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LOST ON THE WEB:
DOES WEB DISTRIBUTION STIMULATE OR DEPRESS TELEVISION VIEWING?

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Lost on the Web: Does Web Distribution Stimulate or Depress Television Viewing?

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ABSTRACT

In the past few years, YouTube and other sites for sharing video files over the Internet have vaulted from obscurity to places of centrality in the media landscape. The files available at YouTube include a mix of user-generated video and clips from network television shows. Networks fear that availability of their clips on YouTube will depress television viewing. But unauthorized clips are also free advertising for television shows. As YouTube has grown quickly, major networks have responded by making their content available at their own sites. This paper examines the effects of authorized and unauthorized web distribution on television viewing between 2005 and 2007 using a survey of Penn students on their tendencies to watch television series on television as well as on the web. The results provide a glimpse of the way young, Internet-connected people use YouTube and related sites. While I find some evidence of substitution of web viewing for conventional television viewing, time spent viewing programming on the web -- 4 hours per week -- far exceeds the reduction in weekly traditional television viewing of about 25 minutes. Overall time spent on network-controlled viewing (television plus network websites) increased by 1.5 hours per week.

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In the past few years, YouTube and other sites for sharing video files over the Internet have vaulted from obscurity to places of centrality in the media landscape. YouTube allows users to post video files up to 10 minutes in length or 100 megabytes in size available to anyone at any time. Founded in February 2005, YouTube was named *Time Magazine's* Invention of the Year for 2006 and is now among the top 10 sites on the Internet.

The files available at YouTube include a mix of user-generated video and clips from network or studio-created fare. Networks fear that users will view clips on YouTube *instead* of watching through conventional channels, depressing television viewing. But YouTube might instead help them. Unauthorized clips are, in one sense, free advertising for television shows. Given the serial nature of television programming, with episodes as complements for one another, the availability of easily accessible clips online could stimulate conventional television viewing.

Another possible effect of unauthorized web distribution is also benign for networks: those viewing material on YouTube might otherwise not have watched television. While their viewership of unauthorized files might not simulate conventional viewership, it may represent a gain to consumers without offsetting losses to the content creators.

As YouTube has grown quickly, major networks have responded by making their content available at authorized online sites. As of July 10, 2007, abc.com offered full episodes of about 20 series. Four recently-aired episodes of *Grey's Anatomy* are available as are four episodes of *Lost*. CBS, NBC, Fox, and Comedy Central also offer their shows online. Network sites differ from unauthorized sites in that they offer full

episodes rather than the excerpts available at, say, YouTube. The network web offerings also include advertising.

The possibility that content available on the web may either stimulate or depress television viewing is by now familiar from the debates over the effect of file sharing in music and movies.¹ Here, as in the examples of music and movies, the question of whether authorized or unauthorized web distribution stimulates or cannibalizes conventional television consumption is an empirical one. The serial nature of television programming – and the attendant complementarity across episodes of a series – give the suggestion that web distribution stimulates television viewing a veneer of plausibility.

To measure such effects, I have undertaken a survey, asking students on a college campus about their habits in viewing television as well as video on the web. The results of the survey provide a glimpse of the way young, Internet-connected people use YouTube and related sites. I am able to provide answers to the following questions:

- 1) What unauthorized and authorized sites do people use for video?
- 2) How much time they spend watching various forms of web video and traditional television?
- 3) Which shows are most commonly viewed on the web as opposed to on television?
- 4) Do authorized and unauthorized web video use displace conventional television use?

The question of whether YouTube stimulates or cannibalizes interest in conventional television viewing gained additional prominence in March of 2007 when

¹ See Liebowitz (2006), Oberholzer-Gee and Strumpf (2007), Rob and Waldfogel (2006, forthcoming), Zentner (2006).

Viacom sued Google (YouTube's parent) for \$1 billion dollars in damages. According to Viacom's complaint, 100,000 of its clips were available at YouTube, and users had viewed these clips 1.5 billion times (see Helft and Fabrikant, 2007). In its filing Viacom charged that the "recent \$1.65 billion acquisition price for YouTube reflects the website's enormous popularity. YouTube's value, however, is built largely on the unauthorized appropriation and exploitation of copyrighted works belonging to others, especially Plaintiffs. As a result, a large part of YouTube's value is directly attributable to the availability of Plaintiffs' copyrighted works on YouTube's website."² The damages that Viacom suggests in its complaint depend on whether clips viewed at YouTube cannibalize or stimulate authorized viewing of Viacom's properties.

This paper proceeds in three sections. Section 1 provides context and theoretical background. Section 2 describes the underlying survey and the resulting data used in the study. Section 3 presents results. A brief conclusion follows.

I. Context and Theoretical Background

YouTube was founded in February 2005 and has grown very rapidly. Ranked by daily traffic from Alexa.com users, YouTube grew from obscurity – a rank of roughly 100,000th – in mid 2005 to nearly the top 100 by the start of 2006 (Figure 1).³ Between January 2006 and July 2006, monthly unique audience grew from 4.9 million to 19.6 million visitors, according to Nielsen.⁴ *Time Magazine* named YouTube the Best

² See Viacom International Inc. v. YouTube and Google Inc., COMPLAINT FOR DECLARATORY AND INJUNCTIVE RELIEF AND DAMAGES, accessed at <http://www.lessig.org/blog/archives/vvg.pdf>, July 9, 2007.

³ Alexa.com provides a time series on the use of YouTube (and many other sites), compiled from users of their toolbar, and they make these statistics available at Alexa.com.

