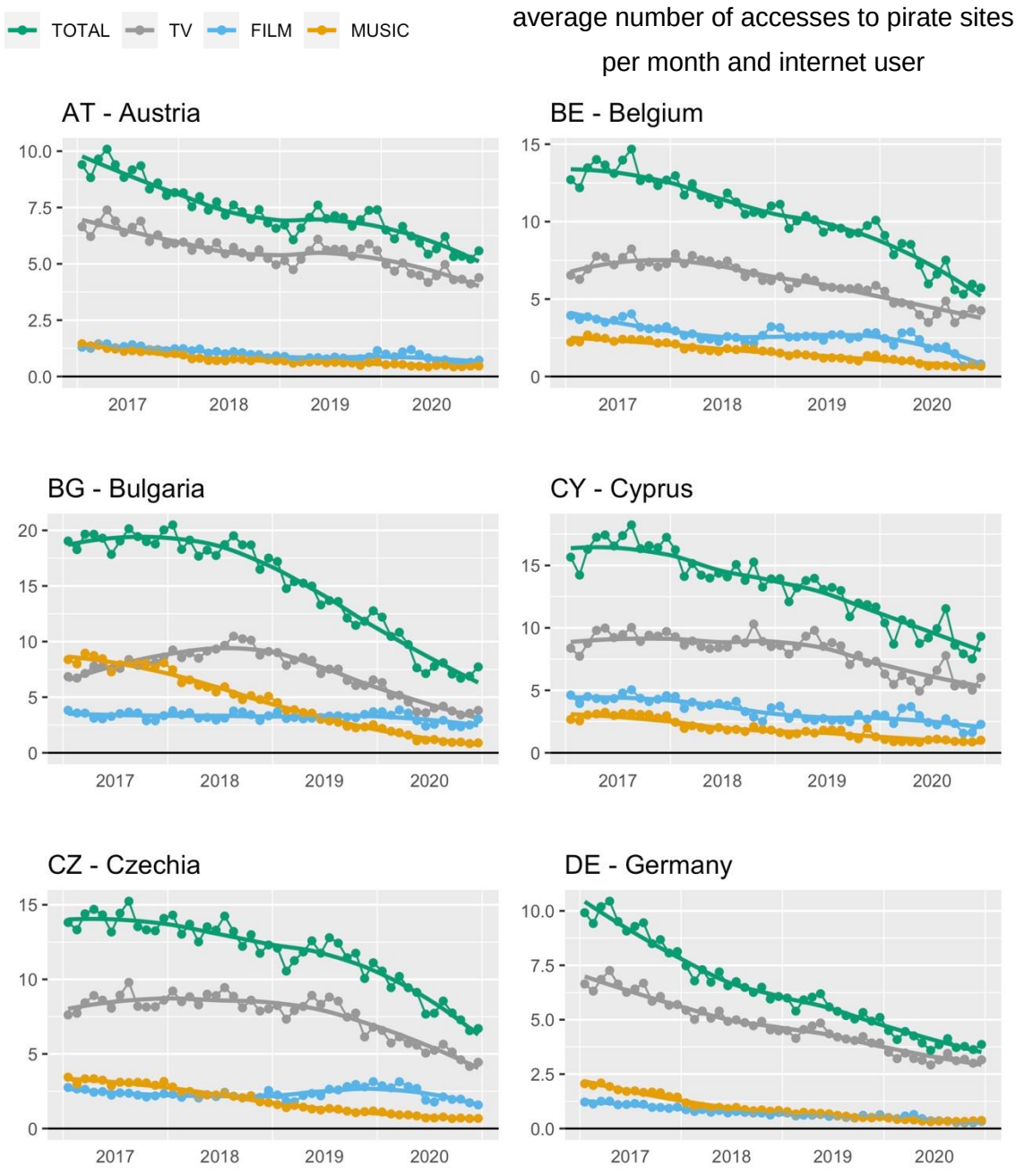
Table A5. IP Perception study (2020)

