Recent Developments in Mass Media: Digitization and Multitasking

Kenneth C. Wilbur[1]

Abstract: Technology and consumer behavior are changing supply and demand for mass media. Digitization has increased consumer control over media content and advertising, with implications for advertising avoidance, advertising targeting and personalization, competition among media platforms, and media market outcomes. In addition, consumers increasingly use a "second screen" to multitask during media programs, enabling immediate online response to program and advertising content, but also offering new opportunities to divert attention. This chapter presents recent data showing that video has remained the dominant mass medium and establishing the prevalence of digitization and multitasking behavior. It then selectively reviews academic research on the antecedents and consequences of the changing picture of mass media consumption, with a particular focus on the past 5-10 years.

Keywords: Advertising, Internet, Marketing, Mass Media, Media Economics, Television

JEL codes: J22, L82, L96, M30, M37

I thank Simon Anderson, Peter Danaher, Ron Goettler, Catherine Tucker and Joel Waldfogel for helpful comments and discussions, with particular gratitude to Anderson and Waldfogel for inviting the chapter.

[1] Associate professor, Rady School of Management, University of California, San Diego. 9500 Gilman Drive, Box 0553, San Diego, California 92093. 619-535-9536. Http://kennethcwilbur.com, kennethcwilbur@gmail.com.

Consumers devote more than half of all available leisure time to mass media. The purpose of this article is to survey recent changes in mass media consumption and research, with a particular focus on the past five to ten years. I begin with recent data on time and advertising revenue allocations across mass media. I then selectively review academic research on how two important trends—digitization and consumer multitasking—are changing mass media industries.

To set boundaries on this review, this article considers mass media to be one-to-many means of communication that convey information and entertainment of primarily ephemeral value. I say "primarily ephemeral" in anticipation that, although there will be a few enduring hits, the large majority of mass media content will be consumed immediately upon, or shortly after, its distribution. For example, while some television series are archived by services like Amazon, Hulu and Netflix, these series constitute a small fraction of the tens of thousands of hours of new television content created and distributed each year.

This definition of mass media includes television, radio, newspapers, magazines, and many other forms of digital audio, text and video communications. However, "one-to-many" excludes personal communications services like telephony, email, search engines, and (arguably) social networks and most other forms of user-generated content. Entertainment and information content distinguish mass media from those that focus on purely commercial communications such as yellow pages or product review sites. Ephemerality excludes most books, movies and video games, as the consumption value of these media seems to diminish more slowly with time (despite a few prominent exceptions).

Mass media industries share a particular set of economic characteristics which often distinguishes their analysis from more conventional economic settings:

- Mass media products are experience goods that are nonrival in consumption and differ in both quality and match value (i.e., horizontally and vertically differentiated product characteristics). Mass media tend to be “hits” industries in which small oligopolies of multiproduct firms compete for consumer attention.
- Many mass media recently shifted from analog to digital distribution, replacing the traditional one-way flow of information with a two-way exchange between providers and consumers. Digitization changes the information that media platforms can learn about how their consumers consume and respond to content and advertising.
- Mass media are operated as platform businesses that enable interactions between consumers and advertisers. Advertisers are charged piece rates for audiences or bundles or audiences. Consumers are normally charged a mixture of subscription fees and attention devoted to advertising interruptions. Multitasking threatens the availability of attention for advertisements, and digitization has increased control over consumer exposure to advertising.

The next section uses recent market data to establish a few facts about mass media consumption and the importance of digitization and consumer multitasking with media. Section 2 reviews some recent academic literature about the implications of digitization for consumer control over advertising exposure, advertising targeting, innovations in traditional media business models, and media market outcomes. Section 3 presents research about how multi-tasking—sometimes called “second screening”—is altering advertising consumption, media complementarities, and competition among media for consumer attention. The final section concludes with some directions for future research.

1. Recent Trends in Mass Media Consumption

Before looking at media consumption data, one must first evaluate the potential sources of information. Broadly speaking, there are three types of media consumption data: measurements based on self-reports, measurements provided by media outlets, and measurements provided by third parties that are financed by media outlets.

Self-reports are known to be imperfect. Respondents may have imperfect knowledge of their own media consumption or may be unwilling to divulge it accurately. A story is often told within business schools about South American countries' switch from Nielsen diaries (self-reports) to PeopleMeters (a passive tracking device that measures television usage). After Nielsen adopted PeopleMeters, audience ratings of lowbrow comedy programs rose substantially and news programs' audience estimates fell. It seems unlikely that the change in measurement technology actually corresponded to a change in viewing habits.

In contrast to self-reports, some media companies measure and report their own audience. However, these measurements are imperfect and may be biased. For example, a magazine may know precisely how many issues it sells at retail and mails to subscribers each month. However, it does not know how many of those magazines go unread or how many are circulated to additional people after purchase. More importantly, the magazine's advertising price is likely to vary with audience size. Therefore, the magazine may want to inflate its audience report and to suppress information that might harm advertising sales.

Recognizing this incentive problem, traditional mass media industries use third-party arbiters to measure audience sizes. These organizations maintain representative samples and try to measure media usage passively. In television, Nielsen Media Research has been the de facto ratings monopoly for decades. Arbitron serves a similar function in radio. Print media report

audience numbers through the Audit Bureau of Circulations. However, these third-party institutions rely primarily on the media industries for their operating budgets and rarely report information contrary to their media clients' interests. No similar set of authoritative third-parties has emerged to validate audience sizes in online mass media industries.[1]

With these caveats in mind, I begin by looking at self-reports. The Bureau of Labor Statistics' American Time Use Survey (ATUS) surveys a stratified subsample of 7,000 members of the Current Population Survey about how they spend their time. Typically 53-58% of those surveyed respond. Figure 1 summarizes the major categories of leisure activity in the survey.

FIGURE 1 HERE

Two conclusions emerge. First, American consumers say they spend more than 10% of all available time, and more than 50% of their relaxation/leisure time, watching TV. (The "watching TV" category does not distinguish video consumption by source, such as traditional TV, Video on Demand or Internet Video.) Second, viewers' reported daily video consumption time did not diminish between 2003 and 2013. If anything, video consumption rose slightly between 2003 and 2009, continuing a 50-year trend documented by Robinson and Martin (2009).

