The Effects of Digital Media on Advertising Markets

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Abstract

This paper examines the viability of sustained advertising spending in an increasingly digital age. Beginning with print media and through the advent of television, the ad market has seen vast evolution in information consumption. The result has been a creative adaptability by advertisers to keep pace with said change. However, growth in ad spending has not significantly outpaced GDP growth, as documented in the *Relative Constancy Hypothesis*. RCH asserts that both ad spending and consumer expenditure as a percent of GDP remain steady over time. This paper focuses on whether the advertising claim holds up through the rise of the Internet. How this powerful medium may alter traditional advertising trends remains unclear. The answer could have implications for both advertisers and parties that rely on them.

JEL Codes: M3; M37; L82; O39

Keywords: Advertising; Relative Constancy Hypothesis; Digital Media

Introduction

Throughout recent history, the state of the U.S. advertising industry seems to have remained somewhat unchanged despite ample evolution in modes of communication. Looking back as far as 1920, we see that advertising as a percent of gross domestic product (GDP) hovers consistently between about 1% and 3%. This range is even tighter–between roughly 1.25% and 2.50%–within the last sixty years (Kirchhoff, 2011). The 20th century does not, in any way, tell a story of outsized growth for one of the nation's largest markets. Yet the century marks a period of continuous evolution in the way Americans consume media and information. Where print media (newspapers, pamphlets, magazines, etc.) offered the written word, radio eventually added audio. Eventually, both joined moving images with the rise of cinema and television. The advent of the Internet provided a new frontier altogether, as it combined audio and visual with elements of connectivity and personalization–both key aspects of a successful advertisement.

It is our contention that the Internet and other digital advertising media have had two main effects: first, of breaking down cost barriers and oligopolistic pricing power enjoyed by "traditional" media (print, radio, and broadcast TV), and second, it has forced revision at the micro level of advertising budgets, resulting in a migration of dollars out of traditional media and into both digital technologies and other areas altogether (such as direct marketing). We further assert that a growing digital advertising market will not make up for the shift of dollars out of traditional media given that digital advertising is cheaper. Thus, the long-term effect is an overall contraction in the general level of advertising expenditures as a percent of nominal GDP. In other words, we must reconsider existing academic thought on the U.S. advertising market, and especially Maxwell McCombs' 1972 *Relative Constancy Hypothesis* (RCH) as it applies to advertising.

This paper is broken down into three main parts. First, Part I will take qualitative and qualitative looks at advertising market trends throughout the 20th century. We will pay close attention to the rise of the Internet as an advertising medium, pointing out how it differs from more traditional platforms. In Part II, a thorough review of all relevant literature (including a special focus on McCombs' *Relative Constancy Hypothesis*) will precede our own tests and findings. Specifically, we will analyze the latest trends and data on ad expenditure. We will then discuss how to best assess RCH given structural changes in the ad market over the last fifteen years. This discussion will shed light on our central hypothesis: that we are seeing the beginnings of a lower long-term ratio of ad spending/GDP. Finally, Part III provides a forward-looking analysis of RCH given the most recent developments in online and digital advertising mechanisms. We will also offer some brief insight into further research that might be conducted, and how to consider corporate valuation in light of our contentions.

Part I: The U.S. Advertising Industry, in Context

The history of the U.S. advertising industry is one that dates back to the 1800's and the proliferation of print media. With the rise of printed forms of communication such as newspapers, magazines, photographs, and telegraphs, came a slew of advertising brokers: individuals who bought ad space and resold that space to clients for a profit. Eventually, brokers began creating advertising content in addition to selling ad space, paving a way for the rise of advertising agencies as we know them today.

The first major technological advancement to change the face of advertising was the growth of radio in the 1920's and 30's. American audiences could now hear the advertisements that they once only saw in print. Notably, ad executives pursued corporate sponsorship of popular radio shows. Advertising would see another wave of transformation in the 1940's and 50's with the advent of television. Realizing that an ad-backed programming model was prohibitively expensive in the realm of TV, ad execs pioneered what we know today as the commercial–a short block of airtime devoted to advertising. After years of tremendous growth, however, the advertising industry saw the beginnings of consolidation in the 1970's and 80's. Industry contraction ran parallel with the rise of promotional advertising and direct marketing.

The advent of the World Wide Web in the 1990's is one of the latest waves of technological change to hit the communications realm, and thus the advertising world as well. Proliferation of digital technology, including a recent boom in mobile technology, has arguably disrupted the advertising industry more than any other platform over the course of the century.

Having described the advertising industry qualitatively, let's now explore the history of the industry from a more quantitative perspective. In doing so, we establish a useful framework for assessing recent industry trends.

The implicit economic role of advertising has traditionally been twofold: (1) it provides consumers and businesses with information about products and services that–in theory–increases competition and reduces prices, and (2) it works as a subsidy for "free" broadcast television, radio, newspapers, and magazines. Our second point is significant, and might be rephrased as: advertisers alter cost dynamics by turning a two-player market relationship into a three-player one. Advertisers assume some portion (if not all) of the costs associated with information distribution in exchange for access to consumers. Advertisers therefore subsidize information consumption, paying a cost to information-distributing agents that the consumer would otherwise pay. U.S. newspapers garner about 80% of their revenues from printed advertisements, with consumer magazines at about 55%, and other publications at as much as 100% (Standard & Poor's, 2008). Similarly, broadcast radio and television attribute a sizeable portion of their revenues to advertising as well. For perspective, the size of the U.S. advertising market is more than $240 billion in 2010, or approximately 1.7% of nominal GDP (Galbi, 2011). By comparison, ad spending as a percent of nominal GDP was about 2.3% in 1997, with total market size of about $188 billion. 1997 marks the last year before Internet advertising contributed to the total ad expenditure number.

The rise of the Internet and the growth of digital advertising have had profound effects on the advertising industry. Despite a bursting tech bubble and a crippling global recession during its early years, Internet advertising has been the fastest-growing marketing platform, with roughly $26 billion spent in 2010 (up from $4.6 billion in 1999) (IAB, 2011). The year 2010 marked a major milestone for Internet advertising, as it surpassed newspaper advertising to rise to second place in overall ad revenue by medium (IAB, 2011).[1] Notably, the Internet has grown nearly twice as fast as cable television did in its early days, when measured on the basis of ad

[1] TV distribution remains in first place at $28.6 billion.

revenue (Kirchhoff, 2011).

In the roughly 15-years to date, Internet advertising has seen multiple incarnations. At first, online ads resembled traditional media ads in simple display-related formats (banner, sponsorship, rich media, etc.), with display ads accounting for 78% of total online ad revenue in 2000 (Evans, 2009). By 2010, however, we had seen a marked shift toward search advertising. In search advertising, relevant ads are paired with search engine query results. The rise of high-powered search engines like Google, Yahoo!, and Microsoft's Bing has prompted a migration of dollars away from display and into search, which has grown from 1% of market share to 46% between 2000 and 2010. Meanwhile, display fell to 38% by 2010 (IAB, 2011). Also of note is the changing nature of Internet pricing models. A cost per impression model (CPM, or "cost per mille")–where advertisers pay based on the number of people who see the ad–dominated the early days of Internet advertising. Eventually, performance-based pricing (such as CPC, or "cost per click") became more standard. As of 2010, 62% of online ad revenue derived from performance-based pricing, whereas only 33% came from CPM pricing (with 5% from hybrid pricing) (IAB, 2011). A shift of this nature and magnitude is not surprising given trends toward search advertising, which usually prices on a performance basis.

The "per click/impression" pricing model in advertising is relatively new, and entirely unique to the Internet. Until the advent of the Internet, real-time analytics on advertising were scarce. Advertisers often struggled to target specific demographics with audio or display ads run in widely circulated broadcasts or publications. Furthermore, figuring out how effective an advertisement was proved difficult. The Internet is poised to solve many of these problems via three key features: measurability, targeting, and interactivity/effectiveness.

Measurability is simply the ability to quantitatively gauge the success of an

advertisement, ultimately allowing for a more definitive calculation of return on investment, or ROI. As discussed earlier, the market is increasingly using performance-based pricing models because of metrics like CTR (clickthrough-rate), where a measure of total clicks divided by total impressions helps establish a success benchmark. While varying degrees of measurability do exist within traditional media, advertisers "have access to faster, more granular measurements" in the digital world (Kirchhoff, 2011). At this point in time, the Internet is the only medium through which advertisers can effectively measure engagement, not just exposure. The ability to thoroughly quantify consumer response to an ad is a valuable asset to advertisers. A more exact sense of ROI on each dollar spent [on online advertising] will allow firms to more efficiently allocate advertising budgets and perhaps spend less overall.

Targeting is not necessarily a new feature of digital advertising, but one that is vastly improved. Before the Internet, reaching a desired demographic was more an art than a science. The frustrations of traditional targeting are well summed up in an old adage revived in Ken Auletta's book *Googled*: "I know half of my advertising works, I just don't know which half" (2009). On the Internet, however, Google and others have created a highly efficient marketplace built on targeting. Chris M. Wilson offers one example of how targeting works within search advertising:

> In equilibrium, firms with the more relevant products are willing to make higher bids for the sponsored links. Consumers then use the sponsored link positions as a signal of firm relevance and are able to optimally search the more relevant firms first by searching the sponsored link positions before the other firms. This allows consumers to find a relevant product more quickly and generates increases in market output (Wilson, 2011).

The reason targeting works so well on the Internet is because for the first time, advertisers receive data from consumers. In seeking out information, consumers simultaneously generate data about their preferences. Intermediaries can then leverage vast swaths of amassed data to connect advertisers with the most relevant consumers. As a result, advertisers can spend less on

wide-net advertising and focus more on reaching ideal demographics. Advertisers also benefit from lower equilibrium prices when advertising online, as there is less competition for any given set of inventory (e.g. a fishing rod company need not bid on the same space as a computer maker).

Interactivity and *effectiveness* are the last, but not the least, of the dynamic features of Internet advertising that we will cover in this paper. The terms refer to two similar but distinct phenomena associated with the web, though both underlie the two features outlined above. "Interactivity" describes the two-way relationship that defines the online experience. Every time a consumer spends time in the digital world, he or she generates information about his or her preferences. Internet companies like Google track and collect data about aggregate search/click patterns. Advertisers can then capitalize on this information and better target their ads. By "effectiveness," we mean the level of sensory engagement that a consumer shares with an advertisement. The Internet provides for a more active user experience through conscious cursor movement and clicks (as opposed to the more passive act of reading a physical newspaper or watching television). It also offers the option of a variety of advertising formats: display, audio, video, etc. Quantifiable levels of consumer engagement across formats (such as views, clicks, and time spent) lead to measurability, as defined above. For the first time, consumers can actively demonstrate possible "intent to buy" by interacting with an advertisement (Newton, 2009).

Having outlined the current state of the U.S. advertising market and the development of the Internet as an advertising platform, we will venture forward toward the crux of this paper: an examination of advertising expenditure trends in the digital age. Our first step is a review of relevant literature, so as to inform our own data testing and analysis later in the paper.

Part II: Updating the RCH Discussion

The size of the advertising market has historically been evaluated or measured relative to GDP. In this section, we will outline the basis of this measurement to provide context through a review of relevant academic literature. We will then proceed to experiment with an updated set of data on aggregate advertising expenditure, testing how recent trends may or may not hold against historic observations.

Review of literature

The idea that economic output and advertising expenditures are related was first introduced into academic literature by Maxwell McCombs (1972) in what he termed Scripps' Constancy Hypothesis, and what is more recently called the *Relative Constancy Hypothesis* (RCH). Drawing from a proposal by Charles Scripps of Scripps-Howard Newspapers, McCombs actually investigates the broader assertion that total advertising expenditure and media expenditure by consumers is a fixed proportion of GNP in the US. The basis of this idea can be understood from a 1965 Scripps publication:

> If we may suggest one broad generalization, it is in spite of the increasing complexity of mass communications with the advent of new media, *the pattern of economic support has been relatively constant,* and *more closely related to the general economy* than to various changes and trends taking place within the mass media field itself (McCombs, 1972, p. 5).

For the purposes of this paper we will address only the advertising portion of McCombs' claim. Separating ad spending and consumer media expenditure is natural because of the different factors that drive the behavior of these two categories. We will also use GDP, which has gained popularity as an economic indicator since McCombs' publication and is consistent with how advertising expenditure is measured (Wurff, Bakker & Picard, 2008).

