

What Are We Not Doing When We're Online?

November 2011

Scott Wallsten

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Abstract

While Americans are spending an increasing amount of leisure time engaged in online activities, total leisure time has remained constant since at least 2003. This paper uses data from the American Time Use Survey from 2003-2010 to investigate the extent to which online leisure is substituting for other leisure activities. The analysis suggests that online leisure, especially online video and social networking, appears to come at the expense of watching traditional television, socializing, and relaxing. However, the net crowding out effect is incomplete—each minute of online leisure is correlated with 0.27 minutes less of other leisure—suggesting that at least some online leisure occurs concurrently with other, offline, leisure. Nevertheless, both the amount of time engaged in online leisure and the magnitude of the (negative) correlation between online and offline activity are increasing, suggesting that online activities are taking the place of a growing share of offline leisure activities. Additionally, some evidence suggests that new online activities also crowd out previous online activities. In particular, online leisure is increasingly negatively correlated with time spent on personal email.

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Introduction

Since 2003, Americans have consistently reported spending just over five hours on leisure activities each day.¹ Yet, more people are spending leisure time online, with social media and online video responsible for the bulk of this increase.² Since the total amount of time spent on leisure has not changed, more time spent on one type of leisure must be offset by less time spent on others. Thus the question, what are we no longer doing when we're on Facebook or watching Netflix?

Given that consumers spend about \$340 billion annually on leisure activities,³ the answer to this question may have large and transformative economic effects. The effects may be especially profound when the online activity has the potential to be a direct substitute for an existing activity. For example, consumers spend about \$134 billion annually on "entertainment media."⁴ A large shift to online distribution could have radical effects not just on distribution models, but also on content creation and, given the long history of government involvement in broadcast retransmission rules, regulation.

Other types of online leisure may have noneconomic as well as economic effects. Scholars in fields outside of economics have studied, for example, the effects of social networking on general well-being.⁵ While the economic effects of social networking may not be immediately apparent, spending less time with people in the physical world to spend more time with people on Facebook may shift some time from nonmarket activities (say, sitting and talking) to activities that may be monetized on social network platforms like Facebook.

To my knowledge, no empirical research has investigated how leisure time online substitutes for or complements other leisure activities.⁶ In this paper I begin to answer that question using detailed data from the American Time Use Survey, which allows me to construct a person-level dataset consisting of about 112,000 observations from 2003 – 2010.

¹ <http://www.bls.gov/tus/#tables> Derived from Table A1

² <http://blog.nielsen.com/nielsenwire/global/led-by-facebook-twitter-global-time-spent-on-social-media-sites-up-82-year-over-year/>

³ See Table 57, <http://www.bls.gov/cex/2009/aggregate/age.xls>. The \$340 billion estimate includes expenditures on entertainment, which includes "fees and admissions," "audio and visual equipment and services," "pets, toys, hobbies, and playground equipment," and "other entertainment supplies, equipment, and services." I added expenditures on reading to entertainment under the assumption that consumer expenditures on reading are likely to be primarily for leisure.

⁴ Helen Davis Jayalath, "US Media Spending is 63 Percent Higher than Western Europe," *iSuppli*, August 11, 2011, <http://www.isuppli.com/Media-Research/MarketWatch/Pages/US-Media-Spending-is-63-Percent-Higher-than-Western-Europe.aspx>.

⁵ See, for example, Sebastián Valenzuela, Namsu Park, and Kerk F. Kee, "Is There Social Capital in a Social Network Site?: Facebook Use and College Students' Life Satisfaction, Trust, and Participation," *Journal of Computer-Mediated Communication* 14, no. 4 (2009): 875-901.

⁶ One existing study tries to investigate the effects of IT use using the same data I use in this paper, though only from 2003-2007. The author finds no particular effect of IT use on other time spent on other activities, though the empirical test is simply whether IT users and non-users spend significantly different amounts of time on various activities. John Robinson, "IT, TV and Time Displacement: What Alexander Szalai Anticipated but Couldn't Know," *Social Indicators Research* 101, no. 2 (April 1, 2011): 193-206.

I find that online leisure is taking the place of other types of leisure. The bulk of online time comes at the cost of relaxing and thinking, but more online time is also correlated with less socializing and less time watching television. Newer types of online leisure, such as social networking, appear to be replacing other popular online activities, such as email. Moreover, the data suggest that while the average amount of online leisure time across the entire population is small, the share of people who spend leisure time online is increasing, as is the magnitude of the correlation between leisure time online and offline.

Leisure Time Online

Detailed data on how Americans spend their leisure time is collected by the U.S. Bureau of Labor Statistics (BLS), which has conducted The American Time Use Survey (ATUS) annually since 2003. As BLS notes, the ATUS “provides nationally representative estimates of how, where, and with whom Americans spend their time, and is the only federal survey providing data on the full range of nonmarket activities, from childcare to volunteering.”⁷

An excellent representation of information contained in ATUS, and thus how Americans spend their time, was produced by The New York Times (Figure 1). As the figure highlights, ATUS data track activities by time of day and activity, as well as by different population groupings due to coordination with the Census Current Population Survey (CPS). Each major activity in the figure can be broken down into a large number of smaller activities under that heading. The figure reveals the relatively large amount of time people spend engaged in leisure activities, including socializing and watching TV and movies.

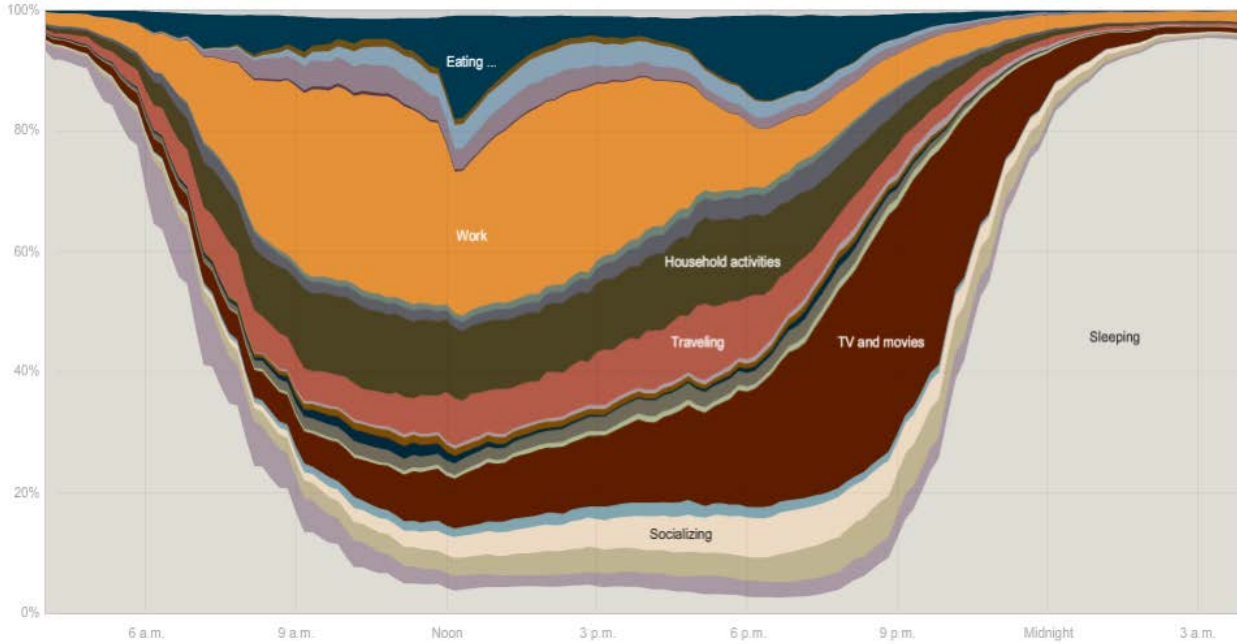
⁷ <http://www.bls.gov/tus/atussummary.pdf>

Figure 1: How Americans Spent Their Time in 2008, based on ATUS

Everyone

Sleeping, eating, working and watching television take up about two-thirds of the average day.

Everyone	Employed	White	Age 15-24	H.S. grads	No children
Men	Unemployed	Black	Age 25-64	Bachelor's	One child
Women	Not in lab...	Hispanic	Age 65+	Advanced	Two+ children



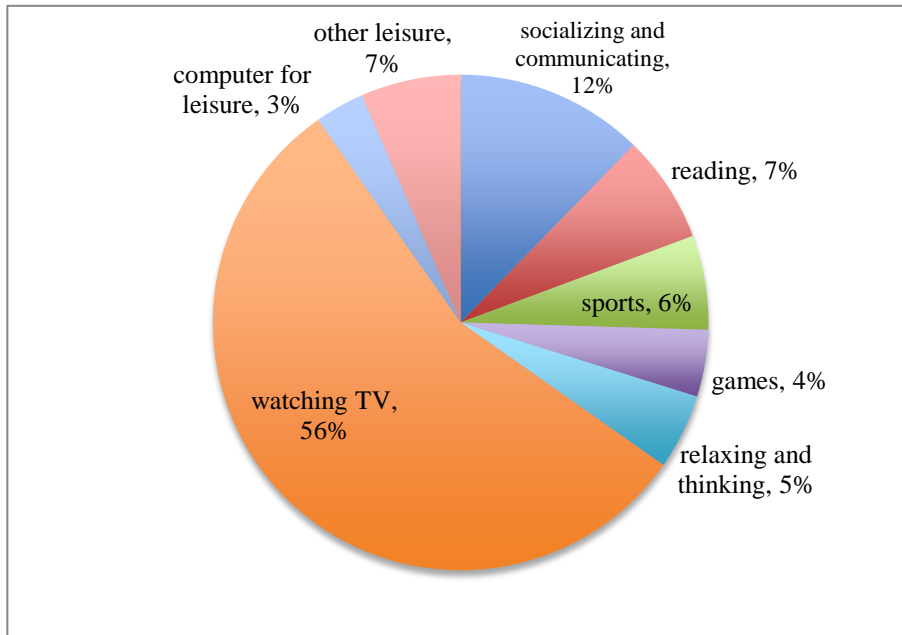
Source: The New York Times (2009).⁸

The first step in analyzing the data for our purposes was to download the relevant files from the BLS for each year and from them construct a dataset at the person-year level. The final dataset has a total of about 112,000 observations, with approximately 13,000 observations in each year except for 2003, which had just over 20,000 observations.