In contrast to the ATUS telephone survey, Nielsen measures television usage continuously within a stratified sample of about 37,000 households. It uses PeopleMeters to record television usage; these devices connect to the television in order to passively measure usage and tuning. The PeopleMeter augments the device-level usage information by requiring viewers to "log in" via remote control when prompted (every 20-40 minutes on average).

TVB (2014) and Nielsen (2014a) report figures that are interesting to compare to the ATUS data. Nielsen reports nearly twice as much television usage time as ATUS: 4.9 hours per

[1] See Wilbur and Zhu (2009) for further discussion in the context of click fraud and the search engine industry.

day in 2009 for American adult men, and 5.52 hours per day for American adult females. The Nielsen figures corroborate the gradual rise in average daily television usage through the 2003-2009 period.

I see four possible explanations for the near-100% difference in the self-reported data and the PeopleMeter data. First, perhaps viewers do not know their actual television usage. Second, perhaps they know it, but prefer to report less than the true figure. Third, there may be multiple ways to "watch television"—e.g., as a focal activity or a peripheral activity. Perhaps viewers count focal usage time but Nielsen counts both focal and peripheral usage time. Fourth, sample selection may skew either estimate. For example, some experts believe that frequent television viewers are more likely to enroll and remain in the Nielsen sample.

I have conducted independent investigations of television usage data collected passively via digital Set-Top Boxes (STBs) by four independent companies. In order to measure daily television usage from STB records, the analyst must define a "bounce"—some time threshold at which an inactive session is assumed to terminate (a similar issue applies to measuring consumer time spent on internet webpages). For example, if a STB is tuned to ESPN for 24 hours, it is unlikely to indicate 24 hours of continuous television usage. A more likely explanation is that the consumer turned off the television at some point after tuning to ESPN, but never turned off the STB. I have found that defining a bounce as about 35-45 minutes produced daily usage estimates comparable to Nielsen figures. Interestingly, Google (2012) claims that the average television tuning event lasts 43 minutes. In my view, this lends some support to the Nielsen viewing statistics.

A second measure of mass media importance is advertising revenue. Here too, television appears to be the most important mass medium. TVB (2014) reports a cross-media comparison

of Kantar Media advertising data. The TVB analysis shows that television attracted about 54.4% of mass media advertising dollars, followed by newspapers (11.7%) and internet display (9.8%). BI (2013) summarized advertising sales revenues reported by 20 large corporations, report that, since 2009 at least, the large increase in online advertising revenues (including 43% from search advertising) is coming from (i) new advertising expenditures and (ii) at the expense of newspapers. It appears that aggregate television and radio advertising revenues changed little between 2009 and 2012.

A third gauge of media importance is subscription revenues. In summary, about 97% of all US households contain televisions and 87% of American households subscribe to some multichannel video service (cable, satellite or telco), generating $95.36 billion in subscription revenues (Digital TV Research 2014). This figure far exceeds the subscription revenue earned by any competing mass medium. However, there are some forecasts that new subscription growth will fall below the rate of new household formation, and that revenues will fall in future years as telcos such as Verizon and AT&T intensify price competition with incumbent cable and satellite companies.

A fourth way to consider the importance of various mass media is to ask consumers about their perceptions. eMarketer (2012) surveyed consumers and found that 45.2% said they trust television most as a source of news and information, followed by newspapers (20.4%), radio (17.7%), internet-only news sources (12.5%) and social media updates (4.1%). However, when asked which sources most influence brand purchase decisions, internet research is named most frequently (61.1%), followed by TV ads (28.3%) and radio ads (20.9%).

The sum of the data indicate that television is the most important mass medium, at least in terms of consumer attention and expenditure, with limited indications of any imminent change

in position. However, two trends that are changing video mass media in fundamental ways. On the supply side, *digitization* is changing the way television signals are distributed and increasing consumers' programming options. On the demand side, *screen proliferation* is changing the way television signals are consumed, making attention ever scarcer.

1.1. *Digitization*

The shift from analog to digital distribution of television signals is still fairly recent. In 2004, only 40% of US households received TV signals over digital networks; by 2011, that figure had risen above 83% (TVB 2014).

A similar shift toward digitization has occurred in other mass media. Newspapers and magazine articles are distributed online through websites and applications on mobile devices. Terrestrial radio stations are broadcast simultaneously online and through mobile applications like "iHeartRadio." This shift has three major consequences: audience fragmentation, personalization, and increased usage information.

Digital signals require less bandwidth to convey than analog signals, so the immediate effect of digitization has been to dramatically increase the amount of mass media content available to consumers. This increase in choice has fragmented the audience. This effect is easiest to observe in television, as national broadcast networks' share of total viewing fell from 41% in 2003 to 25% in 2013 (CAB 2014).[2] However, because total video consumption has not fallen, this loss of attention at the head of the distribution has been reallocated to more niche-oriented competitors, i.e. national cable networks.

[2] Such figures are sometimes misinterpreted as evidence of weakness in demand for television, but such reports gloss over the fact that broadcast networks' losses are mostly recaptured by cable television networks.

The second consequence of digitization has been to increase consumer control over media content. An early example was the digital video recorder, which can now be found in about 47% of American households (up from 3% in 2004; LRG 2013). The primary effect of DVR ownership is to increase the consumer's control over media, enabling such activities as time-shifting and fast-forwarding past advertisements (Wilbur 2008a).

The other way personalization impacts television consumption is by enabling video streaming services. Such "Over-The-Top" (OTT) video services have become prevalent. Nielsen (2013) estimates that 38% of US households have used Netflix, 18% have used Hulu, and 13% have used Amazon Prime Instant Video. LRG (2014) surveyed consumers about three personalization technologies—digital video recorders, video on demand and Netflix—finding that 70% of American homes used at least one of those three services regularly and another one-third of households used two or more.