McCombs (1972) found high correlation (0.947) when he regressed total advertising expenditures and media expenditures on nominal GDP for the period between 1929-1968. He also used simple regressions to test other possible factors, such as total consumer expenditures and personal income, but found GDP to be most closely related. McCombs also investigated if high consumer expenditures on televisions in the 1950's could be funded totally out of GDP growth or if consumers had substituted spending out of other media.

Studies published since 1972 have both examined RCH as a whole and focused exclusively on the advertising component. With respect to the advertising aspect, many acknowledge the seemingly strong connection between economic output and ad spending, but also criticize the relationship because it lacks a theoretical basis and is determined by other factors (Jones, 1985; Picard 2008; Demers 1994). There are significant risks to analyzing trends in macro data when the real decisions that we are trying to understand happen at the firm level, on a case-by-case basis; nonetheless, macro analysis has been the primary method of study for investigating this phenomenon (Jones, 1985).

Studies by Wurff, Bakker & Picard (2008) and Chang & Chan-Olmsted (2005) have focused on cross-national tests to investigate other factors and influences on the relationship between advertising expenditures and GDP. Studies by Chang & Chan-Olmsted (2005), Banks (1986), and Wurff, Bakker & Picard (2008) found that the relationship between advertising and economic output differs across countries, with more developed countries experiencing higher advertising expenditure relative to GDP. To avoid the effects of structural differences, we will focus solely on the United States.

Chang & Chan-Olmsted (2005) regressed GDP, population, foreign direct investment, economic freedom, and press freedom on advertising expenditures in over 70 nations from 1991-

2001. They found that while other variables are positively related to advertising expenditure, only GDP was statistically significant. Van Der Wurff, Bakker, and Picard (2008) continue with cross national research by regressing GDP, relative importance of exports, the share of newspapers in the total advertising expenditures, and time as independent variables for 21 industrialized countries from 1987-2000. They find that economic composition, as well as time, affected the relative level of advertising across countries.[2] Additionally, the media composition of a country influences levels of advertising expenditure as GDP changes, given that different media are more or less affected by the state of the economy. Demers (1994) added a measure of structural pluralism, "the degree of differentiation along institutional and specialized interest group lines," as an independent variable to test if advertising relative to GDP had increased as society became more complicated. Demers did not find strong evidence that structural pluralism affected advertising spending but noted that its effect may have been mediated by GDP.

Callahan (1986) found that advertising expenditures were not related to five macro indicators (Energy, Exports, Imports, Savings and Domestic Investment) but was related to GNP as noted by McCombs. Callahan also "support[s] the hypothesis that advertising changes the composition of consumption, not the level of consumption" (p. 219). This is in line with earlier studies including Borden's study (1942) which found that advertising can "speed up favorable trends of demand (p. 90) but "cannot be considered a cause of cyclical fluctuations" (p. 98) (Van Der Wurff, Bakker, and Picard, 2008)

As of now, academic literature does not propose strong evidence on the mechanisms that explain the relationship of total advertising expenditure and GDP. Picard writes that, "The fact that advertising expenditures are related to the size of the economy, however, does not mean that

[2] Economic consumption involves the relative importance of certain sections such as manufacturing, utilities and exports.

a fixed proportion of GDP is spent on advertising" (p. 47). While no mechanism has been formally outlined, several scholars point to corporate budgeting practices as a driver in this relationship. Schmalensee (1972), Yneu Yang (1964), and San Augustine & Foley (1975) all studied how budgeting by large advertisers is mostly based on a percentage of sales (Wurff, Bakker & Picard, 2008). Because corporate sales are a strong determinant of GDP, this practice could result in the relative constancy that we observe. Another explanation is that GDP and advertising expenditures are driven by the same factors. Advertising expenditures are "deemed postponable" and therefore fall during recessions (Osteimer, 1980, p.16) as corporations navigate recessions (Wurff, Bakker & Picard, 2008). In 1983, Bobel found that most German firms practice pro-cyclical advertising strategies which would seem to contribute to the observed constancy.

McCombs proposed the Relative Constancy Hypothesis in 1972 with a focus on how this phenomenon was maintained in the face of long-term technological change. However, the numerous studies conducted since McCombs have generally focused on a variety of other aspects and implications of his claim. In their 2008 paper, Wurff, Bakker and Picard called for more investigation into the Internet's role in advertising markets in the context of the relative constancy hypothesis.

There have been many books written on the topic of media economics which attempt to explain the nature of media firms and products, how they interact in the market place and how media firms and products differ from other industries. Robert Picard's recent book *The Economics and Financing of Media Companies* (2011) discusses some high level changes in the media industry that are brought on by the Internet and other factors. These influences will be further evaluated later in Part II.

An analysis of the latest advertising data

Before launching into our work on pertaining to McCombs' *Relative Constancy Hypothesis* (RCH), it is important that our readers understand the parameters of our tests and their results. This study in no way seeks to identify causality in advertising trends. To be sure, ad budgets are determined on a case-by-case basis that could manifest themselves in a variety of trends in macro data. Yet, as we will see, the relationship between GDP and ad spending is cointegrated. Therefore, while the relationship is not necessarily causal, this does help us characterize how GDP and ad spending have behaved with relation to each other.

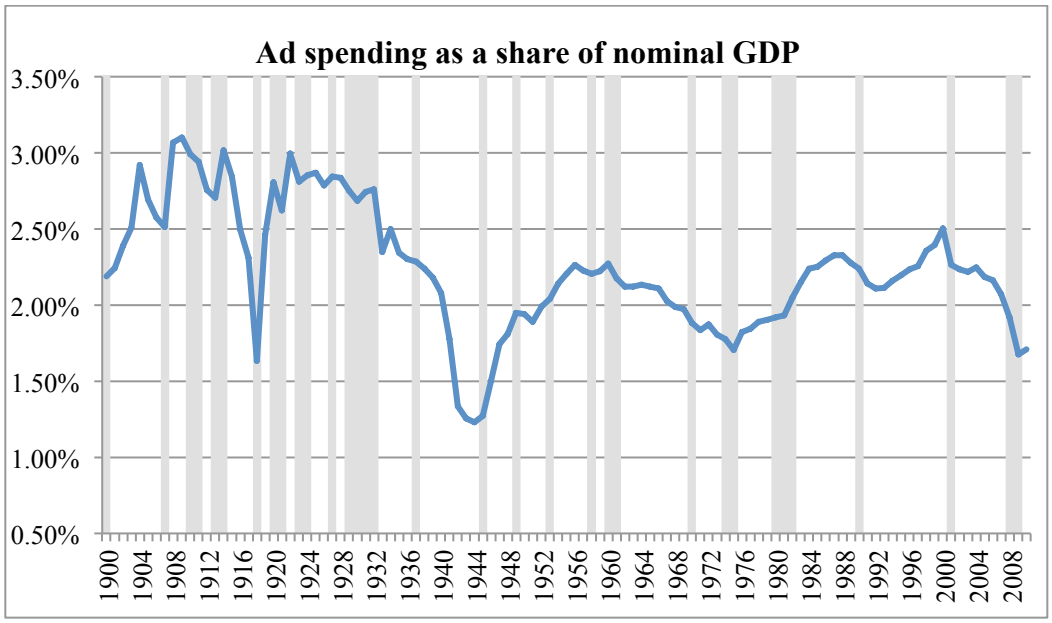
Data on advertising expenditures across media is primarily the work of Robert Coen who, until his retirement in 2008, worked for major advertising agency McCann-Erickson (Galbi, 2009). The specific data used in this study contains additions and refinements by Douglas Galbi, an FCC economist. Because the Coen dataset only spans 1900-2007, additional data for 2008-2010 on total ad spend and television spending comes from *Advertising Age* magazine, and data for radio, magazines, and newspapers comes from IAB. Regarding Internet advertising data, we used numbers from the Interactive Advertising Bureau (IAB), which specializes in this area, instead of Coen's lower estimates. Nominal GDP estimates come from measuringworth.com, which provides time series data dating back to at least 1900, and personal consumption expenditures come from the Bureau of Economic Analysis and date back to 1929.

Graphical analysis

The base of the advertising expenditure component of McCombs' *Relative Constancy Hypothesis* (note: RCH will from now on refer exclusively to ad spending) is most easily

demonstrated in a simple chart (figure 1.1) that traces advertising expenditure as a percent of nominal GDP.

Figure 1.1



The chart above, which spans 1900-2011, derives from a simple division of total U.S. advertising spending by nominal U.S. GDP. The grey bars indicate periods of recession. The primary take away from this simple analysis is that advertising expenditure as a percent of nominal GDP has fluctuated within a rather narrow band over the last century. The range of this trend has always been between 1% and 3% except for a brief period in early 1900. Indeed, the band is even tighter when we focus exclusively on 1950 and beyond. Later parts of this paper will focus on the last 15 years, where we see a momentous decline in advertising as a percent of GDP beginning in the late 1990's.

Also worth examining before beginning more analytical work are trends in ad spending broken down by medium, specifically within the lifetime of the Internet. Figures 1.2, 1.3, and 1.4 show these individual trends over time, as well as in a recent period.