The ATUS includes detailed data on how people spend their leisure time. ATUS has seven broad categories of leisure, but I separate out computer use for leisure separate to yield eight categories. Figure 2 shows the share of time Americans spend on various activities.

⁸ <http://www.nytimes.com/interactive/2009/07/31/business/20080801-metrics-graphic.html>

Figure 2: Share of Leisure Time Spent on Various Activities, 2010



Note: Average total daily leisure time is about five hours.
Source: ATUS 2010 (author's derivation from raw data).

While no specific variable measures leisure time spent online, per se, ATUS measures time spent using a computer for leisure.⁹ This measure explicitly excludes games, email, and computer use for work and volunteer activities. To be sure, some computer leisure activities, such as organizing photos and writing the great American novel, do not necessarily involve the Internet, but it seems reasonable to assume that the majority of computer leisure time involves online activities.¹⁰ Additionally, while the measure is coded as “computer use for leisure,” based on the coding instructions it also likely includes mobile device use.¹¹

Based on what the ATUS measure excludes and other sources of information detailing what online activities include, we can get a good idea of what people are probably spending their time doing. Nielsen identifies the top 10 online activities (Table 1). Of the top 10, the ATUS variable excludes online games, e-mail, and any Internet use for work, education, or volunteer activities. Based on this list, it is reasonable to conclude that the top leisure uses included in the ATUS variable are social networks, portals, and video.

⁹ Computer games are simply recorded as “leisure/playing games,” and e-mail is coded as “household and personal e-mail and messages.” Text messaging is recorded as “telephone calls.” U.S. Bureau of Labor Statistics, *American Time Use Survey (ATUS) Coding Rules*, 2010, 17, 47, <http://www.bls.gov/tus/tu2010coderrules.pdf>.

¹⁰ Additionally, of the eight examples of computer leisure ATUS provides in its “Activity Lexicon,” only two are likely to include offline activities. The examples are “computer use, unspecified; computer use, leisure (personal interest); surfing the internet/web (personal interest); browsing on the internet (personal interest); downloading files, music, pictures (personal interest); participating in a chat room (personal interest); burning CDs (personal interest); designing/updating website (personal interest).” U.S. Bureau of Labor Statistics, *American Time Use Survey (ATUS) Activity Lexicon*, 2010, 26, <http://www.bls.gov/tus/lexiconwex2010.pdf>.

¹¹ See fn 10.

Table 1: Top 10 Online Activities by Time Spent on Them¹²

Rank	Category	Share of time		% Change in Share of Time
		June 2010	June 2009	
1	Social Networks	22.7%	15.8%	43%
2	Online Games	10.2%	9.3%	10%
3	E-mail	8.3%	11.5%	-28%
4	Portals	4.4%	5.5%	-19%
5	Instant Messaging	4.0%	4.7%	-15%
6	Videos/Movies**	3.9%	3.5%	12%
7	Search	3.5%	3.4%	1%
8	Software Manufacturers	3.3%	3.3%	0%
9	Multi-category Entertainment	2.8%	3.0%	-7%
10	Classifieds/Auctions	2.7%	2.7%	-2%
	Other*	34.3%	37.3%	-8%

Source: Nielsen NetView – June 2009-June 2010.

* Other refers to 74 remaining online categories visited from PC/laptops

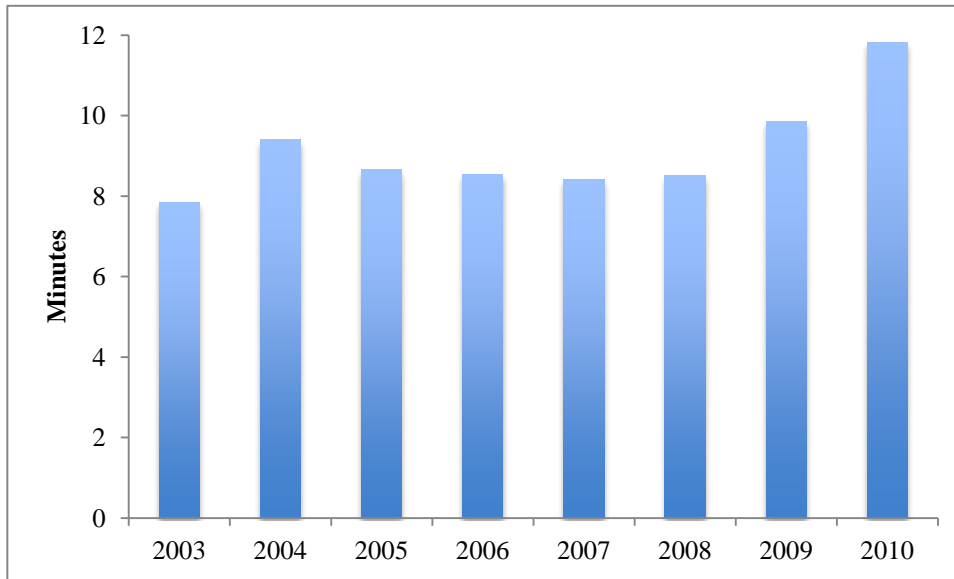
** NetView's Videos/Movies category refers to time spent on video-specific (e.g., YouTube, Bing Videos, Hulu) and movie-related websites (e.g., IMDB, MSN Movies and Netflix) only. It is not a measure of video streaming or inclusive of video streaming on non-video-specific or movie-specific websites (e.g., streamed video on sports or news sites).

Given that the ATUS measure of PC use for leisure excludes email and games, and that of the remaining top 10 categories only time spent on social media and video have been increasing, it seems reasonable to attribute increases in the ATUS measure of time spent using a PC for leisure to social media and video. In fact, because time spent on other online activities has been decreasing, the aggregate measure likely understates the effects of social media and online video.

Figure 3 shows the average number of minutes spent per day using a computer for leisure activities. While the upward trend since 2008 is readily apparent, the data also show that, on average, at about 12 minutes per day, leisure time online is a small share of the total five hours of daily leisure activities the average American enjoys.

¹² This table, including the notes, is a direct reproduction of the Nielsen table available here: http://blog.nielsen.com/nielsenwire/online_mobile/what-americans-do-online-social-media-and-games-dominate-activity/.

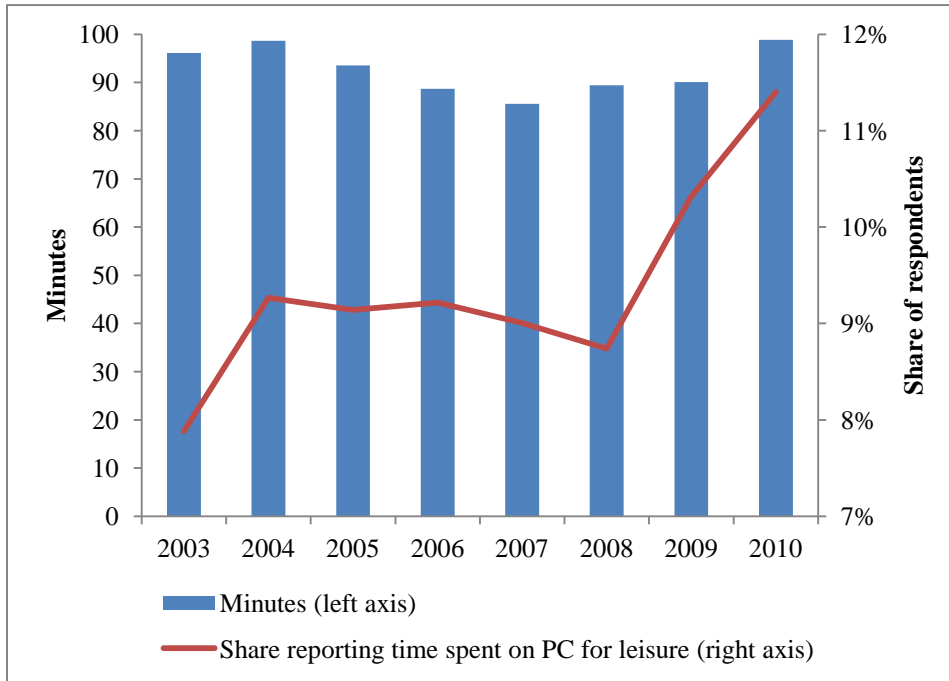
Figure 3: Average Minutes Per Day Spent Using Computer for Leisure



This relatively small average number of minutes engaged in online leisure activities helps explain why we have not yet witnessed the radical transformation of, say, video-related industries. The average, however, is deceptive because it is calculated across the entire population.

