

Banerjee, Aniruddha; Alleman, James; Rappoport, Paul

Conference Paper

Analysis of video-viewing behavior in the era of convergent and connected devices

19th Biennial Conference of the International Telecommunications Society (ITS): "Moving Forward with Future Technologies: Opening a Platform for All", Bangkok, Thailand, 18th-21th November 2012

Provided in Cooperation with:

International Telecommunications Society (ITS)

Suggested Citation: Banerjee, Aniruddha; Alleman, James; Rappoport, Paul (2012) : Analysis of video-viewing behavior in the era of convergent and connected devices, 19th Biennial Conference of the International Telecommunications Society (ITS): "Moving Forward with Future Technologies: Opening a Platform for All", Bangkok, Thailand, 18th-21th November 2012, International Telecommunications Society (ITS), Calgary

This Version is available at:

<https://hdl.handle.net/10419/72512>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

The 19th ITS Biennial Conference 2012

“Moving Forward with Future Technologies: Opening a Platform for All”

18 - 21 November 2012, Thailand

Analysis of Video-Viewing Behavior in the Era of Convergent and Connected Devices

Aniruddha Banerjee*, James Alleman, Paul Rappoport***

CENTRIS*, University of Colorado**

E-mail: axbaner@comcast.net, james.alleman@colorado.edu

Analysis of Video-Viewing Behavior in the Era of Convergent and Connected Devices

Aniruddha Banerjee (CENTRIS),¹ James Alleman (University of Colorado),² and Paul Rappoport (CENTRIS)

1. Introduction

In the United States and elsewhere, traditional sources of television programming (such as cable, satellite, or fiber-based telephone companies) face rising competition from bypass or “over-the-top” (OTT) alternatives that enable consumers to view TV programs in any place and any time of their choosing. Most OTT bypass takes the form of streaming (non-storable video content received over the Internet for viewing in real time) or downloading (storable video content received over the Internet for viewing at any time). Growing availability of high-speed broadband is frequently credited with increasing OTT access to video content; however, a confluence of other factors is, arguably, equally significant as well.

Three coincident developments over the past few years have spurred growing OTT use (and video cord-cutting, specifically). First, multifunctional devices (such as computers, smartphones, tablets, game consoles, etc.) now enable streaming and downloading. These devices all rely on Internet access, are increasingly portable, and extend the video viewing experience well beyond live viewing and fixed locations. Even though most frequently purchased for their primary capabilities (computing, voice calling, playing games, etc.), they generate significant value at practically no additional cost for viewing a wide range of video content. Most of these devices are alternative screens for viewing as well, liberating the viewer from being tethered to a fixed TV set. Hence, these devices are frequently described as “convergent” or “connected.”

Second, demographics play an important role in driving OTT behavior. As with voice cord-cutting (which saw mobile telephones replacing fixed telephones for voice calling purposes), the biggest demographic drivers of video cord-cutting are younger consumers living independently or forming new households, as well as low-income consumers looking to avoid the high cost of subscribing to traditional television service that typically comes in the form of several tiered but packaged channels. However, just as many telephone users possess both mobile and fixed phones, significant numbers of OTT users are actually co-consumers of both traditional television service and OTT. The demographic behind this is typically higher-income consumers who can afford multiple devices and multiple subscriptions. For them, the addition of OTT to traditional live television makes “TV anywhere and at any time” a reality.

¹ Contact author: axbaner@comcast.net +1 978 263 9031

² Presenting author: james.alleman@colorado.edu +1 303 443 4465

Finally, sensing the rising importance of OTT (whether to replace or complement traditional television), many paid or free streaming/downloading services have emerged. The best known among these are Netflix, Hulu, and iTunes but others are gaining ground as well (most notably, Amazon which now offers free and unlimited video content to its Amazon Prime customers). They are frequently the source of movies, TV shows, news and weather, and sports, besides other programming. Realizing the threat these services pose, some traditional television service providers are now co-opting their competition by making OTT access to their programs possible in some circumstances alongside their more traditional broadcasts, a strategy known as “TV Everywhere.”³

The question that motivates the research reported in this paper concerns what these developments are doing to the viewership for video content. If OTT cannibalizes traditional television viewing on TV sets, then household viewership hours may decline. OTT makes for more targeted viewing (assuming consumers know exactly what they wish to view and where/how to get it) and avoids the navigation difficulties and channel superfluity often associated with traditional television service. On the other hand, if OTT extends the viewership option without diminishing the use of traditional television service, viewership hours may actually grow. More likely, those hours may move in one direction for some consumers and in the opposite direction for others.

2. Research Questions and Findings

In this paper, we used econometric modeling of extensive household-level longitudinal survey data to investigate several aspects of video-viewing behavior in the era of convergent and connected devices. We began by identifying three mutually exclusive OTT segments to which we assigned households depending on whether they used traditional or OTT methods for viewing TV programs and other video content.

We formed three OTT segments by first separating households based on their use of traditional television sources and OTT (streaming or downloading activity) within the past month. Households that used traditional television or “Pay TV” sources (e.g., subscriptions to cable, satellite, or fiber-based providers of video services) but had no OTT activity during that month were referred to as “Cord Loyalists.” Households that used both Pay TV and OTT were labeled “Cord Couplers.” Finally, households that relied solely on OTT-based viewing (either because they had replaced Pay TV with OTT activity or had opted for OTT

³ See, e.g., recent developments in Spangler, T., “HBO Go Gets Fired Up for Amazon Kindle,” *Multichannel News*, June 6, 2012, available at <http://www.multichannel.com/article/485577-HBO-Go-Gets-Fired-Up-For-Amazon-Kindle.php>; Spangler, T., “Blue Ridge Green-Lights HBO Go,” *Multichannel News*, March 5, 2012, available at <http://www.multichannel.com/article/481406-Blue-Ridge-Green-Lights-HBO-Go.php>; Chozick, A., “Comcast Declines to Offer Netflix to its Customers,” *The New York Times (Media & Advertising)*, March 8, 2012, available at <http://mediadecoder.blogs.nytimes.com/2012/03/08/comcast-rejects-idea-of-partnering-with-netflix/>; Baumgartner, J., “Comcast Unit Targets Synacor’s Turf,” *Light Reading Cable*, March 29, 2012, available at http://www.lightreading.com/document.asp?doc_id=219287&site=lr_cable&; and Gallagher, J., “Charter: If You Can’t Beat Them, Embrace Them,” *stltoday.com*, March 11, 2012, available at http://www.stltoday.com/business/local/charter-if-you-can-t-beat-them-embrace-them/article_9ed77360-64b9-11e1-a909-001a4bcf6878.html.

over Pay TV at the time of household formation) were assigned to the “Non-Pay TV” segment.⁴

To understand viewing behavior within these OTT segments, we tracked the following metrics:

- (1) genres of video programming being viewed (movies, TV shows, news and weather, sports, clips and other video)
- (2) enabling devices (for traditional television and streaming/downloading)
- (3) household demographics
- (4) average weekly hours of viewership by households, by device and genre

Next, we set up and investigated three research questions regarding video-viewing behavior in the era of convergent and connected devices.

First, do households transition among the three OTT segments over time, i.e., choose different ways to receive TV or video content, and, if so, to what extent? Do households adding OTT to their viewing options also keep their Pay TV service or drop it? Also, do households move back from OTT use to pure Pay TV use?

Second, what determines the decision to stay in, or move from, an OTT segment? In other words, what features of the video consumption environment drive households into different OTT segments or, by the same token, cause those households to move among those segments? The environment in question is made up of household demographics, device ownership and usage, and the diffusion of OTT services for streaming and downloading. We investigated the stay/move choice in terms of these characteristics.

Finally, given OTT’s rise as a viable alternative to Pay TV service, what does that mean for how, and how much, households view TV and video programs? The “how” question refers to choices made by a household that determine to which of the three OTT segments it belongs. OTT use occurs in the Cord Couplers and Non-Pay TV segments, which together account for nearly half of the households in the longitudinal panel. This high incidence of OTT suggests that a wide array of streaming-capable devices is being used and, indeed, more video content is now being provided over those devices than ever before. Even Pay TV service providers are getting into the act.⁵

The accompanying question about “how much” is particularly important to both Pay TV providers and sources of streaming/downloading services. The extent of viewership (often measured in weekly hours) over these different channels determines the division of TV and video revenues that once flowed entirely to Pay TV service providers. This issue parallels

⁴ It is a stretch to characterize Cord Loyalists as an OTT segment because, by definition, they are not OTT users. However, in this paper, the label “OTT segment” is used to identify different groups based on their behavior with respect to OTT. Thus, Cord Loyalists have no OTT use at all, Non-Pay TV households rely solely on OTT for viewing video, and Cord Couplers use both Pay TV and OTT.

⁵ See fn. 3, *supra*.

the one that arose after mobile telecommunications were introduced into a landscape that for decades was the monopoly of fixed telecommunications.

At its core, the third question concerns whether OTT replaces (at least partly) or supplements video viewing through Pay TV service.⁶ On the other hand, if OTT extends the viewership option without diminishing the use of Pay TV services, overall viewership hours actually grow. However, which of these outcomes prevails in the real world is ultimately an empirical question. We expect those hours to move in one direction for some households and in the opposite direction for others.

Besides our findings on these three research questions (which the paper reports in detail), our investigation led to three additional conclusions about connected devices. First, the precise combination of connected devices possessed by a household matters for viewership hours. In particular, the greater the number of screens available, the more likely it is for viewership to decline on the traditional TV set but for it to rise on other devices with screens. Second, for some genres of TV, possession of at least four connected devices is a tipping point. After that, additional devices do not produce significant gains in viewership hours. Finally, rising positive externalities are associated with the possession of a wide variety of connected devices. Households that use a greater variety of devices have markedly higher viewership hours without significant additional costs. This justifies the emerging TV Everywhere strategy of Pay TV service providers that integrate their traditional TV transmissions with streamed video content.

3. Data

US household data on the use of both traditional television and OTT for viewing various genres of TV/video programs were collected using a nationwide Centris survey, conducted from April 2011 to December 2011. We grouped the monthly data by calendar quarters, i.e., for 2Q11, 3Q11, and 4Q11, and then constructed a longitudinal panel from the data. Assignment to this panel was conditioned on a household having responded to the survey in at least two (not necessarily consecutive) quarters. Table 1 summarizes household participation in this unbalanced longitudinal panel.

⁶ There are, of course, ramifications beyond just those for Pay TV service providers' subscription revenues. Declining Pay TV viewership can adversely affect advertising activity and revenues, as well as contractual terms between the service providers and content providers. If Pay TV service providers feel the pressure to abandon traditional business models, then offers based on more tiered or more diverse bundled programs or even a *la carte* pricing are likely to become a serious option. See Adegoke, Y., "In Switch, Cable Operators Want to Go 'A la Carte'," *Reuters*, September 27, 2011, available at <http://www.reuters.com/article/2011/09/27/us-cable-idUSTRE78Q6EE20110927>; Fogarty, K., "Cable Company A la Carte Plan is More Like a Bait-and-Switch," *IT World*, November 28, 2011, available at <http://www.itworld.com/internet/207739/cable-company-la-carte-plan-more-bait-and-switch>; and Lieberman, D., "Cox Scraps ESPN and Other Pricey Channels for New Low-Cost Tier," *Deadline New York*, January 23, 2012, available at <http://www.deadline.com/2012/01/cox-scraps-espn-and-other-pricey-channels-for-new-low-cost-tier/>.

Table 1. Participation Pattern of Unique Households in US Longitudinal Panel on OTT Use, 2Q11-4Q11

Participation	Unique Households	Percent	Cumulative Percent
2Q11, 3Q11, 4Q11	4,241	55.4	55.4
2Q11, 3Q11	1,033	13.5	68.9
2Q11, 4Q11	933	12.2	81.1
3Q11, 4Q11	1,448	18.9	100.0
All	7,655	100.0	

Collectively, the 7,655 unique households produced 19,551 observations over the three quarters, i.e., appeared in the panel 2.6 times on average. The observations were almost uniformly distributed across the three quarters (6,207 in 2Q11, 6,722 in 3Q11, and 6,622 in 4Q11).

We collected wide-ranging information for these households. The first set of data pertained to household ownership and use of devices that deliver TV and video programming and, in some instances, also double as viewing screens. The devices included the TV set, computer (desktop, laptop, or netbook), smartphone, tablet, game console, and connected media device (such as Apple TV or Roku).⁷ All except the last device are multifunctional, and the first four also serve as viewing screens. Households were specifically asked to indicate which of these devices they had used to view each of the five genres of TV/video programs and how much time they had spent during a typical week using the devices to view each genre.

The second set of data pertained to household viewing of streamed or downloaded video, using subscription or pay-per-use services (whether free or paid). Paid subscription services were separated into Netflix and all others (Hulu Plus, Blockbuster, iTunes, and Amazon), while free subscription services included Hulu and websites from which free streamed video are available.

The final set of data pertained to household demographics. Information was collected on the respondent's age, gender, and race/ethnicity, as well as on household size, annual household income, and presence of children in the age ranges 0-6, 7-11, and 12-17.