⁴See http://www.nielsen-netratings.com/pr/pr_060721_2.pdf, accessed July 10, 2007

Invention of 2006 in November 2006.⁵ By late 2006 YouTube was in the top 10, where it has remained through mid 2007. According to Alexa.com, YouTube was the 5th most popular site on the web on July 10, 2007.⁶

Apart from filing the lawsuit described in the introduction, the networks have responded to YouTube's emergence mainly by making their programming available online in various authorized forms. In late 2005 ABC and then NBC began selling episodes of popular shows on iTunes (Pennington, 2006). In early 2006 CBS began to offer episodes of its popular shows for sale at Google's Video Store (Mills, 2006). Even as they were trying to sell episodes online, they were also experimenting with free authorized distribution. Late in 2005, networks experimented with free streaming content at their websites. CBS "streamed episodes of "Two and a Half Men" and "How I Met Your Mother" on Yahoo!" during a "Christmas break experiment" that "increased viewership for the two shows on the network," according to CBS Entertainment President Nina Tassler (Pennington, 2006).

A few months later the networks changed their strategies, making programming available for streaming free online (Grand Rapids Press, 2006). In May 2006, ABC became the first network to offer full-length episodes online (Petrecca, 2006). By the fall of 2006 - with the dawn of the 2006-2007 television season – all of the major networks were offering multiple shows online without charge (Zap2It.com, 2006). Many observers

⁵See <http://www.time.com/time/2006/techguide/bestinventions/inventions/youtube.html>.

⁶ See http://www.alexa.com/site/ds/top_sites?cc=US&ts_mode=country&lang=none, accessed July 10, 2007.

viewed this strategy as a “response to the popularity of digital recording devices and piracy issues that major network broadcasters are facing.”⁷

The rapid growth of both authorized and unauthorized distribution of network’s video content on the web between 2005 and 2007 makes this period an auspicious one for documenting effects of web distribution on viewership of network content on television viewing. The growth in programming viewed on the web in this period reflects newly available supply and is exogenous to the users. The changes in the environment over this period subject intense web users – such as on-campus college students – to a natural experiment: What happens to conventional television viewing of people who are now able to view clips or shows at various authorized or unauthorized websites?

Video obtained over YouTube differs from music or movie file sharing in that YouTube literally provides excerpts, while music and movie file sharing typically provide an unauthorized user with a complete copy of the file in question. While a music downloader might be moved by his conscience to purchase a legal copy of a song, he gets very little direct benefit from making this purchase once he has downloaded a copy. Similarly, because most movie file sharing is done via copied DVDs, the possessor of a pirated copy has little to gain, save perhaps a salved conscience, from purchasing a movie he has already obtained without payment.

Here, though, some of the video available for viewing on the web is of poor quality by design. YouTube hosts video, and the clips are no more than ten minutes or

⁷ See also http://en.wikipedia.org/wiki/American_Broadcasting_Company, accessed July 10, 2007.

100 megabytes in length.⁸ The video of television content at network websites is of higher quality, but like the unauthorized videos at YouTube, it is streamed and can only be watched on a computer. Perhaps more important than their poor quality, episodes can serve as complements for one another: watching one episode or excerpt online can elevate a viewer's interest in seeing other episodes through authorized channels (on television or at a network website).⁹ Hence, it is far more plausible – here than in music or movies – to suppose that web distribution use might stimulate demand for conventional or authorized television viewing.

Even if web distribution use does not stimulate conventional television viewing, there is reason to think - more than in music or movies – that web distribution use would not displace conventional television viewing. Unauthorized web distribution allows users to time-shift their video viewing even if they lack a digital video recorder or VCR. Moreover, web distribution allows viewing on a computer rather than a television. Thus it allows viewing by people unavailable when programming is aired as well as people without ready access to a television set.

The question of whether web distribution stimulates or depresses conventional television viewing has two parts, both of which may be analyzed with a simple demand curve. First, there is the question of whether the viewing on the web would otherwise have occurred if viewers only had access to conventional television. Consider the demand curve in Figure 1 that shows potential viewers' willingness to “pay” to view programming over conventional television. The price here is largely metaphoric given that programming is mostly free, at least at the margin. For our purposes, the price

⁸ See http://www.youtube.com/my_videos_upload, accessed July 9, 2007

⁹ This observation has multiple theoretical antecedents, including Shapiro and Varian (1999), Varian (2000), and Bakos, Brynjolfsson, and Lichtman (1999).

consists of the willingness to watch commercials and viewers' ability to schedule their lives to be available when programming is broadcast.

Prior to the availability of web distribution, viewers watch q_0 shows, enjoying some consumer surplus of CS while networks get revenue proportional to REV.¹⁰ There is also some deadweight loss (DWL), in that some programming would be watched if viewers could time-shift and/or avoid commercials.

The effect of web availability depends on whether users watch programming they would already have watched (i.e. if their valuations exceed the "price"). If viewers watch on the web in instances in which their valuations exceed the price, web distribution will cannibalize conventional viewing. On the other hand, if web viewings is drawn from the region of the viewer demand curve where valuations fall short of the price p_0 , then web distribution will raise consumption without reducing television viewing.

Because of the serial nature of many programs, watching an episode (or an excerpt) on the web can stimulate interest in watching other episodes of the same show on television. This shifts the demand curve out, perhaps raising the number of instances in which people "pay" for conventional television. The higher valuation function raises the number of instances in which consumers would be willing to watch television, but because they have the option of viewing on the web instead, it's not clear whether television viewing will rise. The availability of programming on the web has a theoretically ambiguous effect on the use of conventional television.