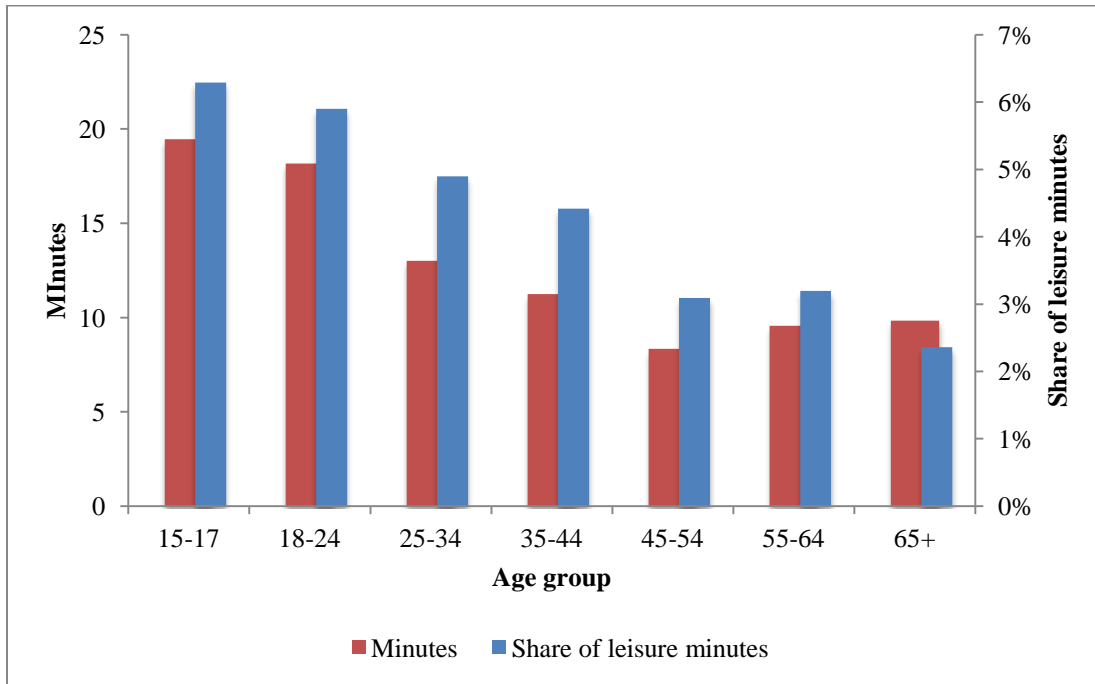
Figure 4 shows that the average is low primarily because a fairly small share of the population reports spending any leisure time online (other than doing email and playing games). However, the figure shows that the share of the population who spend non-gaming and non-email leisure time online is increasing, and, on average, people who spend any leisure time online spend about 100 minutes a day—nearly one-third of their total daily leisure time.

Figure 4: Share of Population Using PC for Leisure and Average Number of Minutes on PC for Leisure on a Given Day, and Minutes Spent on PC for Leisure Among those who Used PC for Leisure



Another way in which the average is deceptive is that leisure time spent online differs by age. As most would expect, the amount of online leisure time decreases with age, more or less (Figure 5). People between 15 and 17 spend the most time online, followed by 18-24 year olds. Perhaps somewhat surprisingly, the remaining age groups do not report noticeably different amounts of time from each other. However, because total leisure time increases with age beginning with the group age 35-44, the share of leisure time spent online continues to decrease with age.

Figure 5: Minutes and Share of Leisure Time Online by Age Group in 2010



Perhaps not surprisingly given the trends discussed above, both the amount of leisure time spent online (Figure 6) and the share of respondents reporting spending leisure time online is generally increasing (Figure 7). The surprising exception to this trend is the 15-17 year-old age group, which appears to be spending less time engaged in online leisure over time.

Figure 6: Time Spent Using PC for Leisure by Age and Time

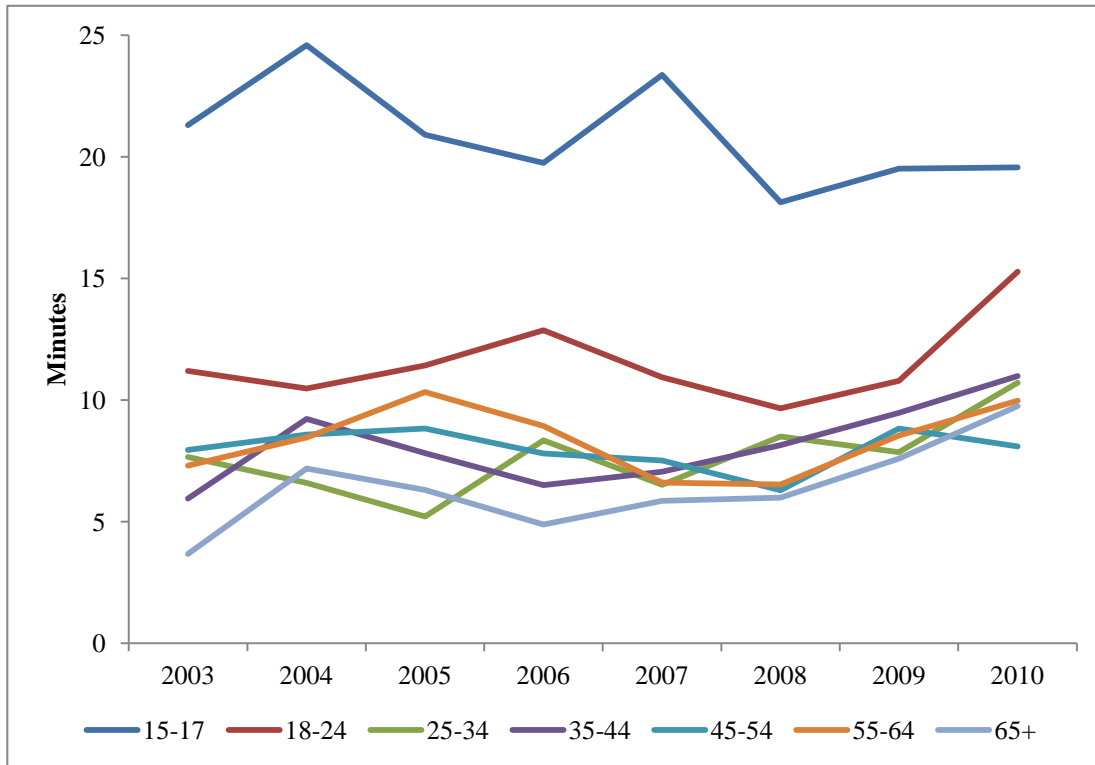
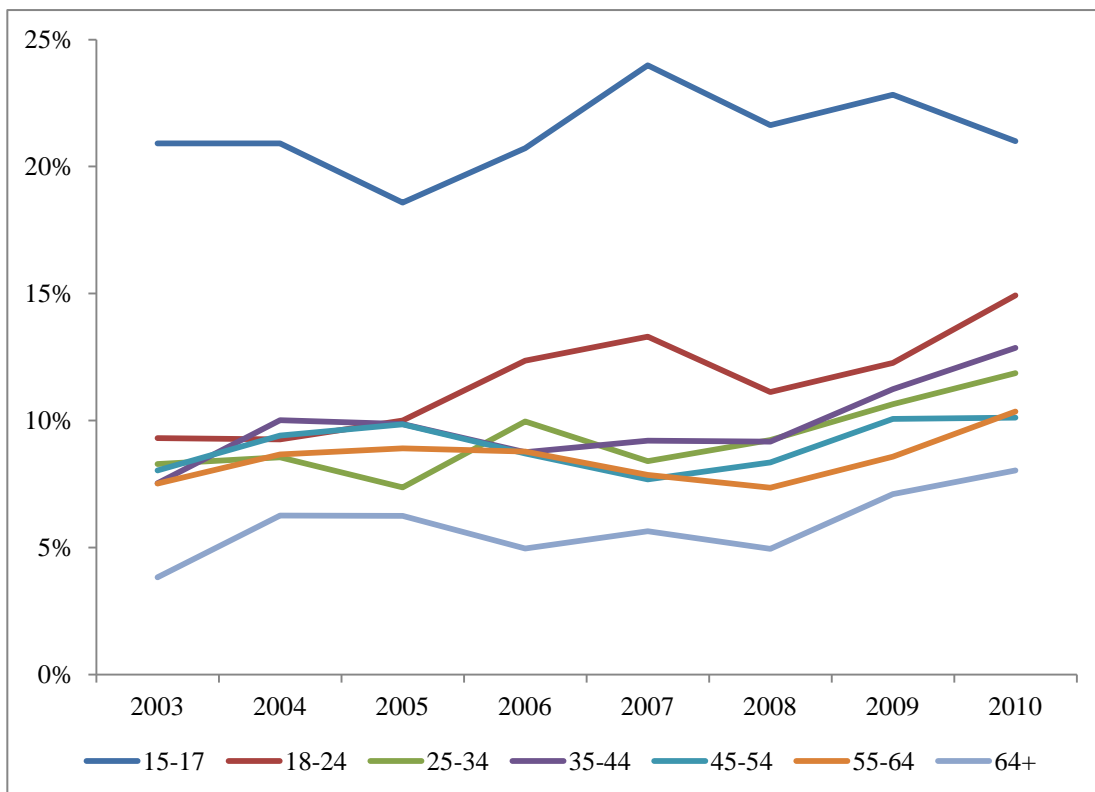


Figure 7: Share of Respondents Reporting PC Use for Leisure by Age and Time



Video

As Figure 1 showed, Americans spend a large share of the day watching TV or movies, reflecting more than half of all leisure time (Figure 2). Given the popularity of video, it should not be surprising that one of the biggest drivers of Internet bandwidth growth is increasing use of online video. Netflix, with about 25 million members in 2011¹³ and whose video streams in 2010 represented about 20 percent of all evening download traffic in the U.S.,¹⁴ is the preeminent example, but others include services like Hulu and iTunes. Additionally, a growing number of devices, including Roku and AppleTV, not to mention Internet-enabled televisions, are making it easier to stream or download video to be watched on televisions.