Although, for the most part, demographic information for households remained the same throughout the period of observation, information on device use (particularly hours of viewership of video programs) and use of OTT services was expected to change over time and generally did. In particular, each household's OTT classification (whether Cord Coupler, Cord Loyalist, or Non-Pay TV) was tracked through all the quarters in which it appeared in the panel.

⁷ Other devices considered included portable video players, video-capable e-Readers, and portable video game systems. These were not, however, included in the final analysis because of their relative insignificance for video viewing purposes.

Except for household size (a count variable), we converted all other demographic variables into categorical variables as follows:

- Age in four categories: 18-34, 35-39, 40-54, 55 and over
- Gender: Male, female
- Annual household income: \$0-\$20,000, \$20,000-\$35,000, \$35,000-\$50,000, \$50,000-\$100,000, and \$100,000 and over
- Race/ethnicity: White, African-American, Asian-American, Hispanic, and Other
- Presence of children: age 0-6, age 7-11, and age 12-17

Similarly, we created binary categorical variables for each device (for both ownership and use) and each streaming/downloading subscription service used (both paid and free). From the latter, we constructed three categorical variables: Netflix Paid Streaming, Other Paid Streaming, and Free Streaming.

Respondent-estimated weekly hours of viewership were recorded by individual device and by genre of TV/video programs.⁸ We created total weekly hours of viewership by device by summing hours across TV genres for each device. Similarly, we created total weekly hours of viewership by TV genre by summing hours across devices for each genre.

Finally, for purposes of analysis, we set up information on device use in three different ways.

- Binary categorical variables were created for the use of the TV set (for linear viewing only), computer, smartphone, tablet, game console (“GC”), and connected media device (“CMD”).⁹
- Counts of devices used, ranging from one to all six, were created for all households and converted into binary categorical variables. For example, the variable “One_device” was set to 1 if a household used only one device and 0 otherwise. Similarly, the variable “Six_devices” was set to 1 if a household used all six devices and 0 otherwise.
- Different combinations of devices used by households were recorded and a binary categorical variable (1 if that combination was used, 0 otherwise) was created for each combination. With six devices, this resulted in $2^6 - 1 = 63$ possible device combinations. Since the vast majority of these device combinations were very sparingly used by households, we retained only 10 such combinations for analysis (using as the cut-off rule that a device combination must have been used by at least

⁸ Survey respondents were asked to estimate, on behalf of the entire household, weekly hours of viewership by both device and TV genre. Unlike the use of metering devices to track which programs are viewed, and for how long, on randomly selected and monitored TV sets, the estimation method was both more flexible (because it captured hours from a wide array of devices and screens) and more susceptible to measurement error (because of limits to respondents’ ability to track or recall viewership by other household members).

⁹ CMDs are available in many forms but their primary purpose is to provide direct access to video content over the Internet, without first connecting to computers for Internet access. Examples include Apple TV, Roku, Boxee, Vudu, and Slingbox.

1% of households in the panel). These top ten device combinations are shown for 4Q11 in Table 2.¹⁰

Table 2. Top Ten Device Combinations Used by Households in 4Q11

Device Combination	Rank
TV only	1
TV, Computer	2
TV, Computer, Game Console	3
TV, Computer, Smartphone	4
TV, Computer, Smartphone, Game Console	5
TV, Computer, Smartphone, Tablet, Game Console	6
TV, Computer, Tablet	7
TV, Computer, Smartphone, Tablet	8
TV, Computer, Tablet, Game Console	9
TV, Computer, Smartphone, Tablet, Game Console, CMD	10

Table 3 provides another perspective on the use of devices by households in the longitudinal panel over the three quarters of interest. It compares the percent of households that *own* a particular device (by itself or in some combination) with the percent of households that *use* that device (by itself or in some combination) *for viewing TV/ video programs*.

Table 3. Ownership and Use for Viewing TV/Video Programs of Devices in 4Q11

Device	Percent Owned	Percent Used	Used/Owned Ratio
TV	98.7	98.7	100.0
Computer	99.0	57.5	58.1
Smartphone	41.3	18.7	45.3
Tablet	13.2	9.0	68.2
Game Console	45.4	25.0	55.1
Connected Media Device	5.2	3.7	71.1

4. Modeling and Estimation

We relied on standard econometric modeling methods to answer the three questions. The first question was addressed by estimating one-period transition probabilities between alternative states. This was a straightforward calculation of the percentage of households that either remained in its original OTT segment or moved to a different OTT segment.

For the second and third research questions, we estimated the relationship between the dependent variable (stay/move choice in the second question and viewership hours in the third question) and independent variables representing demographic, device-related, and

¹⁰ Strictly speaking, the combination with all six devices (shown as ranked 10 in Table 2) did not belong in the top ten in 4Q11. However, because rankings of device combinations after the top six or so became quite variable over the three quarters, we dropped one of the highly ranked combinations in 4Q11 (TV, Game Console) in favor of the combination with all six devices. This was the only combination in Table 2 to include CMD.

streaming-related drivers. For this, we used a regression framework that is general enough to accommodate not only different types of dependent variables but also alternative structures of dependence in intra-household responses over time. The dependent variable for the second question was a multinomial choice variable (a categorical variable with three or more nominal categories) and that for the third question was a continuous variable.

The generalized linear model (GLM) introduced four decades ago¹¹ greatly expanded the range of linear regression models that can be estimated from a common framework. The GLM is typically specified as

$$g\{E(y)\} = X\beta, \quad y \sim F \quad (1)$$

where $g(\cdot)$ is a “link function” for the mean response $E(y)$, $X\beta$ is a linear predictor using covariates X and is often called the “systematic component,” and F is a “distributional family” for the associated error term and, hence, for the dependent variable y . Depending on choices made for the link function and the distributional family, the GLM can generate a large number of familiar regression models.¹²

The GLM has been further extended into a class of models that is appropriate for grouped or clustered data with built-in correlation within the group or cluster. The generalized linear mixed model (GLMM) permits both fixed and random effects for the systematic component and is thus able to accommodate different dependence structures within clusters or groups for which there are repeated measurements, such as in longitudinal panels.¹³ By using random intercepts and random slope coefficients, the GLMM can be used to model multilevel or hierarchical data in which grouping occurs at successively higher levels. In the present case, there are two levels of data: households at the upper level and the quarters (time units) in which they participated in the survey at the lower level. Because household responses are likely to be correlated over time, the GLMM is well-suited to account for the type of dependence most likely to prevail in those responses over time.

¹¹ See, e.g., Nelder, J.A. and R.W.M. Wedderburn, “Generalized Linear Models,” *Journal of the Royal Statistical Society, Series A*, 135, 370-384, 1972. Alternatively, see McCullagh, P. and J.A. Nelder, *Generalized Linear Models*, 2nd edition, London: Chapman and Hall, 1989.

¹² For example, if F is Gaussian and $g(\cdot)$ is the identity function (i.e., $g\{E(y)\} = E(y)$), then the GLM reduces to the standard linear regression model with normally distributed errors. Alternatively, if F is Bernoulli and $g(\cdot)$ is the log-odds or logit function (i.e., $g\{E(y)\} = \log\left(\frac{E(y)}{1-E(y)}\right)$), then the GLM reduces to the standard logistic regression model. Several other types of regression models can be derived from the GLM in this way. See Fitzmaurice, G.M., N.M. Laird, and J.H. Ware, *Applied Longitudinal Analysis*, Hoboken, NJ: John Wiley & Sons, 2004 (esp. Chapter 10).

¹³ See McCulloch, C.E. and A.F.M. Searle, *Generalized Linear and Mixed Models*, New York: John Wiley & Sons, 2001. Also see Fitzmaurice et al. (2004), *op cit.*, (Chapter 11), supra fn. 12. Other useful sources are Verbeke, G. and G. Molenberghs, *Linear Mixed Models for Longitudinal Data*, New York: Springer Verlag, 2009; and Diggle, P.J., K.-Y. Liang, and S.L. Zeger, *Analysis of Longitudinal Data*, Oxford: Clarendon Press, 1994. Users of SAS software, in particular, will find Verbeke and Molenberghs (2009) useful.

An alternative within the GLM family that is also appropriate for modeling longitudinal panel data with dependence in within-subject (or intra-unit) responses or measures is the method of general estimating equations (“GEE”).¹⁴ The principal difference between the GEE and GLMM methods is in the manner in which intra-unit dependence is modeled. The GEE method (which leads to “marginal” or “population averaged” models) incorporates the intra-unit dependence directly by assuming a specific form of that dependence, e.g., no correlation, equal correlation, autocorrelation of some order, etc. In contrast, the GLMM method (which leads to “mixed effects” models) introduces a more flexible form of intra-unit dependence through random effects for some of the model coefficients (that allow those coefficients to vary randomly across units).

As with the GLM, the GLMM can accommodate models with different types of dependent variables (depending on the choice of the distributional family F). For the second research question, we chose the GLMM method because it can handle multinomial choice models for longitudinal panels, with F as Bernoulli and the link function as multinomial logit or probit. This makes it well-suited to investigate the second research question since the three OTT segments may be viewed as alternative “choices” that households make.

Although we could have used the GEE method for the third research question (since the dependent variable, viewership hours, is a continuous variable), we remained within the GLMM framework (with F as Gaussian and the link function as identity) for two reasons. First, it preserves the flexible model estimation approach that is true of the analysis of the stay/move choice among OTT segments in the second research question. Second, and more importantly, there is no difference in the interpretation of the regression coefficients between the GLMM method and the GEE method when the model in question is linear.¹⁵

Although estimation software is widely available for dichotomous choice models with multilevel data, there are fewer options for multinomial choice. One notable example is `gllamm`, a user-written procedure usable with StataCorp’s Stata software.¹⁶ We used `gllamm` for both sets of models by choosing F and the link function as appropriate. We also estimated the viewership hours model using the GEE method (using Stata’s `xtgee` procedure) and compared estimates with those obtained by the GLMM method. As expected, estimates were similar (though not identical), but overall interpretations of the effects of the covariates were exactly the same.¹⁷

¹⁴ For an exposition of GEE, see Liang, K.-Y. and S.L. Zeger, “Longitudinal Data Analysis Using Generalized Linear Models,” *Biometrika*, 73, 1986, 13-22 or Fitzmaurice et al. (2004), Chapter 11.

¹⁵ See Fitzmaurice et al. (2004), p. 361, *op cit.*, *supra*, fn. 12.

¹⁶ See a full description of this procedure in Rabe-Hesketh, S., A. Skrondal, and A. Pickles, “Reliable Estimation of Generalized Linear Mixed Models Using Adaptive Quadrature,” *The Stata Journal*, 2(1), 1-21, 2002. Alternatively, see Skrondal, A. and S. Rabe-Hesketh, *Generalized Latent Variable Modeling: Multilevel, Longitudinal, and Structural Equation Models*, Boca Raton, FL: Chapman & Hall/CRC, 2004. STATA users may see Rabe-Hesketh, S. and A. Skrondal, *Multilevel and Longitudinal Modeling Using Stata*, Vols. 1 and 2, 3rd edition, College Station, TX: Stata Press, 2012. Stata®/MP for Windows 12.1 — the statistical software used for all model estimation in this paper — is a product of StataCorp LP of College Station, TX.

¹⁷ We do not report the GEE model estimates in this paper, but they are available upon request.

5. Analysis

5.1. OTT Transition Patterns: Implications for Video Cord-Cutting

The first order of business was to understand how households alter or maintain their ways of viewing video over time. In this respect, it was particularly useful to be able to track individual households in a longitudinal panel. One obvious way was to estimate transition probabilities between and among the three major OTT segments, namely, Cord Couplers, Non-Pay TV, and Cord Loyalists. That is, we estimated $\Pr(Y_{i,t}|Y_{j,t-1})$, $i, j = 1, 2, 3$, where Y is the OTT segment state variable, i and j each represent the three segments, and Y_i or Y_j equals 1 if a household is in OTT segment i or j , and 0 otherwise. As noted earlier, the transitions were measured over three quarters and accounted for all forms of two-quarter transitions (as well as the three-quarter transition for households that appeared in the panel in all three quarters).¹⁸

Table 4 shows how households were distributed among the three OTT segments over the three quarters in 2011.

Table 4. Distribution of Households by OTT Segment, 2Q11-4Q11

OTT Segment	Number of Households	Percent	Cumulative Percent
Cord Loyalists	10,329	52.83	52.83
Non-Pay TV	1,572	8.04	60.87
Cord Couplers	7,650	39.13	100.00
All	19,551	100.00	

Table 4 shows that the OTT-only households — the Non-Pay TV households — were a relatively small fraction of all households in 2011. However, the size of that segment alone greatly understates the size of overall OTT activity. Since Cord Couplers also used OTT, the true extent of OTT use among US households was actually close to half of those households.

How fixed are households in their OTT status? For this, the transition probabilities shown in Table 5 reveal that while movement *into* the pure OTT-only Non-Pay TV segment was still relatively a trickle in 2011, there was a comparatively more impressive movement from the pure non-OTT Cord Loyalists to the hybrid status represented by Cord Couplers.