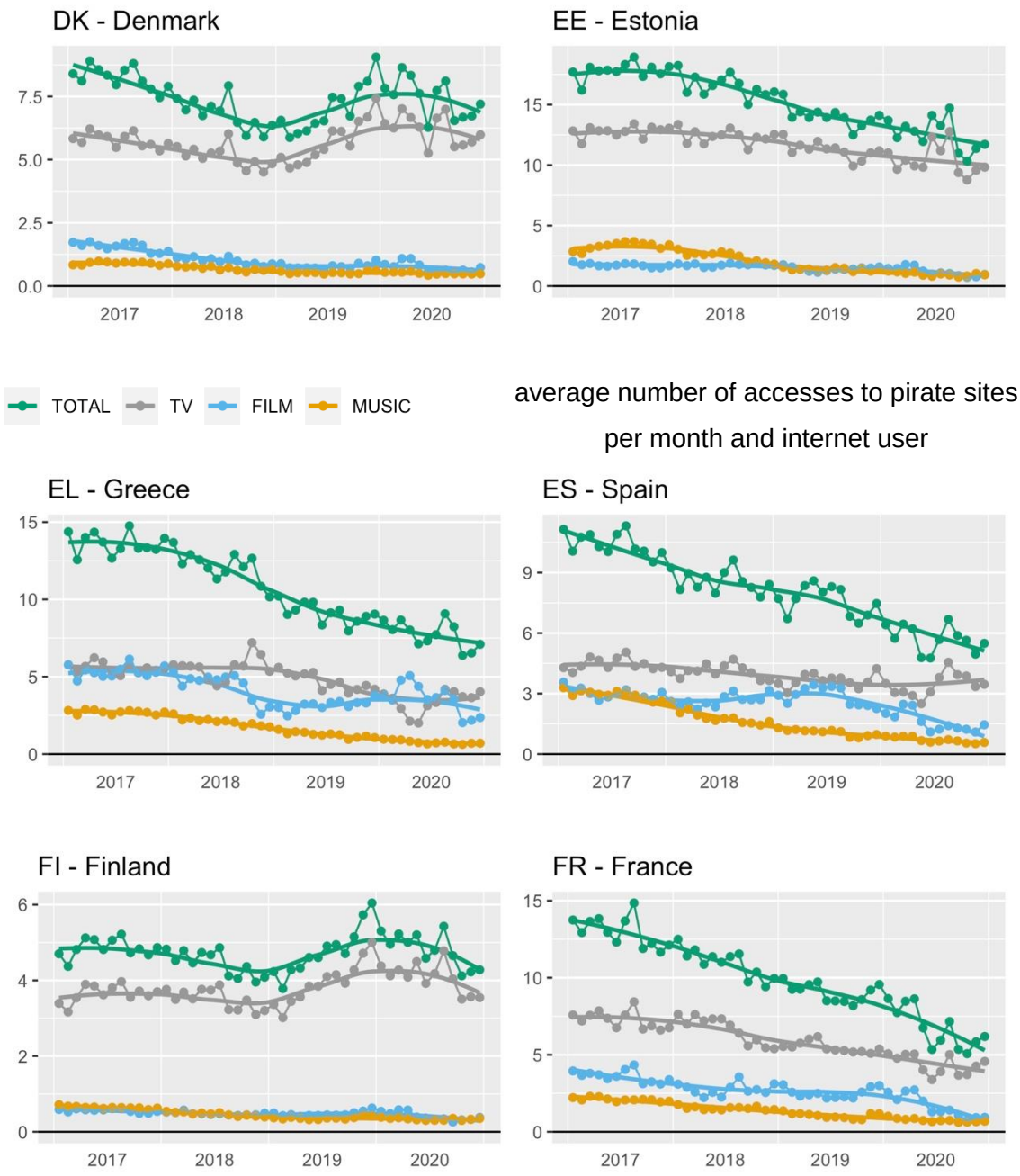
% of respondents answering “totally agree” / “tend to agree”