Perhaps the most interesting study of OTT services was reported by TiVo (2013). TiVo surveyed 9,956 of its customers about their Netflix and Amazon Prime subscriptions, and then analyzed those households' (passively measured) usage of the TiVo STB. 57% of TiVo subscribers reported patronizing Netflix, and 50% reported subscribing to Amazon Prime Video. However, there was no statistically significant difference in television usage time between self-reported Netflix subscribers and non-subscribers. These non-differences led TiVo to conclude that "Netflix does not appear to cannibalize traditional TV."

The final implication of signal digitization is that it changes wired distribution network from one-way to two-way, enabling the signal distributor to observe how consumers interact with media. For example, newspaper publishers are able to easily measure viewer attention to stories published online but not in printed newspapers. A similar shift in audience information is

also occurring within the television industry. Digital signal distributors are able to retrieve complete usage information from viewers' STBs. Even television manufacturers are selling appliances that upload return usage information to their manufacturers. Return-path data have had limited impact on the television industry to date, but several analyses reviewed below suggest that they may have important consequences in the future.

1.2. *Screen Proliferation*

Along with digitization, the second fundamental shift in media consumption is *screen proliferation*. As computers have become smaller and more convenient, sales of new form factors have risen rapidly. In the US, smartphone penetration reached 74% in 2013 and tablet ownership rose to 52% (Sahagian 2013). In the UK, smartphone and tablet penetration rose to 51% and 24%, respectively, in 2013 (Ofcom 2014).

Smartphones and tablets are capable of receiving mass media, but this does not seem to be their primary use. Fetto (2013) reports that the typical smartphone owner in America spends about an hour per day using the device. 71% of usage time is spent on talk, text, email and social networking. Only about 14% of usage is spent visiting websites, suggesting that mass media consumption via smartphone is less than 10 minutes per day.

Although smartphones and tablets are not a major vehicle for mass media consumption in the US, they nonetheless are affecting mass media consumption in fundamental ways. According to numerous recent surveys, consumers increasingly use these devices to multitask while viewing television. For example, Nielsen (2010) claimed that 34% of all internet usage time occurred simultaneously with television consumption. Ofcom (2013) found that 81% of all tablet owners, and 53% of UK adults overall, say that they multitask using by mobile devices during television

programs on a weekly basis. The most frequent self-reported media multitaskers are young, female and high-income.

The “second screen” (a tablet, smartphone, laptop or even a desktop) may serve as either a complement or a substitute to traditional television. According to Google (2012), there are two modes consumers use while multitasking with television: simultaneous usage and sequential usage. In simultaneous usage, the viewer divides attention between unrelated activities on the two devices, for example playing a video game during a commercial break or checking email while the television plays in the background. Consumers report that 78% of media multitasking time is spent on simultaneous usage.

The remaining 22% of media multitasking is sequential usage. This behavior can be related to either television programs or advertisements. For example, the phenomenon of posting messages about programs on social networks (e.g. Facebook or Twitter) has become sufficiently common that some practitioners now refer to it as “social television.” According to Nielsen (2014b), 36% of Australian adults reported interacting with fellow viewers on social networks during or shortly after television programs they watched, up from 31% the previous year.

Sequential usage can also be driven by television advertising. Google (2012) found that 17% of multitasking search occasions were prompted by a television commercial. Television viewers can also respond to advertisements by visiting a retailer to gather product information or make an impulse purchase.

In summary, digitization and media multitasking appear to be fairly prevalent and increasingly important. The next two sections summarize recent academic research on how these two trends are changing mass media markets.

2. Effects of Digitization

Scholars have studied how the shift from analog to digital distribution of mass media is affecting consumers, advertisers and media platforms. For consumers, the most studied phenomena are the increased control digitization offers by, for example, allowing consumers to selectively avoid advertisements. For advertisers, the two-way nature of digital media networks enhances their ability to target their messages to consumers. For media content platforms, digital signal delivery offers new business models. Taken as a whole, these effects change the nature of competition in mass media markets and the range of products provided.

2.1. *Consumer control over advertising exposure*

A burgeoning empirical literature documents how increased viewer control has affected viewers' exposure to advertising.[3] Esteves-Sorenson and Peretti (2012) found that television remains largely a passive activity, with strong state persistence despite the small cost of switching channels. However, viewers do switch when they are annoyed by commercials. Interian et al. (2009) analyzed a large dataset of tuneaway behavior during commercials, showing that the typical advertisement loses 1-3% of the audience at the beginning of the ad slot. Schweidel and Kent (2010) presented moment-by-moment viewing data culled from digital STBs showing that program ratings fall by an average of 10% during ad breaks and that program genre can reliably predict audience retention during commercial breaks. Wilbur (2015) investigated household-level zapping behavior and found that advertising content characteristics reliably predict commercial avoidance, after controlling for program content, audience composition and audience

[3] It is important to remember that advertising avoidance is as old as advertising; Wilbur (2008a) reviewed the literature on traditional modes of avoiding ads, which included leaving the room, muting the television, changing channels, or diverting attention to other activities, or engaging in conversation.

heterogeneity. Movie ads were zapped less often than average while auto insurance and website commercials were avoided more frequently. Tuchman et al. (2015) report that the median household in their data skips about 10% of the ads that it is exposed to.

Have elevated levels of advertising avoidance diminished the profitability of advertising? The limited evidence available suggests that the answer may be no. Zufryden et al. (1993) surprisingly found that ad exposures interrupted by zapping were more strongly associated with sales than uninterrupted exposures; they hypothesized that this difference was due to viewers' heightened attention while changing channels. More recently, Bronnenberg et al. (2010) examined data produced by a field study in which digital video recorders were given to households in a scanner panel data sample. Households' advertising exposures and brand purchases in the following year were compared to baseline brand purchases in the previous year. The confidence interval for the effect of DVR acquisition on advertising effectiveness was tightly centered around zero, suggesting no diminution in advertising effectiveness, a result they attributed to fairly low rates of advertising avoidance among panelists.