Table 5. Probabilities of Transition among OTT Segments, 2Q11-4Q11

OTT Segment	Cord Couplers	Non-Pay TV	Cord Loyalists
Cord Couplers	75%	3%	22%
Non-Pay TV	17%	71%	12%
Cord Loyalists	18%	5%	77%
Total	39%	9%	52%

¹⁸ In at least one instance, the transition occurred over two non-contiguous quarters, i.e., 2Q11 to 4Q11. We still treated this as a “one-period” transition for households that appeared in the panel in that manner.

Approximately three-quarters of households in each OTT segment stayed in place between 2Q11 and 4Q11. Of those households that did move out of their OTT segments, it is interesting that movement into the Non-Pay TV segment was relatively minor. Table 5 shows that households moving out of the Cord Couplers segment were seven times more likely to drop OTT (i.e., become Cord Loyalists) than to become OTT-only (i.e., Non-Pay TV). Similarly, households that moved out of the Cord Loyalists segment were nearly 4 times more likely to combine OTT with Pay TV (i.e., become Cord Couplers) than to become OTT-only (i.e., Non-Pay TV). This suggests that the last three quarters of 2011 marked a period of experimentation among nearly a quarter of US households, some trying out OTT without canceling Pay TV and an almost similarly-sized cohort abandoning OTT to return to Pay TV status.

By contrast, the impetus to cut the video cord remained relatively mute during this period. Only about 9% of US households were in the Non-Pay TV segment, of which roughly half were true “cord-cutters.” Moreover, about 2.6% of households left the Non-Pay TV segment for the other two segments, which mostly offset the 3.8% of households which went in the opposite direction. The evidence in Tables 4 and 5 suggests a relatively small and almost dormant Non-Pay TV movement even as OTT penetration among US households reached impressive levels. That is, greater OTT use did not automatically translate into video cord-cutting.

5.2. Drivers of the Choice to Stay within or Move from an OTT Segment

Households in any time period were assumed to have three choices for the next time period: (1) stay in their current OTT segment, (2) move to the first alternate OTT segment, or (3) move to the second alternate OTT segment. For households that responded to the survey over the three-quarter period between 2Q11 and 4Q11, 27 choices were possible, whereas households that responded in only two of the three quarters selected from among nine possible choices. As Table 1 shows, roughly 55% of households in the longitudinal panel had the 27 choices available to them, while the remaining 45% had nine choices available.

With three possible categories of choice (i.e., the three OTT segments) and an unbalanced panel (slightly more than half of households responding in all three quarters and slightly less than half responding in two quarters), a multinomial panel data choice model was set up to investigate the drivers of the stay/move choice. Independent variables included household demographics expressed as categorical variables (as described above)¹⁹ and various configurations of the variables for the use of devices and of streaming/downloading services.

The GLMM procedure for multinomial choice (with multinomial logit as the link function) was used to estimate four alternative model specifications, which differed only in the manner device use and streaming/downloading-related variables were specified. We did so for two reasons. First, the three variables representing streaming/downloading were

¹⁹ The lone exception was household size which was a count variable.

collinear with device-related variables, particularly those used specifically for streaming and downloading.²⁰ Therefore, the device-related and streaming/downloading variables could not be all loaded into the same regression model. Second, as the paper demonstrates later, models estimated with different configurations of the device-related variables yielded alternative insights about the stay/move choice that were simply not apparent from any single model.

To interpret the findings from GLMM multinomial logit models estimated in this paper, we relied on the relative risk ratio (“RRR”). The RRR is constructed as follows.

Consider a multinomial choice model in which the dependent discrete (nominal) variable y can have one of three outcomes 1, 2, and 3. Suppose outcome 1 is considered the “base category,” i.e., probabilities of outcomes 2 and 3 for any given state variable (or covariate) are measured relative to it. Suppose X is a categorical state variable or covariate that can take on either 0 or 1 as values. Then, the “relative risks” for outcome 2 (relative to outcome 1) for each state of the covariate X are defined as

$$RR1 = \frac{\Pr(y = 2|X = 0)}{\Pr(y = 1|X = 0)} \quad \text{and} \quad RR2 = \frac{\Pr(y = 2|X = 1)}{\Pr(y = 1|X = 1)}$$

where, in a multinomial logit environment specifically,

$$\Pr(y = 2|X = 0) = \frac{e^{\beta_{20}}}{1 + e^{\beta_{20}} + e^{\beta_{30}}}$$

$$\Pr(y = 1|X = 0) = \frac{1}{1 + e^{\beta_{20}} + e^{\beta_{30}}}$$

$$\Pr(y = 2|X = 1) = \frac{e^{\beta_{20} + \beta_{21}}}{1 + e^{\beta_{20} + \beta_{21}} + e^{\beta_{30} + \beta_{31}}}$$

$$\Pr(y = 1|X = 1) = \frac{1}{1 + e^{\beta_{20} + \beta_{21}} + e^{\beta_{30} + \beta_{31}}}$$

β_{20} and β_{30} are fixed intercepts in the regressions for outcomes 2 and 3, respectively, and β_{21} and β_{31} are the coefficients of X when at value 1 for outcomes 2 and 3, respectively. The relative risks for outcome 3 (relative to outcome 1) for both values of X can be defined analogously.

The RRR for outcomes 2 and 1 for the values X can take is then the ratio of $RR2$ and $RR1$.²¹ Being a ratio of probabilities, the RRR is always non-negative. The interpretation of the

²⁰ Tetrachoric correlations (appropriate for binary categorical variables) are shown for the streaming-related and device-related variables in Table A1 in the Appendix.

²¹ With dichotomous choice, the RRR reduces to the more familiar concept of the odds ratio.

RRR is that it expresses the degree to which the odds of outcome 2 are higher or lower than those of outcome 1 when the covariate X switches from its default value of 0 to 1. Those odds are higher, equal, or lower as RRR is greater than 1, equal to 1, or less than 1.

To illustrate the RRR concept and its usefulness for our analysis, consider three outcomes: 1=Cord Couplers, 2=Non-Pay TV, and 3=Cord Loyalists. Assume X is a binary variable for gender, 0 if male (default case) and 1 if female. Suppose Cord Couplers represent the base category. Then, if the RRR for Non-Pay TV relative to Cord Couplers, given the gender variable, is, say, 1.27, we interpret this finding to mean that females are 27% more likely than males to be in the Non-Pay TV segment relative to the Cord Couplers segment (and the odds are correspondingly lower for males than for females).

In general, comparing choice A to choice B , if the RRR exceeds one then A is more likely to be the chosen than B . Moreover, as the margin by which the RRR exceeds one increases, so does the likelihood of A being chosen over B . If, instead, that RRR is less than one, then B is more likely to be chosen over A , and the closer the RRR gets to zero, the greater is the likelihood of B being chosen over A . When the RRR is at or hovers near one, the odds of either choice are about even. The RRR also has the reciprocal property, i.e., an RRR greater than one in a comparison of A to B is equivalent to an RRR less than one in the reverse comparison of B to A . Thus, an RRR conveys both the direction and the magnitude of the relative likelihood of one outcome over another.

Tables 6-8 present the RRRs between each pair of OTT segments for the independent variables in each model.²² All estimated RRRs are statistically significant at the 5% level, except those for “Six Devices” in all three tables and for the (TV,C,S,T,GC,CMD) combination in Tables 6 and 7, which are statistically significant at the 10% level. The RRR for the (TV,C,S,T,GC,CMD) combination in Table 8 is not statistically significant.

Table 6. Relative Risk Ratios in Various Models for Non-Pay TV vs. Cord Couplers

Independent Variable	Model 1: Streaming Only	Model 2: Device Use	Model 3: Device Count	Model 4: Device Combination
Demographics				
Age 18-34	1.35	1.64	1.81	1.54
Age 35-39	1.34	1.49	1.66	1.46
Age 40-54	1.27	1.37	1.43	1.30
Income \$0-\$20K	2.10	1.95	1.92	2.09
Income \$20K-\$35K	1.18	1.23	1.15	1.22
Income \$35K-\$50K	0.90	1.00	0.92	0.96
Income \$50K-\$100K	0.61	0.67	0.64	0.65
Income \$100K and over	0.40	0.49	0.45	0.43
Household size	0.87	0.92	0.90	0.90
White	0.94	0.89	0.89	0.88
African-American	0.74	0.66	0.78	0.74
Asian-American	1.85	1.65	1.89	1.87

²² Details of the underlying estimated GLMM multinomial choice models that lead to the RRRs reported in Tables 6-8 are available from the contact author upon request.

Hispanic	1.00	1.04	1.04	0.99
Children 0-6	1.06	1.05	1.05	1.04
Children 7-11	1.31	1.32	1.30	1.32
Children 12-17	0.96	0.96	0.98	0.96
Streaming/Downloading.				
Netflix Paid Streaming	0.99			
Other Paid Streaming	0.80			
Free Streaming	0.68			
Device Use				
Use TV set		0.00		
Use Computer		0.62		
Use Smartphone		0.68		
Use Tablet		0.78		
Use Game Console		1.39		
Use CMD		0.66		
Device Count				
Two Devices			0.29	
Three Devices			0.22	
Four Devices			0.13	
Five Devices			0.15	
Six Devices			0.06	
Device Combination				
TV only				0.52
TV,C				0.30
TV,C,S				0.24
TV,C,T				0.26
TV,C,GC				0.23
TV,C,S,T				0.18
TV,C,T,GC				0.11
TV,C,S,GC				0.23
TV,C,S,T,GC				0.17
TV,C,S,T,GC,CMD				0.07
TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device				

Table 7. Relative Risk Ratios in Various Models for Cord Loyalists vs. Cord Couplers

Independent Variable	Model 1: Streaming Only	Model 2: Device Use	Model 3: Device Count	Model 4: Device Combination
Demographics				
Age 18-34	0.30	0.36	0.39	0.36
Age 35-39	0.45	0.55	0.58	0.54
Age 40-54	0.56	0.67	0.69	0.67
Income \$0-\$20K	1.22	1.04	0.95	1.07
Income \$20K-\$35K	0.93	0.88	0.85	0.88
Income \$35K-\$50K	1.13	0.90	0.87	0.88
Income \$50K-\$100K	0.95	0.75	0.75	0.73
Income \$100K and over	1.00	0.67	0.69	0.62
Household size	1.04	1.07	1.07	1.07
White	1.86	1.31	1.35	1.37
African-American	1.37	1.42	1.52	1.50
Asian-American	1.11	0.89	0.87	0.92
Hispanic	1.71	1.28	1.32	1.26
Children 0-6	1.07	1.04	1.05	1.03

Children 7-11	1.02	1.05	1.05	1.06
Children 12-17	1.10	1.10	1.10	1.10
Streaming/Downloading				
Netflix Paid Streaming				
Other Paid Streaming				
Free Streaming				
Device Use				
Use TV set		0.00		
Use Computer		0.09		
Use Smartphone		0.70		
Use Tablet		0.57		
Use Game Console		0.21		
Use CMD		0.35		
Device Count				
Two Devices			0.09	
Three Devices			0.04	
Four Devices			0.02	
Five Devices			0.01	
Six Devices			0.01	
Device Combination				
TV only				6.78
TV,C				0.53
TV,C,S				0.43
TV,C,T				0.34
TV,C,GC				0.21
TV,C,S,T				0.30
TV,C,T,GC				0.13
TV,C,S,GC				0.18
TV,C,S,T,GC				0.05
TV,C,S,T,GC,CMD				0.04
TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device				

Table 8. Relative Risk Ratios in Various Models for Non-Pay TV vs. Cord Loyalists

Independent Variable	Model 1: Streaming Only	Model 2: Device Use	Model 3: Device Count	Model 4: Device Combination
Demographics				
Age 18-34	4.49	4.59	4.67	4.27
Age 35-39	2.99	2.73	2.88	2.70
Age 40-54	2.26	2.04	2.07	1.95
Income \$0-\$20K	1.72	1.87	2.01	1.96
Income \$20K-\$35K	1.26	1.39	1.36	1.38
Income \$35K-\$50K	0.80	1.12	1.06	1.10
Income \$50K-\$100K	0.64	0.90	0.85	0.89
Income \$100K and over	0.39	0.74	0.65	0.70
Household size	0.84	0.86	0.84	0.84
White	0.51	0.68	0.66	0.64
African-American	0.54	0.46	0.51	0.49
Asian-American	1.67	1.85	2.17	2.04
Hispanic	0.58	0.81	0.79	0.78
Children 0-6	0.99	1.01	1.00	1.01
Children 7-11	1.28	1.26	1.24	1.24
Children 12-17	0.87	0.87	0.89	0.87

Streaming/Downloading.		
Netflix Paid Streaming		
Other Paid Streaming		
Free Streaming		
Device Use		
Use TV set	0.20	
Use Computer	6.63	
Use Smartphone	0.98	
Use Tablet	1.37	
Use Game Console	6.60	
Use CMD	1.89	
Device Count		
Two Devices		3.34
Three Devices		5.00
Four Devices		5.98
Five Devices		23.96
Six Devices		10.68
Device Combination		
TV only		0.08
TV,C		0.57
TV,C,S		0.55
TV,C,T		0.77
TV,C,GC		1.12
TV,C,S,T		0.61
TV,C,T,GC		0.84
TV,C,S,GC		1.29
TV,C,S,T,GC		3.40
TV,C,S,T,GC,CMD		1.74
TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device		

Estimates of RRR for the demographic variables are, for the most part, robust across the four models. This helps to focus attention on the device-related and streaming-related variables that enter the four model specifications in different ways. Models 2-4 all concern devices used for viewing TV/video programs, but variables representing that use are constituted differently. For example, in model 2, the focus is on *whether households use* any of the six specific devices, regardless of whether they use any other. The stay/move choice among OTT segments can then be understood in terms of the use of each individual device. In model 3, the focus is on *how many devices households use* to view TV and video programs. In that model, the identity of the device is not important, rather it is the count of devices used (signifying how technologically equipped the households are). Finally, in model 4, only specific *combinations of devices households use* matter. From prior analysis, we identified the top ten most used device combinations and introduced them into model 4 for measuring their impacts on the stay/move choice among OTT segments.