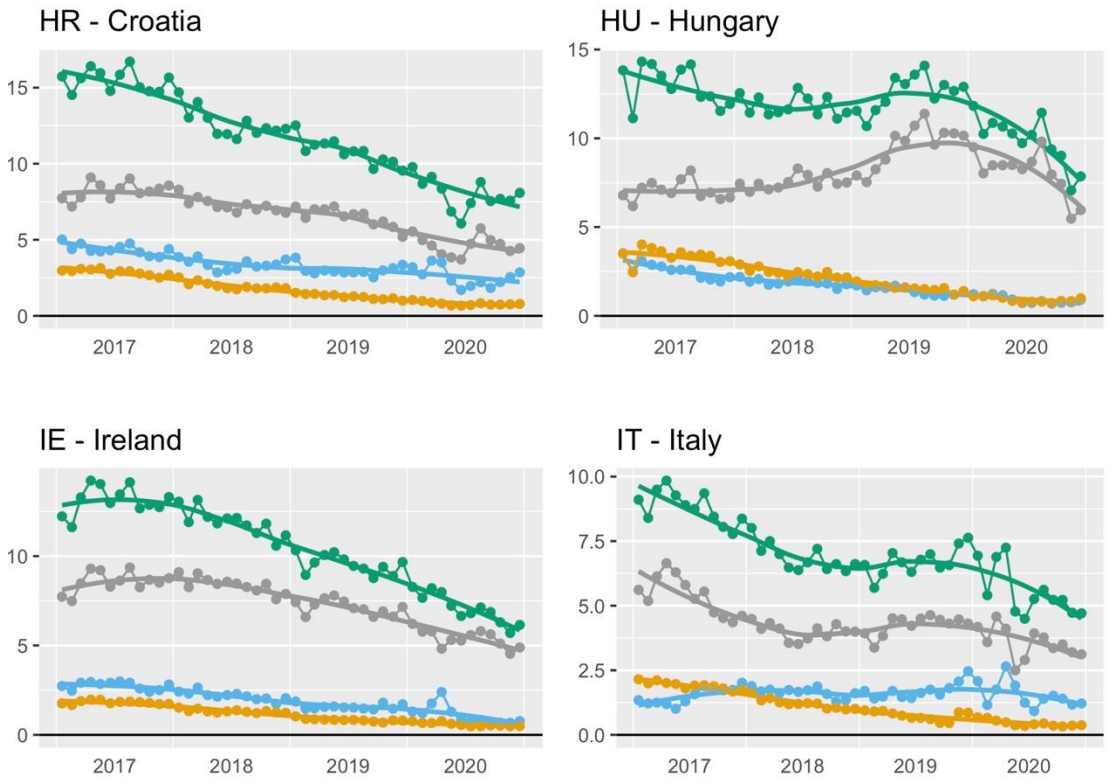
country	q3.5	q4b.2	q6.1	q6.2	q6.3	q6.4	q9.2
AT	27	40	64	66	59	46	23
BE	30	30	61	66	55	45	49
BG	50	32	69	66	61	57	40
CY	36	41	57	56	58	49	34
CZ	31	39	76	75	73	59	17
DE	21	39	62	68	65	58	30
DK	23	55	83	79	82	69	48
EE	32	33	69	68	65	61	21
EL	34	31	61	58	57	47	29
ES	36	54	69	67	65	49	29
FI	20	58	88	83	88	78	60
FR	22	41	61	59	57	45	23
HR	40	24	46	43	42	39	21
HU	31	35	62	61	56	46	15
IE	29	42	75	73	69	60	22
IT	21	45	69	76	64	69	31
LT	38	39	83	83	81	76	39
LU	32	46	64	65	58	45	38
LV	48	30	73	72	69	62	16
MT	30	45	65	65	62	50	9
NL	44	36	77	72	71	62	15
PL	30	51	88	86	84	78	50
PT	31	42	61	55	50	39	26
RO	35	30	71	69	70	62	55
SE	28	57	83	81	81	61	32
SI	35	38	71	71	71	59	38
SK	30	25	56	56	49	45	14

