Trading Dollars for Dollars:

The Price of Attention Online and Offline

(Online Appendix)

Matthew Gentzkow

Chicago Booth and NBER

December, 2013

1 Details of Data Construction

1.1 Advertising Revenue

I combine several sources to produce data on total US advertising revenue for newspapers, magazines, radio, television, and Internet in the years 1920-2012. I report all figures in constant 2012 dollars (Bureau of Labor Statistics 2013a).

The core of the dataset is data for non-Internet media in the years 1935-2007 compiled by Robert Coen of the McCann advertising agency (Newspaper Association of America 2013a). These data are widely considered to be the authoritative source for historical revenue, and have been reported in numerous historical publications (e.g., Bureau of the Census 1975, Sterling 1984, and Sterling and Kittross 2001). I set television revenue to zero for years before 1940.

For the years 1920-34, I supplement these data with estimates for newspapers and radio by Galbi (2008). These estimates are based on data from Robert Coen (which are less complete in these years) along with other historical sources.

For magazines, radio, and television in the years 2007-12, I use data from Kantar Media (2013). To make these data comparable, I scale them for each medium by the mean ratio of the total from Newspaper Association of America (2013a) to the total reported by Kantar in the years where the two datasets overlap, namely 2003-2007. For newspapers in the years 2007-12, I use data from the Newspaper Association of America (2013a).

Data for the Internet in the years 2001-12 are total digital advertising as reported by eMarketer (2013a), collected from various sources. I set Internet revenue to zero for years 1995 and earlier, and linearly interpolate values between zero in 1995 and the eMarketer (2013a) value for 2001. I also use estimates of online newspaper revenue from the Newspaper Association of America (2013a) for the years 2008 and 2012.

1.2 Time Use

I combine several sources to produce data on the average minutes per day spent by American adults reading newspapers, reading magazines, watching television, and using the Internet in the years 1920-2012, and listening to the radio in the years 1920-1970.

The starting point of this dataset is the Video Consumer Mapping Study (VCMS) (Hess 2009), a 2008 study sponsored by Nielsen. Trained surveyors shadowed 376 participants for two full days, one in the fall and one in the spring, observing and recording all media use, as well as "life activities" done concurrently with media use such as eating or driving a car. The sample was drawn from five Designated Market Areas (Atlanta, Chicago, Dallas, Philadelphia, and Seattle), and was designed to be demographically representative. The study reports the number of minutes in which each medium was the only or the primary medium in use, distinguishing time concurrent with other life activities from time devoted to media use exclusively. For each medium, I compute average minutes per day as the minutes for exclusive media use plus half of the minutes concurrent with other activities.[1]

For newspapers, I estimate average minutes in each year by total daily circulation times the ratio of VCMS minutes to daily circulation in 2008. For total daily circulation in the years 1921-1944, I use data from Editor and Publisher (Various Years), and for the years 1945-2012, I use data from Newspaper Association of America (2013b).

For magazines, I estimate average minutes in each year by total monthly circulation reported by Sumner (2010) times the ratio of VCMS minutes to daily circulation in 2008.

For television, I first construct a time series of self-reported television hours by combining American Time Use Study data (Bureau of Labor Statistics 2013b) for 2003-2012 with historical time use data for 1965, 1975, 1985, and 1993 compiled by Aguiar and Hurst (2007), linearly interpolating between the latter years. I extend these data back to 1946 by multiplying the share of households with televisions 1946-65 as reported by Sterling (1984) with the ratio of the Aguiar and Hurst time use value to the share of households with televisions in 1965. I set time use to zero in years before 1946. Finally, I multiply the series by the ratio of VCMS minutes to ATUS minutes in 2008.

For radio, I begin with estimates of average minutes of radio use in various years 1931-70 from Sterling (1984). I construct an annual series by interpolating between years. I extend the series back to 1920 by multiplying the share of households with radios in 1922-31 reported by Sterling (1984) times the ratio of minutes in 1931 to the share of households with radios in 1931. I set radio hours to zero in years before 1922. Finally, I multiply the series by the ratio of my main measure of VCMS radio minutes (exclusive media use minutes plus half of concurrent minutes) to total VCMS radio minutes.