Is this a puzzle? As advertising avoidance has gotten easier, commercial avoidance seems to become more frequent. Yet there is not yet any evidence of diminished advertising effectiveness, and television advertising revenues have not fallen. There are three possible explanations. One is that advertisements may be designed to retain their effectiveness, even when played at high speed. For example, prominent displays of the brand logo reduce advertising avoidance (Teixeira et al. 2010) and can increase brand attitude, intention to purchase and choice behavior (Brasel and Gips 2008). A second possibility, which to the best of my knowledge remains unexplored, is that perhaps households do not avoid ads when they are in the market for the advertised product. In other words, an advertisement exposure that a consumer actively

chooses to avoid might have offered little value to the advertiser in the event of an exposure. Further, many commercials are repeated with such frequency that even frequent ad-avoiders may receive some minimum number of exposures to the most common commercials. The third possibility is that (at least some) ads may be complements to product consumption, as originally proposed by Becker and Murphy (1993). Tuchman et al. (2015) investigated this possibility using a single-source panel database of purchases and advertising exposures. They found that greater recent brand consumption led to a lower probability of zapping the brand's television advertisement in the future.

A number of theoretical analyses have produced competing predictions about how increased levels of advertising avoidance will affect media markets. Anderson and Gans (2011) modeled a monopoly platform and examined how consumer adoption of advertising avoidance technology would alter its strategy. In equilibrium, consumers who value programming the most adopt advertising avoidance technology first, leading to rising advertising time, falling welfare and content quality, and more mass-market content. Athey et al. (2013) extended this framework to allow for competing outlets, imperfect measurement of advertising exposure and endogenous multihoming by advertisers. As consumer switching increases, advertising levels rise and the premium paid for large audiences increases, but total advertising expenditure falls.[4] In contrast, Ghosh and Stock (2010) did not model media platforms but they did consider the effect of informative advertisements on price competition in the product market. In their model, advertising avoidance leads to some consumer ignorance, which can sometimes increase advertisers' product prices and profits in equilibrium, raising the demand for advertising.

[4] See also Chapter [Peitz/Reiseinger].

2.2. *Increased targeting of advertising*

Digital distribution networks enable media platforms to identify individual recipients of programs and to choose the level of targeting offered to advertisers. Media vary in the targeting capabilities they offer. For example, television signal distributors could theoretically sell commercial breaks personalized to individual households, but they have so far only engaged in limited tests of more-aggregated targeting based on geodemographic segments (Deng 2015). Most mass media platforms online allow varying degrees of audience targeting.

Bergemann and Bonatti (2011, 2014), Dukes and Gal-Or 2003 and Ghosh et al. (2013) highlight the essential trade-offs in platforms' choice of ad targeting capabilities.[5] Untargeted advertising produces many low-value, wasted exposures because most consumers are uninterested in most products. Highly targeted advertising eliminates wasted exposures, but it increases advertiser competition in the product market, driving down rents and willingness-to-pay for advertising. Therefore, the media platform will optimally choose between offering some intermediate degree of ad targeting, or combining ad targeting with exclusive advertising rights.

Empirical evidence on the increased targeting of advertising is more scarce. Perhaps the best known papers are Goldfarb and Tucker (2011a, 2011b). They first investigated several thousand randomized advertising experiments, showing that matching advertising content to site content or making advertisements more obtrusive each increases advertising effectiveness individually, but doing both in conjunction backfires. This effect is likely because consumers realize they are being targeted and react negatively, as the negative interaction was largest in sensitive product categories such as health and financial services. Second, they applied a difference-in-differences framework to estimate the effect of a European restriction in

[5] See also Chapter [Peitz/Reiseinger].

advertising targeting on advertising effectiveness. They compared post-policy European advertising response to pre-policy European advertising response, as well as to US advertising response in both periods. The results indicated that display advertising became far less effective, especially so on niche-oriented websites, for smaller advertisements, and for advertisements without obtrusive (e.g., interactive, video, audio) features.

2.3. *New media business models*

Although it has long been known that advertising causes audience loss, television networks have never charged per unit of audience delivered. Nielsen audience estimates are too noisy to precisely estimate audience sizes by commercial. Instead, television networks have always charged per unit of time (i.e., per 30-second spot). Advertising sales contracts do include minimum audience thresholds, but these thresholds are often set approximately two standard deviations below the expected audience size. When Nielsen's point estimate of the audience size falls short of the promised level, then the network provides "make-goods"—free advertising inventory to compensate the advertiser for the difference between the minimum guaranteed audience size and the point estimate of the audience size.

The possibility of substantial inefficiencies in advertising sales arises because of a divergence in television advertisers and networks' interests. Advertisers seek to "break through the clutter" by getting their advertisements noticed, and therefore include obtrusive stimuli which help to gain attention and reinforce their selling message. These stimuli may be aversive to some viewers who are not in the market for the advertised good, leading them to change the channel or start fast-forwarding. Often, these viewers will miss the rest of the commercial break and possibly subsequent breaks as well. Therefore, the most effective ads (i.e., those that sell very

effectively) may actually reduce the network's stock of viewer attention available for sale to other advertisers. This problem is exacerbated by television networks' traditional practice of ordering advertisements within the break on a quasi-random basis.

Goldstein et al. (2013) devised an ingenious test of this hypothesis. They first hired workers online to complete a standard email categorization task while simultaneously being exposed to banner advertisements. The workers were randomly assigned to one of three pay rates and one of three advertising conditions: no ads, annoying ads or innocuous ads. The researchers then observed each worker's output, allowing them to estimate the compensating variation of the various types of advertising content. They found that innocuous ads and no ads led to approximately equal levels of worker output, but annoying ads led to faster task abandonment. To achieve the same rate of task abandonment as caused by annoying ads, the researchers would have had to reduce the workers' pay rate by approximately $1 per 1,000 impressions. This effect exceeds the market price that many websites charge for display advertising. One might speculate the effect is even larger in the context of television, as video advertisements are substantially more obtrusive than banner advertisements.