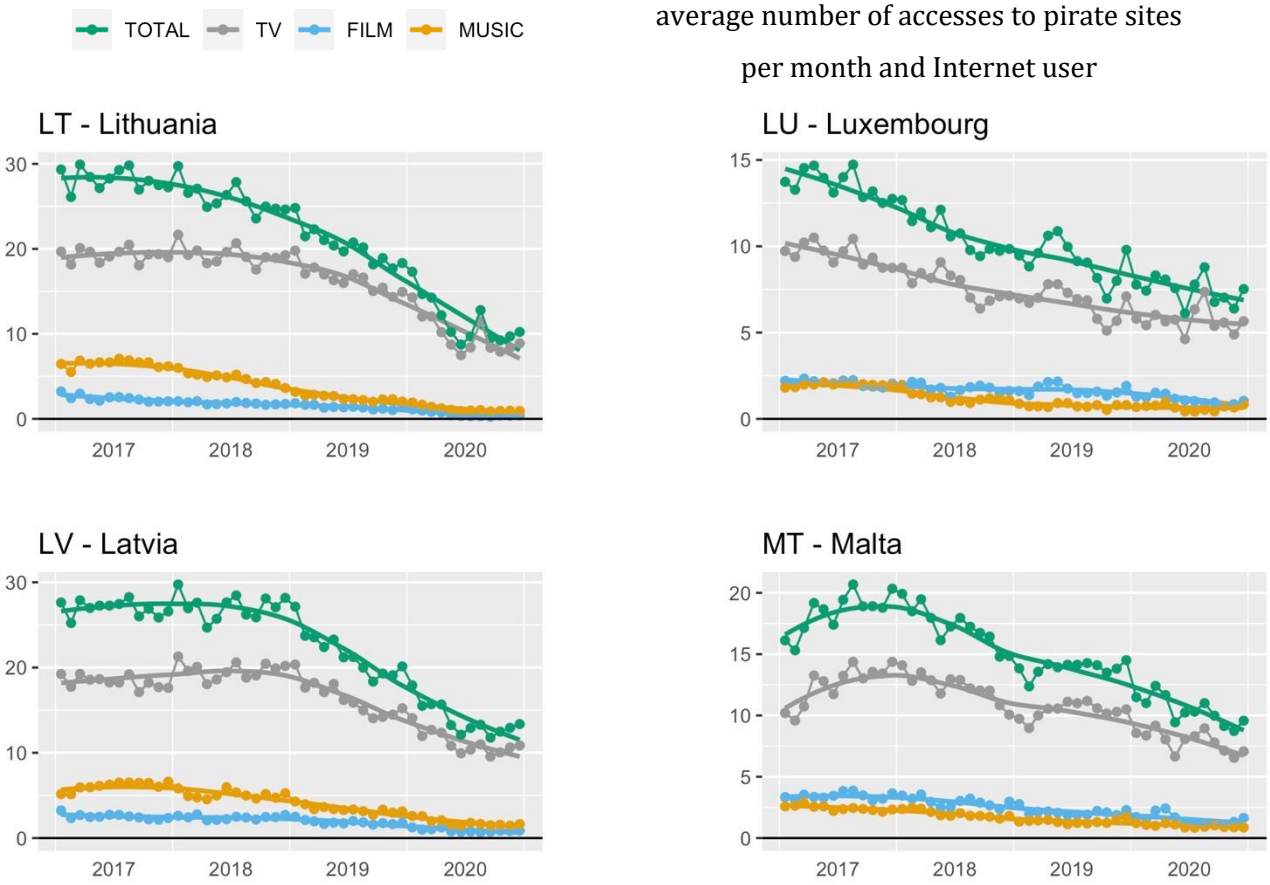
Source: EUIPO (2020)