For Internet, I begin with total minutes of Internet use 2008-12 from comScore (2013a). I extend this series back to 1992 by multiplying the number of Americans using the Internet estimated from the Pew Research Center for the People and the Press (2013) data times total minutes per Internet user extrapolated linearly from the 2008-12 data. I set Internet hours to zero in years before 1996. I then scale this series by

---

[1]The goal here is to roughly approximate time spent paying attention to media. Time concurrent with other activities could include time we would want to include in this definition (listening to the radio while driving or watching TV while eating) as well as time we would not want to include (socializing with the television on in the background). For simplicity, I therefore include half of the concurrent minutes.

the ratio of 2008 VCMS web minutes to 2008 total Internet minutes from comScore.

For online newspapers, I begin with total minutes of online newspaper use in 2010-12 from comScore (2013b). I extend this series back to 2004 using total minutes of online newspaper use in 2004-10 from Nielsen NetRatings (2013) multiplied by the ratio of comScore minutes to Nielsen minutes in 2010.

2   Robustness

The finding that the price of attention for online newspapers is similar or greater than the price for print newspapers is robust to alternative ways of measuring time use.
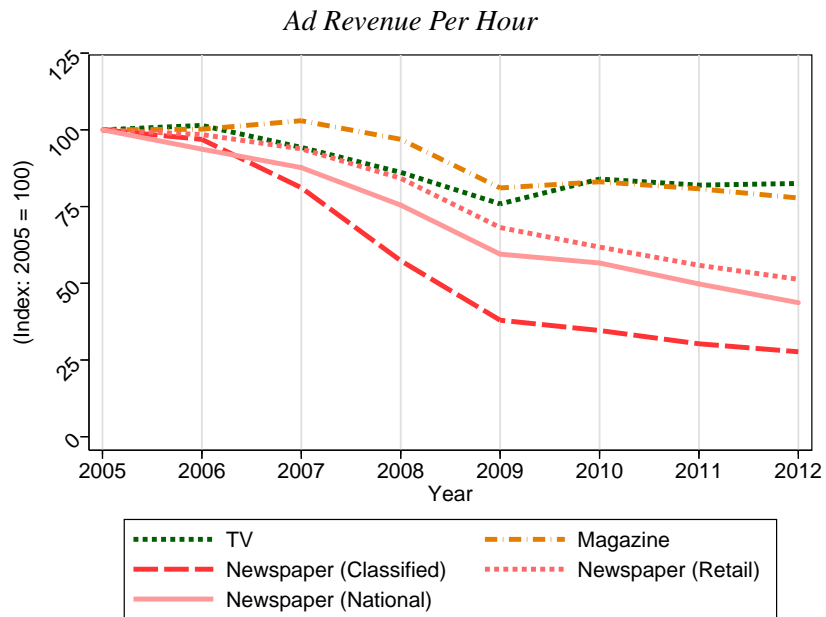
Alternative sources for daily minutes spent reading print newspapers in recent years imply values greater than the 8-9 minutes reported in Table 1, and thus an even lower price of attention offline. For example, eMarketer (2013b) reports an average of 30 minutes in 2010 and 22 minutes in 2012. Barclay's (2009) reports that Americans spend 27% as much time reading newspapers as they spend watching television, whereas the estimates in Table 1 imply they spend less than 5 percent as much time.

Alternative sources for daily minutes spent reading online newspapers imply values smaller than the 0.5-0.6 minutes reported in Table 1, and thus a higher price of attention online. For example, 2010 minutes reported by Nielsen NetRatings (2013) are approximately two thirds of this value.

References

Aguiar, Mark and Erik Hurst. 2007. Measuring trends in leisure: The allocation of time over five decades. *Quarterly Journal of Economics*. 122(3). 969-1006.

Bureau of the Census. 1975. *Historical Statistics of the United States: Colonial Times to 1970*. U.S. Department of Commerce.

Bureau of Labor Statistics. 2013a. Consumer Price Index - All Urban Consumers. Accessed at <http://data.bls.gov> on Oct 16, 2013.