Wilbur et al. (2013) note that the rapid proliferation of digital television signal delivery networks allows the possibility of redesigning television networks' business models to better align networks' and advertisers' interests. They designed an algorithm to select, order and price advertisements in a commercial break of endogenous length. The main idea of the algorithm is to first find the selection and ordering of advertisements that maximizes total welfare of all advertisers in the commercial break. Doing so requires the use of dynamic programming to optimize the networks' opposing goals of retaining audience and allocating each slot in the break to the advertiser with the highest willingness to pay. Payments are assigned using a second-price

auction to incentivize truthful bidding and to reward advertisers with low zapping rates. The authors estimated the primitives of their model using market data and used a series of simulations to show that it consistently finds the globally optimal solution, increases advertiser welfare and network revenues, and runs fast enough to implement at scale.

2.4. *Media Market Outcomes*

Digitization of media distribution networks is changing media markets by lowering distribution and entry costs, by altering consumer discovery of new and niche products, and by changing the resulting range of product quality offered.

Digitization has brought dramatic change in print newspaper markets. George and Waldfogel (2006) studied the effects of entry and expansion by a high-quality national newspaper (the New York Times) into local newspaper markets in the United States. They found that readers targeted by the national newspaper tended to adopt it in place of local newspapers, and that local papers responded by increasing content appealing to the national newspaper's nontargeted segments.

The effects of digital distribution have been studied extensively in the context of consumer products. Brynjolfsson et al. (2011) found that online distribution produces a longer tail of product sales than physical distribution even holding the selection of available products constant. They attributed the increase in the size of the tail to the improved consumer search and recommendation engines enabled by digital delivery. On the other hand, Ellison and Wolitzky (2012) investigated how firms might respond to increased competition online by raising consumers' search costs. They showed that firms have incentives to obfuscate (e.g., complicate

consumer evaluation of available options) when consumer search costs are convex in effort or when consumers have imperfect information about the exogenous components of search costs.

Waldfogel (2013) examined the joint impact of digitization on sales, production and distribution costs, and product quality in the recorded music industry. Digitization triggered three substantial changes: music piracy increased, barriers to entry fell, and new modes of music discovery (e.g., internet radio) were invented. The result was a sharp decrease in album production by traditional music labels, a huge influx of new producers, and a steadily increasing share of commercially successful albums coming from independent producers.

Anecdotally, the print newspaper industry has experienced some changes similar to those documented by Waldfogel (2013). A common question is whether similar changes will eventually occur in the television/video industry? In the author's view, one possible differentiator is that in online video, current bandwidth constraints bind tightly. Video consumption is too high, video program files are too large, and today's cable and telco networks are too slow for all consumers to simultaneously switch from consuming broadcast video to consuming individual video streams over home internet connections without major delays and buffering.[6] However, if internet connection speeds rise significantly (as seems bound to happen eventually, if not yet imminently), then I expect similar changes might occur in the television industry. However, in the presence of binding video distribution constraints, it seems possible that online video will continue to exist as a supplement to traditional television consumption, a channel for niche program demand, user-generated content, delayed releases of major networks' content, and a means for incumbent programmers to identify high-value production inputs.

[6] Waldfogel (2009) surveyed college students to understand how usage of internet video affected their television consumption. He found that the availability of unlicensed television content on youtube.com led to slightly lower network television viewing but an offsetting increase in consumption on television networks' websites.

3. Effects of Media Multitasking

A consumer who is watching television has two primary motivations to multitask: (i) information search which has been prompted by something on the television screen or (ii) seeking refuge from aversive television content (such as advertising or boring parts of a program). I will refer to these as media complementarities and competition for attention, respectively.

Multitasking behavior has been studied in laboratory experiments and in-home observational studies. For example, Barwise and Pearson (2007) analyzed videotapes recorded within 22 households. They found that viewers paid attention to 79% of commercials presented during live programming, defined as "participants looking directly at and listening to the TV while doing nothing else which required conscious attention." They also reported that usage of the digital video recorder is nearly always secondary to live viewing, even among young viewers. Jayasinghe and Ritson (2013) studied videotapes and interviews from eight Australian households, showing a variety of means by which family members engaged with or ignored advertisements. Brasel and Gips (2011) videotaped 42 college students and staff while they used television and internet simultaneously in a lab. Subjects switched their attention between television and internet four times per minute on average, and subsequently underestimated their own switching behavior by a factor of eight. Although findings from such small samples might not represent the broader population, they provide vivid depictions of viewer behavior in natural settings.

3.1. *Media Complementarities*

Do firms achieve economies of scope by simultaneously advertising in multiple media? These might be achieved by spreading the media budget across multiple media to reinforce the message with multitasking consumers in a way that single-medium advertising is unable to do. Also, advertising in more media may reach single-tasking consumers who might otherwise remain uncontacted. Numerous recent studies have found evidence of synergistic effects between television advertising and internet advertising on offline sales (Kolsarici and Vakratsas 2011, Naik and Peters 2009, Naik and Raman 2003, Naik et al. 2005, Ohnishi and Manchanda 2012, Stephen and Galak 2012). However, these studies mostly used aggregate data, which may have trouble disentangling multimedia synergies from other unobserved variables that may correlate with both advertising expenditures and sales. Further corroborating evidence has been found in investigations of individual-level data by Bollinger et al. (2014) and Zantedeschi et al. (2014).

There now exists substantial evidence that television advertisements can prompt consumer search. Zigmond and Stipp (2010, 2011) offered several case studies showing that search queries entered at google.com responded immediately to television advertisements broadcast during the Winter Olympics. Lewis and Reiley (2013) showed that search queries at yahoo.com for particular brands spiked instantly during Super Bowl commercial breaks when those brands advertised (and did not spike during commercial breaks when the brands did not advertise). Joo et al. (2014) investigated hourly advertising and Google search data for a mature category (financial services) over a three-month period, showing that TV advertising both generated new searches in the product category and also increased the share of searches that included branded keywords.