Figure 1.2

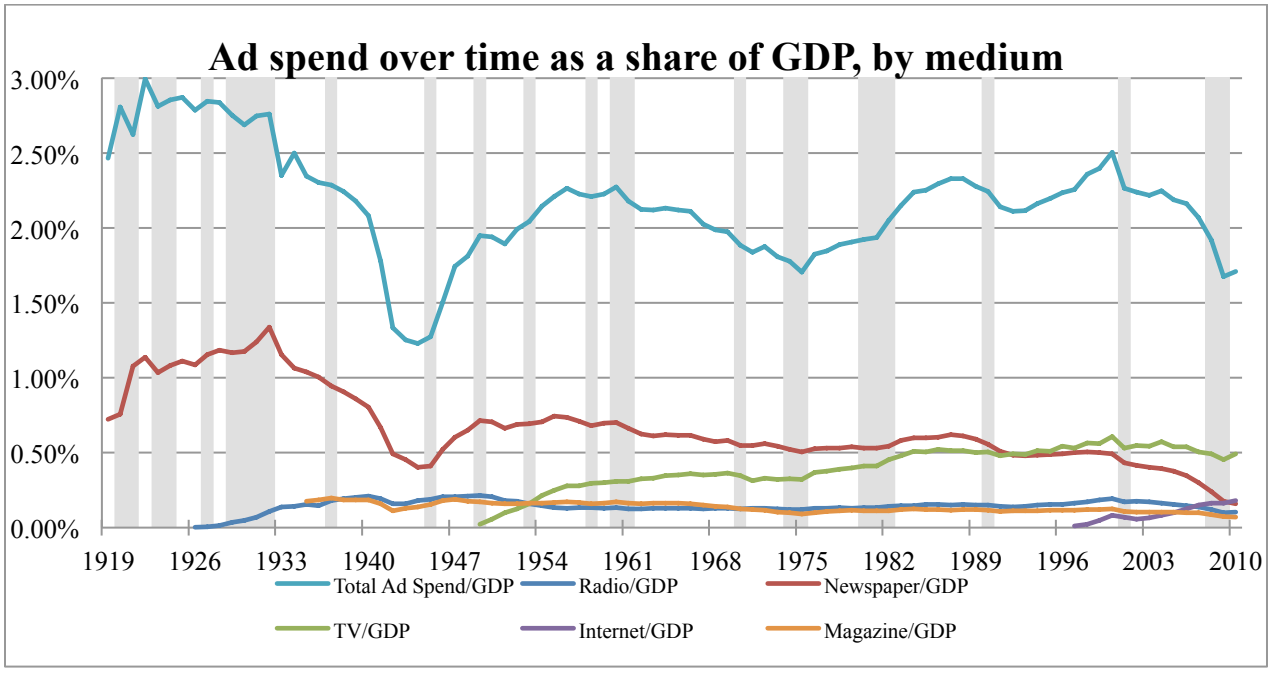


Figure 1.3

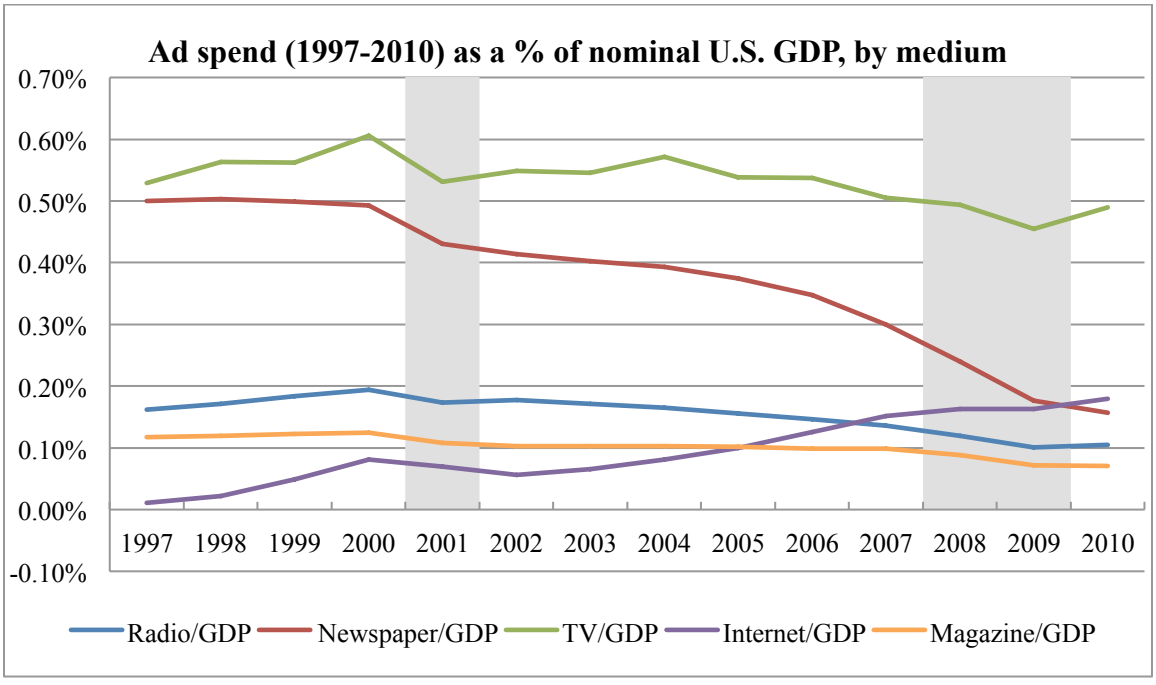
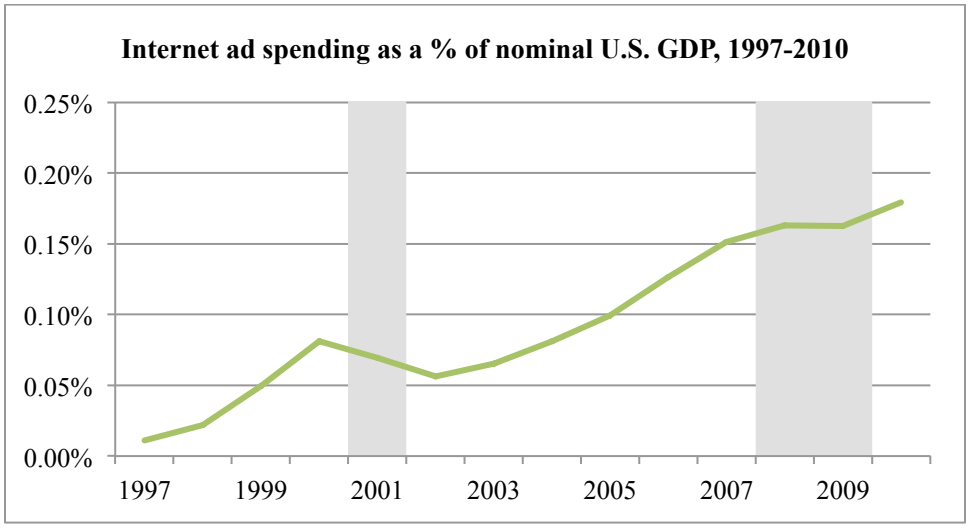


Figure 1.4



Going figure by figure, we begin to see a quantitative portrayal of the qualitative history of advertising told earlier in the paper. Looking at figure 1.2, the early dominance of newspaper advertising becomes truly clear, that is until the advent of radio and television. Interestingly, the true decline of newspaper advertising–and thus the fall of the U.S. newspaper industry–seems to coincide with the rise of the Internet in the late 1990's. Though we cannot infer a causal relationship from figure 1.2 alone, one might consider ways in which the web contributed to the breakdown of a once oligopolistic pricing power enjoyed by traditional media. Figure 1.3 isolates the bottom right corner of figure 1.2 and provides a more in-depth look at how each medium has contracted or grown since 1997, when the web emerged as a viable advertising platform. Not surprisingly, we see no significant growth in any medium but the Internet itself. While projections see the market for television advertising remaining sturdy and possibly growing, it is safe to assume that, barring robust technological change, that newspaper and radio will not see outsized growth down the road given historical trends and newer technologies (Newton, 2009). Figure 1.4 deals exclusively with the web between 1997-2010. As detailed

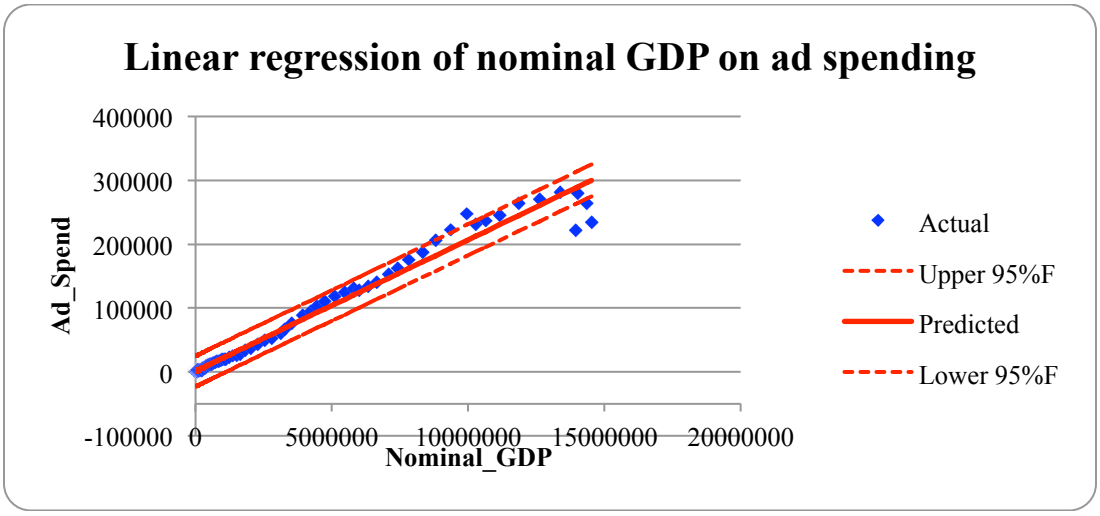
earlier, growth in this market has been tremendous (100% over the last 5 years), and should remain strong into the foreseeable future (emarketer.com expects 120% growth by 2015).

As compelling as some of our "percent of GDP" figures may look at the outset, they are not, ultimately, fully telling when it comes to drawing conclusions about the effect of the Internet on the advertising market. Further, these surface-level analyses reveal very little in the way of market dynamics. In the remaining sections of Part II, we will update and expand a statistical investigation into this phenomenon.

Regression analysis

The first step we took was to conduct a regression of ad spending on GDP. As Figure 1.5 shows, there is a very strong correlation between nominal GDP and total advertising spending, with an R^2 of 0.979. Because both trends are growing and may both be stochastic, it is not surprising that we find a high correlation. However strong this may make the relationship appear, the regression is spurious and requires further investigation. It should also noted that the three points that fall below of the 95% range at the top right of the scatter plot are the years 2008, 2009, and 2010.

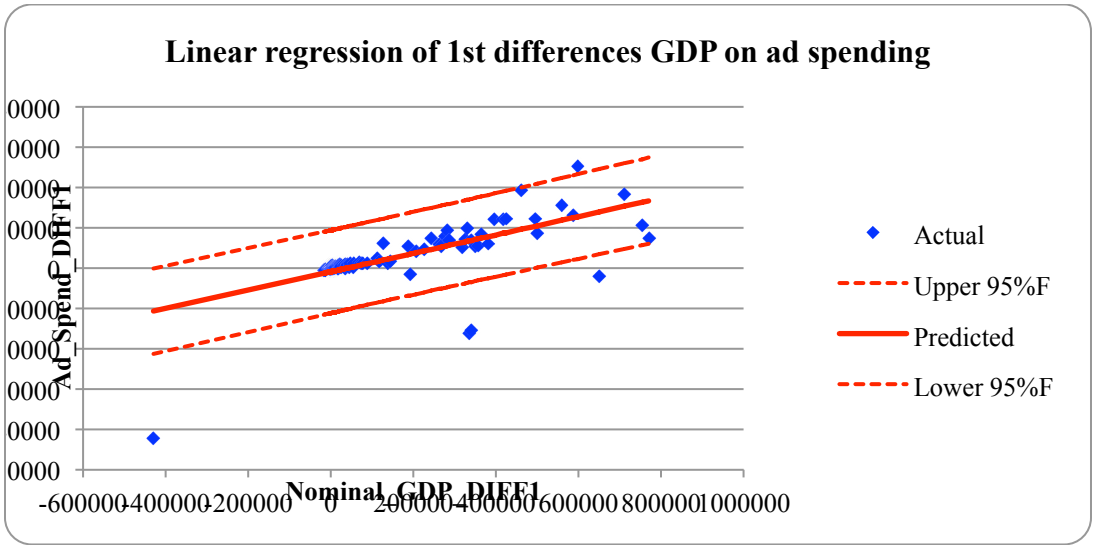
Figure 1.5



Predicted Ad_Spend= 1130.410 (1357.465) + 0.021 (0.000) Nominal_GDP; R^2= .979

A regression of first differences is an easy way to try to correct for stochastic trends. As figure 1.6 shows, the R^2 is reduced to 0.471, but a strong relationship is still present. In fact, the coefficient on GDP is almost the same in a nominal regression (figure 1.5) and on first differences (figure 1.6), .021 and .023, respectively. In this graph the points outside of the 95% bands are the years 2000 (top right), 2001 (bottom middle), 2007 (bottom right), 2008 (bottom middle), and 2009 (bottom left).

Figure 1.6



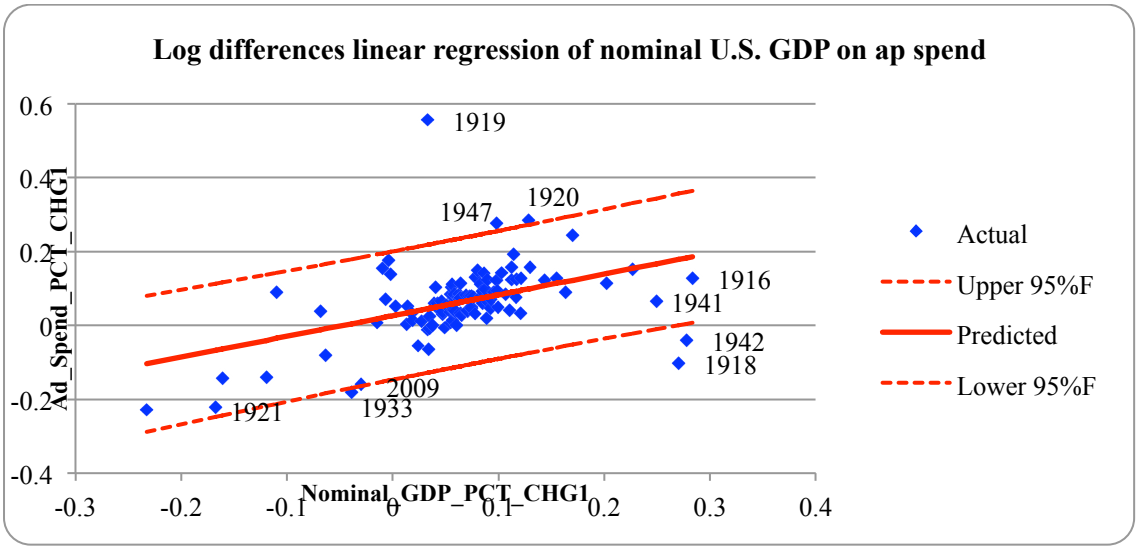
Predicted Ad_Spend_DIFF1 = -876.624(585.763) + 0.023 (.002) Nominal_GDP_DIFF1; R^2=.451

Figures 1.5 and 1.6 suggest a break down in the historical relationship between the two variables since 2007 or 2008, which is almost undoubtedly a function of the "great recession" and resulting mass deleveraging. The depression in the 1930's did not produce such outliers, though ad spend/GDP did fall. These recent years may have produced varied results from other recessions because on a relative basis, GDP did not fall much. However, the influence of consumer and corporate debt could have created an ad spend overhang as spending there was curtailed more than in a more "normal" recession. Additionally, we must consider if this fall in ad spend/GDP in recent years is also partly attributable to structural changes in the advertising market.