¹⁰ The revenue received by networks is not literally the region REV depicted in Figure 1. Instead, it is a rectangle that equals the product of q_0 and the price per viewer for advertising, which is generally not equal to the value of the programming to the viewer.

II. Data

The data for this study come from a survey administered on the campus of the University of Pennsylvania in May 2007. The survey was given to 287 persons on campus, who were asked about their use of television and the web for viewing television programming.

They were asked how often they watch video over the web, which authorized (e.g. abc.com) and unauthorized (e.g. YouTube) video sites they use, how many weekly hours they spent watching conventional television, video at authorized websites, and video at unauthorized websites during the 2006-07 television season. I also asked them to indicate which shows they watched. For each series they indicated viewing mode (on television, authorized web sites, unauthorized web sites) and frequency (watched through that mode sometimes or frequently). I asked for this series-level enumeration for both the 2006-07 season just ending as well as for the previous television season (2005-06).

The resulting data include the numbers of shows that respondents frequently or sometimes watch via one of three modes: on **television**, on the web via **authorized** sites (such as abc.com), or **unauthorized** for both the 2006-07 season and the preceding 2005-06 season.

Respondents listed up to six sites that they use to view television programming. YouTube was by far the most common response: 244 of 283 respondents listed YouTube first. Other unauthorized sites mentioned repeatedly include tv-links.co.uk, peekvid.com, and bittorrent. Authorized sites, including abc.com, nbc.com, fox.com, cbs.com, and cnn.com, are also mentioned frequently.

Which shows do people watch on which media? The shows most frequently viewed on television include *Grey's Anatomy*, *Entourage*, and *The Daily Show*. The shows most frequently viewed via authorized web sites include *Grey's Anatomy*, *Lost*, and *The Daily Show*. The shows most frequently viewed *unauthorized* on the web include *The Daily Show*, *South Park*, and *Scrubs*.

In both seasons, traditional television remains the most popular method of viewing television content. Respondents report spending a mean (median) of 4.5 (3) hours watching conventional television per week, compared with 3.8 (1) hours of authorized web video and 3.0 (1) hour of unauthorized web video, during the 2006-07 television season.¹¹ The numbers of series watched via each medium mirror the hours breakdowns. Table 1 reports the number of shows viewed either frequently or sometimes via each of the three modes during the two seasons. Of 223 persons with valid data for both seasons, respondents watched an average of 2.62 series on television (either sometimes or frequently) during the 2005-06 season, compared with 0.48 shows at authorized web sites and 0.53 at unauthorized web sites.

Between the two seasons, however, growth in viewing via the web far outstripped growth in television viewing (see Table 1). The number of series (sometimes or frequently) viewed unauthorized on the web grew by 96 percent, and authorized web viewing grew even more, by 188 percent. Over the same period, the number of series viewed on conventional television in the sample grew by only 11 percent. The sharp growth in web viewing between the 2005-06 and 2006-07 seasons among survey respondents reflects the overall growth in YouTube and network-authorized web distribution over this period detailed above.

¹¹ The survey asked about weekly viewing hours only for the most recent (2006-07) season.

During the 2006-07 season, television accounted for 72 percent of series that respondents viewed (sometimes or frequently), and this share fell to 55 percent in the following season. In this sample nearly half of series viewed are viewed via the web in the second season. This change in the use of the web is an important source of variation I will use to measure the impact of web distribution on conventional television viewing.

ABC, FOX, and NBC are the most watched networks in the 2005-06 season among the survey respondents. For every network TV viewing is more prevalent than either authorized or unauthorized web distribution. In the later season ABC, FOX, and NBC remain the most watched on television among these respondents. Authorized web viewing rises sharply across the board and most sharply at ABC where respondents watch as many series on abc.com as on television.

The rapid growth of authorized web viewing in the sample suggests that the networks have been successful at undermining the relative appeal of unauthorized distribution. This should not be too surprising given the quality of the viewing experience at, say, abc.com in contrast to YouTube. Abc.com offers full episodes with high picture quality, albeit with some commercials, while unauthorized sites either stream with low resolution (e.g. YouTube) or – for sites used less frequently for viewing television programs – require actual downloading (e.g. BitTorrent).

III. Empirical Strategy and Results

We have two broad strategies for determining whether the use of new modes of distribution displaces traditional television viewing.¹² First, we can ask whether those who watch more web video watch less television, for example using the measures of

¹² These strategies mirror those adopted in Rob and Waldfogel (2006, forthcoming).

hours spent during the 2006-07 television season. An obvious shortcoming with this approach is that those who watch a lot of television series on one outlet may watch a lot on the other simply because they like television series, rather than because one complements or stimulates the other.

Still, it's worth looking at simple statistics: The raw correlation of weekly hours spent watching television and authorized web video in 2006-07 is 0.07, and the correlation of television hours with hours spend watching unauthorized web video is 0.11 (in both cases insignificantly different from zero). The data on series rather than hours reveal similarly non-negative relationships among viewing by different modes.

Aggregating the number of series viewed sometimes and those viewed frequently, TV and authorized web viewing are significantly positively related in both seasons, as are authorized and unauthorized web series viewing in 2005-06. That is, people watching more series on television also watch more at authorized web sites. In the earlier season, people watching more series at authorized web sites also watched more at unauthorized sites. The positive relationships between viewing via different modes are consistent with unobserved heterogeneity (people who like television shows enjoy them via multiple media) but could also reflect complementary between viewing among different modes.