———. 2013b. American Time Use Survey 2003-12. Accessed at <http://www.bls.gov/tus/datafiles_0312.htm> on December 10th, 2013.

comScore Media Metrix. 2013a. Total minutes of Internet use 2008-12. Received in email from Young, Eric <eyoung@comscore.com> on December 16, 2013.

———. 2013b. comScore Newspaper Audience for Web. Accessed at <http://www.naa.org/Trends-and-Numbers/Newspaper-Websites/Newspaper-Web-Audience.aspx> on December 10, 2013.

Editor and Publisher. Various Years. U.S. Historical Circulation 1921-1944. *Editor and Publisher International Yearbook*.

eMarketer. 2013a. US Total Media Advertising Spending 2001-2012. Accessed at <http://www.emarketer.com/Article/US-Total-Media-Ad-Spend-Inches-Up-Pushed-by-Digital/1010154> <http://www.imediaconnection.com/printpage/printpage.aspx?id=11517> <http://www.emarketer.com/Article/US-Online-Ad-Spend-Turns-Corner/1007415> <http://www.iab.net/research/industry_data_and_landscape/1675/1707493> and <http://news.cnet.com/8301-10784_3-9897132-7.html> on December 16, 2013.

eMarketer. 2013b. Digital Set to Surpass TV in Time Spent with US Media. Accessed at <http://www.emarketer.com/Article/ Set-Surpass-TV-Time-Spent-with-US-Media/1010096> on April 2, 2014.

Galbi, Douglas. 2008. U.S. advertising expenditure data. Accessed at <https://spreadsheets.google.com/pub?key=p9LENaiK on December 10, 2013.

Hess, Mike. 2009. Video Consumer Mapping Study. Center for Media Design, Bell State University. Accessed at <http://www.researchexcellence.com/documents/research/15.pdf> on December 16, 2013.

Kantar Media. 2013. Total US Advertising Expenditure. Received in email from Allen, Jackie <Jackie.Allen@kantarmedia.c on December 2, 2013.

Newspaper Association of America. 2013a. Archived Advertising and Circulation Revenue Data. Accessed at <http://www.naa.org/Trends-and-Numbers/Newspaper-Revenue.aspx> on December 26, 2013.

———. 2013b. Newspaper Circulation Volume. Accessed at <http://www.naa.org/Trends-and-Numbers/Circulation-Volume/Newspaper-Circulation-Volume.aspx> on December 10, 2013.

Nielsen NetRatings. 2013. Nielsen Newspaper Web Audience. Accessed at <http://www.naa.org/Trends-and-Numbers/Newspaper-Websites/~/link.aspx?_id=E10BEBCD72464F4884CF86D330355A38&_z=z> on December 16, 2013.

Pew Research Center for the People and the Press. 2013. Pew Internet and American Life Project Surveys, June 1995-May 2013. Accessed at <http://pewinternet.org/Trend-Data-(Adults)/Internet-Adoption.aspx> on December 10, 2013.

Sterling, Christopher H. 1984. *Electronic Media: A Guide to Trends in Broadcasting and Newer Technologies*. Westport, Connecticut: Praeger.

Sterling, Christopher H. and John Michael Kittross. 2001. *Stay Tuned: A History of American Broadcasting*. 3rd Ed. Mahwah, NJ: Lawrence Erlbaum Associates.