Interestingly, a log differences regression (figure 1.7) produces a different set of outliers. In this regression, changes are compared on a relative basis which may be more accurate since the nominal measurements of the two times series are both growing giving later measurements

more influence. As we may now expect, WWI and WWII produced many outliers. Yet, the only recent outlier is the year 2009. The R^2 also drops to .204.

Figure 1.7



Predicted Ad_Spend_PCT_CHG1 = 0.027 (.011) + 0.562 (.107) Nominal_GDP_PCT_CHG1; R^2=.204

The R^2 values of these regressions can be increased by taking differences or log differences over longer time periods as the following table shows. This is not surprising as shorter-term noise is corrected over time as ad spend/GDP has always reverted to around 2%. Over a long enough period of time, the RCH hypothesis seems to have corrected itself.

	1st differences R^2	Log Differences R^2
1 year	.451	.204
5 years	.554	.311
10 years	.784	.423

Cointegration and vector error correction model

A more robust way to tell if our two time series move together is to test for cointegration. If GDP and ad spend are cointegrated, then they have the same stochastic trend (Stock & Watson, 2003). Before performing the cointegration test, we used an Augmented Dickey-Fuller

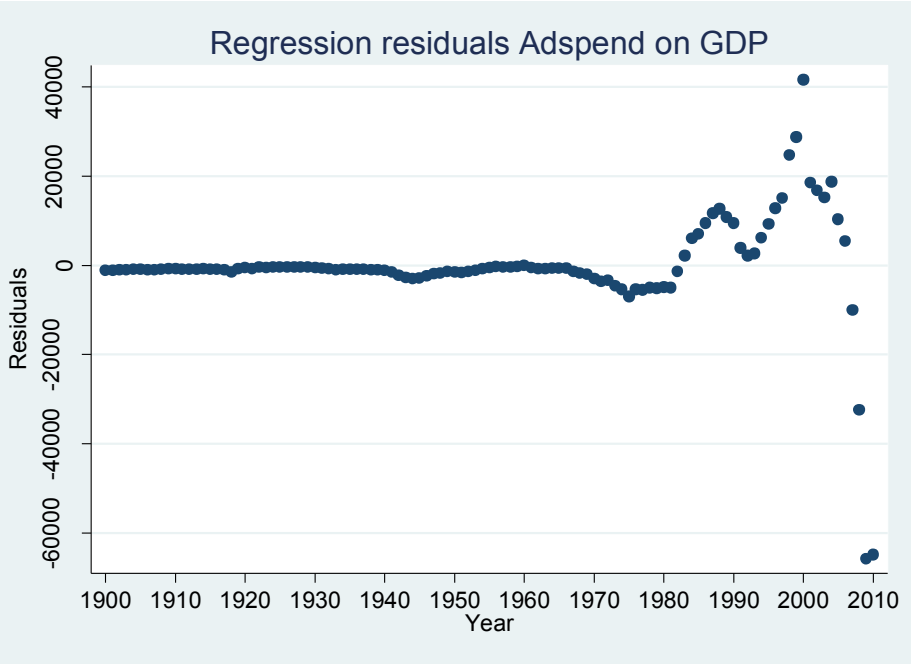
test to verify that GDP and ad spending both have unit roots (see appendix 1 for stata outputs). Dickey-Fuller tests require linear trends; however, the time series are both exponential given that we are working with nominal data. To correct for this, natural logs were used in an augmented Dickey-Fuller tests with αt added as a regressor in the test to account for the linear trend. As expected, we could not reject the null hypothesis that there was a unit root for either variable at a 95% confidence level. The p-values for GDP and ad spend were .4350 and .4980, respectively. This means that there is likely a unit root in each of these two time series.

We tested for cointegration by running an Augmented Dickey-Fuller test with 5 lags of the regression residuals from the GDP on ad spend regression (see appendix 1.2 for the stata outputs). The null hypothesis that the residuals exhibited a unit root was rejected at a 95% confidence level (p-value= .0357). This test shows that while the two time series individually likely exhibit non-stationary stochastic trends, according the Dickey-fuller test, the residuals of a linear regression produce stationary results. This is evidence that they are cointegrated or that they demonstrate the same stochastic trend.

However, analysis of the residuals (shown in figure 1.8) of the ad spending on GDP regression (figure 1.5) actually reveals a more complicated picture than the Dickey-Fuller test for cointegration may suggest. The residuals are centered around zero with little variation until sometime in the 1970's, when they are consistently negative. Then, in striking contrast to the earlier years, the residuals increase in an oscillating pattern until about 2000 and then plunge. It appears that something changed around 1980 that caused the residuals to become less stationary than they had been before 1980. This could have been triggered by the large recession in the early 1980's but it suggests that some fundamental shift in the advertising market took place

during that time. Even though a Dickey-Fuller test did show cointegration, this should be viewed with some skepticism given the trend in the residuals after 1980.

Figure 1.8



Nonetheless, this test for cointegration statistically demonstrates what we had been observing in the above graphs and regressions. The two variables, GDP and ad spend, do move together. This does not mean that they necessarily have a causal relationship but simply that they are driven by the same factors. There are a few possible explanations for this phenomenon. As previously mentioned in the literature but never fully tested, it could be that this trend arises because companies budget advertising as a percent of sales. Because total sales in the economy drive GDP in part, then ad spend should naturally follow GDP. We may also observe this relationship because ad spending is, on the whole, countercyclical, as many advertisers want to spend more when the economy is doing well and less during recessions. Thus, GDP and GDP expectations may then serve as a measuring tool for how much to spend. As noted in the literature, it is not thought that ad spending affects GDP.

Despite the trend in these residuals, we will continue with a Vector Error Correction Model (VECM) because we showed cointegration with a Dickey-Fuller test. A VECM is similar to a Vector Autoregression but includes the residual ($Adspend_{t-1} - \theta GDP_{t-1}$) as a regressor (Stock & Watson, 2003). We are able to add (Adspendt-1 - θGDPt-1) into the regression because we showed it was stationary by testing for cointegration. We used three lags (VECM reduces the number of lag terms by one) because it seems sensible given that the data is annual instead of quarterly and because in a standard autoregression, only the first three lags were significant. The VECM equation is (see appendix 1.3 for the stata output):

$$\Delta Adspend_t = \underset{(727.838)}{369.48} + \underset{(.167)}{.735}\Delta Adspend_{t-1} - \underset{(.205)}{.927}\Delta Adspend_{t-2} - \underset{(.012)}{.027}\Delta GDP_{t-1}$$

$$- \underset{(.015)}{.052}\Delta GDP_{t-2} - \underset{(.021)}{.104}(Adspend_{t-1} - \theta GDP_{t-1})$$

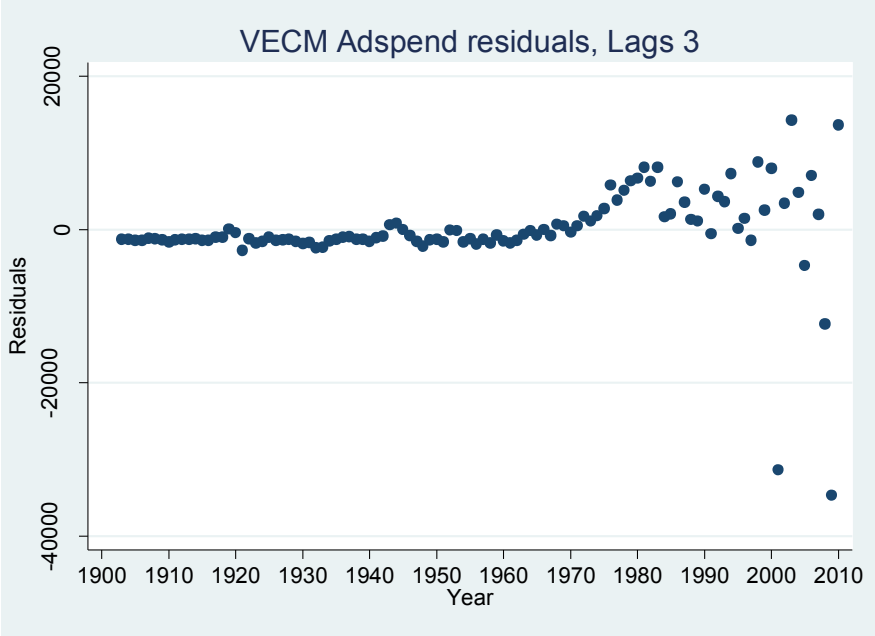
$$\Delta GDP = \underset{(13{,}362)}{-15.933} + \underset{(3.615)}{14.634}\Delta Adspend_{t-1} - \underset{(3.765)}{11.598}\Delta Adspend_{t-2} - \underset{(.225)}{.256}\Delta GDP_{t-1}$$

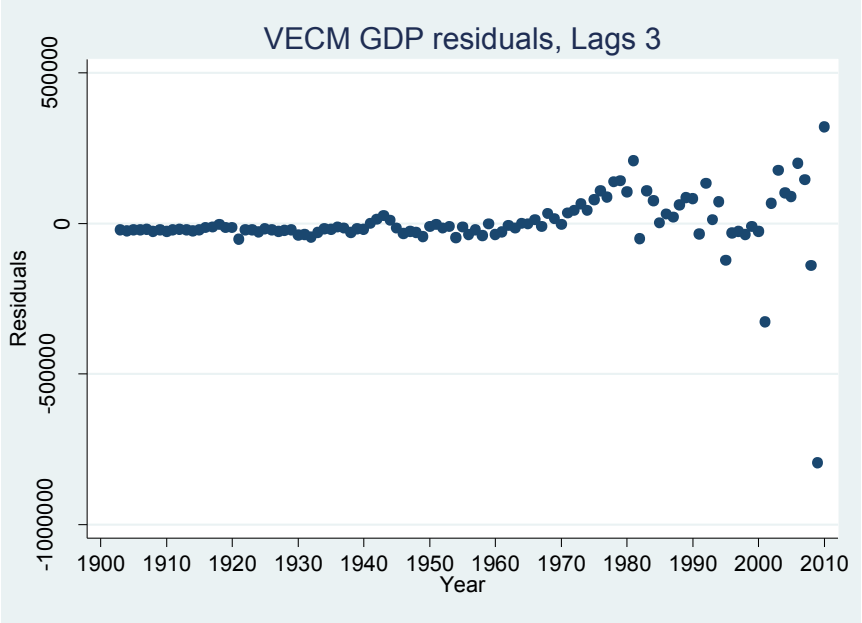
$$- \underset{(.279)}{.653}\Delta GDP_{t-2} - \underset{(.391)}{2.41}(Adspend_{t-1} - \theta GDP_{t-1})$$

The coefficients for the two error terms are both statistically significant and negative, which tells us that the deviations from the regression ad spend on GDP (the basis of RCH) tend to cause a correction in the next period. The residuals from the VECM regression are shown below in figure 1.9. As in figure 1.8, these redisuals do not appear stationary because they start to diverge from zero in later years. This is supported by a Chow test for trend breaks on this VECM yields increasingly higher F-statistics. The F-statistic in 1950 is 0.86 and it gradually increases to 20.42 by 2000 with a p-value of 0.000. Higher F-statistics shown an increased likelihood of a trend

break in that year. This means that the strength of this VECM model has been steadily declining since the mid 1970s.