Distinguishing intense from casual use – series viewed frequently from those viewed only sometimes – via each mode produces somewhat different results. While many correlations remain positive – between the number of series viewed on TV frequently and the number sometimes viewed via authorized web sites, between sometimes authorized and frequent television, between sometimes authorized and sometimes unauthorized – others are significantly negative, notably the relationship

between the number of series frequently viewed via unauthorized channels and the number viewed on television. Given the looming concern of unobserved heterogeneity in this context, these negative correlations provide interesting suggestive evidence of substitution.

1. Cross Sectional Approach

Regressions provide a more systematic way of analyzing these data, via the following statistical model:

$$TV_i = X_i\beta + \alpha_1 WF_i + \alpha_2 WS_i + \varepsilon_i, \text{ where (suppressing the individual's subscript)}$$

TV = number of series watched (sometimes or frequently) on conventional television during a season,

WF = number of series watched frequently at authorized or unauthorized web sites,

WS = number of series watched sometimes at authorized or unauthorized web sites,

X = characteristics of the respondent (age, gender, etc.), and

ε = unobserved determinant's of the respondents' television viewing.

In this model the unobserved heterogeneity problem is the concern is that ε is correlated with AU and UN , for example because of unobserved tastes for television viewing.

We can decompose TV into the separate numbers of series watched frequently (TVF) and sometimes (TVS), where $TV = TVF + TVS$. We can also disaggregate frequent and sometime web viewing into authorized and unauthorized components:

$$WF_i = UNF_i + AUF_i, \text{ and}$$

$WS_i = UNS_i + AUS_i$, where the prefixes “UN” and “AU” refer to unauthorized and authorized viewing. Then we can also estimate a more flexible set of models:

$$TVF_i = X_i\beta^F + \lambda_1UNF_i + \lambda_2UNS_i + \lambda_3AUF_i + \lambda_4AUS_i + \varepsilon_i^F, \text{ and}$$

$$TVS_i = X_i\beta^S + \theta_1UNF_i + \theta_2UNS_i + \theta_3AUF_i + \theta_4AUS_i + \varepsilon_i^S.$$

This allows frequent and casual viewing over the web to bear different relationships to the numbers of series viewed frequently, and casually, on television. Moreover, it allows us to distinguish effects of authorized and unauthorized web distribution on television.

Table 2 presents regressions of the numbers of television series watched, either sometimes or frequently, on television viewing on age, gender, and measures of the numbers of series watched on authorized and unauthorized web sites for the 2005-06 season. The dependent variable in the first column aggregates both series watched frequently and sometimes on television in the 2005-06 season. The number of series watched on television bears a negative and significant relationship to the number of series viewed on the web (-0.34) and a positive and significant relationship to the number viewed sometimes on the web (0.39). The next two columns examine the two constituent parts of the total number of series viewed on television, those viewed frequently (*TVF*) and those viewed sometimes (*TVS*). For the 2005-06 season, web viewings’ relationships with total series watched operate largely through relationships with the number of series watched frequently on television: the coefficients in column (2) are large and significant, while the coefficients in column (3) are indistinguishable from zero.

The latter half of Table 2 repeats the exercise of the first three columns with independent variables disaggregated to allow different coefficients on authorized and unauthorized web viewing. While significance levels decline, we cannot reject the

hypotheses of coefficients on authorized and unauthorized web viewing, equation by equation.

Table 3 repeats the exercise of Table 2 for the latter (2006-07) season. The first column's frequent web viewing coefficient in the total series television viewing equation, -0.34 in the previous season, is now -0.10 and insignificant. The sometime web viewing coefficient in the same equation rises from 0.39 in the previous season to 0.48. In the latter season, frequent and sometime web viewing continue to have significant positive and negative coefficients, respectively, in explaining frequent television viewing (col 2), but both frequent and sometime web viewing have statistically significant coefficients in explaining sometime television viewing (col 3).

Disaggregating web viewing into authorized and unauthorized yields somewhat different results for 2006-07 relative to the previous season. While authorized and unauthorized web distribution had statistically indistinguishable coefficients in the earlier season, in 2006-07 unauthorized distribution measures have consistently more negative or less positive coefficients in explaining total and frequent television viewing.

The cross sectional results contain distinctive positive and negative coefficients. Given the underlying concern that unobserved heterogeneity would induce positive relationships, it is difficult to interpret the positive coefficients as evidence of complementarity. Still, two results are interesting. First, the negative coefficients in Tables 2 and 3 are more convincingly suggestive of substitution. Second, the distinctions between apparent effects of authorized and unauthorized web distribution in the latter season suggest that unauthorized distribution exerts a larger substituting effect.

2. Longitudinal Approach

A second approach is to use the variation across individuals in the change over time in their web and television video use. That is, we can estimate the model:

$\Delta TV_{is} = \alpha_0 + \alpha_1 \Delta WF_{is} + \alpha_2 \Delta WS_{is} + \varepsilon_{is}$ (or its analogues that disaggregate frequent and casual viewing), where variables are defined as above except that an observation is corresponds to a season (s). This model “differences out” the unobservable person effect in conventional television viewing that is potentially correlated with viewing at authorized and unauthorized websites.