There is considerable information about the risks and the most likely directions of transition in Tables 6-8. However, the concise summary presented by Table 9 is useful for comparing how the independent variables shape the risks for the three types of transition shown (and, by extension, the three reverse transitions). The transitions from the Cord Couplers and Cord Loyalists segments to Non-Pay TV status show several similarities, which is as expected because the same demographic composite (younger, lower-income,

small households, Asian-American) equipped with a variety of streaming-capable devices is most likely to feature among Non-Pay TV households. Also, as expected, the drivers of risk of transiting from Cord Couplers to Cord Loyalists have almost exactly the opposite profile.

Table 9. Risks of Transition (or Reverse Transition) Between OTT Segments

Independent Variable	Transition Between OTT Segments		
	Cord Couplers to Non-Pay TV	Cord Couplers to Cord Loyalists	Cord Loyalists to Non-Pay TV
Age	18-34 group has highest risk of transiting; risk diminishes with age	18-34 group has lowest risk of transiting; risk rises with age up to 55 but remains low	Young households up to age 39 have highest risk of transiting
Household income	Lowest income households (up to \$35K) have highest risk of transiting; risk falls with income and reverse transition becomes more likely after \$50K	Model 1 shows lowest income households have almost neutral to slightly positive risk of transiting, but models 2-4 show that risk of transiting is low and diminishes with income (risk of reverse transition rises with income)	Lowest income households (up to \$35K) have highest risk of transiting; risk falls with income and reverse transition becomes more likely after \$50K
Household size	Risk of reverse transition rises with household size	Neutral for risk of transition	Risk of reverse transition rises with household size
Race/ethnicity	Asian-Americans have highest risk of transiting; Whites and African-Americans have a greater risk of reverse transition; Hispanics have neutral risk	Whites, African-Americans, and Hispanics have moderate to high risk of transiting; Asian-Americans are at risk of the reverse transition	Asian-Americans have highest risk of transiting; Whites, African-Americans, and Hispanics have high risk of reverse transition
Presence of children	Risk of transiting exists for households with children 7-11 (not clear why)	Neutral for risk of transition	Risk of transiting exists for households with children 7-11, but risk of reverse transition exists for households with children 12-17
Streaming/Downloading	Risk of reverse transition associated with Free Streaming; Netflix and Other Paid Streaming have neutral risk	Not applicable	Not applicable
Device use	Only game console is associated with high	All streaming-capable devices create	Some streaming-capable devices (not

	risk of transiting; other devices make reverse transition more likely	significant risk of the reverse transition	smartphone) raises the risk of transiting; the TV set by itself causes risk of reverse transition
Device count	Risk of reverse transition increases with device count (greater affordability?)	Risk of reverse transition rises with device count (i.e., as more streaming-capable devices are used)	Risk of transition increases with device count (greater affordability?)
Device combination	No risk of transiting with device combinations considered; risk of reverse transition rises monotonically with size of device combination	Households only using TV set are at high risk of transiting; device combinations with streaming-capable devices create high risk of reverse transition	Device combinations that include the game console create the highest risk of transiting

Based on Table 9, we focus next in some detail on how streaming and device-related variables affect households' stay/move choice with respect to OTT segments.

5.2.1. Transition from Cord Couplers to Non-Pay TV

Streaming and downloading

The effect of streaming/downloading services on the stay/move decision is inconclusive. With an RRR of 0.99, Netflix Paid Streaming appears to have a neutral effect on that decision. That is not surprising since a significant fraction of Netflix's almost 25 million subscribers must already be in the Cord Couplers segment. In fact, approximately a third of both Cord Couplers and Non-Pay TV households in the longitudinal panel were Netflix subscribers. With 17% of Cord Couplers already subscribing to Other Paid Streaming, as opposed to fewer than 13% of Non-Pay TV households, there is no evidence of a major push to move to Non-Pay TV status because of Other Paid Streaming alone. That impetus is even less for Free Streaming, given the RRR of 0.68 and that 72% of Cord Couplers already avail of Free Streaming as opposed to 63% of Non-Pay TV households. If anything, Free Streaming may actually bring some households back from Non-Pay TV to Cord Couplers because adding streaming to existing Pay TV service has no incremental cost (apart from the cost of streaming-capable devices, many of which may already be owned or available for other, non-video viewing purposes).

Device use

Can the use of specific devices actually trigger migration from Cord Couplers to Non-Pay TV? As noted earlier, every device apart from the non-Internet enabled TV set is capable of streaming and downloading, and some among them also serve as screens for viewing video. However, except for CMDs, all other types of devices are multifunctional and viewing videos may not be the primary reason why they are purchased (although, once purchased, there is no incremental cost of using them to view TV/video programs). Hence, it is no

surprise that, except for game consoles, the RRR of moving from Cord Couplers to Non-Pay TV is well below one for the major multifunctional devices/screens, such as the computer, the smartphone, and the tablet. An RRR of zero for the TV set is expected because, by definition, possession and use of a TV set amounts to use of Pay TV service and an end to Non-Pay TV status.²³

More complex are the RRRs for game consoles and CMD which merely facilitate streaming but do not provide viewing screens. An RRR of 1.39 for game console suggests a significant propensity for users of that device to migrate to Non-Pay TV status, using that device to meet all their streamed video viewing needs. Netflix and other streaming sources enable and advertise access to streamed video content over game consoles, and households that move to Non-Pay TV status must then simply use their existing TV sets as “passive” screens for viewing purposes only.

In contrast, with an RRR of only 0.66, CMDs appear to entice households back to Cord Couplers from Non-Pay TV status. CMDs have the sole function of providing direct access to video content from various streaming sources. Therefore, it would appear that their greatest appeal is for households that rely solely on streamed video content rather than Pay TV, i.e., the non-Pay TV households. Yet, it appears that their use may propel such households towards becoming Cord Couplers. It is unclear why that may be so.²⁴

Device count

Possession and use of multiple devices appear to provide more impetus to move from Non-Pay TV status to Cord Couplers than the other way around. In fact, that impetus increases (the RRR falls for the Cord Couplers to Non-Pay TV move, and rises for any move in the opposite direction) as more devices are used to view TV and video programs. This may be a finding more about affordability than about streaming behavior. Possession of the different types of devices is more likely to be driven by higher household incomes than by their inherent utility for streaming or downloading. Cord Couplers are generally more affluent than Non-Pay TV households and may, therefore, use a wider variety of devices to meet their streaming needs.

Device combination

The most noteworthy finding is that the RRR is well below one for all device combinations considered (suggesting a greater risk of moving back from Non-Pay TV to Cord Couplers than of moving in the opposite direction). Second, the highest RRR (0.52) is for households

²³ Of course, it is possible for a Non-Pay TV household to acquire a TV set to use purely as a screen for viewing streamed/downloaded video or, if the TV set is Internet-enabled, to stream video directly to it. However, with an estimated RRR of zero, it appears that those were not serious possibilities in the longitudinal panel used for this study.

²⁴ A plausible explanation is that CMDs are not a causative, but rather a coincident, factor. That is, instead of driving Non-Pay TV households into the Cord Couplers segment, it is possible that CMDs are generally more likely to be found in Cord Couplers households which tend to be more affluent and are able to afford a wider variety of devices. What remains unresolved is why this shows up as a one-period transition, rather than as a contemporaneous event.

that only use the TV set and lowest (0.07) is for households that use all six devices. The RRR declines almost monotonically as the device combinations (whatever their makeup) grow larger — reflecting our findings for device counts. This suggests that the risk of households leaving the Cord Couplers segment for the Non-Pay TV segment declines as they invest in a wider variety of devices.

Conclusion

It does not appear that the decision to move from Cord Couplers to Non-Pay TV status is much influenced by devices (even when represented in multiple different ways). In fact, device-related variables are more likely to drive the opposite movement from Non-Pay TV to Cord Couplers. In contrast, any impetus to move from Cord Couplers to Non-Pay TV appears to be come from demographic factors, such as relatively young, less affluent, or Asian-American households.

5.2.2. Transition from Cord Couplers to Cord Loyalists

Device use

With RRRs below one for all devices used (and at or close to zero with TV set use and computer use), there is little risk of leaving Cord Couplers for Cord Loyalists. The obverse of this finding is more interesting. The use of streaming-capable devices, particularly the computer and the game console, creates a significant risk of moving from Cord Loyalists to Cord Couplers.

Device count

Very low RRRs, particularly as the number of device types used increases, signify an almost inconsequential risk of leaving Cord Couplers for Cord Loyalists. This is expected because a household using two or more types of devices to view TV/video programs must be using at least one, and possibly more, streaming-capable devices. Its willingness to acquire and use more streaming-capable devices would be inconsistent with staying solely with Pay TV service as Cord Loyalists.

Device combination

The RRRs for device combinations confirm the message from those for device counts. Households that only use the TV set are at significant risk of leaving Cord Couplers (if they were ever in that segment) to become Cord Loyalists. The opposite is true for households that use device combinations which include streaming-capable devices, and truer still as the number of devices in their combinations increases.

Conclusion

Possession and use of streaming-capable devices makes it more likely that Cord Couplers stay in their segment, rather than move to Cord Loyalists, i.e. In contrast, selected demographics (age and race/ethnicity, in particular) are major influences on the stay/move decision between Cord Couplers and Cord Loyalists.

5.2.3. Transition from Cord Loyalists to Non-Pay TV

Device use

Certain streaming-capable devices, such as the computer, tablet, game console, and CMD make Cord Loyalists more likely (sometimes intensely so) than not to switch to Non-Pay TV status. Use of the smartphone, however, does not appear to make households move much in either direction. That is probably because smartphone use for viewing TV/video programs is still an occasional activity and not sufficient reason to warrant switching off Pay TV service altogether.

Device count

Possession and use of a wider variety of streaming-capable devices significantly raises the risk of moving from Cord Loyalists to Non-Pay TV status. That risk is particularly high for households that have at least five devices (of which four may be streaming-capable).

Device combination

For some device combinations (namely, TV/computer/game console, TV/computer/smartphone/game console, TV/computer/smartphone/tablet/game console, and all six devices), the risks of leaving Cord Loyalists for Non-Pay TV are better than even or higher. All of these combinations have the game console in common. Arguably, the game console, which can be used to obtain streamed video content from several sources, is a major triggering device for any decision to leave for Non-Pay TV.

Conclusion

Given the clear either-or divide between Cord Loyalists and Non-Pay TV, the use of a wider variety of devices (especially the game console) by some key demographic cohorts (younger, lower-income, and Asian-American households) appears to favor a move from Cord Loyalists to Non-Pay TV, while the remaining factors appear to keep Cord Loyalists in place.

5.3. Drivers of Hours of Video Viewership

For this study, we assumed that a household's total viewership hours were spent on five genres of video programs: TV shows, movies, news and weather, sports, and clips and other video. Households in the longitudinal panel were asked to indicate typical weekly hours (rounded to the nearest whole number) of viewing content from each of these genres, as also the devices they used for viewing them. Table 10 shows average viewership hours by device and genre based on their responses.

Table 10. Weekly Viewership Hours, by Device Used and Genres Viewed, 2Q11-4Q11

Device/Screen	Hours Used	Genre of Video	Hours Viewed
TV set	26.4	TV Shows	15.4
Computer	3.5	Movies	4.9
Smartphone	0.4	News and Weather	5.1
Tablet	0.2	Sports	2.9
		Clips/Other	1.6

According to Table 10, the TV set is, by far, the most preferred device for viewing video content. This finding corroborates those from other research studies.²⁵ Among genres, about half of all viewing hours arise with TV shows.

To explain the likely drivers of these hours, we considered the same set of demographic, device, and streaming-related variables that were used to model the stay/move choice among OTT segments. As before, we estimated four alternative models, one with streaming-related variables only and the other three with alternative representations of device-related variables.