There is also a substantial body of evidence that internet behavior prompted by advertising leads to online sales. Wu et al. (2005) offered the first such evidence. They showed that online-only firms' use of magazine advertising can lead shoppers to a website, and that subsequent conversion rates depend on website characteristics. They also found that joint modeling of user acquisition and conversion was required for correct inference, as unobserved characteristics in visit generation and sales leads may be correlated. More recently, Kim and Hanssens (2014) examined data on advertising, blog mentions, online search and revenue for motion pictures. They found that pre-launch advertising generated both search and blogging, and blogging generated further search. Hu et al. (2014) brought search data collected from Google Insights for Search into a sales/advertising response model. Using aggregate data, they found that automotive advertising is associated with a positive search lift for automotive brands, as well as a heightened conversion probability among interested consumers. Liaukonyte et al. (2015) estimated how measures of online shopping behavior (traffic and sales) at 20 brand websites changed in narrow windows of time around the airing of television advertisements, and how those effects depended on ad content. They found that direct response tactics increase both visit probability and purchase probability. In contrast, informative or emotional branding tactics reduce traffic while simultaneously increasing sales among those who do visit, consistent with improving the efficiency of consumer search, as predicted by Anderson and Renault (2006).

Finally, there is substantial evidence supporting the converse effect: internet content can influence television viewing. Early work in this area focused on the effects of online "buzz" on television viewing and book sales (Godes and Mayzlin 2004, Chevalier and Mayzlin 2006). More recently, Gong et al. (2013) ran field experiments in China, showing that television program ratings respond to promoted posts and content posted on a microblogging service. Hill

and Benton (2014) developed a method by which consumers' Twitter accounts can be mined to generate television program recommendations. In summary, there is ample evidence that television content and advertising can drive online behavior, and that online information can influence television viewing choices.

3.2. *Competition for Attention*

Anderson and de Palma (2012) modeled how consumer attention constraints affect product market competition and advertising. They predicted that the entry of additional classes of new products would raise advertising prices and clutter, but only up to a point. At some point, so many ads are sent that product market competition intensifies and advertising profitability falls.[7]

Wallsten (2014) investigated American Time Use Survey data to determine how increasing attention paid to one medium (internet) affects the attention paid to other activities, such as watching TV. He found that each additional minute of internet usage is associated with 0.13 fewer minutes watching television. Woo et al. (2014) investigated similar survey data from South Korea, replicating the negative correlation between television and internet use, but finding a much smaller negative correlation between television and internet use on a mobile device than between television and internet use on a desktop computer. Zentner (2012) quantified how internet adoption changed advertising revenue in a panel dataset of 80 countries. He found negative correlations between internet penetration and television and print advertising revenues, but no correlation with radio advertising revenues.

Perhaps the best evidence comes from Reis (2015). Reis analyzed data from a "triple-play" television/phone/internet provider and showed, using both instrumental variables approach

[7] See also Chapter [Peitz/Reiseinger].

and a field experiment, that increased television consumption is associated with smaller internet download traffic. However, even this does not speak to how multitasking is influenced by television consumption, as an increase in multitasking time may be reflected as a decrease in download traffic. No study has yet presented solid evidence on simultaneous usage of both television and internet in a large scale sample, perhaps due to the difficulties inherent in acquiring passive measurements of individuals' simultaneous media behavior from multiple competing platforms.

Finally, a small experimental literature indicates how media characteristics influence marketing effectiveness. Magee (2013) reported the results of a field experiment in which subscribers of a promotional magazine received either a print or a digital version of the magazine. Although most readers expressed a preference for the digital version, those who received the print version were more likely to open it, spend more time browsing it, and retain more information. Brasel and Gips (2013) manipulated the physical interface experimental subjects used to access the internet. They found that touch-based interfaces, such as those found in smartphones and tablets, increase perceived psychological ownership and the endowment effect. The implications for online commerce may be substantial, as the authors conclude that "touch-based devices like tablets can lead to higher product valuations when compared to traditional computers."

4. Discussion

Market data show very clearly that video consumption has yet to fall, despite competition from new media and the prevalence of mobile devices, though the forms in which people consume video is evolving. Digitization has increased consumer control over media by offering services

such as over-the-top video and digital video recorders. Screen proliferation has led to an enhanced tendency to multitask using "second screen," both enabling immediate consumer response to advertisements and increasing the already-intense competition for scarce consumer attention.

Important gaps in our understanding remain. Some research opportunities are implied directly by the preceding discussion. Of first order importance: how do media multitasking and advertising avoidance alter advertising effectiveness? How does multitasking affect consumer habit formation and the tendency to become a regular viewer of a program? How do program and advertising content affect the impulse to start, stop or continue diverting attention to a second screen? For example, how do multitasking tendencies vary with the viewer's past experience with the program? How and why does viewer-generated content online influence, enhance or detract from the experience of consuming a live program? How can television networks and advertisers use online channels to try to influence consumer attention during live programs?

A second important area of inquiry is the degree to which incumbent media platforms are able to generate, sample, and adopt new strategies and business models. Traditional newspapers have appeared surprisingly risk-averse as advertising budgets have moved online and newspaper revenues have fallen. Will the incumbent television networks and conglomerates take advantage of the opportunities that digitization affords, or will those opportunities be realized more effectively by a new generation of media platforms? To what extent will individual program creators start offering their content directly to consumers via over-the-top services or direct download, as is occurring in the recorded (audio) music and comedy markets?

Finally, and most fundamentally, it will be difficult to predict the effects of technological changes on mass media industries without a more basic understanding of the needs that media

industries fulfill for consumers. Most media economics research focuses on interactions between platforms or interactions between types of agents (e.g., advertisers and viewers). Yet we still do not have a great understanding of *why* the typical viewer is watching 3-5 hours of video per day, why video media appear to be so prevalent and habit-forming, or what is the range of different needs (education, entertainment, information, status, social connection, etc.) that are addressed through video consumption. A basic taxonomy of viewer needs and behaviors would be very helpful in predicting the specific aspects of the current mass media industries will evolve in response to future technological changes.

Works Cited.

Anderson, S.P., J.S. Gans. 2011. Platform Siphoning Ad-Avoidance and Media Content. American Economic Journal Microeconomics, 3 (4) 1-34.