Online, or over-the-top (OTT), video delivery could radically affect several industries. If it significantly alters the way people obtain video it may upset the current model in which distributors aggregate content and sell it in bundles to consumers. For example, if all video content were available online and a la carte without traditional cable-type subscriptions, the current bundled subscription model would probably no longer be profitable.¹⁵ And dramatic increases in bandwidth—whether from video or any other source—may affect the investment levels required by the network and have implications for peering and transit arrangements that were negotiated under different circumstances.

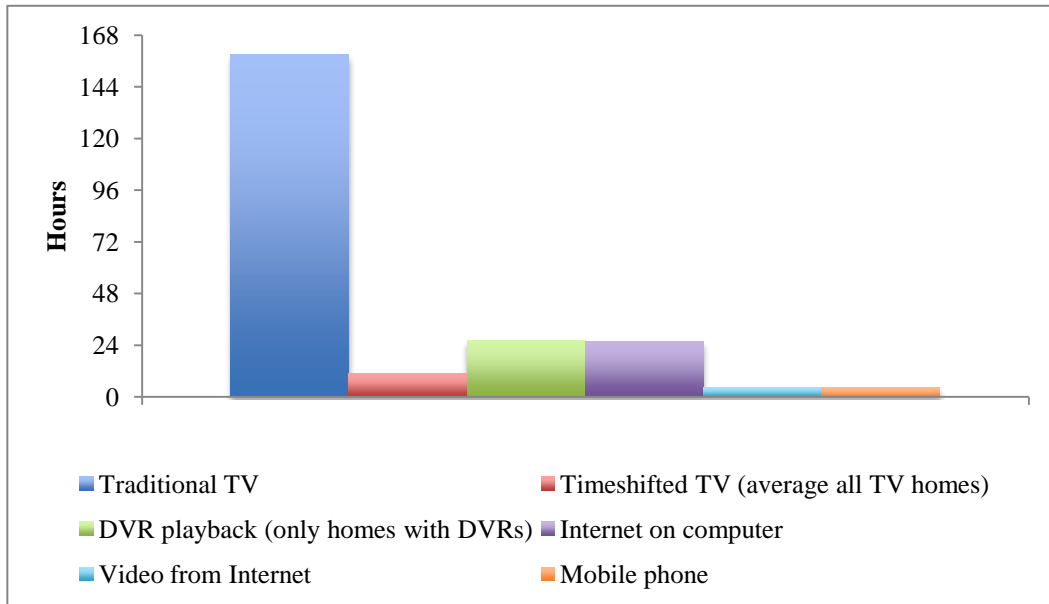
The first step in thinking about potential changes in the economics of video creation and distribution is to quantify the real effects of OTT video on video delivery: how big is it compared to traditional video delivery, how fast is it growing, and is it a substitute or a complement to traditional video? Despite the hype, OTT video thusfar remains small relative to traditional video. According to Nielsen, in the first quarter of 2011, the typical U.S. households watched about 158 hours of traditional TV and only 29 hours of Internet video (Figure 8). This ratio has the potential to change quickly, however: the amount of time spent watching Internet video increased by more than one hour over the previous year while the amount of time spent watching traditional TV increased by only 22 minutes.

¹³ <http://ir.netflix.com/> Accessed October 2, 2011.

¹⁴ Sandvine Intelligent Broadband Networks, *Fall 2010 Global Internet Phenomena Report*, 2010.

¹⁵ Laura Martin and Scott Wallsten, *Pricing Strategies in a Digital World*, Needham Insights (Needham & Company, LLC, March 8, 2011).

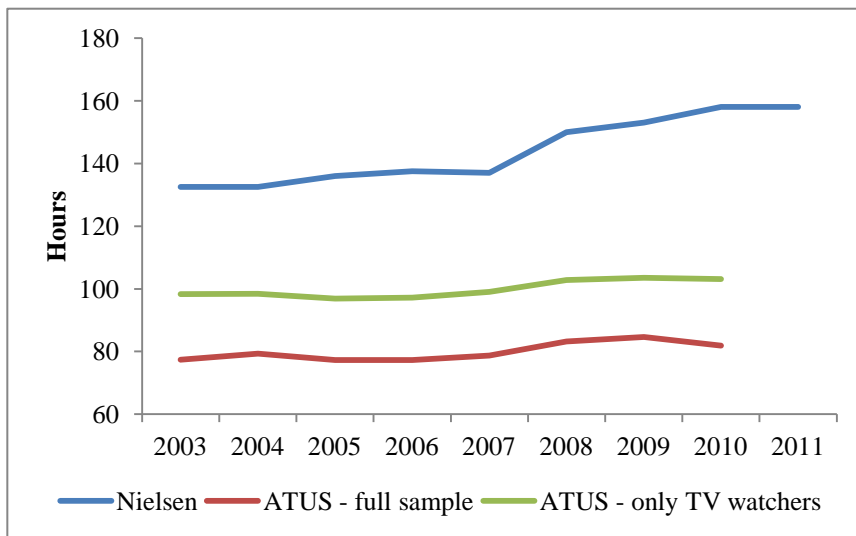
Figure 8: Monthly Hours of Video Watched in U.S. Households by Source, Q1 2011



Source: Nielsen (2011), Table 3.¹⁶

The ATUS data on TV watching differ significantly in magnitude from the Nielsen data, though show similar trends (Figure 9). While Nielsen says Americans watched about 158 hours of TV per month in the first quarter of 2011, the ATUS finds that in 2010 Americans watched about 163 minutes per day, or about 82 hours per month.

Figure 9: Average Minutes per Month Individuals Spend Watching TV by Data Source



The reasons for this large difference are unclear, but several explanations are possible. One possible explanation is sample selection. Nielsen data come from viewers who choose to

¹⁶ The Nielsen Company, *The Cross-Platform Report: Quarter 1, 2011*, State of the Media, 2011.

participate in Nielsen's measurement program.¹⁷ It is possible that these families consume more TV than the typical household, though one would imagine that Nielsen would try to correct for this bias. ATUS respondents also opt-in, but TV is but one of hundreds of activities they are asked to report.

Another partial explanation is that the ATUS numbers are averages across the entire sample (and weighted to reflect the population as a whole), including people who report spending no time on those activities. Nielsen, by contrast, includes only information from people who watch TV. But because almost everyone watches TV, even (weighted) averaging across the population that watches TV increases the ATUS estimate to about 200 minutes per day, or about 100 hours per month, still significantly below the Nielsen estimates.

Existing Research on Complement vs Substitute

Most analyses of video conclude that OTT and traditional video are complements, and the data to date have pointed in that direction. Nielsen has reported generally increased amounts of time watching TV and watching video.¹⁸ Israel and Katz (2010) cite those statistics as well as other Nielsen surveys suggesting that people watch online video to “catch up with programming or if the TV itself is unavailable.”¹⁹ While such data are suggestive, they do not necessarily demonstrate that the two are complements. That is, because other factors also affect time spent on these activities, simply because the two move together does not necessarily mean they are complements.

Indeed, other data suggest reasons to believe that the two are not complements. Subscription TV services lost a record number of subscribers in the second quarter of 2011 with estimates of the loss ranging from 380,000 to 450,000.²⁰ However, a decreasing number of subscribers to traditional cable-type services does not necessarily mean that people are substituting it with online video. A weak economy, for example, could just as easily account for the decrease.

Liebowitz and Zentner (2009) examine econometrically the relationship between Internet penetration and TV watching, using data from 1997 through 2003.²¹ They find a small negative correlation between the two, suggesting that online video was substituting for TV watching, at least among younger people. To my knowledge, this is the only paper that econometrically examines the relationship between TV and the Internet, and is an important step forward. The authors took the data as far as they possibly could, but their data are problematic, as they freely admit. First, 2003 is early in the world of online video, and not much content was yet available that could truly substitute for content on television. Second, Internet penetration is a crude variable in that it does not directly measure the key factor, which is online video use.

¹⁷ More specifically, Nielsen selects participants randomly “to represent the entire TV audience.” Even if it does manage to create a representative sample based on certain demographics, it is left with a bias created by measuring based on families who want to be measured <http://www.nielsen.com/us/en/about-us/nielsen-families.html>

¹⁸ The Nielson Company, *The Cross-Platform Report: Quarter 1, 2011*.

¹⁹ Mark Israel and Michael Katz, *The Comcast/NBCU Transaction and Online Video Distribution*, May 4, 2010, para. 30.

²⁰ http://www.usatoday.com/money/media/2011-08-10-cable-satellite_n.htm

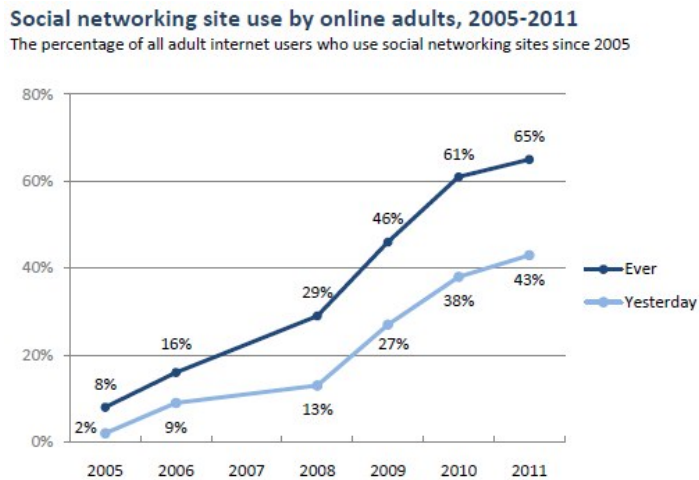
²¹ Stan J Liebowitz and Alejandro Zentner, “Clash of the Titans: Does Internet Use Reduce Television Viewing?,” *Review of Economics and Statistics*, Forthcoming (2009).