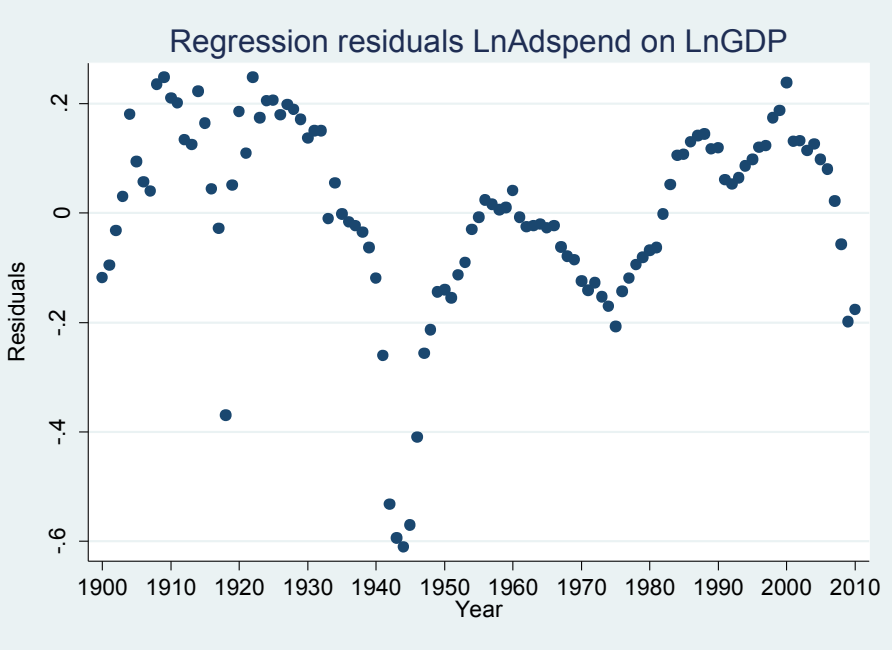
Figure 1.9





This apparent weakening of the model in later years could be because we are using nominal data that increases exponentially. Therefore, an error that is the same size as another on a percentage basis appears larger if it is in a later year because the notional size of the underlying data has grown so significantly. To correct for this, we can perform similar cointegration analysis on the natural logs of this data. We already demonstrated that the logs of the data likely have unit roots. However, cointegration tests using Dickey-Fuller on the residuals of the regression do not produce results that are convincingly stationary; with 3, 4 and 5 lags, the p values are 0.0508, 0.1721, and 0.0996, respectively (see appendix 1.4). A graph of the residuals (figure 1.10) shows trends that do not support cointegration.

Figure 1.10



To be thorough, we will proceed with a VECM with natural logs even though this is likely not stationary. The results are (appendix 1.5):

$$\Delta LnAdspend_t = \underset{(.0165)}{-.00753} + \underset{(.106)}{.133}\Delta LnAdspend_{t-1} - \underset{(.107)}{.083}\Delta LnAdspend_{t-2} - \underset{(.139)}{.136}\Delta LnGDP_{t-1}$$

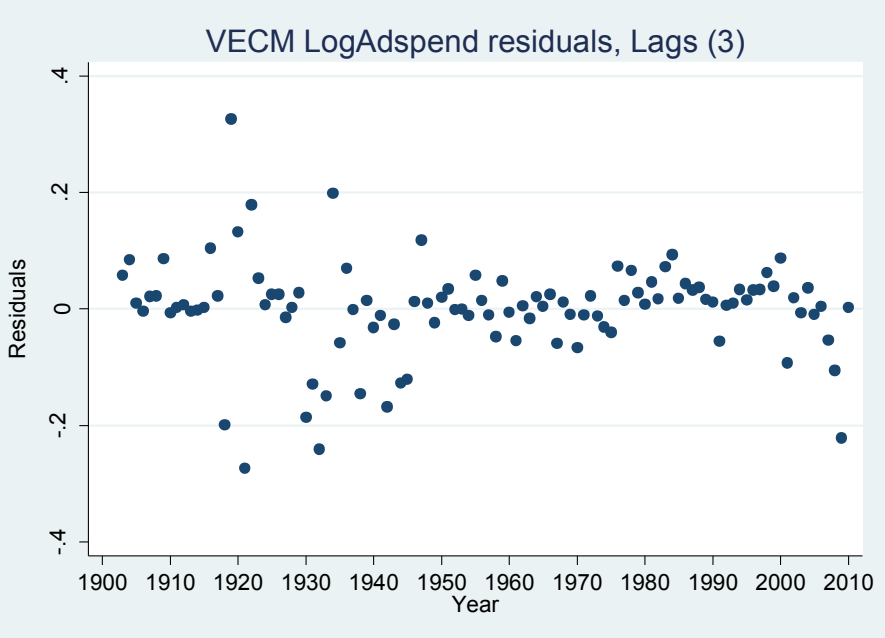
$$-.0464\Delta LnGDP_{t-2} - .173(LnAdspend_{t-1} - \theta LnGDP_{t-1})$$
$$(.143) \qquad (.0543)$$

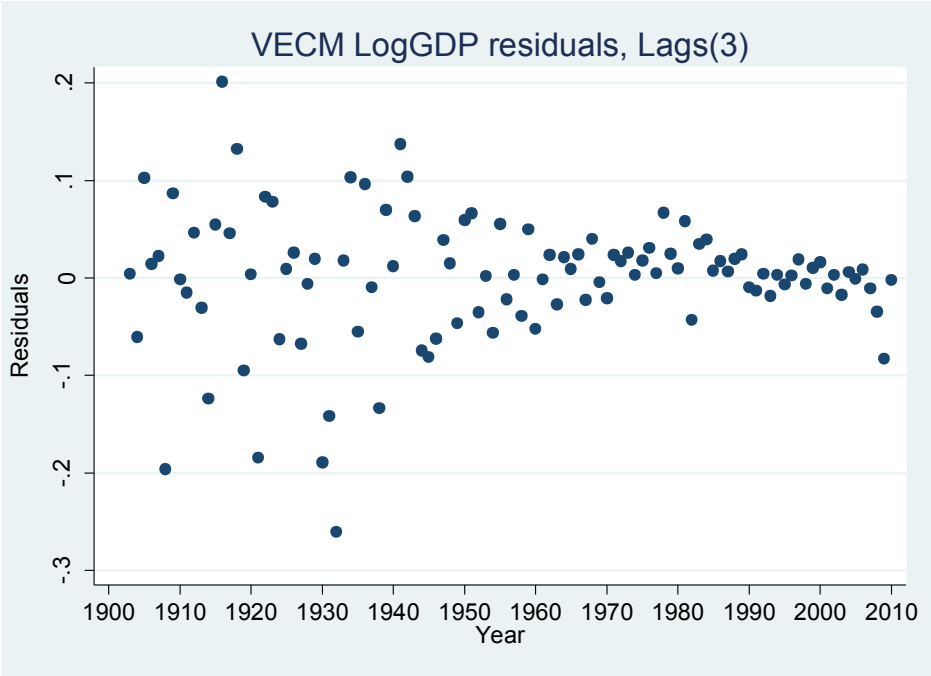
$$\Delta LnGDP = .0307 - .0702\Delta LnAdspend_{t-1} - .209\Delta LnAdspend_{t-2} + .370\Delta LnGDP_{t-1}$$
$$(.0134) \quad (.0886) \qquad (.0873) \qquad (.113)$$

$$+ .0435\Delta LnGDP_{t-2} - .0425(LnAdspend_{t-1} - \theta LnGDP_{t-1})$$
$$(.116) \qquad (.0443)$$

A VECM using natural logs produces a statistically significant error terms in the LnAdspend equation but not in the LnGDP equation. Both coefficients are also negative pointing to some correction. This VECM on natural logs produces residuals (figure1.11) that get tighter over time, the opposite of the nominal VECM model (figure 1.9). While the VECM using logs may not be preferable given that the error term may not be stationary, the LogAdspend residual graph (figure 1.11) has the same down trend around the year 2000 that was present in the regression of Adspend on GDP (figure 1.8).

Figure 1.11





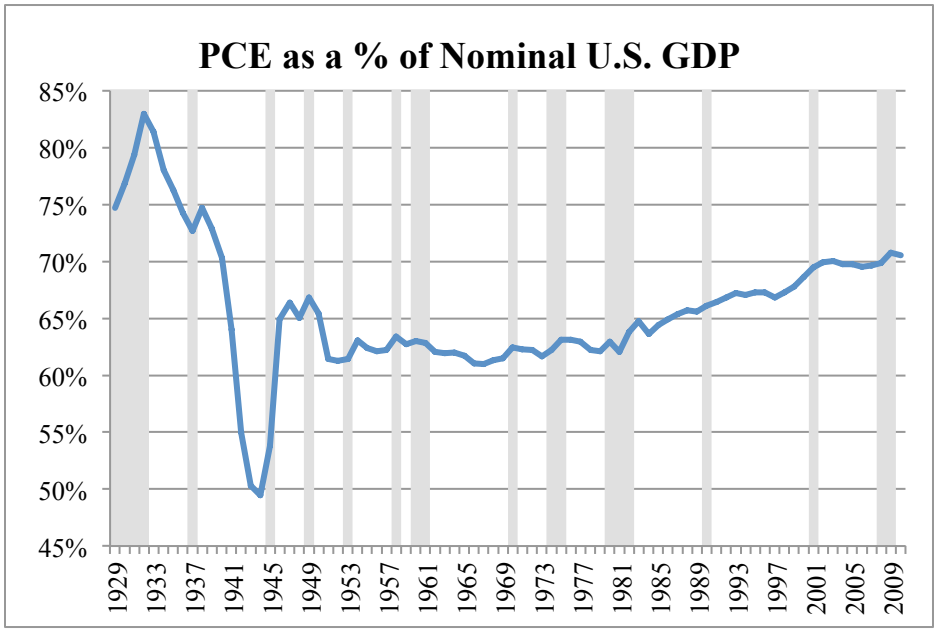
Examination of the Internet's influence to date

Over the last hundred years, there have been major technological innovations which have not upset RCH as we may have expected. Consider the profound influence television came to have in the advertising world. As it developed, it drew around a quarter of advertising dollars and allowed advertisers a captive audience on a large scale. Also, consider the rise of radio and its similar effects a generation earlier. Though these media experienced high growth and forever altered the advertising industry, ad spend/GDP remained in the 1%-3% band. Based on this historical evidence, it would be reasonable to assume that the Internet will not cause growth in this market. In fact, the data seems to suggest that, if anything, it will lower our advertising expenditure/nominal GDP "baseline."

It is difficult to quantitatively describe how the Internet has affected the tested relationships given the limited number of data points, but there is evidence that the Internet is bringing ad spending as a percent of GDP down lower. We see this in figure 1.8 above. The

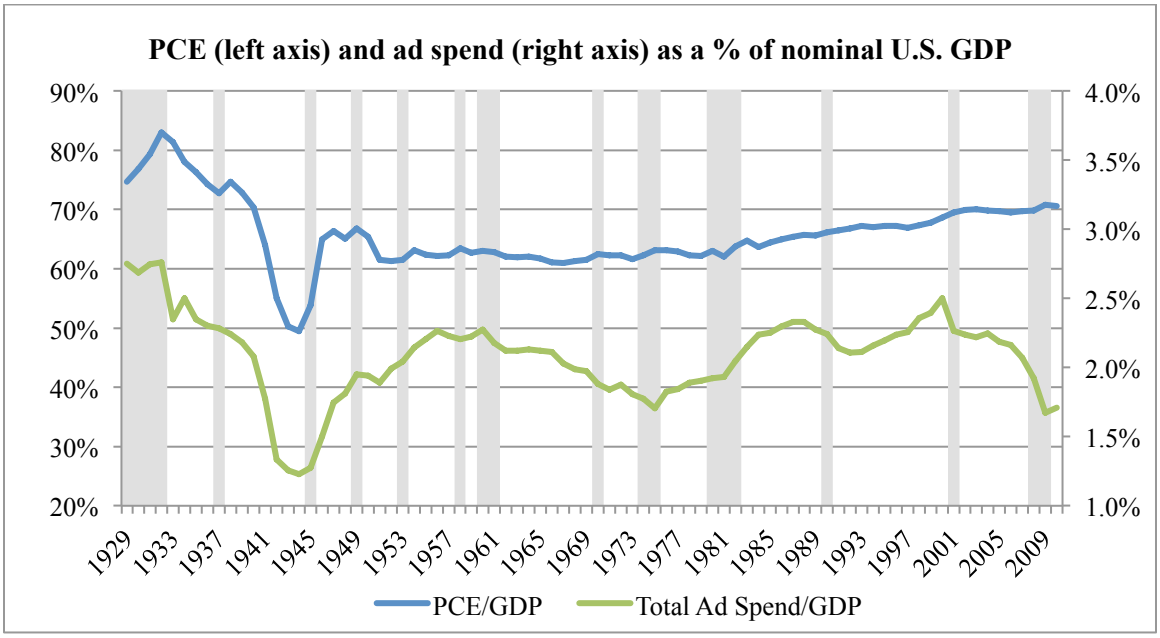
residuals in the standard regression, which has served as the basis of our RCH discussion, start to trend up in the 1980's but precipitously decline around the year 2000. Because this decline happened before and continued through the "great recession," it is likely the result of the Internet and its effects on advertising markets in general. Additionally, a notable corollary to figure 1.13 (ad spend as a percent of GDP) is a graph depicting total annual personal consumption expenditure (PCE) between 1929-2011 as a percent of GDP (Catalyst, 2009).

