



TV watching in the new millennium: insights from Europe

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Abstract

In the present paper we empirically investigate the economic reasons why people spend time watching television both for informative and leisure purposes. We consider individual characteristics and country-level features. Particular attention is devoted to the impact of education and economic status on the allocation of time to TV and new media. We use data from the European Social Survey (ESS) Round 5—2010, 2012 and 2014 and from other minor empirical sources.

Keywords Television · Information · Entertainment · Education

JEL Classification L82 · L83

1 Introduction

In the last 20 years the television (TV) sector has been transformed by pervasive technological change and the consequent introduction of new business models. On the supply side, the introduction of digital terrestrial television and digital satellite platforms, broadband and ultra-broadband networks, strongly increased the convergence between audio–visual services and telecommunications. On the demand side, the consumption of audio–visual services is increasingly characterized by a high degree of customization and expansion of available choices. The traditional passive watching of scheduled TV programs is consequently becoming just one of the many possible ways of consuming TV services.

Not surprisingly, given these dramatic transformations, coupled with the fast growth of audiovisual services provided through the so-called new media,

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Table 1 Average television viewing per person (min per day). Source: COE, European Audiovisual Observatory, Yearbook 2018

	2010	2012	2014	2017	% change 2012/2017
Belgium	182	188	185	181	− 3.7
Czech Republic	197	201	207	199	5.0
Germany	225	222	221	204	− 23.1
Denmark	198	195	173	138	− 0.5
Spain	239	246	238	207	− 8.5
Finland	172	175	176	149	− 4.0
France	236	230	221	205	− 3.5
Hungary	286	286	289	263	− 2.4
Ireland	205	203	194	153	− 13.8
Lithuania	204	216	204	214	9.3
Netherlands	191	196	200	155	− 9.2
Poland	242	243	260	251	6.6
Sweden	162	164	153	132	− 14.6
Slovenia	186	193	199	201	11.4
Norway	168	165	163	131	− 16.1

television watching time has changed in the last few years (see e.g. Waldfogel 2002). Table 1 reports the average TV viewing times in a sample of European countries (notice that the last column displays the rate of change in average TV watching weighted on population).

The total percentage change over the five years considered is − 2.8%. However, individual countries exhibit remarkably divergent paths, as growth rates range between 11.4 % (Lithuania) and − 23% (Denmark). If we consider the countries where average TV viewing time increased in the 2012–2017 period, the average growth rate was + 8.1%; in the other countries TV viewing time decreased by 9% over the same period.

This first-sight evidence suggests that national context matters. This suggestion however lends itself to two different interpretations.

On the one hand, TV viewing (both for informative and leisure purposes) belongs to the realm of individual choices, and as such it stems from a comparison of benefits against costs. Benefits depend on individual tastes (and therefore on personal characteristics, ranging from demographic, to economic, social and cultural ones). Costs consist partly in capital costs (purchase of equipment and connection to networks) and mainly in the opportunity cost of time. In this regard, we believe that education plays a double role, influencing on the one hand the cost of time (educated individuals are more effective than less educated in understanding and evaluating information), while on the other hand education moulds the tastes and preferences over information vs. entertainment, over TV vs. other media, and over media use vs. alternative ways of employing time. Then one way of interpreting Table 1 is that individuals in country A (say Slovenia) are systematically different from individuals in country B (say, Denmark).

On the other hand, it seems reasonable that media-related behavior be conditioned by a set of country-level characteristics, namely: the structure of the media market and the type of media services available; the incentives which the social and institutional environment provides to gather information for political choices; externalities such as those generated by the general cultural level of the country, its overall wealth, and so on. The interpretation of Table 1 here is: the same type of individual behaves differently in Slovenia relative to Denmark, since Slovenia differs from Denmark.

The purpose of this paper is to analyze the TV watching habits doing justice to both interpretations, assessing the relevance of the country-level variables on individual TV-related behavior, while controlling for the characteristics of the individual watcher.

We shall therefore analyze the determinants of time devoted to TV watching (with some disaggregation as regards the purpose of watching) using individual-level data coupled with a set of country-level variables.

As for the individual level, we employ data from 15 European countries, collected by the European Social Survey (ESS), over three waves, namely, Round 5 (2010), Round 6 (2012) and Round 7 (2014). This is not a genuine panel data set, since the same individuals are not followed overtime. Therefore the three waves correspond to a repeated cross-sections.

As regards countries, data are collected from other minor sources, to be described in the subsequent paragraphs.

As a short preview of our results, education, economic and professional status of the individual turn out to have a statistically significant effect on TV consumption, which is also influenced by time constraints and opportunity costs. Furthermore, we find that country-level environment contributes to explain individual TV behavior. Technical innovation and market dynamics in the media sector, press freedom and commitment to education diffusion seem to be the key drivers at the country level.