Figure A1. Evolution of piracy by country

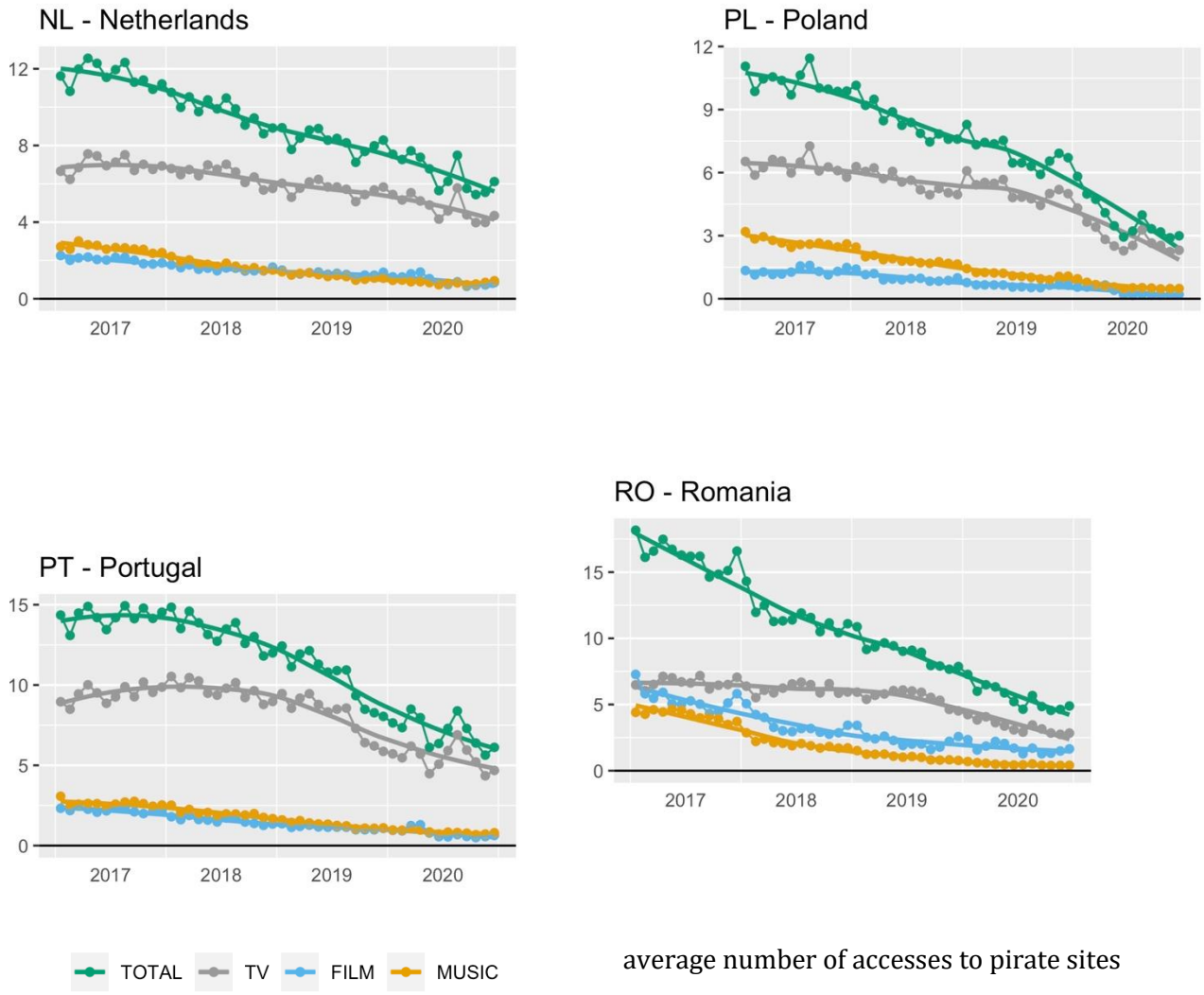


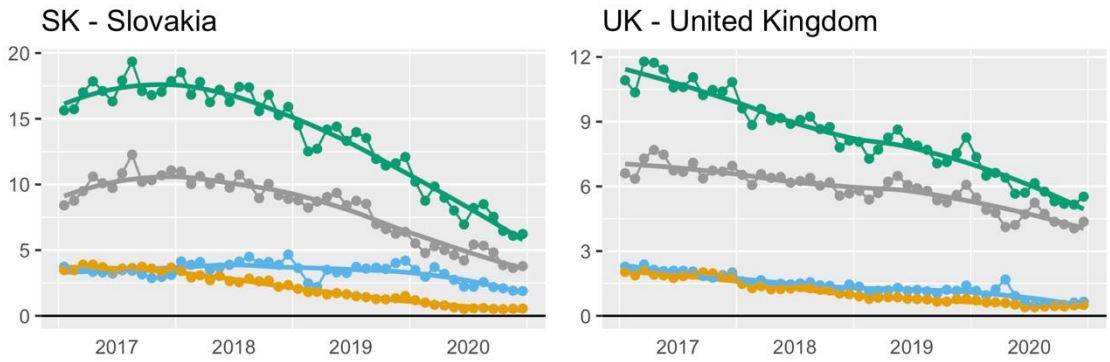

DK - Denmark
EE - Estonia
TOTAL
TV
FILM
MUSIC
average number of accesses to pirate sites per month and internet user
EL - Greece
ES - Spain
FI - Finland
FR - France
2017
2018
2019
2020