For ease of understanding, we report only the main inferences about the drivers of viewership hours (estimates of model coefficients are reported in Tables A2-A13 in the Appendix). Accordingly, we identify the statistically significant drivers and how they affect viewership hours for every genre of TV/video programs, both individually and collectively. The coefficient estimates are reported in Tables A2, A4, A6, A8, A10, and A12. Because all of the regression models in Tables A2-A13 are linear, the coefficients are all the *marginal contributions* to viewership hours made by the drivers with which they are associated. For example, the coefficient estimated for the Age 18-34 variable indicates how much viewership hours rise or fall uniquely because of that variable. The constant term in the regression represents the level of viewership hours *before* the unique marginal contributions of the various drivers are taken into account.

In addition, for every genre, we report the results from pairwise tests of equality of the estimated coefficients in Tables A3, A5, A7, A9, A11, and A13. These tests were conducted to determine whether or not viewership was affected differently by different sources of streaming or by different device count or device combination variables.²⁶

Model 1 for every genre estimated the effects of the three sources of streaming. Coefficient equality tests helped to determine whether these sources produced different hours of viewership and, if so, by how much.

Similarly, Model 3 estimated the effects of device counts on viewership hours. However, because device counts are entered as dummy variables, the coefficient equality tests for these variables have to be interpreted differently. Being dummy variables, the variables representing two through six devices are each either 0 or 1 in value and the constant term reflects (in part) the default case of one device. Coefficients of the dummy variables for two through six devices show the viewership hours associated with each. These make it possible to determine the marginal contribution from *adding the last device*, such as when the device count goes from two to three or from three to four (regardless of what that last device is). If the difference between the coefficients is positive and statistically significant, then the marginal contribution of

²⁵ See, e.g., Wallenstein, A., "Multiplatform Viewing Grows, but TV Still Rules," *Variety*, February 23, 2012, available at <http://www.variety.com/article/VR1118050668>.

²⁶ We did not conduct such tests for device *use* variables. Rather than conduct 30 separate pairwise tests for these variables, we preferred to infer how different devices affect viewership hours at the margin by applying the coefficient equality tests to the device combinations.

the last device added is to increase viewership hours, with the amount of the difference indicating the magnitude of the gain.²⁷

Finally, Model 4 estimated the effects of important device combinations selected for analysis. While we report the contributions to viewership hours of these combinations, of greater interest is, again, the marginal contribution from adding a new device to a given device combination. For these, we conducted a series of “hierarchical” tests to determine how adding a specific device to any device combination affected viewership hours. For example, these tests determined whether the contribution to viewership hours changed statistically significantly between a device combination that contained, say, the smartphone and another device combination that had every other device in the first combination except for the smartphone. The test results helped to identify how important each device was for viewing different genres of TV/video programs. In addition, we conducted a series of “non-hierarchical” tests for the relative contribution to viewership hours of device combinations that differed in only one device but had the same devices otherwise.²⁸

Tables 11-13 summarize the effects of all selected independent variables on viewership hours for each genre. These summaries are based on model estimates reported in Tables A2-A13.

Table 11. Drivers of Viewership Hours for Movies and TV Shows, 2Q11-4Q11

Independent Variable	Viewership Hours for Genres	
	Movies	TV Shows
Age	Rises with age; 55 and over group has nearly one full hour more than the 35-39 group	Rises with age; 55 and over group has over two hours more than the 18-34 group
Household income	Inversely related to income level; households with income below \$20K annually have 15% more hours than those in the \$20K-\$35K income range, and even more than those with higher incomes	Inversely related to income level; households with income below \$20K annually have 11% more hours than those in the \$20K-\$35K income range, and even more than those with higher incomes

²⁷ For example, in Table A2, the coefficients of “Three Devices” and “Four Devices” indicate that 1.73 hours of movies are viewed on average when households use three devices and 2.77 hours are viewed when households use four devices. Thus, the marginal contribution to movie viewership of the fourth device (whichever that may be) is, on average, 1.04 hours. Table A3 then tests whether this incremental gain is statistically significant (see the test for “Three Devices = Four Devices” under the null hypothesis that their respective coefficients are equal) and finds that it is so.

²⁸ For example, in Table A3, three pairwise hierarchical tests help to determine the marginal contribution of the smartphone. These are the comparisons between (TV,C) and (TV,C,S), (TV,C,T) and (TV,C,S,T), and (TV,C,GC) and (TV,C,S,GC). In every case, the addition of the smartphone (S) produces a marginal contribution to movie viewership hours that is statistically significant at the 10% level. From Table A2 (Model 4), we can then confirm that the marginal contributions in all three cases are positive, i.e., movie viewership increases by 0.35 hours, 0.80 hours, and 0.75 hours, respectively, for the three comparisons made. Also, in Table A3, a non-hierarchical test reveals that replacing the (TV,C,T) combination by the (TV,C,GC) combination, i.e., swapping the tablet for the game console, produces a statistically significant effect on movie viewership, which Table A2 shows to be a gain of 0.98 hours.

Household size	Rises about 24 minutes weekly with every additional person in household	Rises about 30 minutes weekly with every additional person in household
Race/ethnicity	Marginal contribution to hours positive for African-Americans, but negative for Whites and Asian-Americans	Marginal contribution to hours positive only for African-Americans
Presence of children	Negative marginal contribution to hours from households with younger children (up to age 11)	Negative marginal contribution to hours from households with children in the 7-11 age group
Streaming/Downloading	Netflix Streaming contributes 23% more to hours than Other Paid Streaming, and 230% more than Free Streaming	Free Streaming makes marginal contribution of almost 1.5 hours; Netflix and Other Paid Streaming contribute little to hours
Device use	All devices (led by the TV set and, among streaming-capable devices, by the CMD) make significant marginal contributions to hours	The TV set makes the most significant marginal contribution to hours, followed at a distance by the computer and the smartphone (and very little from the other devices)
Device count	Hours rise uniformly with an increase in the device count (almost eight times more hours with six devices than with two)	Hours increase up to a device count of four, after which no significant increase in hours occurs (four devices may be a “tipping point”)
Device combination	All device combinations (except for “TV set only”) make significant marginal contributions to hours; hours tend to rise with the number of devices in any combination	The “TV set only” combination makes, by far, the greatest contribution; adding other devices increases hours little or moderately

Table 12. Drivers of Viewership Hours for News/Weather, Sports, and Clips/Other Video, 2Q11-4Q11

Independent Variable	Viewership Hours for Genres		
	News/Weather	Sports	Clips/Other Video
Age	Rises with age; 55 and over group has roughly twice the hours of the 18-34 group	Rises (unexpectedly) with age; 55 and over group has roughly one-third more hours than the 18-34 group ²⁹	Highest among the youngest households, and falls with age
Household income	Inversely related to income level, but only above \$50K annually	Rises with household income	Inversely related to income level, but only above \$50K annually

²⁹ This finding is unexpected and further research is needed to understand why, in an age when sports programming is increasingly accessible via streaming, younger households (associated with greater use of streaming) do not make more of a contribution to sports viewership hours.

Household size	Has no discernible relationship to hours	Rises modestly with household size	Rises modestly with household size
Race/ethnicity	Has no discernible relationship to hours	Has no discernible relationship to hours	Marginal contribution to hours positive for African-Americans, but negative for Whites
Presence of children	Has no discernible relationship to hours	Lower by about 6%-8% in households with younger children (up to age 11)	Lower in households with younger children (up to age 11) but higher in households with older children
Streaming/Downloading	Only Other Paid Streaming contributes significantly (about 50 minutes weekly) to hours	Only Other Paid Streaming contributes significantly (about 30 minutes weekly) to hours	All forms of streaming make significant marginal contributions to hours
Device use	The TV set contributes most to hours, followed at a distance by the computer and the smartphone (and very little from the other devices)	The TV set contributes most to hours, followed at a distance by the computer and the smartphone (and very little from the other devices)	The computer and the smartphone make the leading contributions to hours
Device count	Adding devices (especially those that are streaming-capable) raises hours very little	Besides the TV set, only adding the smartphone raises hours significantly	Adding devices (especially those that are streaming-capable) raises hours
Device combination	The “TV set only” combination makes, by far, the greatest contribution; adding the smartphone increases hours modestly	The “TV set only” combination makes, by far, the greatest contribution; adding the smartphone increases hours as well	Any combination with one or more streaming-capable devices contributes to hours; the smartphone and the game console play a complementary role in adding hours

Table 13. Drivers of Viewership Hours for All Video Genres, 2Q11-4Q11

Independent Variable	Viewership Hours for All Genres
Age	Rises with age; the 18-34 age group has only about 75% of the hours of the 55 and over age group
Household income	Inversely related to income level; households with annual income under \$20K have 19% more hours than those with \$100K or more
Household size	Rises more than an hour weekly with every additional person in household

Race/ethnicity	African-Americans contribute more to hours than any other race/ethnicity (about four hours above average)
Presence of children	Reduces hours between 2% and 8% in households with younger children (up to age 11), but increases hours by 3% in households with older children
Streaming/Downloading	All forms of streaming make significant marginal contributions to hours (led by Other Paid Streaming, followed by Free Streaming and Netflix Streaming)
Device use	The TV set is overwhelmingly the lead contributor to hours, followed at a distance by the smartphone and the computer, and then by the tablet, the CMD, and the game console (in that order)
Device count	Rises significantly with device count, particularly when four or more devices are used
Device combination	Households with only the TV set make the least marginal contribution, while those with all six devices contribute almost six times as much to hours

Given these summaries, we focus next in some detail on how streaming and device-related variables affect households' viewership hours for various genres of video content.

5.3.1. Drivers of Viewership Hours for Movies

Streaming/downloading

The marginal contribution to movie viewership hours of Netflix Streaming is considerably larger than of other streaming sources (23% higher than Other Paid Streaming sources and almost 230% higher than Free Streaming). The preeminence of Netflix as a streaming source for movies is obvious.

Device use

All devices make statistically significant marginal contributions to hours of movie viewership. As expected, the greatest contribution is made by the TV set, followed by the CMD, the computer, the game console, the smartphone, and the tablet (in that order). Among streaming-capable devices, the CMD contributes twice as many weekly hours as either the computer or the game console, almost three times as much as the smartphone, and almost six times as much as the tablet.

While the computer and the game console are tied, only the former is also a viewing screen, which explains its appeal for streaming. Even though the game console is not a screen, it is almost equal to the computer as a contributor because it has emerged as a significant means of streaming from many sources, especially Netflix. The smartphone lags behind, perhaps because of reception limitations or smallness of the screen. The tablet is a relatively new (but fast-growing) device which has yet to become a major contributor to movie viewership.

Device count

Hours of movie viewership increases with the variety of devices available to a household. While households using only two devices have just over an hour of movie viewing per week, households that use all six devices have almost eight times as many hours. The largest incremental gain of 3.28 hours comes from adding the sixth device. While that sixth device may vary across households, it is very likely to be the CMD or even the TV set.³⁰

Device combination

With one exception (the TV set only), all of the important device combinations make statistically significant marginal contributions to hours of movie viewership. There is, however, no obvious pattern to how those hours vary by device combination, except a general tendency to increase with the number of devices in any combination (reinforcing the finding about device counts).

The hierarchical tests reveal that the smartphone and the game console make statistically significant marginal contributions to movie viewership, although that is presently not true of the tablet. The marginal contribution of the smartphone to movie viewership is noted in fn. 28. Adding the game console to a (TV,C) combination increases movie viewership by 0.9 hours, while adding it to the (TV,C,S) and (TV,C,T) combinations increases viewership by 1.3 and 1.16 hours, respectively. In this respect, the game console emerges among all streaming-capable (non-CMD) devices as the most important *additional* device that contributes *at the margin* to movie viewership. By adding over 4 hours at the margin to movie viewership, the CMD is also an important (albeit infrequently used) contributor.

The non-hierarchical tests clearly show a “saturation effect” with respect to movie viewership. While swapping out the smartphone or the tablet for the game console in a three-device combination produces a significant gain in movie viewership hours, the same is not true when the swap happens in a four-device combination. This suggests that *any* device in a combination with four or more devices is unlikely to have a strong marginal contributory impact unless, of course, that device is the CMD.

Conclusion

Several factors drive movie viewership: demographics (increasing age, lower household income, larger households, being African-American) and use of a variety of devices (especially streaming-capable devices led by the CMD and the game console). Collectively, streaming-capable devices contribute relatively more to hours of movie viewership than the TV set alone. This underscores the importance for movie viewership of OTT alternatives to Pay TV.

³⁰ As indicated earlier, households with all six devices were relatively few in number (in fact, well under 1% of all households in every quarter). As Model 2 shows, the two largest contributors to movie viewership were the TV set and the CMD, respectively. It is conceivable that at least some of the households with six devices started out as streaming-only and eventually became Cord Couplers by adding the TV set as the final device. Our data cannot be used to determine the order in which a household added devices to view movies or other genres of video.

5.3.2. Drivers of Viewership Hours for TV Shows

Streaming/downloading

Only Free Streaming makes a statistically significant marginal contribution (of almost 1.5 hours) to TV shows viewership hours. Unlike that for movie viewership, Netflix or any other form of Paid Streaming contributes little to TV shows viewership. This may be attributed to the widespread availability of TV shows from free sites such as Hulu.com or websites operated by broadcast networks that carry those shows live on Pay TV channels.