Figure 1.12



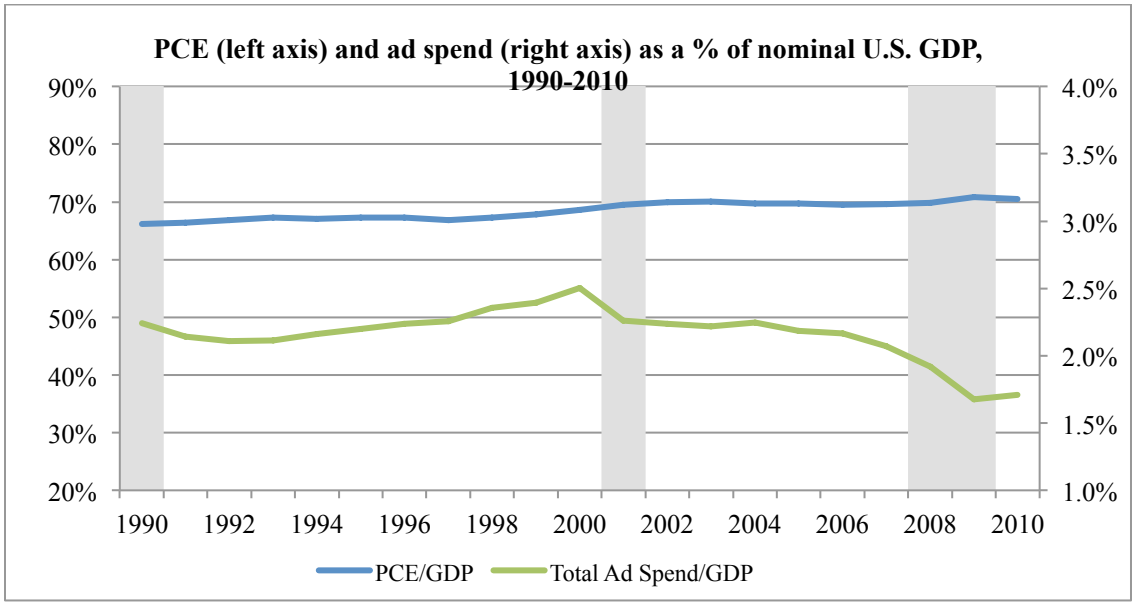
As with ad spending, PCE levels off after 1950 (post-WWII) and climbs slowly toward 70%, where we see it today. In the context of recent trends in ad spending, figure 1.12 is interesting in that between 1998-2011 PCE rises or remains stagnant. During this same period, as we saw in figure 1.1, ad spending falls as a percent of GDP. Before the late 1990's, advertising expenditure trends largely aligned with those of consumer expenditure, as detailed in figure 1.13:

Figure 1.13



The noticeable trend between ad spending and consumer spending seems to break in the late 1990's as seen in figure 1.14 (Newton, 2009). This break in the relationship between consumer expenditure and ad spending, and in ad spending as a percent of GDP alone, calls into question the relevance of the RCH in an increasingly digital age. It is our contention that this discontinuity is, in large part, attributable to the rise of the web as an advertising medium. We will now explore some of the ways in which the Internet may be contributing to the ad spend/GDP phenomenon detailed above. Specifically, we contend that the Internet breaks down cost barriers and pricing power once enjoyed by traditional media, and is forcing budget revision and media substitution at the micro level.

Figure 1.14



The Internet as an advertising platform

Our analysis in Part II is motivated primarily by one main question: is the Internet as a platform for information consumption disrupting, in any meaningful way, historical trends in advertising expenditure? This question, while difficult to definitively answer, is not hard to empirically address. In fact, we will begin our discussion with a basic analysis of how a series of supply-demand dynamics have changed since the dawn of Internet advertising in the late 1990's. Robert Picard provides a useful overview of the shift in market dynamics in his 2011 book, *The Economics and Financing of Media Companies*, as referenced in the Literature Review. According to Picard, five main factors are driving change in media environments: "media abundance, audience fragmentation and polarization, product portfolio development, the eroding strength of media companies, and an overall power shift in the communications process" (p. 3). We believe that factors one, two, and five are intimately tied to the rise of the Internet as an advertising medium.

Picard's first factor, media abundance, is perhaps his most important. Essentially, an explosion in both types and units [per type] of media is causing erosion in the pricing power of market participants. Put another way, advertising inventory–or supply of advertising space–is expanding rapidly relative to consumption–or "demand" for advertising space. As with any supply-demand relationship, a large increase in supply relative to demand increases overall quantity and forces equilibrium price down. The rise in abundance of ad-sponsored media is, most believe, very much attributable to the rise of the Internet both as a standalone advertising platform (i.e. Google search advertising) and as an additional consumption outlet for existing media entities (i.e. *The New York Times* online). Tyler Newton, Partner and Director of Research at investment firm Catalyst Investors, echoes this sentiment in a 2009 report entitled, *Traditional Media: Down but not Out*. Mr. Newton contends that:

> From 2000-2007 however, it would appear that supply [of potential advertising inventory] began to outstrip demand. While consumer spending remained elevated from 2000-2007, advertising expenditure as a percent of GDP declined overall. We believe that the decline is due to the effect of the Internet, with its unlimited supply of content and high measurability of advertising performance, which has broken apart the oligopolistic pricing power that traditional media enjoyed in the 1980's and 1990's (p. 3).

Indeed, analysis of personal consumer expenditure as a percent of GDP takes on a new degree of significance. It makes sense that ad expenditure and PCE (on a percent of GDP basis) closely tracked one another in years prior to the late 1990's, especially if we think of PCE as a useful proxy for demand (which Newton essentially does). Through the economic growth of the 1980's and early 1990's, outsized demand for ad inventory relative to supply drove the market for ad expenditure, creating for a tight link between PCE and ad spend. Thus, the divergence between PCE and ad expenditure that begins in the late 1990's and intensifies through the present might be explained by a reversal in supply-demand dynamics within the advertising market. Specifically, with the growth of the Internet as an advertising platform, growth in ad

inventory (supply) significantly outpaced ad space demand. The result is deterioration in the pricing power of traditional media entities.

Picard's second major factor, audience fragmentation and polarization, can also be boiled down to shifts in simple supply-demand dynamics. Media abundance, along with technological change, is causing consumers to redistribute their attention across both more media channels (e.g. Internet versus magazines) and consumption vehicles (devices like computers, televisions, iPads, mobile phones, etc.). Mass audiences are, ironically, becoming harder and harder to reach. In response, advertisers are at once spreading ad expenditure across channels, spending less to target smaller audiences, and shifting dollars into other (often more direct) marketing efforts. This phenomenon captures the essence of what Picard identifies as the rise of an "attention economy," as well as of an "experience economy" (2011, p. 4). In his "attention economy" theory, Picard characterizes consumer attention as an increasingly scarce resource for which advertisers are now fiercely competing. As a corollary, the "experience economy" emphasizes the importance of creating "satisfying and memorable interactions" for customers who engage with advertisements–in other words, efficient use of attention as a scarce resource (2011, p. 4).

One enduring legacy of the Internet, by many accounts, is that it seemingly blurs the lines between media channels. The acts of watching television, reading a newspaper, or listening to radio–formerly very separate and distinct media consumption events–can now all take place on the Internet (perhaps simultaneously). Further, at no point in human history have we ever had almost instantaneous access to such an expansive body of information across a variety of consumption vehicles. The combination of the two trends mentioned create for what we will informally label in this paper as an "attention wall." Saturation of the American attention span is

reaching a peak, making for a figurative asymptotic "wall" on how much consumers can meaningfully process (Wilson, 2005). The challenge for advertisers is how to effectively vie for consumers' attention, especially as consumers direct an increasing amount of their time toward digital technologies.

Finally, the third Picard factor that we will address is what he labels as an "overall power shift in the communications process." This "shift" denotes an alteration in consumer attitude and expectations that follows a marked transformation in information consumption media. Picard sums it up well:

> The media space used to be controlled by media companies; today, however, consumers are gaining control of what has become a demand rather than a supply market… Major advertisers are cutting back on traditional media types of advertising–already only about one third of their total marketing expenditures–and spending their money on personal marketing, direct marketing, sponsorships, and cross-promotion (2011, p. 5).

Picard makes two salient points here. First, that the Internet has, in a sense, democratized the market for media consumption. Consumers can also now easily produce and disseminate their own information via blogs, photos, videos, etc. Advertisers are thus left trying to figure out how to appeal to an audience–once concentrated and robust–that is constantly eroding. Second, it is a mistake to assume that a slowdown in the growth rate of ad expenditure since the late 1990's is *fully* due to a migration of dollars away from certain traditional media outlets and into the Internet. The effect of the Internet has also been to generally force corporate ad/marketing budget revision. One might persuasively attribute this "revision" in part to the two factors previously discussed: media abundance and audience fragmentation/polarization.

The re-slicing of the ad expenditure pie as a point of consideration, however, should not be ignored. The flow of advertising dollars across various advertising media over time is an important concept to explore. As the Internet erodes advertisers' pricing power, and as consumers increasingly divide their time across media platforms, advertisers are faced with

decisions about how to best allocate their ad budgets. Understanding how these micro-level decisions are made may ultimately shed some light on why aggregate advertising expenditure is trending as it is. Thus, we will also examine issues related to "substitutability" of media platforms, both by advertisers and consumers.

Academic work on media substitutability among advertisers and/or consumers is scarce. Further, among existing academic literature on the topic, there is little in the way of consensus regarding media substitutability trends. Alvin J. Silk et al. attempted to make sense of substitutability among national advertisers in a 2002 study entitled *Intermedia Substitutability and Market Demand by National Advertisers*. Silk et al. conclude that market demand for "most major mass advertising media is price inelastic" and that "interdependencies among these demands involve a balanced mix of weak substitute and complementary relationships" (2002, p. 342). Silk also attributes price inelasticity to reliance by national advertising agencies on media commissions, which could mitigate price sensitivity in media purchasing decisions.

Another 2002 study by Joel Waldfogel for the FCC examined consumer substitution among media. His conclusions are laid out in the following table, labeled figure 2.1. A "Y" indicates "yes," there is evidence for some degree of substitutability here, whereas an "N" implies no substitutability. Cells left blank (--) refer to relationships where statistical analysis was inconclusive.

Figure 2.1

	Internet	Broadcast TV	Cable TV	Newspapers (daily)	Newspapers (weekly)	Radio
Internet		Y	--	Y (news)	--	N
Broadcast TV			--	Y (news)	N	Y (news)
Cable TV				Y	--	N
Newspapers (daily)					Y	--
Newspapers (weekly)						--
Radio						

*"(news)" indicates there is evidence for substitutability for news consumption within the media

Overall, Waldfogel asserts that,

> The conception of each medium as entirely distinct would be unduly restrictive because there is evidence (here and elsewhere) that consumers substitute across media. As the same time, however, substitution is not apparently so complete that the effects of changes in one medium are offset by changes in another (2002, p. 41).

To Waldfogel, it is clear that consumers are very much capable (and apparently very willing) to substitute across media types, especially when it comes to news and information consumption. Additionally, substitution is not perfectly "complete," meaning zero-sum.