Anderson, S.P., A. de Palma. 2012. Competition for Attention in the Information (Overload) Age. RAND Journal of Economics, 43 (1) 1-25.

Anderson, S.P., R. Renault. 2006. Advertising Content. American Economic Review, 39 (1) 305-326.

Athey, S., E. Calvano, J.S. Gans. 2013. The Impact of the Internet on Advertising Markets for News Media. Mimeo, University of Toronto.

Becker, G., K. Murphy. 1993. A Simple Theory of Advertising as a Good or a Bad. The Quarterly Journal of Economics, 108 (4) 941-964.

Bergemann, D., A. Bonatti. 2011. Targeting in Advertising Markets Implications for Offline vs. Online Media. RAND Journal of Economics, 42 417-443.

Bergemann, D., A. Bonatti. 2014. Selling Cookies. American Economic Journal: Microeconomics, forthcoming.

Bollinger, B.K., M.A. Cohen, J. Lai. 2013. Measuring Asymmetric Persistence and Interaction Effects of Media Exposures across Platforms. Mimeo, New York University.

Bronnenberg, B.J., J.-P. Dube, C.F. Mela. 2010. Do Digital Video Recorders Influence Sales? Journal of Marketing Research, 30 (3) 447-468.

Brynjolfsson, E., J. Hu, D. Simester. 2011. Goodbye Pareto Principle, Hello Long Tail the Effect of Internet Commerce on the Concentration of Product Sales. Management Science, 57 (8), 1373-1387.

Brasel, S.A., J. Gips. 2008. Breaking through Fast-Forwarding Brand Information and Visual Attention. Journal of Marketing, 72 (Nov.) 31-48.

Brasel, S.A., J. Gips. 2011. Media Multitasking Behavior Concurrent Television and Computer Usage. Cyberpsychology, Behavior and Social Networking, 14 (9) 527-534.

Brasel, S.A., J. Gips. 2013. Tablets, Touchscreens and Touchpads How Varying Touch Interfaces Trigger Psychological Ownership and Endowment. Journal of Consumer Research, forthcoming.

Business Insider (BI). 2013. The Future of Digital 2013. Slide deck.

Cable Advertising Bureau (CAB). 2014. Why Ad-Supported Cable? White paper.

Chevalier, J., D. Mayzlin. 2006. The Effect of Word of Mouth on Sales Online Book Reviews. Journal of Marketing Research, 43 (3) 345-354.

Danaher, P.J., J.R. Rossiter. 2011. Comparing Perceptions of Marketing Communications Channels. European Journal of Marketing, 45 (1/2) 6-42.

Danaher, P.J., T. Dagger. 2013. Comparing the Relative Effectiveness of Advertising Channels a Case Study of a Multimedia Blitz Campaign. Journal of Marketing Research, 50 (4) 517-534.

Deng, Y. 2015. DVR Advertising Targeting. Mimeo, Duke University.

Digital TV Research. 2014. North America to Add 5 Million Pay TV Subscribers. Press release.

Dinner, I.M., J.V. Van Heerde, S.A. Neslin. 2014. Driving Online and Offline Sales: The Cross-Channel Effects of Traditional, Online Display, and Paid Search Advertising. Journal of Marketing Research, 51 (5) 527-545.

Dukes, A., E. Gal-Or. 2003. Negotiations and Exclusivity Contracts for Advertising. Marketing Science, 22 (2) 222-245.

Ellison, G., A.G. Wolitsky. 2012. A Search Cost Model of Obfuscation. RAND Journal of Economics, 43, 417-441.

Esteves-Sorenson, C., F. Perretti. 2012. Micro-costs Inertia in Television Viewing. Economic Journal, 122 (563) 867-902.
eMarketer. 2012. Traditional Media Still Most Trusted Sources of Info. Press release.
Feit, E.M., P. Wang, E.T. Bradlow, P.S. Fader. 2013. Fusing Aggregate and Disaggregate Data with an Application to Multiplatform Media Consumption. Journal of Marketing Research, 50 348-364.
Fetto, J. 2013. Americans Spend 58 Minutes a Day on their Smartphones. Accessed March 2014.
George, L.M., J. Waldfogel. 2006. The New York Times and the Market for Newspapers. American Economic Review, 96 (1), 435-447.
Ghosh, B., A. Stock. Advertising Effectiveness, Digital Video Recorders, and Product Market Competition. Marketing Science, 29 (4) 639-649.
Ghosh, B.P., M.R. Galbreth, G. Shang. 2013. The Competitive Impact of Targeted Television Advertisements Using DVR Technology. Decision Sciences, 44 (5) 951-971.
Godes, D., D. Mayzlin. 2004. Using Online Conversations to Study Word-of-Mouth Communication. Marketing Science, 23 (4) 545-560.
Goldfarb, A., C. Tucker. 2011a. Online Display Advertising Targeting and Obtrusiveness. Marketing Science, 30 (3) 389-494.
Goldfarb, A., C. Tucker. 2011b. Privacy Regulation and Online Advertising. Management Science, 57 (1) 57-71.
Goldstein, D.G., R.P. McAfee, S. Suri. 2013. The Cost of Annoying Ads. Proceedings of the 23rd International World Wide Conference.
Google. 2012. The New Multi-Screen World Understanding Cross-Platform Consumer Behavior. White paper.
Hill, S., A. Benton. 2012. Talkographics Using What Viewers Say Online to Calculate Audience Affinity Networks for Social TV-Based Recommendations. Mimeo, University of Pennsylvania.
Hu, Y., R. Du, S. Damangir. 2014. Decomposing the Impact of Advertising: Augmenting Sales with Online Search Data. Journal of Marketing Research, 51 (3) 300-310.
Interian, Y., S. Dorai-Raj, I. Naverniouk, P. J. Opalinski, Kaustuv, D. Zigmond. 2009. Ad Quality on TV: Predicting Television Audience Retention. *Proceedings of the Thrid International Workshop on Data Mining and Audience Intelligence for Advertising*, Paris, France, p. 85-91.
Jayasinghe, L., M. Ritson. 2013. Everyday Advertising Context an Ethnography of Advertising Response in the Living Room. Journal of Consumer Research, 40 (1), 104-121.
Joo, M., K.C. Wilbur, B. Cowgill, Y. Zhu. 2014. Television Advertising and Online Search. Management Science, 60 (1), 56-73.
Joo, J., K.C. Wilbur, Y. Zhu. 2015. Effects of TV Advertising on Keyword Search. International Journal of Research in Marketing, forthcoming.
Kim, H., D.M. Hanssens. 2014. Paid and Earned Media, Consumer Interest and Motion Picture Revenue. Mimeo, University of California, Los Angeles.
Kolsarici C., D. Vakratsas. 2011. The complexity of multi-media effects. Marketing Science Institute Working Paper Series 2011 Report No. 11-100. Marketing Science Institute.
Leichtman Research Group (LRG). 2013. The Rise and Plateau of DVRs. White paper.
Liaukonyte, J., T. Teixeira, K.C. Wilbur. 2015. How TV Ads Influence Online Search. Marketing Science, forthcoming.