Device use

When it comes to TV shows, the conventional TV set is, by far, the device of choice for viewers. Although some streaming of TV shows occurs, such activity is confined mostly to the computer and the smartphone. The tablet is not a big player at this time, and the game console and the CMD make virtually no contribution.

Device count

Hours of TV shows viewership increase slowly but steadily with increases in the device count. However, as the coefficient equality test for Model 2 in Table A5 shows, the last of the statistically significant increment in hours occurs as households move from three to four devices. After that, the marginal contributions to TV shows viewership from adding other devices are not statistically significant. The use of four devices may, therefore, be seen as a tipping point for TV shows viewership. The addition of further devices (most likely the game console and the CMD) does little to increase household viewership of TV shows.

Device combination

The TV-only combination, by itself, makes a large marginal contribution to TV shows viewership hours (see Table A4). Thereafter, adding other devices raises the marginal contribution but the increment in most cases is small to moderate. The hierarchical and non-hierarchical tests both reveal that, after the TV set, the greatest statistically significant marginal contributions to TV shows viewership are made by the computer and the smartphone.

Conclusion

TV shows account for approximately half of the video viewership hours of a household. However, TV shows viewership remains largely the province of the traditional TV set, i.e., it is much more likely to occur through traditional live or time-shifted television broadcast than through streaming. Thus, although they have very similar demographic drivers, TV shows viewership differs from movie viewership in two important respects. First, streaming has a far less important role in TV shows viewership currently. Second, there is little gain in TV shows viewership hours when more than four devices are used.

5.3.3. Drivers of Viewership Hours for News and Weather

Streaming/downloading

Other Paid Streaming makes a modest but statistically significant marginal contribution (of almost 50 minutes per week) to viewership hours for news and weather. In contrast, Free

Streaming has a relatively small marginal contribution (of almost 8 minutes) and Netflix Streaming actually reduces viewership to below the average level for all households. The latter finding suggests that Netflix Streaming (most likely for viewing movies or TV shows) occurs at the expense of time that could be spent viewing news and weather programs.

Device use

As with TV shows, the conventional TV set is, by far, the device of choice for viewers of news and weather programs. Among streaming-capable devices, only the computer and, to a somewhat greater degree, the smartphone make statistically significant contributions to viewership hours for news and weather programs.

Device count

Hours of news and weather viewership increase slowly but steadily with increases in the device count. However, as the coefficient equality test for Model 2 in Table A7 shows, that increment in viewership hours is not, in general, statistically significant as the device count increases. This confirms the relatively small role of streaming-capable devices at this time for viewership of this genre.

Device combination

The hierarchical and non-hierarchical tests in Table A7 both confirm that, after the TV set, the greatest marginal contribution to viewership hours for news and weather programs is made by the smartphone.

Conclusion

Unlike movies and TV shows, viewership of news and weather programs relies mostly on the TV set and, to a more modest extent, on the smartphone. In fact, because of the convenience provided by mobility and just-in-time access to news and weather information, the smartphone is understandably the most used of all streaming-capable alternatives to the TV set. In general, the contribution to viewership made by streaming-capable devices is relatively minor.

5.3.4. Drivers of Viewership Hours for Sports

Streaming/downloading

Other Paid Streaming makes a modest but statistically significant marginal contribution (of almost 30 minutes per week) to viewership hours for sports. In contrast, Free Streaming has a relatively marginal contribution (of almost 9 minutes) and Netflix Streaming actually reduces viewership to below the average level for all households. The latter finding suggests that Netflix Streaming (most likely for viewing movies or TV shows) occurs at the expense of time that could be spent viewing sports programs.

Device use

As with some other genres, the conventional TV set is, by far, the device of choice for viewers of sports programs. As with news and weather programs, among streaming-capable devices, only the computer and, to a greater degree, the smartphone make statistically significant contributions to viewership hours for sports.

Device count

Hours of sports viewership increase slowly but steadily with increases in the device count. However, as the coefficient equality test for Model 2 in Table A9 shows, only the increment in viewership hours associated with the increase from three to four devices is statistically significant. Given the findings about both device counts and device combinations, we conjecture that the addition of the smartphone to the three-devices set is what causes that statistically significant increment in hours.

Device combination

The hierarchical and non-hierarchical tests in Table A9 both confirm that, after the TV set, the greatest marginal contribution to viewership hours for sports is made by the smartphone. The tablet and the game console play relatively minor roles currently.

Conclusion

Similar to news and weather, viewership of sports programs relies mostly on the TV set and, to a more modest extent, on the smartphone. The convenience of mobility and just-in-time access to sports information also explains the smartphone's popularity as a streaming-capable alternative to the TV set and the rising inclination of programmers to provide sports content over smartphones.

5.3.5. Drivers of Viewership Hours for Clips and Other Video

Streaming/downloading

All forms of streaming contribute statistically significantly to viewership hours for this genre. That is as expected because video clips, by definition, are streamed summaries or extracts of longer-form video programs. Table A10 shows that the most contribution is made by Other Paid Streaming (almost 1.5 hours), followed by Free Streaming (1.25 hours) and Netflix Streaming (a more modest 24 minutes). Table A11 confirms that the differences in these marginal contributions are statistically significant.

Device use

While all six devices appear to make statistically significant contributions to viewership hours for this genre, the clear leaders are the computer and the smartphone (each contributing more than an hour), followed by the tablet and the CMD (each contributing just under an hour).

Device count

Hours of viewership for this genre increase slowly but steadily with increases in the device count. However, past the four devices point, the gain in hours actually appears to accelerate. Thus, adding more streaming-capable devices expands viewership for this genre steadily and seemingly without limit. The coefficient equality test for Model 2 in Table A11 confirms this finding.

Device combination

Every device combination that has at least one streaming-capable device makes a statistically significant contribution to viewership hours for this genre. Consistent with our findings for device counts, the combinations with the greatest number of devices (five or six) have significantly more hours than smaller combinations. Importantly, the hierarchical tests in Table A11, which are designed to test for the effects of incrementing device combinations, confirm that finding as well. The non-hierarchical tests in Table A11 provide additional perspective. For example, in device combinations without the game console, replacing the tablet with the smartphone makes no statistically significant difference to the marginal contribution. However, in the presence of the game console in the device combination, such swapping leads to a significant gain in hours. This suggests a complementary role of the smartphone and the game console, which between them provide full access to clips and other video in both fixed locations and while mobile. Moreover, replacing the smartphone with the game console actually reduces hours, perhaps because, unlike the smartphone, the game console cannot provide access to clips and other video when the user is not at a fixed location.

Conclusion

As expected, for a residual genre like clips and other video, streaming and streaming-capable devices are important contributors to viewership hours. The most interesting findings concern the relative differences in the contribution to viewership of mobile devices (the smartphone and the tablet) and fixed devices (the game console and the CMD).³¹

5.3.6. Drivers of Viewership Hours for All Video Genres

Streaming/downloading

All forms of streaming make statistically significant marginal contributions to viewership hours for all video genres. Although Free Streaming is the most common form of streaming, the leader in the streaming category is Other Paid Streaming which contributes 35% more than Free Streaming and 117% more than Netflix Streaming to overall viewership hours. That may be because Other Paid Streaming provides access to a wider range of video content compared to Netflix Streaming (primarily movies) and Free Streaming (primarily TV shows).

Device use

It is no surprise that, as Model 2 in Table A12 shows, the TV set has a commanding lead over any streaming-capable device when it comes to overall video viewership. This is driven primarily by a similar pattern for TV shows, which accounts for just over half of all viewership hours. The smartphone is a distant second (at only 18% of the TV set), followed closely by the computer. The tablet and the CMD are almost tied in fourth

³¹ Within the “computer” category, laptops and netbooks are mobile while desktops are usually considered fixed. Because our data merged all types of computers into a single device category, we could not determine separately the nature of the contributions made by each type.

position (at between 8% and 9% of the TV set), while the game console is in last place (at under 4% of the TV set).

Device count

It follows from Model 3 in Table A12 that viewership hours for all video increase rapidly with an increase in the device count. The increase of 76% between five and six devices is the most impressive. Table A13 confirms that these increases in the marginal contribution are all highly statistically significant. The clear implication of this finding is two-fold.

First, streaming-capable devices expand viewership hours significantly. This is an argument in favor of strategies for integrating traditional with streamed video content, i.e., directing subscribers in the direction of becoming Cord Couplers rather than remaining entrenched in either the Cord Loyalist (no OTT) or Non-Pay TV (all OTT) segments.

Second, the expansion in viewership hours clearly owes itself to the *variety* of devices available to (and used) by households. This is different from the use of multiple numbers of the same device. Variety brings out the unique advantages of each type of device (screen size, mobility, content availability, etc.) and enables users to access TV/video programs in diverse circumstances or locations. Hence, the evidence in Table A12 portends a device variety-driven effect similar to the so-called “network effect” in telecommunications (where additional subscribers to a network raises its value exponentially). In essence, the value of all of the devices taken together exceeds the sum of the values associated with individual devices.

Device combination

As noted earlier, every device combination makes a statistically significant marginal contribution to viewership hours for all video (see Model 4 in Table A12). Households with only the TV set realize the least marginal contribution, while those with all six devices realize almost six times as large a marginal contribution.

A more interesting finding emerges from the hierarchical and non-hierarchical tests of coefficient equality. While the game console, by itself, makes the least marginal contribution, combining it with the smartphone produces a more impressive boost to viewership hours than either adding the tablet to the device set or combining the tablet with the game console. At present, the mobility of the smartphone and content designed for it, when combined with the access to movies and TV shows through game consoles, appear to be a bigger booster of viewership hours overall than the tablet in any combination. Although the tablet is also a mobile device, it is not as widely adopted as the smartphone³² and most users depend on Wi-Fi rather than cellular (3G or 4G) connectivity

³² Centris survey research shows that, in the first quarter of 2012, almost 22% of US Internet (i.e., streaming-enabled) households owned tablets and only 16% of such households actually used their tablets to view video content.

to use it. These factors limit the current impact of the tablet as a streaming-capable device, although this situation may change in the future.³³

Conclusion

The analysis of the drivers of viewership hours reveals that the effects of demographic, streaming-related, and device-related variables vary by individual genre, often significantly. This makes it risky to form generalizations about drivers of viewership hours for *all* forms of video content. Given that caveat, however, we reach two important conclusions.

First, while there is no question about the primacy of the TV set and of traditional television distribution generally, the significant role played by streaming (aided by a proliferation of streaming services and devices) in expanding viewership is undeniable. Although the wholesale replacement of traditional television by OTT (and, in particular, by video cord-cutting) is not imminent, that does *not* mean that OTT activity is weak or inconsequential. The existence of a large Cord Couplers segment is proof that OTT can be a major player and a determinant of viewership patterns without it necessarily having to displace the traditional way to view TV/video programs.

Second, video viewership is now a multi-faceted experience and any judgment about its current and future trajectory cannot, and should not, be made by following trends in only a single dimension. All too often, hours of viewership is the sole metric used in research studies to understand how well (or not) traditional distribution channels have performed in bringing video content to viewers. This study shows that a lot more is involved than merely the aggregate hours of viewership. There are serious differences among genres of TV/video programs, sometimes opposing trends in the influence of demographics (particularly age and household income), and the hitherto unknown “variety of devices” effect that predicts that viewership expands faster when certain (mostly streaming-capable) devices are combined than when they are used separately. The viewership environment is now complex: live vs. time-shifted viewing, fixed vs. mobile viewing locations, devices that double as both video content receivers and display screens, individual-centric rather than household- or community-centric viewing, etc. Knowing how viewership hours behave along these many dimensions brings richer insights than merely tracking the aggregate hours of viewership.

³³ With a bigger screen, a sharper image, and access to 4G speeds, some models of tablets should, in theory, take the lead in mobile streaming. However, tablets are more expensive to buy and connect to networks than smartphones. Other research has shown that smartphones remain the favored mobile and computing device for lower-income and younger households — two significant demographic segments for streaming-based viewership of video content.