So what can we conclude about current ad expenditure trends and the Internet given the studies conducted by Silk and Waldfogel? At first glance, the studies seem to diverge on the issue of substitutability: advertisers generally do not see different media platforms as substitutes, yet consumers often do. We, however, do not believe this to be an inherent contradiction but a function of the advertising and consumption landscapes in 2002, when both studies were published. In reality, advertising is now beginning to embrace the Internet as a medium (as consumers have already done), implying that substitutability may be a notable phenomenon. At the core of our conviction are two observations made earlier: that the ad market is increasingly supply-driven, and that power dynamics have shifted toward consumers. In 2002, we were only beginning to see the rise of the Internet as a viable, long-term advertising platform. Additionally,

consumers had not yet shifted their attention en masse toward digital realms. Writing in 2012, it is clear that the status quo is vastly different than it was in 2002. Thus, let us examine substitutability with the benefit of more hindsight.

Basic analyses of current advertising trends seem to be more receptive to the idea of some degree of substitutability between media among advertisers. In a 2011 report for the Congressional Research Service entitled *Advertising Industry in the Digital Age*, Suzanne Kirchhoff implies that major advertisers will need to think seriously about the web as a viable advertising platform:

> Even as the advertising industry grapples with the immediate impacts of the recession, it must adapt to structural changes as consumers migrate from traditional media to online platforms. Internet advertising has been the fastest-growing segment of the market, rising to $22.6 billion in 2009, from $4.6 billion in 1999… eMarketer, a forecasting and analysis firm, expects U.S. digital advertising to rise from more than $22 billion in 2009 to $40.5 billion by 2014… and with the advent of new technologies allowing long-form video on the web, [the Internet] has the capacity to emerge as a substitute for television as it presently exists (2011, p. 5-6).

Kirchhoff aptly mentions what underlies an argument for substitutability between media among advertisers: consumer migration. Year-to-year, consumers are spending an increasing portion of their media-exposure time in the digital realm (see Figure 2.2 below) (eMarketer, 2012). It should be noted, however, that substitutability among consumers today is not as simple as moving on from one medium to another. Rather, consumers shift between a "plethora" of consumption choices (i.e. one can "consume" TV on multiple devices, and in a variety of ways) (Perez, 2012). Figure 2.2 makes obvious the media that exhibit more staying power in terms of consumer time spent: while growth in Internet and mobile use has been explosive and TV seems stable, traditional media (radio, newspapers, and magazines) display varying degrees of decline.

Figure 2.2

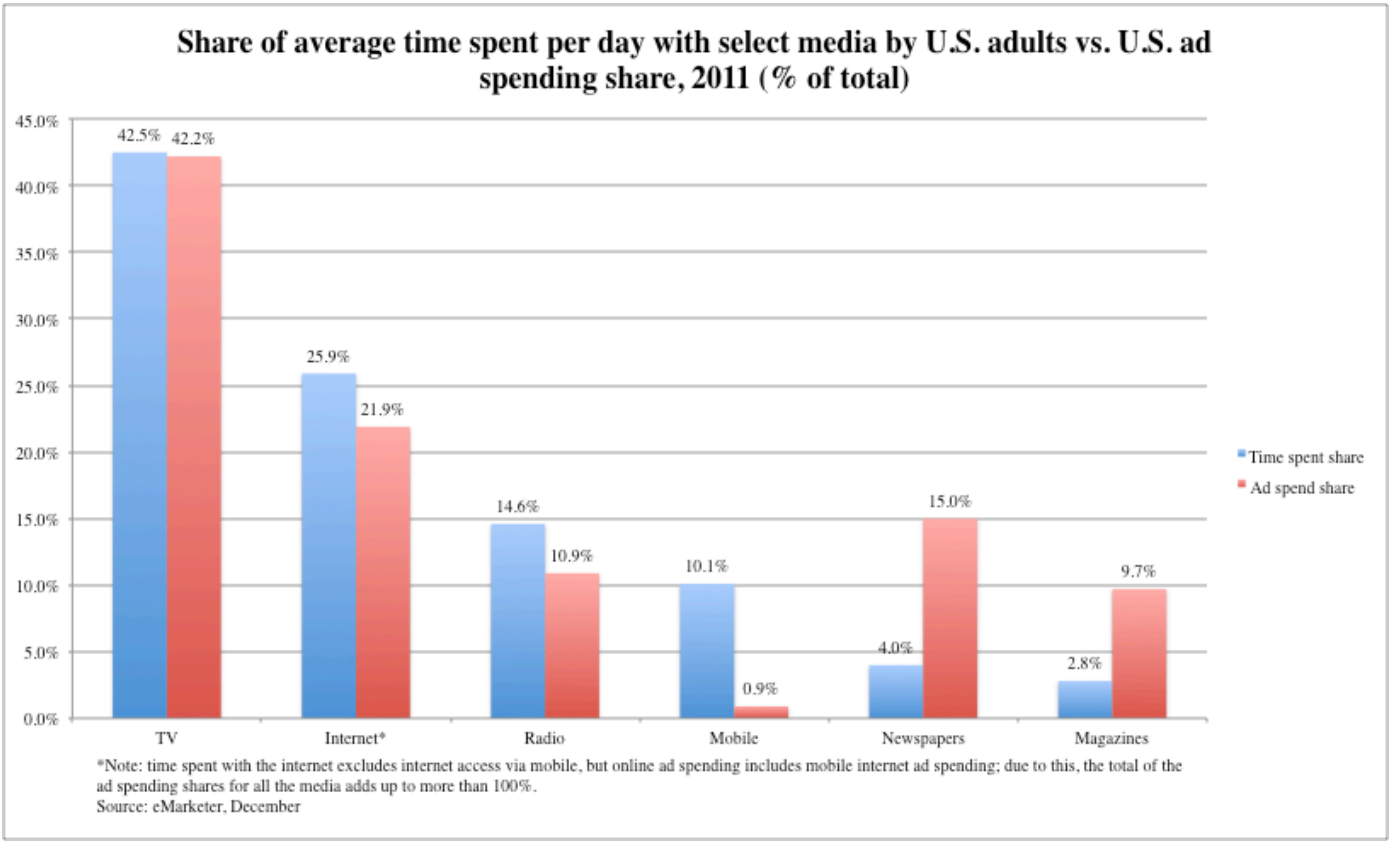
Average time spent per day with major media by U.S. adults, 2008-2011

	2008	2009	2010	2011
TV & video	254	267	264	274
% change	--	*5.12%*	*(1.12%)*	*3.79%*
Internet	137	146	155	167
% change	--	*6.57%*	*6.16%*	*7.74%*
Radio	102	98	96	94
% change	--	*(3.92%)*	*(2.04%)*	*(2.08%)*
Mobile	32	39	50	65
% change	--	*21.88%*	*28.21%*	*30.00%*
Newspapers	38	33	30	26
% change	--	*(13.16%)*	*(9.09%)*	*(13.33%)*
Magazines	25	22	20	18
% change	--	*(12.00%)*	*(9.09%)*	*(10.00%)*
Other	48	46	46	48
% change	--	*(4.17%)*	*0.00%*	*4.35%*
Total	635	650	660	693
% change	--	*2.36%*	*1.54%*	*5.00%*

Note: values denominated in minutes, except percentage changes
Note: time spent with each medium includes all time spent with that medium, regardless of multitasking; for example, 1 hour of multitasking on the Internet and watching TV is counted as 1 hour for TV and 1 hour for Internet; numbers may not add up to total due to rounding
Source: eMarketer

As a result, advertisers seem to be cautiously adjusting and diversifying their ad platform "portfolios," a term popularized by Robert Picard, to better capitalize on changing consumption habits. Not surprisingly, ad dollars are flowing into a variety of Internet advertising mechanisms. And while we cannot say definitively that these dollars are taken from allocations toward more traditional media outlets (radio, newspapers, magazines, etc.) at the micro level, we should not dismiss the possibility. Figure 2.3 further illustrates the breakdown by medium of time spent versus ad dollar allocation.

Figure 2.3



Note the disparity between dollars and time spent in newspapers and magazines. Despite the heavy usage decline detailed in Figure 2.2, newspapers and magazines still receive a substantial portion of total advertising spending. We believe that such a phenomenon may provide further evidence of a lag in ad dollar allocation relative to consumer attention. It is reasonable to believe that just as media like the Internet (and, eventually, mobile) are achieving more parity in relative ad dollars and consumer use over time, declining media like print and perhaps radio will see drainage in total ad dollars spent. Whether these dollars then migrate into Internet and/or TV advertising, or are pulled from advertising budgets altogether, is uncertain. This is largely a micro-level, case-by-case decision. Regardless, we contend that the effect would be an overall contraction in the equilibrium level of aggregate advertising spending.

Part III: A Forward-Looking Take on RCH

At this point, it is worth offering a reminder to maintain a sense of perspective with respect to time. Specifically, one should recognize that the online and digital realms are very much still in a process of evolution. The online and digital advertising industry is, thus, also a work in progress. Part III draws on the foundation built in Parts I and II to explore recent developments in, and future potential of, digital advertising. We will focus here on two emerging digital platforms that are shaping the advertising experience: Facebook and mobile. Of course, we will continue to relate back to Part II's central theme of downsized or diminished growth in aggregate advertising expenditure as a result of new digital platforms.

The future of digital advertising

Let us begin with a thorough look at Facebook, which we will use as something of a proxy for a larger field of increasingly popular social media and social networking websites. Founded in 2004 by Mark Zuckerberg, Facebook has grown rapidly and amassed over 845 million active monthly users as of December 2011. Of these 845 million active monthly users, over 483 million were active *daily* users as of the same date (Protalinski, 2012). Facebook allows users to create profiles, become "friends," exchange messages, upload photos and videos, and "like" parts of other profiles (photos, videos, status updates, etc.). Since its inception, Facebook has always relied heavily on advertising in its revenue mix. Advertising revenue comprised 85% of Facebook's total revenue in fiscal year 2011 ($3.154 billion out of $3.711 billion in total revenue). Additionally, fiscal year 2011 saw a 69% jump in advertising revenue from fiscal year 2010n (SEC filings, 2012). Facebook's $3.154 billion in ad revenue is a sizeable portion of the $5.54 billion global 2011 social network ad market (Rao, 2011). As with

many social media sites, Facebook's desire to keep the service totally free for its massive user base has forced the company to improve its advertising mechanisms, so as to market itself as a high-powered advertising platform. It has done so in a number of ways, and has achieved a steady record of success as of late. We will explore some of these mechanisms here.

The most fundamental form of advertising on Facebook is simply to bid on display (banner) ads. This takes place on a cost per click (CPC) or cost per impression (CPM) basis, whereby each time a user views a page that displays ads, an auction takes place to determine which eligible ad(s) will be shown on that impression. The selection process is obviously predicated on bid range, but also on past performance and quality of the ad. As discussed earlier, this open auction process (which resembles that of Google's search auctions) makes for a more efficient market. And, because each individual impression or click through can be uniquely monetized (i.e. viewers can be targeted), Facebook can charge advertisers less.

Not all are optimistic about Facebook's potential in the realm of advertising. Especially in light of its imminent initial public offering, detractors are beginning to paint a more negative picture of Facebook, Google, and other online giants that rely heavily on ad revenue. One such critic, VentureBeat columnist Jennifer Van Grove, cited Facebook's low click-through rate (CTR) in a recent article:

> Facebook does not publish its average click-through rate (CTR), but independent analysis from Webtrends on more than 11,000 Facebook campaigns showed that the average CTR for Facebook ads in 2010 was 0.051 percent, which is about half the industry standard CTR of 0.1 percent. The rate, according to the Webtrends report, dropped from 0.063 percent in 2009, which points to a downward trend (2012).

Van Grove's research highlights a major question for Facebook and web companies like it. If advertisers who bid on Facebook ad space are attracted to the company's targeting capabilities, will they continue to pay premiums to advertise there if Facebook users refuse to actually click on the ads? Empirically, it seems that Van Grove's concern, while legitimate, is premature.

Facebook and others are creatively adapting to an increasingly ad-immune user environment. Their evolution, some maintain, will help sustain the robust rise of social networks and the like as powerful advertising platforms.