The paper is organized as follows. In Sect. 2 we expose our theoretical framework, the econometrics method adopted and the dataset. Then Sect. 3 provides an overview of the media systems. Estimates and results are discussed in Sect. 4. The final Sect. 5 provides the concluding remarks.

1.1 Related literature

There is a vast interdisciplinary literature on all the aspects of the television consumption, its determinants and its effects, from a sociological, psychological, medical, managerial and economic perspectives. However, the present work it is mainly related to the reasons affecting the individual decisions to resort to TV set from an economic point of view. In this respect, despite the broad theoretical and empirical literature on media economics, we just focus on a specific research theme, namely the demand for media or media use.

On the theoretical side, this literature copes with the standard issue of the individuals allocating scarce resources to alternative uses specifically in the media sector. Therefore the resource allocation problem is largely a time allocation matter (e.g.

Battaggion and Vaglio (2012, 2015), Alaoui and Germano (2016)). Second, a closer glance to the reason why individuals resort to media and the different type of contents (ranging from information-carrying messages (news) to entertainment of various types and advertising) makes clear the role of cognitive skills and education to receiving, understanding and elaborating messages.

On the empirical side, various annual reports describe the TV watching trend for different countries (see e.g. OFcom report *Media Nation* on the UK media market; COE, European Audiovisual Observatory on a worldwide scale; AGCOM *Relazione annuale* on the Italian media market). However, these reports do not address the analysis of the determinants of individuals' demand for broadcasting.

Recent empirical literature mainly focuses on the media diet, distinguishing between new media consumption and old media use. Many contributions investigate how media use differs across age groups (see e.g. Loader 2007; Lenhart et al. 2010) and whether this matters for people's participation to voting and political life (see e.g. Lupia and Philpot 2005; Strömbäck and Shehata 2010; Bakker and de Vreese 2011; Holt et al. 2013). In the same stream of the literature, the existence of complementarity vs. substitutability between new and old media has been deeply investigated (see e.g., Waldfogel 2002; Van der Wurff 2011; Liebowitz and Zentner 2012; Jang and Park 2016). We plainly depart from these contributions since we focus on a single medium, namely broadcasting.

Conversely, empirical studies closer to our approach on TV consumption indicate time opportunity cost and education levels as the prominent explanatory variables. Since receiving, understanding and elaborating messages of any kind engages to varying extent the cognitive skills of individuals, education is likely to have, in explaining media use, a more prominent place than it has in the demand for the majority of others goods and services. Such studies differ as to the media investigated, the specific focus of research and needless to say, as to the empirical strategy. Chapela (2016) isolates the pure income effect from the opportunity cost effect of personal earnings on the demand for time online and on adoption of the Internet. The level of education is included among controls and it has a positive impact especially as regards adoption, while it has positive effects on usage only in specified age/sex groups, a result which confirms previous findings by Goldfarb and Prince (2008). Fernandez-Gutierrez and Calero (2016) find a negative effect of education on TV watching as opposed to other forms of leisure (book reading, newspapers, sports, theatre/cinema/exhibitions). Molina et al. (2016) obtain similar results concerning TV vis à vis reading and radio listening. In these papers, income-related variables are not included among the controls. Stromback et al. (2013) find a positive relationship from education on a composite index of news media consumption, but a negative one when referred to TV watching. Not always education turns out to be relevant: Dou et al. (2006) (preferences for contents in young Chinese consumers) and Pantea and Martens (2016) (estimation of consumer surplus from Internet use) find a limited impact of education on media-related behavior. In the former paper, income also has no effect on individual media choices.

Relative to the existing literature, our contribution consists in studying individual choices regarding TV watching as the outcome of the interplay between the characteristics of individuals and those of the social, cultural and institutional context. For

this reason, while the previously reviewed papers all provide one-country results, we exploit the cross-country variation.

2 Methodology and data

Suppose there exists a population of individuals, divided into a number of mutually exclusive sub-populations, corresponding to countries (15, in our case). Consider an individual i , belonging to country j , in period t , with a given time endowment, which he/she must allocate either to TV watching or to a residual, non-TV activity (including both leisure and non-leisure time).

The utility that the individual assigns to different time allocations depends on m individual features and on a set of k country level dimensions. The values of the individual variables are collected in the $(1 \times m)$ vector \mathbf{x}_t^{ij} .

The values of the country level variables in country j in period t are instead summarized in the $(1 \times k)$ vector \mathbf{v}_t^j , and are the same for all the individuals belonging to the same country that year. Finally, other things being equal, there might be a trend in TV watching, captured by t ($t = 1, 2, 3$). Therefore, we shall estimate the following linear relationship:

$$TV_t^{ij} = a_0 + \mathbf{a}_1 \mathbf{x}_t^{ij} + \mathbf{a}_2 \mathbf{v}_t^j + a_3 t + \varepsilon_t^{ij} \quad (1)$$

where TV_t^{ij} represents TV time for the ij th individual at time t .