Lin, C., S. Venkataraman, S.D. Jap. 2013. Media Multiplexing Behavior Implications for Targeting and Media Planning. Marketing Science 32 (2) 310-324.
Magee, R.G. 2013. Can a print publication be equally effective online? Testing the Effect of Medium Type on Marketing Communications. Marketing Letters, 24 85-95.
Naik, P. A., K. Peters. 2009. A Hierarchical Marketing Communications Model of Online and Offline Media Synergies. Journal of Interactive Marketing, 23 288-299.
Naik, P. A., K. Raman. 2003. Understanding the Impact of Synergy in Multimedia Communications. Journal of Marketing Research, 13(4) 25-34.
Naik, P.A., K. Raman, R.S. Winter. 2005. Planning Marketing-Mix Strategies in the Presence of Interaction Effects. Marketing Science, 24 (1) 25-34.
Nielsen. 2010. Three Screen Report, 1st Quarter 2010. White paper.
Nielsen. 2013. 'Binging' is the New Viewing for Over-the-top Streamers. Accessed March 2014.
Nielsen. 2014a. The Cross-Platform Report. Accessed March 2014.
Nielsen. 2014b. Social TV on the Rise Almost One in Two Online Australians Engaging in Digital Conversation. Accessed March 2014.
Ofcom. 2013. Communications Market Report 2013. White paper.
Ohnishi, H., P. Manchanda. 2012. Marketing Activity, Blogging and Sales. International Journal of Research in Marketing 29(2012) 221-234.
Pearson, S., P. Barwise. 2007. PVRs and Advertising Exposure A Video Ethnographic Study. Qualitative Market Research an International Journal, 11 (4) 386-399.
Robinson, J.P., S. Martin. 2009. Of Time and Television. Annals of the American Academy of Political and Social Science. 625 74-86.
Sahagian, J. 2013. Study U.S. Smartphone Penetration is at 74 Percent. Accessed March 2014.
Schweidel, D.A., R.J. Kent. 2010. Predictors of the Gap between Program and Commercial Audiences an Investigation Using Live Tuning Data. Journal of Marketing, 74 (3) 18-33.
Stephen, A.T., J. Galak. 2012. The Effects of Traditional and Social Earned Media on Sales A Study of a Microlending Marketplace. Journal of Marketing Research, 44 (Oct.) 624-639.
Television Bureau of Advertising (TVB). 2014. TV Basics. Accessed March 2014.
Teixeira, T., M. Wedel, R. Pieters. 2010. Moment-to-moment Optimal Branding in TV Commercials Preventing Avoidance by Pulsing. Marketing Science, 29 (5) 783-804.
Tivo. 2013. TiVo Research and Analytics Netflix Not Cannibalizing Traditional TV Viewing. http//www.marketwired.com/press-release/TiVo-Research-and-Analytics-Netflix-Not-Cannibalizing-Traditional-TV-Viewing-1815308.htm. Accessed April 2014.
Tuchman, A., H. S. Nair, P. Gardete. 2015. Complementarities in Consumption and the Consumer Demand for Advertising. Mimeo, Stanford GSB.
Wallsten, S. 2014. What Are We Not Doing When We're Online? Mimeo, NBER.
Wilbur, K.C. 2008a. How the Digital Video Recorder Changes Traditional Television Advertising. Journal of Advertising, 37 (1) 143-149.
Wilbur, K.C. 2008b. A Two-Sided, Empirical Model of Television Advertising and Viewing Markets. Marketing Science, 27 (3) 356-378.
Wilbur, K.C. 2015. Television Advertising Avoidance. Mimeo, University of California, San Diego.
Wilbur, K.C., L. Xu, D. Kempe. 2013. Correcting Audience Externalities in Television Advertising. Marketing Science, 32 (6) 892-912.
Wilbur, K.C., Y. Zhu. 2009. Click Fraud. Marketing Science, 28 (2) 293-308.

Wu, J., V.J. Cook Jr., E.C. Strong. 2005. A Two-stage Model of the Promotional Performance of Pure Online Firms. Information Systems Research, 16, (4) 334-351.

Zantedeschi, D., E.M. Feit, E.T. Bradlow. 2014. Measuring Multi-Channel Advertising Effectiveness Using Consumer-Level Advertising Response Data. Mimeo, University of Pennsylvania.

Zigmond, D., H. Stipp. 2010. Assessing a New Advertising Effect Measurement of Impact of Television Commercials on Internet Search Queries. Journal of Advertising Research, 50 (2), 162-168.

Zigmond, D., H. Stipp. 2011. Multitaskers may be Advertisers' Best Audience. Harvard Business Review, 12 (1/2), 32-33.

Zufryden, F.S., J.H. Pedrick, A. Sankaralingam. 1993. Zapping and Its Impact on Brand Purchase Behavior. Journal of Advertising Research, 33 58-66.

Figure 1. ATUS Television Usage Data