The modeling approach asks whether those with larger growth in viewing of television series at either authorized or unauthorized sites experience larger decreases – or smaller increases – in television use. Figure 3 plots the inter-season change in the number of series watched frequently on television (on the vertical axis) against that change in the number of series viewed frequently at unauthorized web sites (on the horizontal axis). A negative relationship is evident. The correlation is -0.18 and statistically significantly negative. Figure 4 repeats the exercise replacing unauthorized with frequent authorized website viewing on the horizontal axis. Again, a negative relationship is evident. The correlation is -0.17 and significant. Both frequent authorized and frequent unauthorized series viewing on the web bear significant negative relationships with the number of series viewed frequently on conventional television.

Table 4 reports regressions of the change in series watched on television on changes in series viewed on the web. The table has the same organization as Tables 2 and 3, although variables are now in changes rather than levels. The dependent variable in the first and second columns is the combined number of series watched sometimes or

frequently on television. Column (1) presents a regression of the change in the number of series watched on television on the change in the numbers of series viewed frequently and sometimes on the web. Neither frequent nor sometime web viewing has a significant coefficient, although the sometime coefficient (0.17) is nearly twice its standard error. In column (2) explaining the change in series watched frequently on television, frequent web viewing gets a negative (-0.31) and significant coefficient that is similar to its cross section analogues (-0.3 to -0.4), while sometime web viewing gets an insignificant coefficient that contrasts with its positive and significant cross sections analogues (0.3). In column (3) explaining the change in series watched sometimes on television both frequent and sometime web viewing measures have positive and significant coefficients similar to their cross sectional analogues, particularly those for 2006-07.

The latter half of the table allows authorized and unauthorized web viewing to have different coefficients. For the most part, authorized and unauthorized web viewing coefficients are statistically indistinguishable, but while unauthorized web series viewing bears no relationship to sometime television viewing, authorized web viewing has a positive and significant coefficient of 0.30.

An additional series viewed frequently via unauthorized and authorized web channels reduces the number of series viewed frequently on television but increases the number of shows viewed sometimes on television. Evaluating equations (2) and (3) from Table 4 at the mean values of frequent and sometimes web viewing in the latter season, reduces the number of series viewed frequently on television (*TVF*) by 0.36, while they increase the number of series viewed sometimes on television (*TVS*) by 0.55.

Determining the overall effect of the web viewing on conventional television requires a way of comparing the amount of viewing associated with series viewed “frequently” and “sometimes.” Because we have data on the number of hours respondents spend in all three modes of viewing in the second season, we can run a regression of, say, weekly hours of conventional television viewing on the numbers of series watched frequently and sometimes, respectively. That is, we can run the regression:

$$TVHours_i = \pi_0 + \pi_1 TVF_i + \pi_2 TVS_i + \varepsilon_i .$$

The coefficients π_1 and π_2 from this regression map sometime and frequent television viewing of series into weekly hours. They have the interpretation that each additional series viewed frequently adds π_1 hours to weekly television viewing while each additional series viewed sometimes adds π_2 hours to weekly viewing.

Table 5 presents results. The first two columns report a linear regression and a median regression, respectively, for television. The next 2 columns repeat the exercise for authorized web viewing, and the final two columns for unauthorized web viewing. The first column indicates that an additional sometimes-watched series adds about half an hour to weekly television viewing, while an additional frequently-watched series adds over twice as much. The latter number is difficult to take literally, since few programs are broadcast for over an hour per week. Still, it is comforting that the frequently coefficient exceeds the sometimes coefficient.

The overall effect on television hours can then be estimated as

$$\Delta TVHours = \pi_1 \Delta TVF + \pi_2 \Delta TVS .$$

Using the mean estimates of π_1 and π_2 from column 1, the answer is a quarter of an hour (-0.24), which is 5 percent of the mean value of TV hours, 4.53 hours. Thus, web distribution has on balance, reduced television viewing hours in this sample by 5 percent. Separating the effects of authorized and unauthorized web distribution, unauthorized accounts for 69 percent of the reduction.

While television hours decline slightly, total hours viewing network video content rise overall because of the series viewing at authorized and unauthorized web sites. We can use the hours regressions in the remainder of Table 5 to calculate the additional hours of associated with the authorized and unauthorized web viewing in the 2006-07 season. Additional hours of weekly viewing of authorized web video are 1.78,¹³ while the change in unauthorized web viewing hours is 2.26 hours per week. Thus, overall web viewing rises by 4.04 hours per week, far offsetting the 0.24 hour reduction in weekly television viewing in the sample. Hours of network-controlled viewing rise by 1.54 per week (a 1.78 hour increase in network authorized web viewing in conjunction with a 0.24 hours reduction in traditional television viewing).

Much of these respondents' viewing would not have occurred absent web distribution. Using the demand framework introduced earlier, the additional consumption represents some combination of reduced deadweight loss of traditional distribution and demand stimulation effected by web distribution.

Conclusion

¹³ This is calculated as $\pi_1^{AU} \overline{AUF}_{06/07} + \pi_2^{AU} \overline{AUS}_{06/07} = 2.14(0.57)+0.68(0.82)$.

The empirical literature on file sharing in music and movies has, for the most part, found depressing effects of web distribution on legal sales. We too find significant depressing effects of web distribution on conventional television viewing, but we also document largely offsetting positive relationships, reflecting complementarity.

Overall, conventional television viewing is reduced slightly in this sample, while overall viewing of network programming rises substantially. Hours spent viewing television programming overall nearly double with web distribution. While conventional television viewing falls by about 5 percent, this is more than offset by increases in time spent viewing network-authorized web programming.