An alternative way of representing country-level effects might consist in inserting in Eq. (1) a set of country dummies \mathbf{d}_t , in place of \mathbf{v}_t^j covariates.

$$TV_t^{ij} = a_0 + \mathbf{a}_1 \mathbf{x}_t^{ij} + a_2 t + \mathbf{b} \mathbf{d}_t + \varepsilon_t^{ij} \quad (2)$$

In both equations ε_t^{ij} represents the random component which we assume to be independently distributed across individuals, countries and over time. We shall estimate Eqs. (1) and (2) employing OLS. Endogeneity issues will be discussed later on (Sect. 4).

In our approach, the \mathbf{v}_t^j variables are assumed to represent the factors common to all individuals belonging to the same country: this is the reason why we assume away correlations among individual residuals within the same country.

Data The main source for our dataset is represented by the European Social Survey (ESS) Rounds 5, 6 and 7 (corresponding to 2010, 2012 and 2014 waves respectively).¹ The ESS is an academically-driven multi-country survey that has been conducted every two years across Europe since 2001. Its first aim is to monitor and interpret changing public attitudes and values within Europe and to develop a series of European social indicators, including attitudinal indicators. The survey covers about 30 countries, depending on the wave. For the purposes of this analysis we selected a subsample of 19 countries in order keep a sufficient level of geographical,

¹ Unfortunately, the latest wave of the ESS Survey (2016) does not provide information as regards TV watching.

Table 2 Total time on average weekday

	TVTOT%	TVPOL%
No time at all	4.55	8.50
Less than 0.5 h	5.57	31.78
0.5 h to 1 h	13.04	35.68
More than 1 h, up to 1.5 h	13.51	12.98
More than 1.5 h, up to 2 h	16.30	5.65
More than 2 h, up to 2.5 h	13.05	2.38
More than 2.5 h, up to 3 h	12.15	1.30
More than 3 h	21.83	1.73
Total	100	100

institutional and data homogeneity in the sample and considering only countries present in all of the three waves. We further excluded 4 countries, because of missing values problems. Therefore the final sample includes 15 countries.² Among the wide range of individual-level information provided by the survey, we focus on TV consumption and on a range of demographic, social and economic variables, to be described below. The units of analysis are the individuals aged 15 and over, resident within private households in the participating countries. The overall sample covers 109801 individuals [35901 (2010), 38072 (2012) and 35828 (2014)]. We employ weights correcting for the population size and for sample biases, provided by ESS. In particular we employ in this paper, the set of weights defined by EES as post-stratification, meant to reduce the sampling error (related to attempting to measure only a fraction of the population) and potential non-response error (which may lead to a systematic over-or- under-representation of people with certain characteristics).³

Dependent variables ESS provides data on individual TV watching time in average weekdays, classified into seven 30-minutes intervals ranging from 0 to more than 3 h.

The survey distinguishes between total time devoted to TV watching (TVTOT; in short total TV) and the TV time devoted to news/policy/current affairs (TVPOL; in short news-oriented TV). TV time is measured independently of being public, free-to-air, payTV, etc. Table 2 illustrates the descriptive statistics for the dependent variables.

Explanatory variables As we stated above the determinants of the utility of resorting to media can be classified into two levels. In the first one we include individual characteristics: the age of the respondent (AGE), the sex (SEX, dummy variable, value 1 for female), the fact of belonging to an ethnic minority (ETHNIC_MINORITY, dummy variable, 1 if belonging to a minority), the size of the place where the respondent lives (BIGCITY takes value 1 for individuals describing

² Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Lithuania, Netherlands, Norway, Poland, Slovenia, Spain and Sweden.

³ See, Documentation of ESS Post-Stratification Weights, April 2014.

themselves as living in big cities or in their suburbs, VILLAGE instead is 1 when the individual declares he/she lives in a country village or in the countryside).⁴ We also consider among first-level variables the respondent's education level (EDUCATION, measured in years in education); his/her per capita family income (INC_FAMILYPROC).⁵ As for the professional and labour market position we consider his/her being or not retired (RETIRED), being unemployed in the last week, but actively looking for job (UNEMPLOYED), having been a long term unemployed (LTUNEMPLOYED). These are dummy variables, taking value 1 if the condition of the respondent corresponds to the description. OCCUP_HIGH, OCCUP_TECHPROF, OCCUP_CLERK, OCCUP_BLUECOLLAR 1, OCCUP_BLUECOLLAR 2 take value 1 if the individual is, in the order an high-rank manager or an entrepreneur, a highly qualified professional, a clerk, a high-skilled bluecollar, a low skilled bluecollar.