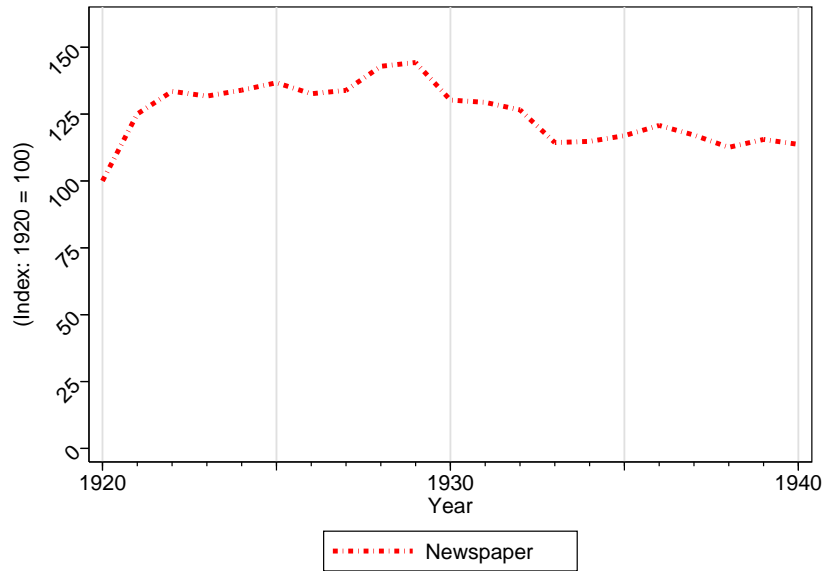Sumner, David E. 2010. *The Magazine Century: American Magazines Since 1900*. NY: Peter Lang.

Figure A. 1: Breakdown of Newspaper Ad Revenue Decline
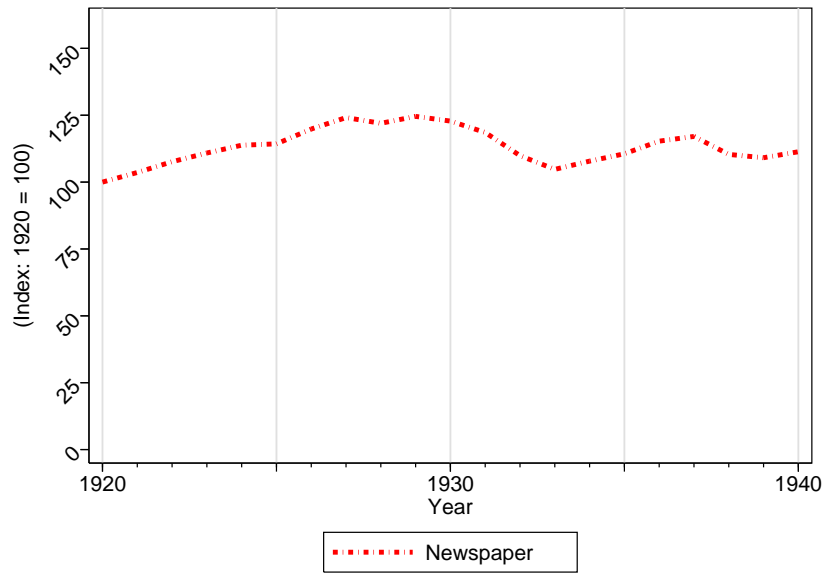
Ad Revenue Per Hour

Notes: The figure repeats the TV and Magazine series from Figure 1, Panel C for the years 2005-12, along with series for newspaper classified (Npc), retail (Npr), and national (Npn) advertising.
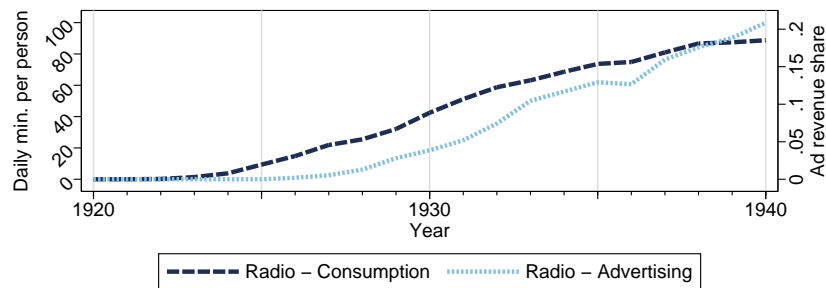
Figure A. 2: Introduction of Radio

Panel A: Ad Revenue Per Hour

Panel B: Minutes Per Person Per Day

Panel C: Growth of Radio

Notes: Panel A shows radio minutes per person per day and radio advertising revenue as a share of total radio and newspaper revenue. Minutes per person per day is for American adults 18 and older. Advertising revenue per hour is total annual advertising revenue divided by total annual minutes in 2012 dollars.