If OTT continues to grow, however, its growth will almost certainly come at the expense of traditional TV. The total amount of time in a day is fixed, and people generally have a relatively fixed amount of time for entertainment. More time spent on one form of entertainment is likely to come out of time that would have been spent on another form of entertainment, and video is likely to be the closest substitute to video.

Social Networking and Socializing

Connecting with other people has long been one of the great popular appeal of the Internet, from the days of AOL’s “You’ve Got Mail!” to Facebook today. Social networking has become the most popular online activity (Table 1). Survey data from the Pew Internet and American Life Project confirm this trend (Figure 10).

Figure 10: Share of Internet Users who Use Social Networking Sites



Source: Pew Research Center’s Internet & American Life Project surveys: February 2005, August 2006, May 2008, April 2009, May 2010, and May 2011. 22

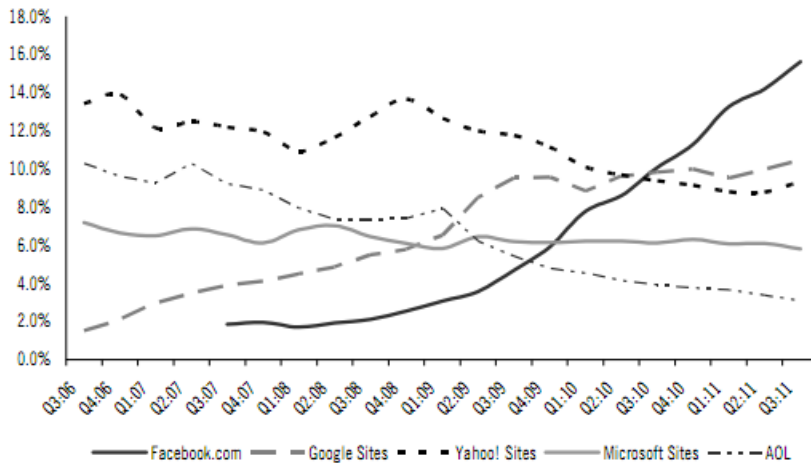
Indeed, Facebook claims to have 800 million “active” users,²³ and appears to represent the single largest share of time U.S. Internet users spend online (Figure 11).

²² <http://www.pewinternet.org/Reports/2011/Social-Networking-Sites/Report/Part-1.aspx>

²³ <http://www.facebook.com/press/info.php?statistics>

Figure 11: U.S. Share of Time Spent Online

Figure 6. U.S. Share Of Time Spent Online



Source: Citi Investment Research and Analysis

Scholars in various fields have investigated whether social networking strengthened or weakened other social ties, though there does not appear to be consensus on the answer.²⁴ Other work has examined the relationship between social networking and “life satisfaction.” One study of college students, for example, found generally positive, though small, correlations between more intense Facebook use and satisfaction measures.²⁵

Previous studies have asked whether online social networking might crowd out other activities. Early studies were inconclusive,²⁶ though the relevance of that research to today’s activities is questionable, given the changes in the Internet, its ubiquity, and the growing variety of social networking applications.

Most of the research, such as that discussed above, on how socializing online affects socializing offline appears to come from fields other than economics. On the one hand, that is not surprising—there may not be any first-order economic implications of these changes in time use. On the other hand, one can easily imagine economic effects if the changes were large.

For example, much of the value people derive from socializing comes from non-market activities: simply interacting with other people. By comparison, at the beginning of 2011 Facebook was valued at \$50 billion.²⁷ To be sure, people use Facebook while engaged in other

²⁴ See, for example, Barry Wellman et al., “Does the Internet Increase, Decrease, or Supplement Social Capital? : Social Networks, Participation, and Community Commitment,” *American Behavioral Scientist* 45, no. 3 (November 2001): 436-455; Valenzuela, Park, and Kee, “Is There Social Capital in a Social Network Site?: Facebook Use and College Students’ Life Satisfaction, Trust, and Participation.”

²⁵ Valenzuela, Park, and Kee, “Is There Social Capital in a Social Network Site?: Facebook Use and College Students’ Life Satisfaction, Trust, and Participation.”

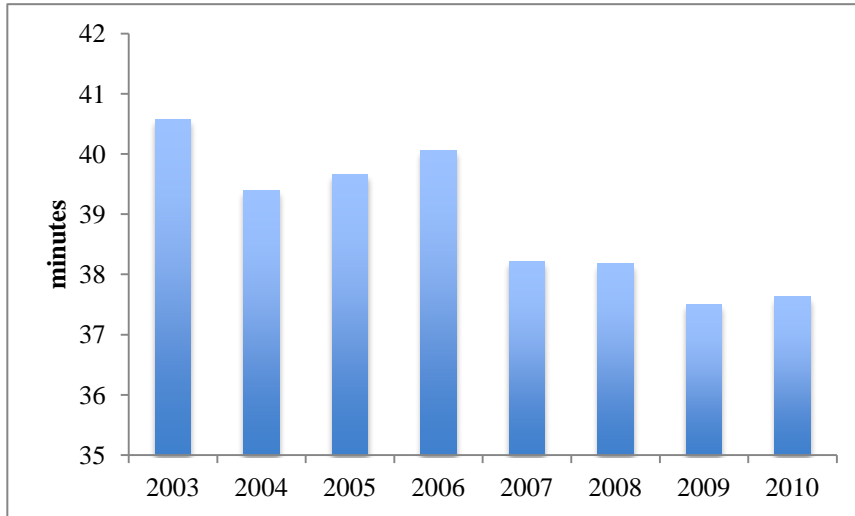
²⁶ Wellman et al., “Does the Internet Increase, Decrease, or Supplement Social Capital? : Social Networks, Participation, and Community Commitment,” 439.

²⁷ <http://www.guardian.co.uk/technology/2011/jan/03/facebook-value-50bn-goldman-sachs-investment>

socializing activities, meaning that this value is not solely monetizing time that was once used for nonmarket activities. Nevertheless, to the extent that Facebook crowds out other types of socializing, it is turning a non-market activity into a monetizable market activity.

At a high level, while time spent on social networking sites has been increasing, according to the ATUS the time spent socializing offline has been steadily, though slowly, decreasing (Figure 12).

Figure 12: Minutes per Day Spent Socializing Offline



Source: Derived from ATUS.

However, just because time spent socializing offline and time spent socializing online are moving in opposite directions does not, by itself, mean that one is crowding out the other. Just as with video, answering the question requires a more careful empirical analysis. The paper turns to that task now.

Empirical Analysis: Complements or Substitutes?

If leisure time is fixed, then more time spent on one leisure activity means less time spent on other activities. The general approach here is to explore the correlation between PC use for leisure and other leisure activities. The variables measuring leisure time are all continuous and left-censored at zero, suggesting a tobit analysis is most appropriate.²⁸ The analysis involves estimating equations of the following form using tobit analysis:

$$\text{leisure activity}_{it} = f\{\text{PC Use}_{it}, \text{income}_{it}, \text{labor force status}_{it}, \text{age}_{it}, \text{geographic and year fixed effects}\}$$

where i indicates a survey respondent and t indicates the survey year. I estimate the equation separately for each broad leisure activity, including watching TV, socializing, reading, playing

²⁸ Technically, daily time spent on any activity is also right-censored at 24 hours, though in practice no observations are right-censored when the equations are estimated.

sports, playing games, relaxing and thinking, and “other leisure.”²⁹ PC use is the amount of time spent using a computer for leisure except for playing games.

Other variables control for important factors affecting how much time people can spend on leisure activities. In particular, employment status, income, and age, all affect the amount of time a person has for leisure activities. “Labor force status” is a vector of dummy variables indicating whether the respondent is employed and working, employed but absent from work, employed but on layoff, unemployed and looking for work, or not in the labor force. Income is a vector of income ranges. The geographic fixed effects control for any differences in leisure time related to location, while the year fixed effects control for anomalies in any given year or general trends unrelated to the effects that interest us.

As a first step, I estimate the relationship between PC use for leisure and all other leisure time aggregated together. If PC use were net additive, then we would expect no correlation between that variable and other leisure time. If it were complementary in the sense that it increased other leisure activities we would expect a positive coefficient. If it crowds out other leisure activities then we would expect a negative coefficient, with perfect crowding out yielding a coefficient of negative 1.

Table 2 shows the results of this first regression. The regression reveals that the average net correlation between PC use and all other leisure was -0.28 and highly statistically significant. In other words, on average, between 2003 and 2010 each minute spent using a computer for leisure reduced time spent on other leisure activities by 0.28 minutes, suggesting that leisure time has been crowding out other leisure, but that the crowding out effect is only partial.

²⁹ “Other leisure activities” include “playing with household (hh) children, not sports,” “attending or hosting parties/receptions/ceremonies,” “attending movies/film,” “arts and entertainment, n.e.c.” (not elsewhere classified), “attending household children’s events,” “playing with non-hh children, not sports,” “attending performing arts,” “attending gaming establishments,” “attending museums,” “attending non-hh children’s events,” “relaxing and leisure n.e.c.,” “attending sporting events, n.e.c.,” “arts and crafts with hh children,” “attending/hosting social events, n.e.c.,” “socializing, relaxing, and leisure, n.e.c.,” and “arts and crafts with non-hh children.” Of these, only playing with hh children and attending or hosting parties, at 7.5 and 6.3 minutes, exceeds 2 minutes daily.