Country-level variables include, for years 2010, 2012 and 2014:

- GPPRO (Per capita GDP in PPP—World Bank), as a proxy of the general economic and social condition of the country;
- a group of variables representing the social and political environment (LIMITFREE: a measure of the degree of freedom in media market—World Press Freedom Index, TURNOUT: election turnout—Institute for Democracy and Electoral Assistance– IDEA, PISA scores: a measure of the country commitment to education enhancement—OECD). We expect an environment encouraging political participation (TURNOUT) combined a free media system to stimulate TV watching (as well of other media).
- a group of variables related to the structure of broadcasting (PUBLICAUDIENCE: share of audience of the public broadcasting system—COE⁶; PAYTVSUBS: ratio of pay-TV subscribers to the population—COE; IPTV: number of families with Internet Protocol TV per 1000 individuals; SMART number of families with smart TV per 1000 individuals; ONDEMREV ratio of revenues from on-demand TV services to GDP). Finally we take into account the broadband diffusion (BROADBAND, share of households with a broadband connection). In general, the variables in this group are positively related to the innovation propensity of the media system, the variety in supply and the choice opportunities for the viewer.
- a group of variables related to the advertising attractiveness of alternative media (ADVNEWSPTVRATIO: ratio of newspapers advertising revenues to the broadcasting advertising revenues WAN-IFRA; ADVINTTVRATIO: ratio of internet advertising revenues to the broadcasting advertising revenues WAN-IFRA). The issue of complementarity and substitutability between TV

⁴ VILLAGE and BIGCITY identify extremes (very large cities and small villages): roughly 30% of the sample lives in towns or small cities.

⁵ ESS provides a re-classified measure of family income as declared by the respondent. We further divide this value by the number of family components.

⁶ COE-European Audiovisual Observatory 2010–2012–2014

and other media is one of the most debated in current literature. The sign of the effect is in principle an ambiguous one.

- Finally, as an indicator of TV quality, we referred to the Prix Europe Awards Archive, (PRIZEFICTION: number of prizes and special recommendations for TV fictions; PRIZEJOURN : number of prizes and special recommendations for documentary, current affairs and IRIS). We expect these indicators to positively affect TV use.

The list of the individual and country- level variables is in Appendix 6.

3 The media systems: an overview

We believe that the national context matters as far as TV-related individual behavior is concerned. Before turning to test this contention, we provide here a descriptive account of the countries involved in our analysis from a media market structure perspective, in order to emphasize the cross-country differences. To do so, we use as a descriptive tool a Ward-type cluster analysis where each country is identified by the vector of standardized average values for the above described country-level variables related to the media market (that is, with the exception of GDP, PRO, TURNOUT and PISA). Such an analysis highlights similarities and differences among countries, by means of a hierarchical aggregation algorithm. The analysis has been performed for years 2010 and 2014. Figures 1 and 2 show the tree diagrams obtained. The first insight is that the 15 countries in the sample fall into two main groups, which remain fairly stable in the two years covered. The first group includes Northern Europe countries such as Germany, Netherlands, Denmark, Sweden, Finland, Norway. The other includes instead all of the Eastern European countries considered (Lithuania, Slovenia, Poland, Hungary, Czech Republic) and a miscellany of others (Belgium, France, Spain and Ireland). At this level of aggregation, the only change in 2014 relative to 2010 is represented by France, which joins the Northern European group.

The differences between the Northern European group (plus France in 2014) and the rest of the sample could not be more clear cut (Table 3 shows the average values for the two groups in 2014). With the exception of the percentage of households endowed with IPTV and LIMITFREE, all the remaining indicators are larger in Northern Europe than elsewhere. This describes Northern Europe as a media environment where advanced TV equipment has a large diffusion, public TV on the one hand and pay TV on the other are prominent relative to commercial, free-to-air broadcasting, media other than TV are well represented with relatively high advertising revenues, and TV programs, both in fiction and journalism reach good quality standards as witnessed by international prizes. Finally, limitations to information freedom are smaller in the Northern European group. The non-media indicators, such as GDP, PISA rating and electoral participation are also higher in the Northern European Group than in the rest of the sample.

Table 3 Average values for the two groups (2014)

	Group 1 DE DK NL NO SE FI FR	Group 2 LT PL CZ HU SI BE IE ES
	Mean	Mean
SMART	0.1155099	0.0786043
IPTV	0.0587356	0.0663089
Paytvsubs	0.4092648	0.2605772
Ondemrev	11.93064	2.994344
Advinttv ratio	1.495046	0.5333437
Publicaudience	41.87143	24.83125
Advnwsptvratio	1.055104	0.3416392
Broadband	86.71429	74.25
Prixfiction	0.2857143	0.125
Prixfourn	0.5714286	–
Gdppro	46426	30441.25
Limitfree	0.6014286	0.87625
PISA	505.2857	494.625
Turnout	50.64429	41.7225