The networks' own web distribution has smaller but similar effects as the unauthorized distribution on conventional television viewing. Of course, in the network efforts, the network broadcasts advertising, so the loss the traditional viewing is at least partially offset by online ad revenue.

This study has examined the relationship between web viewing and conventional television viewing for a small group of media users on a college campus. This is a good population for study, given its intense computer use. Relationships documented in this sample may offer a glimpse of relationships that will hold for a more general population as broadband continues to spread. But it bears repeating that this sample is not representative of the US population generally. Wider-scale sampling would be very useful for determining typical effects of web distribution of television programming on television viewing.

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Table 1: Series Viewed, by Network, Mode and Season

		web	web
	TV	authorized	unauthorized
2005-06			
ABC	0.49	0.19	0.06
CBS	0.05	0	0
Comedy Central	0.26	0.09	0.09
FOX	0.44	0.03	0.12
NBC	0.3	0.03	0.05
Other	1.13	0.14	0.22
total	2.67	0.48	0.54
2006-07			
ABC	0.61	0.61	0.09
CBS	0.05	0.02	0
Comedy Central	0.28	0.18	0.17
FOX	0.38	0.12	0.22
NBC	0.35	0.13	0.19
Other	1.29	0.32	0.39
total	2.96	1.38	1.06
% change			
ABC	24%	221%	50%
CBS	0%		
Comedy Central	8%	100%	89%
FOX	-14%	300%	83%
NBC	17%	333%	280%
Other	14%	129%	77%
total	11%	188%	96%

Note: number of series viewed here includes both those that respondents watch frequently and those that respondents watch sometimes.

Table 2: Web Viewing and Television Viewing in the 2005-06 Season

	(1)	(2)	(3)	(4)	(5)	(6)
	TV Series Watched '05- '06	TV Series Watched Freq'ly '05- '06	TV Series Watched Sometimes '05-'06	TV Series Watched '05- '06	TV Series Watched Freq'ly '05- '06	TV Series Watched Sometimes '05-'06
Series Watched...						
Freq'ly on Web - '05-'06	-0.3397 (0.1485)*	-0.4214 (0.1459)**	0.0817 (0.1030)			
Sometimes on Web - '05-'06	0.3926 (0.0985)**	0.2849 (0.0968)**	0.1077 (0.0683)			
Freq'ly Unauth'd '05-'06				-0.3364 (0.1778)	-0.4208 (0.1744)*	0.0844 (0.1234)
Freq'ly Auth'd '05-'06				-0.3325 (0.2572)	-0.4009 (0.2522)	0.0683 (0.1784)
Sometimes Unauth'd '05-'06				0.2893 (0.1782)	0.1258 (0.1748)	0.1635 (0.1236)
Sometimes Auth'd '05-'06				0.4728 (0.1517)**	0.4084 (0.1488)**	0.0644 (0.1052)
male	0.1412 (0.2391)	0.1361 (0.2349)	0.0051 (0.1658)	0.1694 (0.2438)	0.1802 (0.2391)	-0.0107 (0.1691)
age	0.0067 (0.0305)	-0.0130 (0.0299)	0.0197 (0.0211)	0.0050 (0.0307)	-0.0156 (0.0301)	0.0207 (0.0213)
Constant	2.2787 (0.6526)**	1.9142 (0.6411)**	0.3645 (0.4526)	2.3038 (0.6559)**	1.9533 (0.6433)**	0.3505 (0.4551)
Observations	225	225	225	225	225	225
R-squared	0.09	0.07	0.02	0.09	0.08	0.02
H ₀ : Equal Frequent Auth & Unauth Coeffs (p-val)				0.99	0.95	0.94
H ₀ : Equal Sometimes Auth & Unauth Coeffs (p-val)				0.49	0.28	0.59
H ₀ : Both sets equal (p-val)				0.78	0.55	0.86

Notes: Standard errors in parentheses. * significant at 5%; ** significant at 1%.

Table 3: Web Viewing and Television Viewing in the 2006-07 Season

	(1)	(2)	(3)	(4)	(5)	(6)
	TV Series Watched '06'- '07	TV Series Watched Freq'ly '06- '07	TV Series Watched Sometimes '06-'07	TV Series Watched '06'- '07	TV Series Watched Freq'ly '06- '07	TV Series Watched Sometimes '06-'07
Series Watched...						
Freq'ly on Web - '06-'07	-0.0961 (0.0907)	-0.2834 (0.0826)**	0.1873 (0.0617)**			
Sometimes on Web - '06-'07	0.4751 (0.0829)**	0.2633 (0.0755)**	0.2118 (0.0564)**			
Freq'ly Unauth'd '06-'07				-0.2567 (0.1360)	-0.4239 (0.1237)**	0.1672 (0.0936)
Freq'ly Auth'd '06-'07				0.0731 (0.1206)	-0.1276 (0.1097)	0.2006 (0.0830)*
Sometimes Unauth'd '06-'07				0.2717 (0.1422)	0.0505 (0.1293)	0.2213 (0.0979)*
Sometimes Auth'd '06-'07				0.6250 (0.1238)**	0.4221 (0.1126)**	0.2029 (0.0852)*
male	0.2044 (0.2581)	0.2832 (0.2352)	-0.0788 (0.1756)	0.4341 (0.2728)	0.5035 (0.2482)*	-0.0695 (0.1878)
age	0.0572 (0.0348)	0.0283 (0.0317)	0.0289 (0.0237)	0.0465 (0.0348)	0.0177 (0.0317)	0.0287 (0.0240)
Constant	0.9015 (0.7623)	0.7515 (0.6945)	0.1500 (0.5188)	1.0180 (0.7579)	0.8644 (0.6894)	0.1535 (0.5217)
Observations	267	267	267	267	267	267
R-squared	0.12	0.09	0.09	0.14	0.11	0.09
H ₀ : Equal Frequent Auth & Unauth Coeffs (p-val)				0.07	0.07	0.78
H ₀ : Equal Sometimes Auth & Unauth Coeffs (p-val)				0.09	0.05	0.90
H ₀ : Both sets equal (p-val)				0.05	0.03	0.96

Notes: Standard errors in parentheses. * significant at 5%; ** significant at 1%.