Table 2: PC Use and All Other Leisure

Dependent variable = Leisure time excluding PC use			
Mean of dependent variable = 289.31			
Computer use for leisure (exc. Games)	-0.275 (17.48)**	Family income \$35,000 to \$39,999	-12.452 (1.34)
Employed, absent	80.829 (22.16)**	Family income \$40,000 to \$49,999	-14.608 (1.90)+
Employed, but "on layoff"	119.301 (14.73)**	Family income \$50,000 to \$59,999	-6.889 (0.88)
Unemployed, looking for work	111.861 (37.27)**	Family income \$60,000 to \$74,999	-20.621 (2.90)**
Not in labor force	127.508 (90.37)**	Family income \$75,000 to \$99,999	-22.906 (3.34)**
Age	1.297 (35.07)**	Family income \$100,000 to \$149,999	-31.229 (4.40)**
Family income Less than \$5,000	4.557 (0.34)	Family income \$150,000 and over	-20.084 (2.48)*
Family income \$5,000 to \$7,499	8.521 (0.58)	Year 2004	2.850 (1.31)
Family income \$7,500 to \$9,999	24.762 (1.96)*	Year 2005	-0.722 (0.32)
Family income \$10,000 to \$12,499	14.834 (1.38)	Year 2006	-0.899 (0.40)
Family income \$12,500 to \$14,999	42.470 (3.66)**	Year 2007	0.621 (0.27)
Family income \$15,000 to \$19,999	21.815 (2.34)*	Year 2008	7.934 (3.53)**
Family income \$20,000 to \$24,999	-8.488 (0.95)	Year 2009	5.898 (2.65)**
Family income \$25,000 to \$29,999	-18.103 (2.00)*	Year 2010	5.047 (1.39)
Family income \$30,000 to \$34,999	-7.504 (0.86)	Constant	206.307 (40.75)**
Observations	112038		
Absolute value of t-statistics in parentheses			
+ significant at 10%; * significant at 5%; ** significant at 1%			

Notes: State fixed effects included, but not shown. The excluded category from the labor force indicators is "employed and working," from family income is "not reported," and 2003 from years.

The results on other variables are largely as one might expect. Given that the excluded labor market category is people who are employed and working, the results show that people with jobs tend to have the least leisure time, while those completely out of the labor force have the most leisure time. Age is generally positively correlated with leisure time, largely because retired people have large amounts of leisure time. The family income variable shows that, in general, leisure time decreases as income increases, until the top income category, when leisure time appears to increase again. The year variables indicate no particular trend.

Because computer and Internet use has changed substantially since 2003 it is reasonable to ask whether the correlation between online computer use and its relationship to other leisure activities has also changed. To investigate that question I estimate a variant of the above equation, by interacting PC use with year dummies to create a separate PC use variable for each year.

Table 3 shows the relevant results from estimating this regression. The results suggest that the correlation has, in fact, changed over time, increasing in magnitude from about -0.20 in 2003 to

as much as -0.37 in 2009. Curiously, the coefficient decreased to about -0.30 in 2010. Several possibilities could explain this result. One possibility could be that the relatively large increase in online leisure time in 2010 came disproportionately (relative to other years) from non-leisure activities. Another possibility is that as Internet use begins to migrate to other devices, such as television and smartphones, online time is actually increasingly recorded as other, offline, activities. I discuss this issue in more detail below.

Table 3: Abridged Regression results - Computer Use For Leisure Over Time

Computer use for leisure 2003	-0.211 (5.53)**
Computer use for leisure 2004	-0.236 (5.62)**
Computer use for leisure 2005	-0.259 (5.57)**
Computer use for leisure 2006	-0.199 (4.27)**
Computer use for leisure 2007	-0.300 (5.96)**
Computer use for leisure 2008	-0.364 (7.38)**
Computer use for leisure 2009	-0.372 (8.34)**
Computer use for leisure 2010	-0.295 (7.14)**

Note: All other variables identical to those shown in Table 2, but not shown here.

The above results evaluate the relationship between PC use and leisure time as a whole, but leisure time consists of many activities. The next step is to unpack the various components of leisure time. PC use might complement some and substitute for others.

Table 4 shows the results of these regressions. The biggest single source of time for online activities appears to be relaxing and thinking, followed by socializing, watching TV, and playing sports. The coefficient on “other leisure” is also negative and relatively large.

PC use is positively correlated with reading and playing games. Because respondents can report time spent on multiple activities simultaneously, however, it is not possible to know whether the positive correlation for reading means more time with traditional materials, that some of the time on the PC is spent reading online, or both. Similarly, while the variable for using PCs for leisure explicitly excludes games, the variable for playing games does not exclude computers. Thus, the complementary nature of using PCs for leisure and playing games could simply mean that people who spend more leisure time online also spend time playing games online as there is no way to separate online versus offline game playing.

Table 4: Regression Results - PC Use and Leisure Activities

	Watching TV	Socializing and communicating	Reading	Sports	Games	Relaxing and thinking	Other leisure
Mean of dependent variable	160.03	38.88	22.16	18.1	11.47	17.7	21
Computer use for leisure (exc. Games)	-0.123 (7.85)**	-0.141 (8.28)**	0.061 (4.48)**	-0.038 (1.68)+	0.132 (3.91)**	-0.264 (10.48)**	-0.363 (10.59)**
Employed, absent	38.437 (10.59)**	34.029 (9.29)**	25.040 (8.06)**	17.649 (3.47)**	22.373 (2.51)*	-4.582 (0.90)	27.267 (4.17)**
Employed, but "on layoff"	75.728 (9.47)**	35.945 (4.41)**	-2.441 (0.33)	32.920 (2.99)**	46.128 (2.47)*	-4.899 (0.43)	30.672 (2.12)*
Unemployed, looking for work	79.732 (26.90)**	39.269 (13.11)**	4.486 (1.58)	15.399 (3.72)**	91.937 (14.38)**	-1.625 (0.38)	-11.584 (2.11)*
Not in labor force	80.236 (57.40)**	33.747 (23.43)**	20.488 (16.76)**	21.067 (10.63)**	105.483 (31.84)**	17.080 (9.01)**	12.190 (4.63)**
Age	1.584 (43.16)**	-0.644 (17.06)**	2.673 (78.55)**	-1.159 (22.37)**	-1.502 (18.21)**	1.619 (32.11)**	-3.549 (48.38)**
Family income Less than \$5,000	1.654 (0.13)	4.937 (0.36)	-14.368 (1.14)	-9.490 (0.973)	-20.777 (0.69)	55.086 (29.393)	-72.432 (-26.471)
Family income \$5,000 to \$7,499	12.204 (0.85)	-10.023 (0.64)	-58.382 (3.80)**	-21.313 (0.95)	-88.836 (2.32)*	69.548 (3.83)**	-58.104 (1.86)+
Family income \$7,500 to \$9,999	9.258 (0.74)	19.654 (1.52)	-49.814 (4.00)**	-20.085 (1.04)	8.139 (0.30)	66.869 (4.25)**	-52.155 (1.88)+
Family income \$10,000 to \$12,499	9.508 (0.90)	26.457 (2.43)*	-20.801 (2.09)*	-59.553 (3.29)**	-50.422 (1.90)+	48.914 (3.57)**	-49.000 (2.11)*
Family income \$12,500 to \$14,999	14.942 (1.31)	35.684 (3.06)**	-15.172 (1.44)	2.454 (0.15)	30.250 (1.22)	44.764 (3.03)**	-3.418 (0.15)
Family income \$15,000 to \$19,999	11.469 (1.24)	17.637 (1.83)+	-8.121 (0.95)	-35.112 (2.37)*	-18.486 (0.85)	39.314 (3.25)**	-37.061 (1.90)+
Family income \$20,000 to \$24,999	-11.346 (1.29)	3.083 (0.33)	-16.945 (2.04)*	-19.612 (1.44)	-13.582 (0.66)	51.872 (4.54)**	-16.916 (0.94)
Family income \$25,000 to \$29,999	-25.137 (2.81)**	12.452 (1.33)	-1.318 (0.16)	-8.091 (0.60)	-41.089 (1.85)+	10.635 (0.86)	-24.489 (1.34)
Family income \$30,000 to \$34,999	-13.980 (1.61)	12.259 (1.36)	-7.264 (0.91)	12.783 (1.02)	-29.663 (1.40)	23.806 (2.03)*	-23.793 (1.33)
Family income \$35,000 to \$39,999	-20.796 (2.25)*	-9.886 (0.99)	2.502 (0.30)	-0.182 (0.01)	14.299 (0.68)	10.282 (0.81)	5.643 (0.31)
Family income \$40,000 to \$49,999	-22.545 (2.96)**	2.268 (0.28)	4.497 (0.65)	0.497 (0.09)	-38.385 (2.03)*	(3.24)**	(2.56)*
Family income \$50,000 to \$59,999	-34.632 (4.45)**	16.225 (2.01)*	6.502 (0.92)	18.488 (1.67)+	-5.850 (0.32)	34.710 (3.32)**	22.968 (1.58)
Family income \$60,000 to \$74,999	-43.141 (6.09)**	16.009 (2.18)*	11.504 (1.80)+	42.536 (4.37)**	-4.461 (0.27)	11.407 (1.15)	27.792 (2.12)*
Family income \$75,000 to \$99,999	-45.670 (6.66)**	1.887 (0.26)	11.956 (1.94)+	46.094 (4.94)**	-21.343 (1.29)	13.731 (1.44)	41.101 (3.28)**
Family income \$100,000 to \$149,999	-53.148 (7.50)**	5.363 (0.72)	22.115 (3.55)**	33.198 (3.40)**	-6.948 (0.41)	-20.831 (1.98)*	54.872 (4.32)**
Family income \$150,000 and over	-58.896 (7.27)**	12.050 (1.44)	40.414 (5.89)**	87.514 (8.50)**	-49.440 (2.37)*	-27.961 (2.26)*	86.613 (6.19)**
Year 2004	4.367 (2.01)*	-1.244 (0.56)	7.019 (3.77)**	-0.084 (0.03)	6.415 (1.21)	-15.777 (5.43)**	5.813 (1.43)
Year 2005	-0.473 (0.21)	-0.017 (0.01)	4.240 (2.22)*	-0.070 (0.02)	6.299 (1.17)	-3.951 (1.35)	-1.184 (0.28)
Year 2006	2.566 (1.16)	-0.085 (0.04)	0.092 (0.05)	0.382 (0.12)	12.313 (2.29)*	-8.522 (2.89)**	-0.144 (0.03)
Year 2007	4.489 (1.99)*	-7.118 (3.04)**	-5.710 (2.90)**	6.371 (1.98)*	13.939 (2.55)*	-15.388 (5.08)**	2.866 (0.67)
Year 2008	16.832 (7.55)**	-4.587 (1.99)*	-8.620 (4.41)**	2.925 (0.92)	23.103 (4.33)**	-19.059 (6.35)**	-0.785 (0.19)
Year 2009	16.104 (7.29)**	-5.135 (2.25)*	-11.424 (5.90)**	3.522 (1.12)	32.976 (6.32)**	-25.293 (8.43)**	3.413 (0.82)
Year 2010	28.739 (8.02)**	-17.726 (4.68)**	-26.944 (8.23)**	-11.136 (2.12)*	27.500 (3.27)**	-37.582 (7.39)**	-15.560 (2.23)*
Constant	58.313 (10.97)**	-50.756 (9.08)**	-187.265 (27.15)**	-160.125 (19.85)**	-239.629 (48.57)**	-412.221 (28.20)**	-147.103 (13.43)**
Observations	112038	112038	112038	112038	112038	112038	112038