4 Estimates and results

In this section we shall provide the estimation results for Eq. (1) above described. Endogeneity problems are ubiquitous in empirical economics. In the present paper, we are particularly concerned with education. On the one hand, a wide range of variables simultaneously affect education-related choices which are observable only to a limited extent. On the other hand, education plays a paramount role in our framework. Therefore, we choose an IV approach. We augment our model by adding one further equation, where the potentially endogenous variable is regressed on a set of instruments. Following the literature (see the exhaustive survey by Holmlund et al. 2011), and taking advantage of our data set, we choose as instruments a set of variables related to the respondents' parents education and occupation:

$$\begin{aligned}
 \text{education} = & \alpha_0 + \alpha_1 \text{age} + \alpha_2 \text{sex} + \alpha_3 \text{ethnic_min.} \\
 & + \alpha_4 \text{education_m} + \alpha_5 \text{education_f} \\
 & + \alpha_6 \text{high_m} + \alpha_7 \text{high_f} + \alpha_8 \text{whitecoll_f} \\
 & + \alpha_9 \text{whitecoll_m} + \alpha_{10} \text{bluecoll_f} + \alpha_{11} \text{bluecoll_m} \\
 & + \alpha_{12} \text{farm_f} + \alpha_{13} \text{farm_m} + \alpha_{14} \text{essround} + v
 \end{aligned} \quad (3)$$

Equation (3) explains the individual education by means of parents' education levels (EDUCATION_F and EDUCATION_M) and professional status when the respondent was 14, (HIGH_M, HIGH_F, WHITECOLL_M, WHITECOLL_F, BLUECOLL_M, BLUECOLL_F, FARM_F, FARM_M). In addition to the

Table 4 Estimates of Eq. (3)

Education	
Age	− 0.0224
Sex	− 0.0973
Ethnic _ min	0.2005
Education _ m	0.02443***
Education _ f	0.3545***
High _ m	− 0.2127
High _ f	0.7511***
Whiteco11 _ f	0.3930***
Whiteco11 _ m	0.2122
Blueco11 _ f	− 0.4680**
Blueco11 _ m	0.0284
Farm _ m	− 0.1273*
Farm _ f	− 1.3159**
Essround	0.1389**
Constant	10.52017***
Number of obs	90.334
R-squared	0.1888

***P < 0.001, **P < 0.01, *P < 0.05

mentioned regressors the equation includes country dummies. v is an error term, for which the same assumptions as stated for ε apply. The predicted values, denoted as EDUCATION_IV are then employed in the estimation of Eq. (1).

Notice that educated parents positively affect the level of education of the children as well as the father high professional status. Surprisingly, the mother high or good professional status is never statistically significant. Conversely, low professional skills discourage children education level. Dummy country variables are all significant, but they are omitted for the sake of simplicity (Table 4).

The following Tables 5 and 6 summarize the estimation results, comparing (1) and (2).⁷

Comparing the estimates with country dummies and those with country-level variables, we find very few changes as regards the significance and signs of individual-level regressors.

TVTOT is larger with retired, unemployed and less skilled individuals and it increases with age. Conversely, general TV time decreases with education and it is smaller with highly qualified professionals. TV watching is comparatively smaller in tiny towns and in very large cities relative to intermediate sized towns. Family income does not affect general TV viewing when country-level variables are employed, while the corresponding coefficient is barely significant (and negative) with dummies. Among country-level variables, those expressing

⁷ The absolute values of the estimated coefficients do not lend themselves to an meaningful interpretation, given the heterogeneity of measurement units.

Table 5 Dependent variable: TVTOT

	Estimates of Eq. (2)	Estimates of Eq. (1)
Age	0.0164***	0.0172***
Sex	0.0461	0.0525
Ethnic_min	0.0208	-0.0158
Retired	0.6794***	0.6770***
Education_iv	-0.1457***	-0.1316***
Inc_familyproc	-0.0201*	-0.0149
Unemployed	0.3870	0.3769***
Itunem	0.3181***	0.2940***
Occup_high	-0.2964***	-0.2933***
Occup_techprof	-0.2331***	-0.2235***
Occup_bluecollar2	0.2417***	0.2765***
Occup_bluecollar1	0.2304**	0.2666***
Occup_clerk	0.1378*	0.1665**
Bigcity	-0.0969**	-0.1015**
Village	-0.2317***	-0.2365***
Essround	-0.0725***	-0.1453
gdppro		0.0001***
limitfree		-0.4276***
PISA		0.0025
Publicaudience		-0.0024
IPTV		4.2577***
SMART		-4.7622**
Turnoutnew		-0.0008
Advnwsptvratio		-0.6175***
Advinttvratio		0.4942***
Paytvsubs		-1.5847***
Broadband		0.0022
Ondemrev		-0.0242433***
Prixfiction		0.0197
Prixjourn		-0.1063***
Constant	47.209***	46.736***
Number of obs	50808	50808
R-squared	0.1575	0.1475