HR - Croatia
HU - Hungary
IE - Ireland
IT - Italy
2017
2018
2019
2020



average number of accesses to pirate sites per month and Internet user


NL - Netherlands
PL - Poland
RO - Romania
PT - Portugal
TOTAL
TV
FILM
MUSIC
average number of accesses to pirate sites per month and Internet user
SE - Sweden
SI - Slovenia
2017
2018
2019
2020


SK - Slovakia
20
15
10
5
0
2017
2018
2019
2020
UK - United Kingdom
12
9
6
3
0
2017
2018
2019
2020

Annex 2 – Econometric analysis: further details

This annex shows a number of other models that were evaluated for each of the three content types, with the model chosen in the main body of the report shown first in each table.

Table A6 shows the descriptive statistics for all the variables used in the models.

Table A6. Descriptive statistics for the explanatory variables

Variable		Mean	St. Dev.	Min	Max	Observations
FILM	overall	2.0	1.1	0.34	5.38	N=112
	between		.96	.48	4.13	n=28
	within		.56	.51	4.18	T=4
MUSIC	overall	1.74	1.36	0.33	8.15	N=112
	between		.97	.45	4.57	n=28
	within		.97	-1.54	5.31	T=4
TV	overall	7.28	3.44	2.88	19.68	N=112
	between		3.14	3.79	16.39	n=28
	within		1.49	.91	10.57	T=4
l_GDP	overall	4.36	.26	3.79	4.93	N=111
	between		.26	3.8	4.92	n=28
	within		.13	4.32	4.39	T=3.96
Gini	overall	29.76	4.05	20.9	40.8	N=106
	between		4.03	21.95	40.15	n=28
	within		.77	27.78	33.08	T=3.79
you_unemp	overall	16.6	8.15	5.6	43.6	N=112
	between		7.97	6.55	38.43	n=28
	within		2.15	11	22.35	T=4
q3.5	overall	33.22	7.62	20.0	50.0	N=110
	between		7.24	21.5	48	n=28
	within		2.9	26.72	39.72	T=3.93
q4b.2	overall	32.71	12.24	12.0	58.0	N=110
	between		8.84	19	51	n=28
	within		8.60	16.71	48.71	T=3.93
q6.1	overall	63.85	12.28	36.0	88.0	N=110
	between		10.13	43	81	n=28
	within		7.12	50.85	76.85	T=3.93
q6.2	overall	61.31	12.60	36.0	86.0	N=110
	between		9.62	39.5	75.5	n=28
	within		8.23	45.81	76.81	T=3.93
q6.3	overall	58.55	14.19	28.0	88.0	N=110
	between		11.37	35	79.5	n=28
	within		8.67	40.05	77.05	T=3.93
q6.4	overall	51.65	12.12	28.0	78.0	N=110
	between		10.08	34.5	71.5	n=28
	within		6.79	33.65	69.65	T=3.93
n_plat_mu	overall	15.54	6.83	4	33	N=112
	between		6.78	6.5	30.5	n=28
	within		1.40	10.04	21.04	T=4
n_plat_vi	overall	86.96	57.63	11	282	N=112
	between		27.26	58.5	189	n=28

	within		50.90	-6.04	179.96	T=4
n_TVch	overall	1,421.66	305.66	1,150	2,874	N=112
	between		306.67	1,183	2787.5	n=28
	within		43.88	1,316.16	1,527.16	T=4
l_Int_us	overall	6.69	.61	5.46	7.56	N=112
	between		.61	5.50	7.74	n=28
	within		.02	6.64	6.73	T=4
p_young	overall	10.86	1.1	8.84	13.66	N=111
	between		1.09	9.02	13.11	n=28
	within		.23	10.18	11.75	T=3.96

Econometric models

The models shown in Section 5 above were selected from several tested specifications as shown in the tables below.