Table 4: Changes in Web Viewing and Television Viewing between Seasons

	(1)	(2)	(3)	(4)	(5)	(6)
	Chg # of Series Watched on TV	Chg # of Series Watched Frequently on TV	Chg # of Series Watched Sometimes on TV	Chg # of Series Watched on TV	Chg # of Series Watched Frequently on TV	Chg # of Series Watched Sometimes on TV
Change in Number of Series Viewed...						
Freq'ly on Web	-0.0394 (0.0889)	-0.3127 (0.0792)**	0.2733 (0.0721)**			
Sometimes on Web	0.1676 (0.0861)	-0.0167 (0.0767)	0.1843 (0.0699)**			
Freq'ly on Web at Unauthorized Sites				-0.0654 (0.1378)	-0.3727 (0.1229)**	0.3073 (0.1114)**
Freq'ly on Web at Authorized Sites				-0.0113 (0.1101)	-0.2786 (0.0982)**	0.2673 (0.0890)**
Sometimes at Unauthorized Sites				0.0244 (0.1537)	0.0065 (0.1371)	0.0179 (0.1243)
Sometimes at Authorized Sites				0.2665 (0.1240)*	-0.0364 (0.1107)	0.3029 (0.1003)**
Constant	0.2398 (0.1433)	0.1388 (0.1276)	0.1009 (0.1163)	0.2290 (0.1439)	0.1400 (0.1284)	0.0890 (0.1163)
Observations	223	223	223	223	223	223
R-squared	0.02	0.07	0.09	0.02	0.07	0.10
H ₀ : Equal Frequent Auth & Unauth Coeffs (p-val)				0.75	0.53	0.77
H ₀ : Equal Sometimes Auth & Unauth Coeffs (p-val)				0.26	0.82	0.10
H ₀ : Both sets equal (p-val)				0.52	0.80	0.25

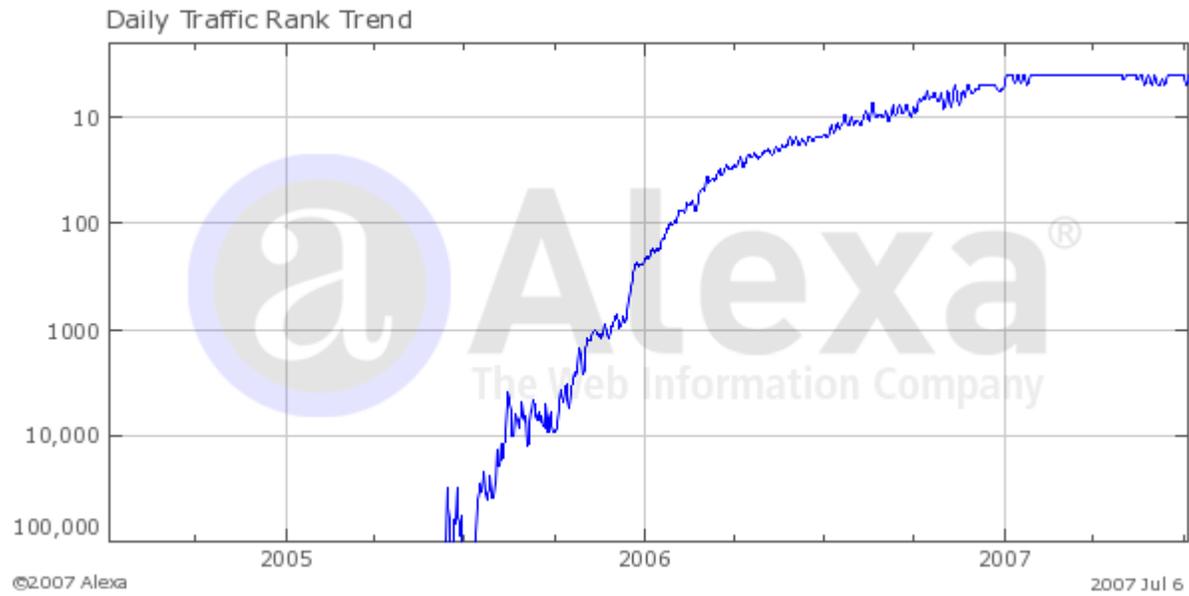
Notes: Standard errors in parentheses. * significant at 5%; ** significant at 1%.