(*) The estimated values for the constant are omitted for expository simplification

*** $p < 0.001$, ** $P < 0.01$, * $P < 0.05$

larger personalization of TV services (such as PAYTVSUBS, SMART and ONDEMREV) exert a negative effect on time devoted to general TV viewing. This effect might be interpreted as the consequence of a more efficient use of TV time, related to an improved choice process. A large presence of the web in the advertising market (ADVINTTVRATIO) seems to reinforce TV watching rather than contrasting it. On the contrary an advertising-competitive press sector

Table 6 Dependent variable: TVPOL

	Estimates of Eq. (2)	Estimates of Eq. (1)
Age	0.0197***	0.0195***
Sex	-0.1924***	-0.1923***
Ethnic_min	-0.1194	-0.1078
Retired	0.2286***	0.2255***
Education_iv	0.0059	0.0030
Inc_familyproc	0.0054	0.0023
Unemployed	0.1840***	0.1946***
Itunem	0.0843**	0.0866**
Occup_high	0.0623	0.0682
Occup_techprof	0.0945*	0.0808*
Occup_bluecollar2	0.0180	-0.0018
Occup_bluecollar1	0.0829	0.0625
Occup_clerk	0.1373**	0.1203**
Bigcity	0.09133***	0.1009***
Village	-0.0982***	-0.0928***
Essround	0.0677***	0.4438***
gdppro		0.0001***
limitfree		-0.0752*
PISA		0.0062***
Publicaudience		0.0029**
IPTV		4.6592***
SMART		-11.3278***
Turnoutnew		-0.0012*
Advnwsptvratio		-0.2966***
Advintvratio		0.5070***
Paytvsubs		-0.7387***
Broadband		-0.0125***
Ondemrev		-0.0264***
Prixfiction		-0.0915**
Prixjourn		-0.0176
Constant	0.588	-3.75***
Number of obs	48860	48860
R-squared	0.1289	0.1259

(*) The estimated values for the constant are omitted for expository simplification

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

(ADVNEWSPTVRATIO) reduces the propensity to watch TV. The issue of complementarity vs. substitutability seems therefore to have different answers for different media, with traditional media being more competitive with TV than the newer ones. Analogously, high quality of news contents (PRIXJOURN) tends to reduce TVTOT. Limitations to freedom of information (LIMITFREE) seem to discourage TV viewing, while TVTOT is increasing with respect to GDPPRO

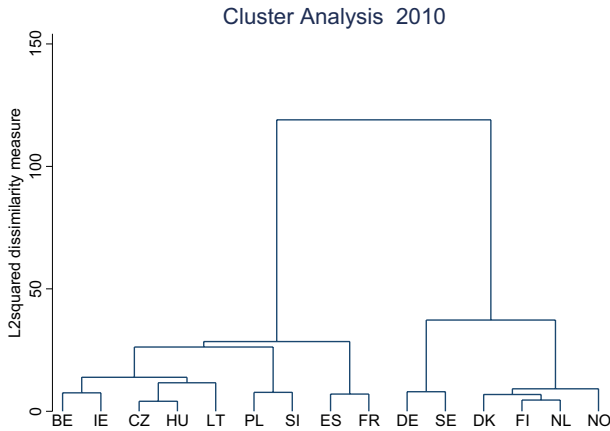


Fig. 1 Cluster analysis 2010

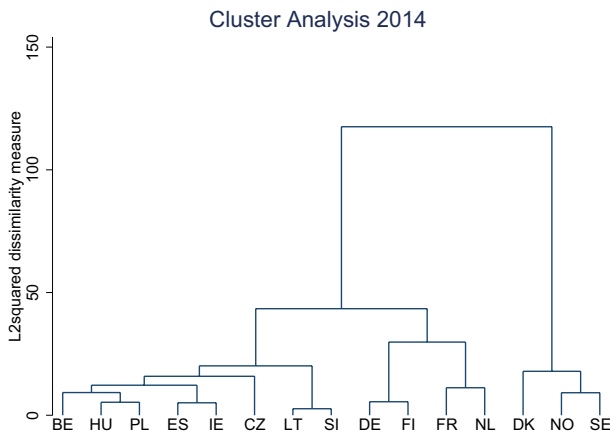


Fig. 2 Cluster analysis 2014

and IPTV. The coefficient of the time trend (ESSROUND) is significantly negative with dummies, while it is statistically 0 with country level variables. This suggests that changes in country-level regressors account for most of the time change.

Turning to news oriented TV use, some striking differences emerge with respect to general TV. First of all, education and family income are not significant. This result suggests that TV represent a universal source of information (at least as a first-resort one). It would be interesting to verify whether or not education and status affect the use of other, more sophisticated, sources (e.g. press, web). Women devote less time than men to TV news. Occupation appears to have no impact on TV watching with informative purposes with the exception of clerks, with a positive sign. TV news are particularly appealing in large cities.