APPENDIX

Table A1. Tetrachoric Correlations Among Streaming-Related and Device-Related Variables

	Netflix Streaming	Other Paid Streaming	Free Streaming
Use TV	0.0583	0.0325	0.0781
Use Computer	0.5448	0.5623	0.7570
Use Smartphone	0.3862	0.4814	0.4177
Use Tablet	0.3801	0.4413	0.3792
Use Game Console	0.6101	0.3934	0.3145
Use CMD	0.5201	0.4070	0.2238
One Device	-0.6395	-0.5814	-0.7196
Two Devices	-0.1346	-0.1537	0.1882
Three Devices	0.3277	0.2094	0.3367
Four Devices	0.4997	0.4263	0.4031
Five Devices	0.5153	0.5464	0.4296
Six Devices	0.5220	0.5581	0.3829
TV,C	-0.1715	-0.1274	0.2631
TV,C,S	0.0183	0.1524	0.2612
TV,C,T	0.0744	0.1280	0.2093
TV,C,GC	0.4436	0.1072	0.2705
TV,C,S,T	0.1505	0.3009	0.2948
TV,C,S,GC	0.4799	0.3833	0.3551
TV,C,T,GC	0.3783	0.1899	0.3256
TV,C,S,T,GC	0.4773	0.5080	0.4256
TV,C,S,T,GC,CMD	0.5220	0.5581	0.3929

Table A2. Drivers of Viewership Hours for Movies, 2Q11-4Q11

Independent Variable	Model 1: Streaming Only	Model 2: Device Use	Model 3: Device Count	Model 4: Device Combination
Demographics				
Age 18-34	-0.90**	-0.72**	-0.78**	-0.57**
Age 35-39	-0.97**	-0.91**	-0.97**	-0.79**
Age 40-54	-0.28**	-0.27**	-0.29**	-0.19
Income \$0-\$20K	1.76**	1.93**	1.87**	1.79**
Income \$20K-\$35K	1.19**	1.27**	1.29**	1.26**
Income \$35K-\$50K	1.00**	1.00**	1.04**	1.04**
Income \$50K-\$100K	0.10	0.09	0.14	0.19
Income \$100K and over	-0.31	-0.35	-0.32	-0.18
Household size	0.39**	0.35**	0.36**	0.37**
White	-1.07**	-1.08**	-1.10**	-1.11**
African-American	1.04**	0.91**	0.82*	0.86*
Asian-American	-1.26**	-1.17**	-1.38**	-1.32**
Hispanic	-0.47	-0.46	-0.50	-0.39
Children 0-6	-0.15*	-0.15*	-0.15*	-0.15*
Children 7-11	-0.20*	-0.19*	-0.19*	-0.21*
Children 12-17	0.09	0.10	0.06	0.08
Streaming/Downloading.				
Netflix Paid Streaming	2.44**			
Other Paid Streaming	1.98**			
Free Streaming	0.74**			
Device Use				
Use TV set		3.61**		
Use Computer		1.05**		
Use Smartphone		0.71**		
Use Tablet		0.37*		
Use Game Console		1.02**		
Use CMD		2.05**		
Device Count				
Two Devices			1.02**	
Three Devices			1.73**	
Four Devices			2.77**	
Five Devices			4.76**	
Six Devices			8.04**	
Device Combination				
TV only				-0.10
TV,C				0.81**
TV,C,S				1.16**
TV,C,T				0.73*
TV,C,GC				1.71**
TV,C,S,T				1.96**
TV,C,T,GC				1.89**
TV,C,S,GC				2.46**
TV,C,S,T,GC				3.23**
TV,C,S,T,GC,CMD				7.55**
Constant	3.87**	0.17	3.70**	3.94**
TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device				
** Statistically significant at 5% level; * Statistically significant at 10% level				

Table A3. Equality of Coefficients Test for Viewership Hours for Movies, 2Q11-4Q11

Model 1		Model 2	
Coefficients Compared	F-value	Coefficients Compared	F-value
Netflix Paid = Other Paid	2.73*	Two Devices = Three Devices	23.32**
Netflix Paid = Free Streaming	71.80**	Three Devices = Four Devices	23.74**
Other Paid = Free Streaming	24.95**	Four Devices = Five Devices	25.20**
		Five Devices = Six Devices	9.60**
Model 4			
Coefficients Compared	F-value		
(TV) = (TV,C)	50.35**	Hierarchical tests	
(TV,C) = (TV,C,S)	3.15*		
(TV,C,S) = (TV,C,S,T)	3.95**		
(TV,C,S) = (TV,C,S,GC)	19.30**		
(TV,C,S,T) = (TV,C,S,T,GC)	5.09**		
(TV,C,S,GC) = (TV,C,S,T,GC)	2.47		
(TV,C) = (TV,C,T)	0.05		
(TV,C,T) = (TV,C,S,T)	5.72**		
(TV,C,T) = (TV,C,T,GC)	3.12*		
(TV,C,T,GC) = (TV,C,S,T,GC)	3.79*		
(TV,C) = (TV,C,GC)	15.86**		
(TV,C,GC) = (TV,C,S,GC)	5.67**		
(TV,C,GC) = (TV,C,T,GC)	0.09		
(TV,C,S,T,GC) = (TV,C,S,T,GC,CMD)	15.72**		
(TV,C,S)=(TV,C,T)	1.15		Non-hierarchical tests
(TV,C,S)=(TV,C,GC)	4.29**		
(TV,C,T) = (TV,C,GC)	5.53**		
(TV,C,S,T) = (TV,C,S,GC)	1.28		
(TV,C,S,T) = (TV,C,T,GC)	0.01		
(TV,C,S,GC) = (TV,C,T,GC)	0.93		
TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device			
** Statistically significant at 5% level; * Statistically significant at 10% level			

Table A4. Drivers of Viewership Hours for TV Shows, 2Q11-4Q11

Independent Variable	Model 1: Streaming Only	Model 2: Device Use	Model 3: Device Count	Model 4: Device Combination
Demographics				
Age 18-34	-2.35**	-2.57**	-2.98**	-2.27**
Age 35-39	-1.95**	-2.09**	-2.41**	-1.88**
Age 40-54	-1.03**	-1.12**	-1.30**	-0.95**
Income \$0-\$20K	3.20**	3.69**	3.35**	3.23**
Income \$20K-\$35K	1.91**	1.90**	1.93**	1.83**
Income \$35K-\$50K	1.67**	1.43**	1.59**	1.50**
Income \$50K-\$100K	0.40	0.06	0.25	0.27
Income \$100K and over	-0.98	-1.60**	-1.33**	-1.16*
Household size	0.51**	0.44**	0.45**	0.49**
White	1.23	1.32	1.30	1.34
African-American	1.81*	1.85*	1.66	1.77*
Asian-American	-0.88	-0.50	-1.02	-0.90
Hispanic	-0.25	-0.43	-0.51	-0.33
Children 0-6	0.02	0.06	0.07	0.06
Children 7-11	-1.36**	-1.32**	-1.34**	-1.35*
Children 12-17	0.34	0.34	0.24	0.36
Streaming/Downloading.				
Netflix Paid Streaming	0.16			
Other Paid Streaming	0.27			
Free Streaming	1.48**			
Device Use				
Use TV set		14.51**		
Use Computer		1.71**		
Use Smartphone		1.25**		
Use Tablet		0.73		
Use Game Console		-0.24		
Use CMD		-0.38		
Device Count				
Two Devices			2.08**	
Three Devices			2.58**	
Four Devices			3.91**	
Five Devices			5.43**	
Six Devices			5.92**	
Device Combination				
TV only				4.43**
TV,C				6.01**
TV,C,S				6.38**
TV,C,T				5.78**
TV,C,GC				5.29**
TV,C,S,T				7.19**
TV,C,T,GC				5.21**
TV,C,S,GC				7.15**
TV,C,S,T,GC				9.08**
TV,C,S,T,GC,CMD				8.87**
Constant	12.56**	-1.87	11.88**	8.17**
TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device				
** Statistically significant at 5% level; * Statistically significant at 10% level				

Table A5. Equality of Coefficients Test for Viewership Hours for TV Shows, 2Q11-4Q11

Model 1		Model 2	
Coefficients Compared	F-value	Coefficients Compared	F-value
Netflix Paid = Other Paid	0.03	Two Devices = Three Devices	2.00
Netflix Paid = Free Streaming	7.43**	Three Devices = Four Devices	6.93**
Other Paid = Free Streaming	4.07**	Four Devices = Five Devices	2.55
		Five Devices = Six Devices	0.04
Model 4			
Coefficients Compared	F-value		
(TV) = (TV,C)	27.19**	Hierarchical tests	
(TV,C) = (TV,C,S)	0.62		
(TV,C,S) = (TV,C,S,T)	0.74		
(TV,C,S) = (TV,C,S,GC)	1.21		
(TV,C,S,T) = (TV,C,S,T,GC)	2.00		
(TV,C,S,GC) = (TV,C,S,T,GC)	2.77*		
(TV,C) = (TV,C,T)	0.06		
(TV,C,T) = (TV,C,S,T)	1.34		
(TV,C,T) = (TV,C,T,GC)	0.14		
(TV,C,T,GC) = (TV,C,S,T,GC)	5.57**		
(TV,C) = (TV,C,GC)	1.80		
(TV,C,GC) = (TV,C,S,GC)	6.16**		
(TV,C,GC) = (TV,C,T,GC)	0.00		
(TV,C,S,T,GC) = (TV,C,S,T,GC,CMD)	0.01		
(TV,C,S)=(TV,C,T)	0.39	Non-hierarchical tests	
(TV,C,S)=(TV,C,GC)	2.98*		
(TV,C,T) = (TV,C,GC)	0.25		
(TV,C,S,T) = (TV,C,S,GC)	0.00		
(TV,C,S,T) = (TV,C,T,GC)	1.63		
(TV,C,S,GC) = (TV,C,T,GC)	1.88		
TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device			
** Statistically significant at 5% level; * Statistically significant at 10% level			

Table A6. Drivers of Viewership Hours for News/Weather, 2Q11-4Q11

Independent Variable	Model 1: Streaming Only	Model 2: Device Use	Model 3: Device Count	Model 4: Device Combination
Demographics				
Age 18-34	-3.76**	-3.88**	-3.99**	-3.78**
Age 35-39	-2.76**	-2.83**	-2.90**	-2.75**
Age 40-54	-1.68**	-1.71**	-1.77**	-1.65**
Income \$0-\$20K	-0.18	-0.01	-0.16	-0.17
Income \$20K-\$35K	-0.45	-0.46	-0.47	-0.50
Income \$35K-\$50K	-0.27	-0.36	-0.32	-0.35
Income \$50K-\$100K	-0.75**	-0.87**	-0.81**	-0.81**
Income \$100K and over	-0.96**	-1.17**	-1.07**	-1.04**
Household size	0.07	0.06	0.06	0.07
White	-0.24	-0.21	-0.21	-0.19
African-American	0.51	0.54	0.53	0.54
Asian-American	-0.07	-0.04	-0.13	-0.09
Hispanic	-0.08	-0.12	-0.13	-0.07
Children 0-6	-0.12	-0.11	-0.10	-0.11
Children 7-11	-0.16	-0.14	-0.15	-0.15
Children 12-17	0.12	0.13	0.10	0.13
Streaming/Downloading.				
Netflix Paid Streaming	-0.46**			
Other Paid Streaming	0.81**			
Free Streaming	0.13**			
Device Use				
Use TV set		4.68**		
Use Computer		0.19**		
Use Smartphone		0.78**		
Use Tablet		0.05		
Use Game Console		-0.20		
Use CMD		-0.40**		
Device Count				
Two Devices			0.34**	
Three Devices			0.50**	
Four Devices			0.75**	
Five Devices			1.27**	
Six Devices			4.18**	
Device Combination				
TV only				1.81**
TV,C				1.94**
TV,C,S				2.37**
TV,C,T				1.72**
TV,C,GC				1.48**
TV,C,S,T				2.48**
TV,C,T,GC				1.01
TV,C,S,GC				2.35**
TV,C,S,T,GC				2.49**
TV,C,S,T,GC,CMD				5.50**
Constant	6.99**	2.40**	6.84**	5.28**
TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device				
** Statistically significant at 5% level; * Statistically significant at 10% level				

Table A7. Equality of Coefficients Test for Viewership Hours for News/Weather, 2Q11-4Q11

Model 1		Model 2	
Coefficients Compared	F-value	Coefficients Compared	F-value
Netflix Paid = Other Paid	11.71**	Two Devices = Three Devices	0.65
Netflix Paid = Free Streaming	4.80**	Three Devices = Four Devices	0.76
Other Paid = Free Streaming	4.16**	Four Devices = Five Devices	0.98
		Five Devices = Six Devices	4.24**
Model 4			
Coefficients Compared	F-value		
(TV) = (TV,C)	0.54	Hierarchical tests	
(TV,C) = (TV,C,S)	2.73*		
(TV,C,S) = (TV,C,S,T)	0.04		
(TV,C,S) = (TV,C,S,GC)	0.00		
(TV,C,S,T) = (TV,C,S,T,GC)	0.00		
(TV,C,S,GC) = (TV,C,S,T,GC)	0.05		
(TV,C) = (TV,C,T)	0.19		
(TV,C,T) = (TV,C,S,T)	1.23		
(TV,C,T) = (TV,C,T,GC)	0.68		
(TV,C,T,GC) = (TV,C,S,T,GC)	2.62		
(TV,C) = (TV,C,GC)	2.36		
(TV,C,GC) = (TV,C,S,GC)	4.31**		
(TV,C,GC) = (TV,C,T,GC)	0.37		
(TV,C,S,T,GC) = (TV,C,S,T,GC,CMD)	4.35**		
(TV,C,S)=(TV,C,T)	1.48	Non-hierarchical tests	
(TV,C,S)=(TV,C,GC)	6.43**		
(TV,C,T) = (TV,C,GC)	0.20		
(TV,C,S,T) = (TV,C,S,GC)	0.05		
(TV,C,S,T) = (TV,C,T,GC)	2.87*		
(TV,C,S,GC) = (TV,C,T,GC)	2.88*		
TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device			
** Statistically significant at 5% level; * Statistically significant at 10% level			