Table 5: Translating Viewing Frequency Into Weekly Hours

	(1)	(2)	(3)	(4)	(5)	(6)
	Weekly Hrs TV	Weekly Hrs TV	Weekly Hrs Auth Web	Weekly Hrs Auth Web	Weekly Hrs Unauth Web	Weekly Hrs Unauth Web
TV Series Watched Freq'ly '06-'07	1.4188 (0.1249)**	1.4000 (0.2660)**				
TV Series Watched Sometimes '06-'07	0.4852 (0.1679)**	0.5000 (0.2360)*				
Series Watched Freq'ly Auth'd '06- '07			2.1433 (0.6690)**	0.7500 (0.2517)**		
Series Watched Sometimes Auth'd '06-'07			0.6804 (0.6757)	-0.0000 (0.1368)		
Series Watched Freq'ly Unauth'd '06-'07					2.4253 (0.5686)**	1.0000 (0.1388)**
Series Watched Sometimes Unauth'd '06-'07					1.9007 (0.6082)**	0.6667 (0.1844)**
Constant	1.6135 (0.3901)**	0.5000 (0.4380)	1.9799 (0.9846)*	1.0000 (0.2886)**	0.3138 (0.7543)	0.0000 (0.0000)
Observations	264	264	235	235	224	224
R-squared	0.33		0.05		0.12	

Notes: Odd-numbered columns are linear regressions. Even numbered regressions are median regressions with bootstrapped standard errors. Standard errors in parentheses. * significant at 5%; ** significant at 1%.

Figure 1: YouTube Traffic Rank from Alexa.com



Source: http://www.alex.com/data/details/traffic_details?q=&url=youtube.com, accessed July 10, 2007.

Figure 2

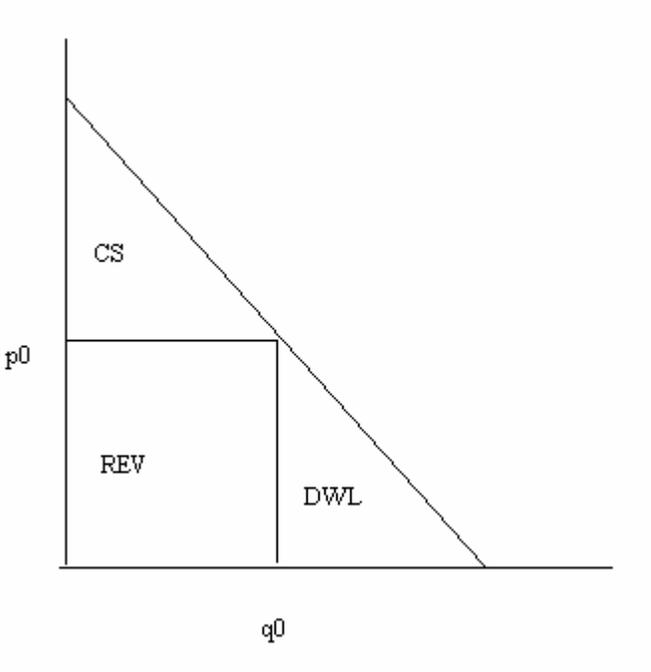


Figure 3: Change in Frequent Viewing on Web (Unauthorized) and Television

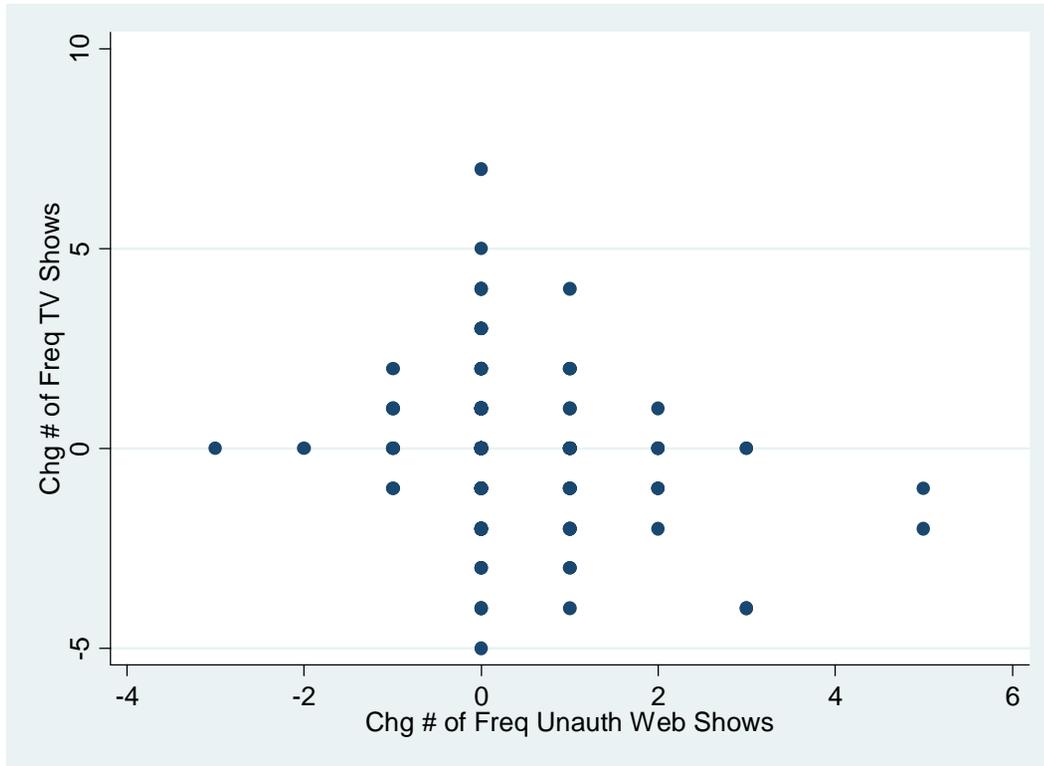


Figure 4: Change in Frequent Viewing on Web (Authorized) and Television