The variance inflation factor (VIF) was used as a first quality control of the models ([55]). A high VIF indicates that the associated independent variable is highly collinear with the other variables in the model. In principle, only models with VIF less than 5 would be considered; however, the VIF was below 2 for all models.

The models were then chosen based on how many hypotheses they allowed to test and the Bayesian Information Criterion (BIC).

The BIC is an indicator that allows for selection of the best model specification. It addresses the fact that it is possible to improve the fit of a model by including additional variables, even if their explanatory power is relatively low. BIC introduces a relatively larger penalty term for variables with relatively lower explanatory power. The general rule of thumb is that models with lower BIC should be preferred over the models with higher value of this indicator. The BIC can be negative and in that case the models with the highest absolute value are preferred.

Table A7 shows the regressions carried out for film piracy.

Model 1 has the lowest BIC and it allows for testing the hypotheses on the role of attitude towards piracy and knowledge and accessibility of the legal offer. Once the control for the number of video platforms is introduced, the variable of the knowledge of legal offers loses its significance. In addition, variable 3.5 (attitude to piracy if legal offers are not available) is not significant in any of the models. This hints at the possibility that attitude towards piracy can explain the piracy ratios in countries and markets where platforms already provide a broad range of legal offers at affordable price (as is the case for music). However, when access to legal offers is still fragmented and subscription to several

([55]) VIF is a measure of the amount of multicollinearity in a set of multiple regression variables. Mathematically, the VIF for a regression model variable is equal to the ratio of the overall model variance to the variance of a model that includes only that single independent variable. This ratio is calculated for each independent variable.

platforms is necessary to cater for an average customer's tastes (film, TV), it may be the main factor explaining differences in the piracy rates. It is however important to emphasise that the measure of legal offer used in this study (number of platforms) is not necessarily optimal. The relationship between legal offers and piracy should be investigated in the future using variables of legal offer uptake, such as the number of subscriptions to platforms or subscription penetration rates.

Table A7. Regression models for film piracy

	Total film activity					
	(1)	(2)	(3)	(4)	(5)	(6)
l_GDP	-0.098***	-0.083**	-0.087***	-0.050	-0.092***	-0.078**
	(0.035)	(0.037)	(0.033)	(0.039)	(0.035)	(0.033)
Gini		0.024				
		(0.027)				
p_young	0.057*	0.061*	0.070**		0.063**	0.076***
	(0.030)	(0.031)	(0.029)		(0.031)	(0.029)
q3.5	0.004	0.013	0.032	0.014	0.001	0.017
	(0.021)	(0.022)	(0.021)	(0.024)	(0.022)	(0.022)
q4b.2					-0.031	-0.064***
					(0.026)	(0.024)
q6.2	-0.007	-0.015	-0.081***	-0.091***	0.006	-0.029
	(0.023)	(0.024)	(0.016)	(0.015)	(0.026)	(0.025)
l_plat_vi	-0.074***	-0.065***			-0.061***	
	(0.018)	(0.019)			(0.021)	
l_Int_us				-0.027		
				(0.039)		
Constant	-0.705***	-0.704***	-0.703***	-0.703***	-0.705***	-0.703***
	(0.028)	(0.028)	(0.026)	(0.038)	(0.028)	(0.026)
Observations	110	106	110	110	110	110
R^2	0.460	0.466	0.390	0.330	0.468	0.427
Variance Inf. Fact.	1.853	1.871	1.64	1.492	1.878	1.746
Bayesian Inf. Crit.	-177.791	-169.219	-157.628	-170.193	-174.024	-162.887
Note:					*p<0.1; **p<0.05; ***p<0.01	

Table A8 shows the regressions for TV piracy.

Model 5 has the lowest BIC (35.62); however, model 1, with only slightly higher BIC (36.41), was preferred because it has a lower VIF.

Apparently part (-0.3) of the variation transfers from the number of television channels (l_TVch) in model 1 to the number of internet users (l_Int_us) in model 5, both of which are strongly correlated with each other and with the size of the country. Finally, the model with a more plausible explanation (1) was chosen. This would certainly be an interesting problem to study again if better data were available. Contrary to expectation, the variable awareness of legal offer on TV (q6.3) is not significant in any of the models, in contrast to the film and music models.