Absolute value of t-statistics in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Note: State fixed effects included, but not shown.

The results in Table 4 suggest that, on average, since 2003, each leisure minute spent online is correlated with 0.12 minutes less watching TV, 0.14 minutes less socializing, and 0.26 minutes less relaxing. As online content changes, however, it is possible that these correlations have also changed over time. To investigate this possibility, I estimate the same equation but interact the computer leisure time variable with the year dummy variables.

Table 5 shows the results of this regression. The clearest trend is the relationship between online leisure time and relaxing. The correlation in 2003 was -0.20 but by 2010 had increased to -0.42, suggesting that online time is increasingly crowding out relaxation.

Table 5: Abridged Regression Results - Computer Use and Leisure Activities Over Time

	Watching TV	Socializing and communicating	Reading	Sports	Games	Relaxing and thinking	Other leisure
Computer use for leisure 2003	-0.033 (0.87)	-0.105 (2.56)*	0.030 (0.90)	-0.108 (1.87)+	0.144 (1.73)+	-0.205 (3.57)**	-0.549 (6.05)**
Computer use for leisure 2004	-0.103 (2.46)*	-0.151 (3.38)**	0.084 (2.41)*	-0.034 (0.55)	0.143 (1.60)	-0.225 (3.42)**	-0.304 (3.40)**
Computer use for leisure 2005	-0.122 (2.59)**	-0.159 (3.18)**	0.088 (2.25)*	-0.020 (0.29)	0.182 (1.81)+	-0.369 (4.75)**	-0.197 (2.13)*
Computer use for leisure 2006	-0.068 (1.45)	-0.174 (3.40)**	0.092 (2.30)*	0.090 (1.46)	0.135 (1.37)	-0.158 (2.29)*	-0.568 (5.00)**
Computer use for leisure 2007	-0.177 (3.49)**	-0.113 (2.10)*	0.043 (0.97)	0.013 (0.19)	0.148 (1.41)	-0.319 (3.73)**	-0.210 (2.11)*
Computer use for leisure 2008	-0.178 (3.63)**	-0.170 (3.17)**	0.039 (0.90)	-0.112 (1.54)	-0.009 (0.08)	-0.319 (3.87)**	-0.352 (3.32)**
Computer use for leisure 2009	-0.244 (5.45)**	-0.161 (3.23)**	0.029 (0.75)	-0.008 (0.12)	0.107 (1.12)	-0.194 (2.80)**	-0.322 (3.25)**
Computer use for leisure 2010	-0.117 (2.84)**	-0.115 (2.58)*	0.080 (2.17)*	-0.108 (1.75)+	0.169 (1.94)+	-0.418 (5.44)**	-0.396 (4.27)**

Note: Income, age, geographic and year dummies included but not shown here.

Other activities also, however, show interesting trends. The correlation between online leisure time and watching TV increased steadily, both in magnitude and in statistical significance from 2003 – 2009. The coefficients suggest that not only was the amount of online leisure time increasing, but the crowding out effect was increasing, as well.

In 2010, however, the magnitude of the correlation between PC use for leisure and TV watching decreased. One explanation could be that online leisure simply became less of a substitute for TV watching. The trend in online video, however, suggests that such an explanation is implausible. A more plausible explanation has to do with the way the variables are measured and the changing way people watch video online. In particular, people are increasingly watching online video televisions instead of on computers. Roku, manufacturer of one device that streams to televisions, reported that by January 2011 it had “served its one billionth stream of content”³⁰ while its sales apparently doubled over 2010.³¹

The tradeoff between online video and traditional television viewing is likely to increase. Video that people traditionally have watched on television, such as prime-time network shows, are increasingly available online through services like Hulu. In addition, it is becoming easier to watch online video on television sets through devices like Roku and AppleTV, gaming systems like Xbox and Nintendo Wii, and Internet-enabled televisions. Some reports suggest that traditional video distributors are considering unbundling channels at least partly because of competition from online video.³²

³⁰

http://www.roku.com/Libraries/Press_Releases/Roku_Reaches_1_Billion_Streams_of_Content_to_the_TV.sflb.ashx?download=true

³¹ http://articles.businessinsider.com/2010-12-20/tech/30046832_1_apple-tv-amazon-app-store

³² <http://www.reuters.com/article/2011/09/27/cable-idUSS1E78K05L20110927>

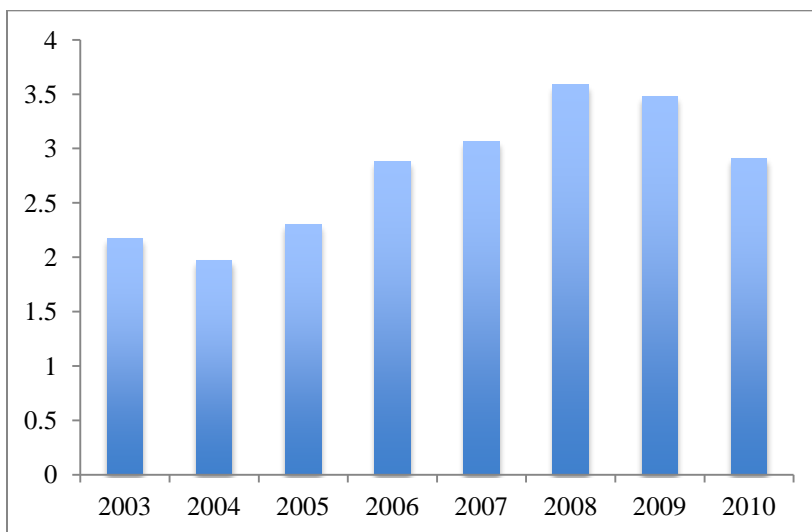
The transition to watching online video through television set also means, unfortunately, that ATUS is unlikely to be a useful dataset in the future for measuring a tradeoff between online and traditional television viewing unless BLS changes the survey questions or coding methods. The ATUS questions are written in such a way that respondents are likely to code online video viewed on their televisions as “watching TV” rather than “using a PC for leisure.” This is a serious problem with using ATUS to measure the effects of online video going forward—the more people watch video on their televisions, the less likely that ATUS will be able to capture this effect.

E-Mail is So 2008

As discussed above, time spent engaged in personal (as opposed to work or volunteer) email is separate from computer leisure in the ATUS data. This separation allows us to examine the relationship not just between online and offline leisure, but between shifts in time spent in online activities—in particular, email and online leisure.

As shown in Table 1 above, Nielsen reported that e-mail decreased as a share of online time from 11.5 percent in 2009 to 8.3 percent in 2010. ATUS data are consistent with Nielsen’s finding. Figure 13 shows that time spent engaged in personal e-mail peaked in 2008 at X minutes and fell sharply in 2009 and 2010, from X minutes to X minutes, respectively .

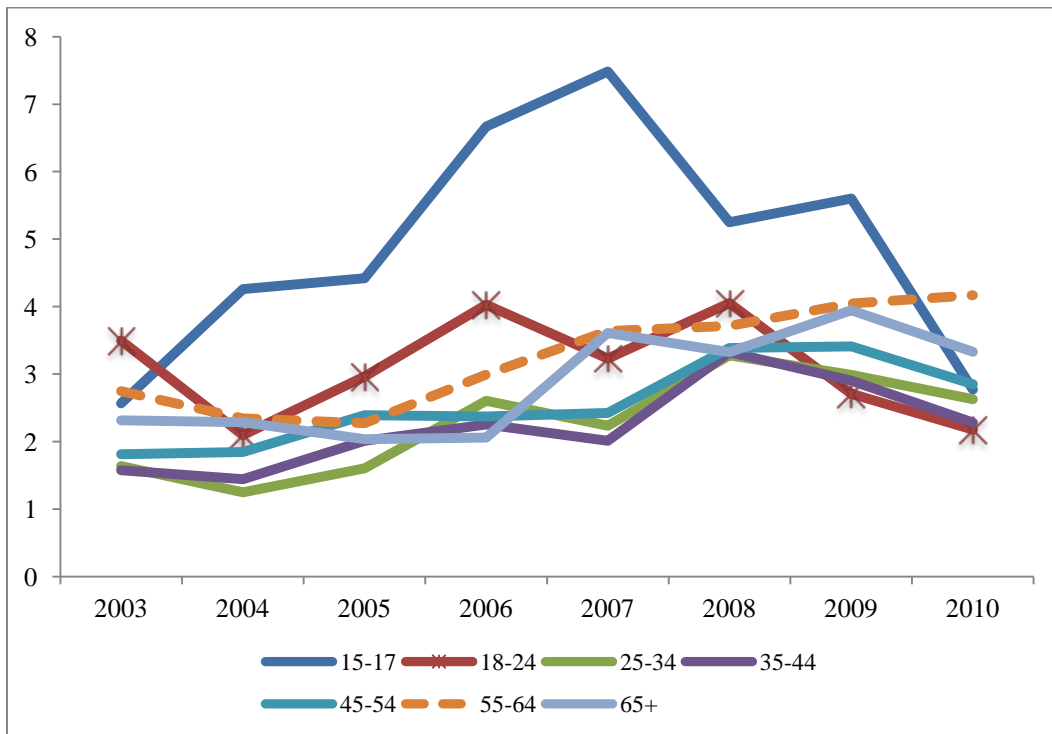
Figure 13: Minutes Per Day Engaged in Personal E-Mail



Source: Derived from ATUS.