Table A8. Drivers of Viewership Hours for Sports, 2Q11-4Q11

Independent Variable	Model 1: Streaming Only	Model 2: Device Use	Model 3: Device Count	Model 4: Device Combination
Demographics				
Age 18-34	-0.84**	-1.07**	-1.07**	-0.99**
Age 35-39	-0.64**	-0.78**	-0.77**	-0.72**
Age 40-54	-0.47**	-0.53**	-0.54**	-0.49**
Income \$0-\$20K	-1.14**	-1.03**	-1.10**	-1.12**
Income \$20K-\$35K	-0.45**	-0.45**	-0.45**	-0.47**
Income \$35K-\$50K	-0.22	-0.28	-0.25	-0.26
Income \$50K-\$100K	0.03	-0.07	-0.02	-0.02
Income \$100K and over	0.52**	0.34*	0.40**	0.42**
Household size	0.15**	0.13**	0.14**	0.14**
White	-0.12	-0.09	-0.09	-0.09
African-American	0.54	0.51	0.53	0.52
Asian-American	0.08	0.09	-0.01	-0.00
Hispanic	0.31	0.26	0.26	0.29
Children 0-6	-0.18**	-0.16**	-0.16**	-0.16**
Children 7-11	-0.23**	-0.22**	-0.22**	-0.22**
Children 12-17	0.04	0.02	0.02	0.03
Streaming/Downloading.				
Netflix Paid Streaming	-0.20*			
Other Paid Streaming	0.51**			
Free Streaming	0.15*			
Device Use				
Use TV set		2.23**		
Use Computer		0.14*		
Use Smartphone		0.74**		
Use Tablet		0.11		
Use Game Console		0.17		
Use CMD		0.03**		
Device Count				
Two Devices			0.31**	
Three Devices			0.35**	
Four Devices			1.11**	
Five Devices			1.31**	
Six Devices			5.64**	
Device Combination				
TV only				0.57**
TV,C				0.77**
TV,C,S				1.10**
TV,C,T				0.50*
TV,C,GC				0.51**
TV,C,S,T				1.47**
TV,C,T,GC				0.89**
TV,C,S,GC				1.77**
TV,C,S,T,GC				1.51**
TV,C,S,T,GC,CMD				6.01**
Constant	3.07**	0.87**	2.95**	2.49**
TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device				
** Statistically significant at 5% level; * Statistically significant at 10% level				

Table A9. Equality of Coefficients Test for Viewership Hours for Sports, 2Q11-4Q11

Model 1		Model 2	
Coefficients Compared	F-value	Coefficients Compared	F-value
Netflix Paid = Other Paid	11.98**	Two Devices = Three Devices	0.17
Netflix Paid = Free Streaming	5.43**	Three Devices = Four Devices	23.11**
Other Paid = Free Streaming	3.88**	Four Devices = Five Devices	0.46
		Five Devices = Six Devices	31.02**
Model 4			
Coefficients Compared	F-value		
(TV) = (TV,C)	4.36**	Hierarchical tests	
(TV,C) = (TV,C,S)	5.23*		
(TV,C,S) = (TV,C,S,T)	1.57		
(TV,C,S) = (TV,C,S,GC)	9.47**		
(TV,C,S,T) = (TV,C,S,T,GC)	0.01		
(TV,C,S,GC) = (TV,C,S,T,GC)	0.53		
(TV,C) = (TV,C,T)	0.98		
(TV,C,T) = (TV,C,S,T)	6.62**		
(TV,C,T) = (TV,C,T,GC)	0.68		
(TV,C,T,GC) = (TV,C,S,T,GC)	1.45		
(TV,C) = (TV,C,GC)	2.46		
(TV,C,GC) = (TV,C,S,GC)	29.53**		
(TV,C,GC) = (TV,C,T,GC)	0.82		
(TV,C,S,T,GC) = (TV,C,S,T,GC,CMD)	31.91**		
(TV,C,S)=(TV,C,T)	4.18**	Non-hierarchical tests	
(TV,C,S)=(TV,C,GC)	9.19**		
(TV,C,T) = (TV,C,GC)	0.00		
(TV,C,S,T) = (TV,C,S,GC)	0.85		
(TV,C,S,T) = (TV,C,T,GC)	1.44		
(TV,C,S,GC) = (TV,C,T,GC)	4.00**		

TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device
 ** Statistically significant at 5% level; * Statistically significant at 10% level

Table A10. Drivers of Viewership Hours for Clips and Other Video, 2Q11-4Q11

Independent Variable	Model 1: Streaming Only	Model 2: Device Use	Model 3: Device Count	Model 4: Device Combination
Demographics				
Age 18-34	0.24**	-0.02	-0.03	0.04
Age 35-39	0.25*	0.02	0.04	0.09
Age 40-54	0.25**	0.13	0.13	0.16**
Income \$0-\$20K	0.04	0.16	0.16	0.11
Income \$20K-\$35K	-0.13	-0.08	-0.09	-0.10
Income \$35K-\$50K	0.05	0.02	0.01	0.02
Income \$50K-\$100K	-0.33**	-0.40**	-0.40**	-0.37**
Income \$100K and over	-0.39**	-0.57**	-0.57**	-0.51**
Household size	0.16**	0.12**	0.11**	0.12**
White	-0.75**	-0.70**	-0.73**	-0.75**
African-American	0.54*	0.38	0.42	0.38
Asian-American	0.35	0.22	0.25	0.19
Hispanic	-0.03	-0.14	-0.17	-0.13
Children 0-6	-0.13**	-0.11**	-0.10*	-0.11**
Children 7-11	-0.28**	-0.26**	-0.27**	-0.28**
Children 12-17	0.31**	0.26**	0.24**	0.26**
Streaming/Downloading.				
Netflix Paid Streaming	0.39**			
Other Paid Streaming	1.48**			
Free Streaming	1.25**			
Device Use				
Use TV set		0.75**		
Use Computer		1.37**		
Use Smartphone		1.13**		
Use Tablet		0.90**		
Use Game Console		0.40**		
Use CMD		0.90**		
Device Count				
Two Devices			1.22**	
Three Devices			2.02**	
Four Devices			2.78**	
Five Devices			4.58**	
Six Devices			6.83**	
Device Combination				
TV only				-0.99**
TV,C				0.37**
TV,C,S				1.28**
TV,C,T				1.50*
TV,C,GC				0.56**
TV,C,S,T				1.79**
TV,C,T,GC				0.82**
TV,C,S,GC				2.05**
TV,C,S,T,GC				3.46**
TV,C,S,T,GC,CMD				5.80**
Constant	3.07**	0.15	1.00**	1.94**
TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device				
** Statistically significant at 5% level; * Statistically significant at 10% level				

Table A11. Equality of Coefficients Test for Viewership Hours for Clips and Other Video, 2Q11-4Q11

Model 1		Model 2	
Coefficients Compared	F-value	Coefficients Compared	F-value
Netflix Paid = Other Paid	11.98**	Two Devices = Three Devices	64.71**
Netflix Paid = Free Streaming	5.43**	Three Devices = Four Devices	28.57**
Other Paid = Free Streaming	3.88**	Four Devices = Five Devices	45.19**
		Five Devices = Six Devices	10.05**
Model 4			
Coefficients Compared	F-value		
(TV) = (TV,C)	250.02**	Hierarchical tests	
(TV,C) = (TV,C,S)	47.51**		
(TV,C,S) = (TV,C,S,T)	3.60*		
(TV,C,S) = (TV,C,S,GC)	14.91**		
(TV,C,S,T) = (TV,C,S,T,GC)	19.36**		
(TV,C,S,GC) = (TV,C,S,T,GC)	18.30**		
(TV,C) = (TV,C,T)	20.52**		
(TV,C,T) = (TV,C,S,T)	0.70		
(TV,C,T) = (TV,C,T,GC)	2.44		
(TV,C,T,GC) = (TV,C,S,T,GC)	32.27**		
(TV,C) = (TV,C,GC)	1.56		
(TV,C,GC) = (TV,C,S,GC)	49.44**		
(TV,C,GC) = (TV,C,T,GC)	0.45		
(TV,C,S,T,GC) = (TV,C,S,T,GC,CMD)	10.30**		
			Non-hierarchical tests
(TV,C,S)=(TV,C,T)	0.70		
(TV,C,S)=(TV,C,GC)	16.45**		
(TV,C,T) = (TV,C,GC)	11.50**		
(TV,C,S,T) = (TV,C,S,GC)	0.73		
(TV,C,S,T) = (TV,C,T,GC)	4.91**		
(TV,C,S,GC) = (TV,C,T,GC)	9.44**		

TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device
 ** Statistically significant at 5% level; * Statistically significant at 10% level

Table A12. Drivers of Viewership Hours for All Video Genres, 2Q11-4Q11

Independent Variable	Model 1: Streaming Only	Model 2: Device Use	Model 3: Device Count	Model 4: Device Combination
Demographics				
Age 18-34	-7.62**	-8.26**	-8.85**	-7.57**
Age 35-39	-6.07**	-6.60**	-7.01**	-6.05**
Age 40-54	-3.20**	-3.50**	-3.78**	-3.13**
Income \$0-\$20K	3.69**	4.73**	4.12**	3.83**
Income \$20K-\$35K	2.07**	2.17**	2.20**	2.01*
Income \$35K-\$50K	2.24**	1.80*	2.07**	1.96*
Income \$50K-\$100K	-0.54	-1.19	-0.84	-0.74
Income \$100K and over	-2.13**	-3.34**	-2.89**	-2.48**
Household size	1.28**	1.09**	1.11**	1.19**
White	-0.94	-0.76	-0.83	-0.80
African-American	4.44**	4.19**	3.96**	4.07**
Asian-American	-1.78	-1.32	-2.29	-2.12
Hispanic	-0.52	-0.89	-1.04	-0.63
Children 0-6	-0.55*	-0.47	-0.45	-0.46
Children 7-11	-2.21**	-2.14**	-2.17**	-2.20**
Children 12-17	0.91**	0.82**	0.66*	0.86**
Streaming/Downloading.				
Netflix Paid Streaming	2.33**			
Other Paid Streaming	5.06**			
Free Streaming	3.74**			
Device Use				
Use TV set		25.78**		
Use Computer		4.46**		
Use Smartphone		4.61**		
Use Tablet		2.17**		
Use Game Console		0.95*		
Use CMD		2.39**		
Device Count				
Two Devices			4.96**	
Three Devices			7.17**	
Four Devices			11.32**	
Five Devices			17.34**	
Six Devices			30.62**	
Device Combination				
TV only				5.72**
TV,C				9.89**
TV,C,S				12.29**
TV,C,T				10.24**
TV,C,GC				9.54**
TV,C,S,T				14.91**
TV,C,T,GC				9.82**
TV,C,S,GC				15.78**
TV,C,S,T,GC				19.77**
TV,C,S,T,GC,CMD				33.73**
Constant	27.80**	1.73	26.38**	21.81**
TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device				
** Statistically significant at 5% level; * Statistically significant at 10% level				

Table A13. Equality of Coefficients Test for Viewership Hours for All Video Genres, 2Q11-4Q11

Model 1		Model 2	
Coefficients Compared	F-value	Coefficients Compared	F-value
Netflix Paid = Other Paid	5.95**	Two Devices = Three Devices	14.11**
Netflix Paid = Free Streaming	3.02*	Three Devices = Four Devices	23.72**
Other Paid = Free Streaming	1.72	Four Devices = Five Devices	14.44**
		Five Devices = Six Devices	9.86**
Model 4			
Coefficients Compared	F-value		
(TV) = (TV,C)	67.18**	Hierarchical tests	
(TV,C) = (TV,C,S)	9.32**		
(TV,C,S) = (TV,C,S,T)	2.66		
(TV,C,S) = (TV,C,S,GC)	8.77**		
(TV,C,S,T) = (TV,C,S,T,GC)	4.72**		
(TV,C,S,GC) = (TV,C,S,T,GC)	4.20**		
(TV,C) = (TV,C,T)	0.05		
(TV,C,T) = (TV,C,S,T)	5.19**		
(TV,C,T) = (TV,C,T,GC)	0.03		
(TV,C,T,GC) = (TV,C,S,T,GC)	13.10**		
(TV,C) = (TV,C,GC)	0.15		
(TV,C,GC) = (TV,C,S,GC)	24.62**		
(TV,C,GC) = (TV,C,T,GC)	0.01		
(TV,C,S,T,GC) = (TV,C,S,T,GC,CMD)	10.42**		
(TV,C,S)=(TV,C,T)	1.64	Non-hierarchical tests	
(TV,C,S)=(TV,C,GC)	6.75**		
(TV,C,T) = (TV,C,GC)	0.18		
(TV,C,S,T) = (TV,C,S,GC)	0.24		
(TV,C,S,T) = (TV,C,T,GC)	3.81*		
(TV,C,S,GC) = (TV,C,T,GC)	6.32**		

TV=Television set, C=Computer, S=Smartphone, T=Tablet, GC=Game Console, CMD=Connected Media Device
 ** Statistically significant at 5% level; * Statistically significant at 10% level