Some remarkable differences relative to the general TV viewing pattern appear also as we turn to country-level variables. The country commitment to education enhancement (as measured by PISA scores) favour news-oriented TV time. It is remarkable that education matters as an externality, while, as mentioned, individual education has no effect on the use of TV as source of information. A strong presence of public broadcaster also stimulates news collection through the TV. Quality of TV fictions (PRIXFICTION) reduces TVPOL and so does broadband diffusion. Surprisingly enough, TURNOUT seems to discourage TV watching for informative purposes. Other country-level variables have the same impact on news-oriented TV time as in the general viewing case. A significantly positive time trend emerges even after the introduction of country-level variables. This interestingly compares to the evidence in Table 1, which refers to total TV watching.

5 Conclusions

As a general result of our analysis we found that TV watching is actually related to a set of individual level variables as well as to a set of country-level factors. Regarding individual level drivers the estimates remain reasonably stable across econometric specifications.

Education plays different roles in explaining TVTOT and TVPOL. General purpose TV watching decreases with education, while news oriented TV watching seems to be unresponsive to variations in the education levels. This suggests that on the one hand TV provides a basic information service valuable to a large share of the population independently of education level; on the other hand, the entertainment contents of broadcasting are relatively more characterized from the cultural viewpoint.

As regards the income index (INC_FAMILYPROC), it is important to stress that it catches an income effect in a broad sense, while it is not a measure of opportunity cost of time. As such its influence turns out to be negligible, the reason being that we control for a set of covariates which are usually related to income, but more precisely linked to media related behavior. Among this set of variable associated to income, the professional condition plays an interesting role. Unemployed people tend to devote more time to TV watching for information and entertainment alike. Less skilled and lower wage individuals devote relatively more time to general TV watching. Conversely, high qualified professionals refrain from spending too much time watching general television. Finally, retired persons are strong TV watchers, both for entertainment and information. Notice that since we control for age, this is purely an effect of retirement. A general conclusion seems to be that the softer the time constraint, or opportunity cost, the more TV watching becomes attractive.

Turning to country-level variables, we can safely conclude that the basic features of the national media markets and of the social and political environment matter.

First of all, the larger the choice opportunity, as expressed by pay, on-demand, smart TV and broadband diffusion, the shorter the TV watching time. This suggests a substitution between quantity and quality of TV time.

Second, advertising related variables, signal a different role of internet as opposed to newspapers as competitors to broadcasting. The extension of web related activities is complementary to TV watching, while the real competitor of television for time use rather seems to be the press. Furthermore the presence of a well-established public broadcasting system encourages news oriented TV. Prix Europe awards do not necessarily reflect the ability to catch a large audience, but rather express the creative and productive effort of broadcasting systems at the country level. Under this limitation, success in journalistic production seems to reduce entertainment oriented TV time. On the contrary, countries with high achievements on fictions show reduced levels of news-oriented TV time.

Two environmental variables suggest interesting implications. Limitation to journalist freedom seems to depress TV viewing, both for entertainment and news. PISA scores are associated with larger news oriented TV viewing; this is a remarkable result given that, on the contrary, the respondents education level does not affect TVPOL.

I the overall picture that our analysis provides TV appears to be at the crossroads of a number of dynamic processes within industrialized countries, namely technical innovation, market evolution and change in cultural attitudes and behavioral patterns. On the individual side, education and time constraints keep playing a major role.

Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest

Appendix

Explanatory variables: individual level

AGE	The age of the respondent
SEX	Dummy variable, value 1 for female
ETHNIC_MINORITY	Dummy variable, value 1 for a minority
BIGCITY	Dummy variable, value 1 for individuals living in big cities
VILLAGE	Dummy variable, value 1 for individuals living in a country village
EDUCATION	The years of education
INC_FAMILYPROC	Per capita family income of the respondent
RETIRED	Dummy variable, value 1 being retired
UNEMPLOYED	Dummy variable, being unemployed in the last week, but looking for job
LTUNEMPLOYED	Dummy variable, being long term unemployed
OCCUP_HIGH	Dummy variable, value 1 if individual is a high-rank manager or an entrepreneur
OCCUP_TECHPROF	Dummy variable, value 1 if individual is a highly manager or an entrepreneur

Explanatory variables: individual level

OCCUP_CLERK	Dummy variable, value 1 if individual is a clerk
OCCUP_BLUECOLLAR 1	Dummy variable, value 1 if individual is a high-skilled bluecollar
OCCUP_BLUECOLLAR 2	Dummy variable, value 1 if individual is a low skilled bluecollar