This average masks large differences across age groups, as shown in Figure 14. The Figure shows that time spent using e-mail by the youngest group (ages 15-17) decreased by more than 60 percent from its peak of 7.5 minutes per day in 2007 to 2.8 minutes per day in 2010. Similarly, the time people age 18-24 spent on personal e-mail decreased about 50 percent from its peak of 4 minutes in 2008. The only group that showed a consistent increase in time spent on personal e-mail is people age 55-64, who spent 4.2 minutes on e-mail in 2010, the most of any age group.

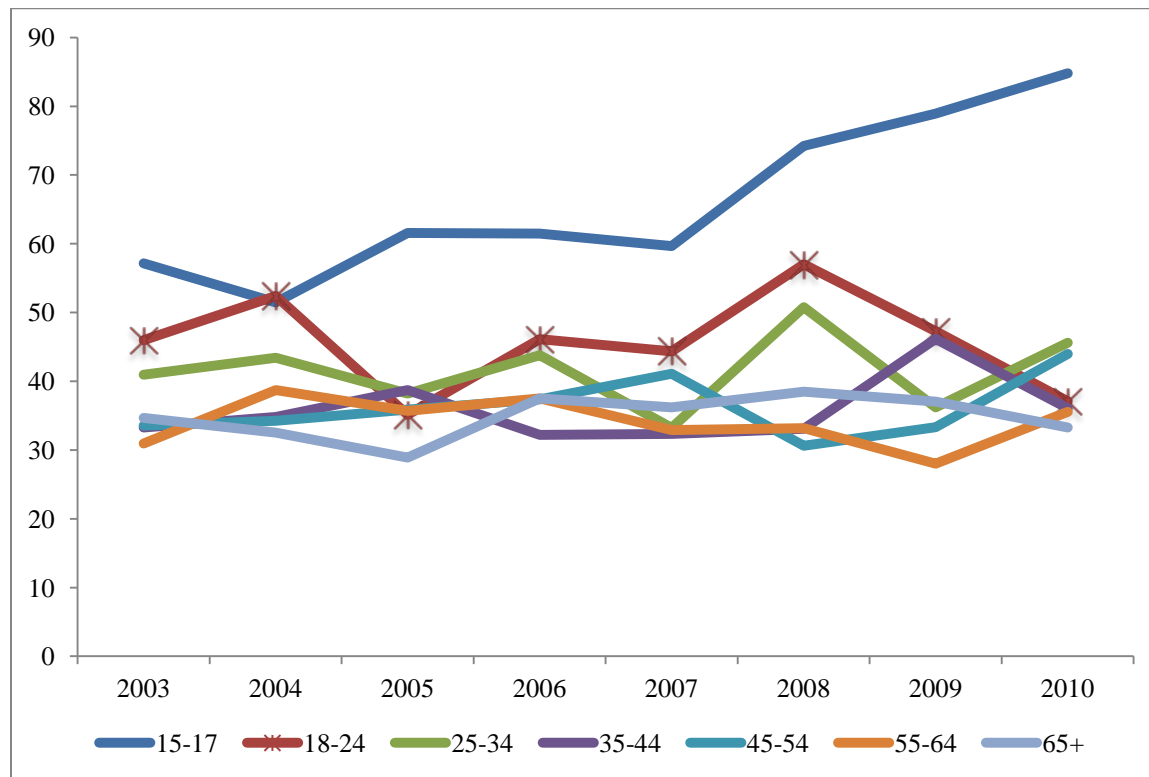
Figure 14: Minutes Per Day Engaged in Personal E-Mail By Age and Year



Especially for younger people, texting via mobile phone is likely to be at least a partial substitute for e-mail. Unfortunately, ATUS does not separately track time spent texting, and instead includes it in its measure of time spent engaged in telephone calls. Several factors make it difficult to identify the effect of texting on this measure. In particular, rapidly growing mobile phone use by young people and changing prices of marginal minutes of voice make it difficult to know what is affecting the ATUS measure.

Nevertheless, looking at time spent on telephone calls may give us some insights. We can partially mitigate the problem of increasing cell phone ownership by looking at averages only among people who have phones. Figure 15 shows average time spent on the phone with neighbors, friends, and acquaintances among people who spent any time on the phone.

Figure 15: Average Minutes Per Day on Telephone With Neighbors, Friends, and Acquaintances by Age and Year Among People Who Spend Any Time on the Phone



The figure shows a sharp increase in this time among people age 15-17, which is consistent with the decrease in time spent on e-mail and the decrease in measured online leisure time. People age 18-24, however, show a sharp *decrease* in time spent on the phone after 2008. Recall that group saw an increase in online leisure time, so perhaps they are more likely to substitute e-mail with certain online activities like Facebook rather than texting. However, those hypotheses should be considered critically. The correlations are consistent with the hypotheses, but do not rule out many others, including those stemming not just from changes in voice telephony markets discussed above, but also from the problem that time spent texting is only a component—of unknown magnitude—of telephone calls.

We can explore the decline of email a bit more rigorously using the same empirical framework we used above. This analysis presents two challenges, only one of which I feel the data can handle in a plausibly defensible manner. First, email and online leisure are likely to be highly correlated and therefore endogenous regardless of potential substitutability between them—people who engage in online leisure are also likely to use email, and (probably) vice-versa. We can mitigate this problem similar to what we did above, by making the analysis conditional on spending any time engaged in online leisure.

The second problem is that of texting, as described above. Without a good measure of texting it is difficult to separate the different activities that might substitute for e-mail.

Table 6 shows the (abridged) results of the tobit analysis, with time spent engaged in personal e-mail as the dependent variable. As above, the analysis controls for income, age, labor force status, year, and location. The analysis reveals a negative, but generally statistically insignificant, correlation between e-mail and online leisure from 2003 – 2009. In 2010, however, the correlation becomes statistically significant and of much larger magnitude. The result is consistent with the hypothesis that people are substituting e-mail with certain types of online leisure—a result that would certainly please Facebook. The analysis suggests that in 2010 each additional minute on online leisure led to 0.17 minutes less time doing e-mail. But without being able to incorporate texting explicitly, we cannot say for sure that the relationship is not spurious.

Table 6: Abridged Regression Results: Email and Online Leisure

Online leisure 2003	-0.07 (1.27)
Online leisure 2004	-0.09 (1.64)+
Online leisure 2005	-0.09 (1.28)
Online leisure 2006	-0.07 (1.16)
Online leisure 2007	-0.03 (0.51)
Online leisure 2008	-0.07 (1.02)
Online leisure 2009	-0.05 (0.88)
Online leisure 2010	-0.17 (2.49)**

Discussion and Conclusions

Analysis of about 110,000 person-year observations from the American Time Use Survey demonstrates not only that an increasing share of Americans are spending an increasing amount of their leisure time online, but that the cost of online leisure time is less time spent on other leisure activities. Online leisure time comes from a variety of other types of leisure, principally relaxing and thinking, socializing and communicating, and watching TV and movies.

The results strongly suggest that online leisure time comes, at least partly, out of other leisure time. But taken together, the analysis suggests that each minute of online leisure, on net, crowds out about 0.27 minutes of offline leisure. This raises the obvious question regarding the remaining 0.33 minutes.

One possibility is that online leisure crowds out other types of activity, such as paid or volunteer work. A more likely explanation, however, is that while online leisure has a crowd-out effect, some online leisure is done simultaneously with other types of leisure. A 2011 survey by Harris Interactive, for example, found that more than half of all respondents are engaged in online

activities while watching television.³³ While most people are probably not watching video online while watching television, many surely use sites like Facebook and Twitter while watching TV.

As discussed above, while ATUS records events done simultaneously, that information does not appear to be available as usable data. As a result, we cannot know how much online leisure takes place coincidentally with offline leisure. Answering that question is clearly important for better understanding the implications of online leisure.

Nevertheless, the empirical results raise intriguing questions. First, to the extent that a large share of online leisure involves social networking, as Nielsen and Pew surveys suggest, then these results suggest that one cost of online social networking is less time socializing in the real world.

Second, the results suggest that online video is already at least a partial substitute for watching television and videos. Across the entire population the numbers, in terms of minutes of online video watched and share of the population engaged in that activity, is small, at least was small through 2010.

Additionally, the data show a dramatic decrease in time spent doing personal e-mail, and the analyses are consistent with the possibility that new online activities crowd out previous online activities as well as some offline activities.

In sum, online leisure activities like video and social networking are not purely additive. They come with costs, which include less of other types of leisure: less traditional television watching, less socializing, and less relaxing.

33

<http://www.harrisinteractive.com/NewsRoom/HarrisPolls/tabid/447/mid/1508/articleId/818/ctl/ReadCustom%20Default/Default.aspx>