Table A8. Regression models for TV piracy

	Total TV activity					
	(1)	(2)	(3)	(4)	(5)	(6)
Gini	0.201**	0.228***	0.230***	0.249***	0.210***	0.182**
	(0.085)	(0.079)	(0.077)	(0.076)	(0.080)	(0.077)
you_unemp		-0.241***	-0.238***	-0.211***	-0.256***	
		(0.070)	(0.069)	(0.070)	(0.071)	
q3.5					0.119*	
					(0.062)	
q4b.2	-0.140***	-0.143**	-0.159**	-0.177***	-0.108*	-0.178**
	(0.038)	(0.059)	(0.066)	(0.065)	(0.060)	(0.070)
q9.2	-0.048		-0.011	-0.067		-0.024
	(0.037)		(0.041)	(0.042)		(0.044)
q6.3		-0.071	-0.049	0.018	-0.085	0.007
		(0.066)	(0.076)	(0.078)	(0.065)	(0.080)
l_Int_us	-0.164	-0.334***	-0.329***		-0.300***	-0.368***
	(0.134)	(0.094)	(0.089)		(0.099)	(0.088)
l_TVch	-0.318***			-0.342***		
	(0.121)			(0.086)		
Constant	0.375***	0.375***	0.375***	0.374***	0.378***	0.376***
	(0.1 05)	(0.092)	(0.087)	(0.086)	(0.095)	(0.087)
Observations	106	106	106	106	106	106
R^2	0.364	0.400	0.405	0.417	0.419	0.340
Variance Inf. Fact.	1.572	1.666	1.681	1.714	1.72	1.516
Bayesian Inf. Crit.	36.413	38.057	47.928	45.784	35.62	59.611
Note:				*p<0.1;	**p<0.05;	***p<0.01

Most of the models show a negative relationship between youth unemployment (you_enump) and TV piracy. This could be because in the countries with the highest youth unemployment, more young people live with their parents, which could give them access to legal offers. In future studies, this

hypothesis could be examined if data on the proportion of young people living with their parents in each Member State could be obtained.

Finally, Table A9 shows the regressions for music piracy.

Table A9. Regression models for music piracy

	Total music activity					
	(1)	(2)	(3)	(4)	(5)	(6)
l_GDP	-0.047*	-0.073**	-0.071***	-0.069***	-0.111***	-0.067***
	(0.028)	(0.032)	(0.024)	(0.026)	(0.038)	(0.024)
Gini	0.073***	0.075***	0.068***	0.069***	0.070**	0.079***
	(0.025)	(0.029)	(0.022)	(0.023)	(0.029)	(0.023)
you_unemp						-0.044**
						(0.021)
q3.5	0.098***	0.094***	0.103***	0.103***	0.084***	0.107***
	(0.025)	(0.030)	(0.024)	(0.024)	(0.030)	(0.023)
q6.1	-0.078***					
	(0.022)					
l_Int_us		-0.033			-0.107**	
		(0.029)			(0.049)	
n_plat_mu				-0.004	0.091*	
				(0.023)	(0.050)	
Constant	-0.749***	-0.748***	-0.749***	-0.749***	-0.749***	-0.749***
	(0.023)	(0.027)	(0.021)	(0.021)	(0.027)	(0.020)
Observations	106	106	106	106	106	106
R^2	0.436	0.334	0.441	0.436	0.359	0.468
Variance Inf. Fact.	1.774	1.502	1.79	1.772	1.561	1.879
Bayesian Inf. Crit.	-31.476	-24.446	-15.864	-11.918	-22.952	-15.531
Note:						*p<0.1; **p<0.05; ***p<0.01

Model 1 is the model with the lowest BIC. In two of the other models, the number of internet users in a country l_Int_us (the size of the market) is negatively associated with piracy, but the relationship is weak.

The number of music platforms n_plat_mu does not seem to explain music piracy well, most likely due to the low variability of this variable across Member States. Knowledge of legal offers (q6.1) is significant and has the expected negative sign.

The coefficient of q3.5 (attitude to piracy) is positive and significant in all music models. This variable is also positive in the models for the other types of content, however, it is not as statistically significant in those cases.

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