Explanatory variables: country level

GDPPRO	Per capita GDP in PPP
LIMITFREE	Index of freedom in media market
TURNOUT	Election turnout
PUBLICAUDIENCE	Share of audience of the public broadcasting system
PAYTVSUBS	Ratio of pay-TV subscribers to the population
IPTV	Number of families with Internet Protocol TV per 1000 individuals
SMART	Number of families with smart TV per 1000 individuals
ADVINTTVRATIO	Ratio of internet advertising revenues to the broadcasting advertising revenues
ADVNEWSPTVRATIO	Ratio of newspapers advertising revenues to the broadcasting advertising revenues
ONDEMREV	Ratio of revenues from on-demand TV services to GDP
BROADBAND	Share of households with a Broadband connection
PRIZEFICTION	Prix Europa: Number of prizes and special recommendations for TV fictions
PRIZEJOURN	Prix Europa: Number of prizes and special recommendations for documentary, current affairs and IRIS

References

- Alaoui, L., & Germano, F. (2016). Time Scarcity and the Market for News HAL Paper Id: halshs-01251522.
- Bakker, T. P., & de Vreese, C. H. (2011). Good news for the future? Young people, internet use, and political participation. *Communication Research*, 38(4), 451–470.
- Battaglion, M. R., & Vaglio, A. (2012). The market for news: A demand oriented analysis. *Economia Politica*, XXIX, 81–110.
- Battaglion, M. R., & Vaglio, A. (2015). Pin-ups and journalists: A model of media market with news and entertainment. *Journal of Media Economics*, 28(4), 217–245.
- Bishop, C. (1995). *Neural networks for pattern recognition*. Oxford: Clarendon Press.
- Chapela, J. G. (2016). Disentangling income and price effects in the demand for time online. *Information Economics and Policy*, 35, 65–75.
- COE, European Audiovisual Observatory, various years 2010, 2012, 2014, 2018
- Dou, W., Wang, G., & Zhou, N. (2006). Generational and regional differences in media consumption patterns of chinese generation X consumers. *Journal of Advertising*, 35, 101–110.
- European Social Survey
- Fernandez-Gutierrez, M. Calero, -J. (2016). Leisure and education: Insights from a time-use analysis. In *IEB Working Papers 2016–18*
- Goldfarb, Avi, & Prince, Jeff. (2008). Internet adoption and usage patterns are different: Implications for the digital divide. *Information Economics and Policy*, 20, 2–15.
- Hiller, R. S., Savage, S. J., & Waldman, D. M. (2015). Market structure and media diversity. *Economic Inquiry*, 53(2), 872–888.

- Holmlund, H., Lindahl, M., & Plug, E. (2011). The causal effect of parents' schooling on children's schooling: A comparison of estimation methods. *Journal of Economic Literature*, 49(3), 615–651.
- Holt, K., Shehata, A., Strömbäck, J., & Ljungberg, E. (2013). Age and the effects of news media attention and social media use on political interest and participation: Do social media function as leveller? *European Journal of Communication*, 28(1), 19–34.
- Jang, S., & Park, M. (2016). Do new media substitute for old media?: A panel analysis of daily media use. *Journal of Media Economics*, 29(2), 73–91.
- Lenhart, A., Purcell, K., Smith, A., & Zickuhr, K. (2010). *Social media and mobile internet use among teens and young adults*. Washington, DC: Pew Research Center.
- Liebowitz, S. J., & Zentner, A. (2012). Clash of the titans: Does internet use reduce television viewing? *Review of Economics and Statistics*, 94(1), 234–245.
- Loader, B. (2007). *Young citizens in the digital age: Political engagement, young people, and new media*. London: Routledge.
- Lupia, A., & Philpot, T. S. (2005). Views from inside the net: How websites affect young adults' political interest. *Journal of Politics*, 67(4), 1122–1142.
- Molina, J. A., Campaña, J. C., & Ortega, R. (2016). What do you prefer for a relaxing time at home: reading, watching TV or listening to the radio? *Applied Economics Letters*, 23(18), 1278–1284.
- Ofcom, (2018), Media Nations. https://www.ofcom.org.uk/__data/assets/pdf_file/0014/116006/media-nations-2018-uk.pdf
- Pantae, S., & Martens, B. (2016). The value of the internet for consumers. *Journal of Media Economics*, 29(1), 16–30.
- Strömbäck, J., & Shehata, A. (2010). Media malaise or a virtuous circle? Exploring the causal relationships between news media exposure, political news attention and political interest. *European Journal of Political Research*, 49(5), 575–597.
- Stromback, J., Djerf-Pierre, M., & Shehata, A. (2013). The dynamics of political interest and news media consumption: A longitudinal perspective. *International Journal of Public Opinion Research*, 25(4), 414–434.
- Van der Wurff, R. (2011). Are news media substitutes? Gratifications, contents, and uses. *Journal of Media Economics*, 24(3), 139–157.
- Waldfogel, J. (2002). *Consumer Substitution Among Media*, Federal Communicatiuon Commission, Media Ownership Working Group.

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