Facebook's near-term answer to the stale nature of simple online display advertising is three-pronged: action spec targeting, Sponsored Story advertising, and monetization of a growing mobile user base. Innovative efforts like these have led like analyst Rocky Agrawal to argue that, "Facebook is the future of advertising" (2012, b). Agrawal notes that he sees Facebook not as the future of *online* advertising, but as the future of advertising as a whole:

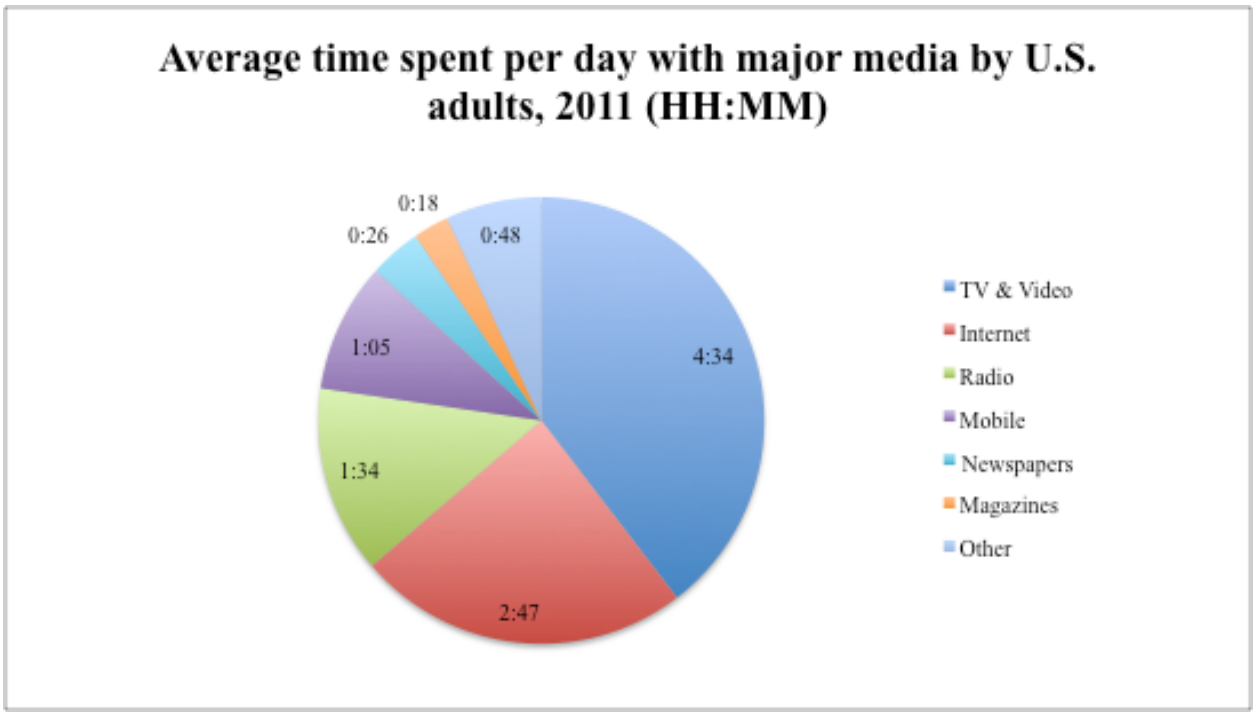
> Over the next decade, we will see a greater migration from traditional advertising like television and print to online advertising… The lack of scale problem has essentially been flipped on its head. It's now easier to reach 40 million people with Facebook than it is with television. A top-rated TV program can't reach that many people. The Super Bowl is the only event that can reach more people than Facebook can in a day (2012).

Facebook's massive user base, however, is of little value unless they can leverage user attention, hence the social network's latest efforts to revamp ad mechanisms. The focus of new advertising initiatives is, not surprisingly, to produce higher click-through and conversion rates. Action spec targeting accomplishes this by allowing advertisers to target users based on what they listen to, where they travel, what they buy, and other in-app activity. Sponsored Stories deliver to users the interactions of a user's friends with brands. Early results from market tests point toward long-term success. New targeting options stemming from action spec targeting "could improve the ROI of Facebook ads, and thereby attract a new class of advertisers, get existing ones to spend more, and pull in dollars from search, display, and offline channels" (Constine, 2012, c). Furthermore, Sponsored Stories attract up to a 46% higher CTR, have a 20% lower CPC, and boast an 18% lower cost per fan than Facebook's standard ad units (Constine, 2012, d). Facebook's new advertising mechanisms should continue to break down price barriers and costs for advertisers, ultimately driving fresh advertising dollars to the site. Conversion en masse

among advertisers will not take place overnight however. Most expect migration of ad dollars into Facebook and other popular online destinations to temper eventually, but remain steady well into the future (Rao, 2011).

The third prong of Facebook's new advertising initiatives entails a push to monetize their rapidly growing mobile user base. For Facebook and others, mobile (smart phones, tablets, and other mobile devices) represents the latest digital frontier ripe for revenue growth via ad exposure. Overall spending on mobile advertising in the U.S. is expected to reach $2.6 billion in 2012 according to research firm eMarketer. $2.6 billion would mean an 80% uptick in mobile ad expenditure from 2011, when advertisers paid $1.45 billion in aggregate (Wortham, 2012). While still a small fraction of what total online advertising stands at today–an expected $39.5 billion in 2012–mobile use is exploding, and advertisers generally follow consumers' eyes. In fact, 2011 marks the year that mobile passed print in absolute time spent by consumers (see Figure 2.4) (Schonfeld, 2011).

Figure 2.4



Note: average time spent with all media per day in 2011 was 11 hours 33 minutes; time spent with each medium includes all time spent with that medium regardless of multitasking; for example, 1 hour of multitasking on the Internet and watching TV is counted as 1 hour for TV and 1 hour for Internet.
Source: eMarketer, December 2011

The question of how to effectively advertise on mobile devices remains a legitimate one given the lack of physical display space on objects with smaller screens. Preliminary ideas seem to pertain mostly to a Facebook-esque "Sponsored Story" model, whereby relevant brand names appear in a user's news feed. Micro-blogging service Twitter recently launched a monetization initiative around "promoted tweets" that allows advertisers to pay to have their branded tweets appear in select users' Twitter feeds. Still, these somewhat basic first attempts are very much works in progress. Entrepreneur and blogger Frank Barbieri notes that, "analytics, measurement and targeting have not caught up to where online is, exactly when we're hearing inventory volume is set to surpass online" (Barbieri, 2012). Yet, as consumer attention increasingly shifts to mobile devices and away from more traditional media platforms, advertisers will invariably have to make decisions about how to allocate, or reallocate, advertising budgets.

A lower ad spend/GDP baseline going forward

Having examined the Internet and other emerging digital technologies as advertising media in both their current and future forms, we now return to our original question of how to assess RCH in this increasingly digital age. Clearly, there is no simple answer. Our analysis of RCH in the modern age yields convincing evidence that the recent trend break in aggregate ad expenditure as a percent of nominal GDP is of some statistical significance. We have suggested that said break is, in part, attributable dually to the destruction of cost barriers and pricing power once enjoyed by traditional media, and the beginning of ad budget revision at the micro level whereby dollars are increasingly flowing into digital advertising platforms and away from traditional media like print (or out of advertising altogether). While we cannot definitively assess such a phenomenon statistically, we have explored more qualitatively the rise of the Internet as an advertising platform. Due to factors like growth in ad inventory (space), targeting, measurability, interactivity, and an increasing share of consumers' attention, we feel that our two claims above are justifiable.

So what should we make of RCH going forward? It is our firm belief that the metric on which much of RCH is predicated–aggregate ad expenditure as a percent of nominal GDP–will settle at lower overall level for the foreseeable future. While we cannot provide a specific number, we do feel that this new baseline will represent a significant departure from average levels leading up to the present (which have been around 2%). Despite the traditional cyclicality of the metric, we see no reason for any near-term rebound in ad spend/GDP. Thus, we would recommend a revision of RCH that considers recent technological changes and consequential evolution in the advertising market.

The state of the digital advertising industry outlined in this paper, however, is by no means static. As has been mentioned, we must keep perspective on time and recognize that the Internet and other digital technologies are relatively young and in many ways still growing. A forward-looking 2009 paper written by Professor Eric Clemons of the Wharton School at the University of Pennsylvania makes the case that the Internet is "not replacing advertising but shattering it." Clemons points out that, while the Internet has been a democratizing force within the ad industry itself, it has also been a liberating force for the consumers on which advertisers rely. His piece is not so much an indictment of Internet advertising, but of the concept of advertising as a whole. As consumers become increasingly informed, interconnected, and in control of their information consumption, advertisers will lose the ability to effectively "push" commercial messages. Instead, consumers will lean on an extensive "trust" network of personal contacts and reliable recommendations when making purchasing decisions.

Whether there is real truth to Clemons' argument is unclear. What is clear, however, is that advertising seems to be attempting to capitalize on "trust" networks already. Facebook is arguably at the fore of online advertising by doing what no other traditional outlet, and few other online outlets, can do: adding elements of social interface to advertising–specifically to brand advertising. Facebook's Sponsored Story and Open Graph action spec targeting are exactly this. Here, one's exposure to an advertisement is based on either an acquaintance's interaction with a business (i.e. friend X purchased coffee at Starbucks), or on your own declared intent to interact with a business (i.e. searching for a new pair of running shoes). Advertisers (and Facebook) hope that a less intrusive ad will in turn drive traffic to the company's official Facebook "page," from which point the chances of a consumer conducting a transaction are obviously much higher.

As has been discussed, full-scale migration away from traditional media and into digital platforms by major advertisers might be described as tempered at best. Because advertisers tend to follow consumers, and because the Internet is only now maturing as a technology, more sustained migration would be logical. Additionally, advertisers held reservations about online advertising and its ultimate effectiveness. In a conversation with Robert Picard, Dr. Picard cited a few of shortcomings of the Internet as an advertising platform in its current form. For example, while the Internet has proven an effective tool for brand advertising and searchable classifieds, it is a poor medium for retail advertising (R. Picard, personal communication, March 22, 2012). Small and local businesses looking to advertise on the Internet often find it difficult because of the inability to effectively target locally. Yet, as retailers increasingly build, and learn to drive traffic to, online "pages," trepidation around advertising may fade. Bob McDonald, the CEO of Proctor & Gamble, recently commented on the future of the company's $10 billion ad budget:

> As we've said historically, the 9% to 11% range [for advertising as a percentage of sales] has been what we've spent. Actually, I believe that over time, we will see the increase in the cost of advertising moderate. There are just so many different media available today and we're quickly moving more and more of our businesses into digital. And in that space, there are lots of different avenues available… In the digital space, with things like Facebook and Google and others, we find that the return on investment of advertising, when properly designed, when the big idea is there, can be much more efficient. One example is our Old Spice campaign, where we had 1.8 billion free impressions and there are many other examples I can cite from all over the world. So while there may be pressure on advertising, particularly in the United States, for example, during the year of a presidential election, there are mitigating factors like the plethora of media available (Edwards, 2012).

Mr. McDonald cites two important elements of Internet advertising as crucial to a more expansive move into the realm by P&G: cost and effectiveness. While online advertising has always been relatively low cost for reasons discussed throughout this paper, it is only now beginning to embrace how effective it can be. As online (and, perhaps, mobile) channels

continue to build more potent advertising mechanisms, we see no reason why other advertisers will not join P&G in pursuing a more dynamic online strategy.

Though the Internet is not fully developed as an effective advertising medium, it is nonetheless continuing to evolve and attract more advertising dollars. Assuming that features such as measurability, targeting, interactivity, and effectiveness also continue to evolve, it is reasonable to assume that digital technologies will eventually thrive as low-cost and effective advertising options. This will allow firms to spend less and still achieve a similar, or higher, return on investment. This has already occurred in the classifieds market, where craigslist.com has reduced U.S. newspaper valuations by at least $30 billion as advertisers achieve comparable results online at a fraction of the cost (Anderson, 2009). Going forward, the effectiveness and low cost of digital advertising will compel many businesses to rethink the size and makeup of their advertising budgets. We anticipate a general shift in dollars out of more costly traditional media and into digital. The dual phenomenon of cost barrier deterioration and micro-level budget revision will have, we believe, the singular effect of slowing growth in aggregate advertising expenditure, forcing a lower baseline level of ad spending/nominal GDP.

Greater implications of our findings

By nature, this paper is somewhat hypothetical and forward-looking. It serves both to add to an existing discussion on the advertising industry, as well as ignite a new one concerning the effect of digital technologies. The implications of this new discussion are far-reaching. For example, continued expansion of the Internet as an advertising medium affects valuations of new and traditional media companies that rely heavily on advertising. Furthermore, as ad dollars move from traditional media into the Internet, we expect that certain traditional media will

suffer. Updated and expanded research on the issue of media substitutability among advertisers is needed to fully identify the magnitude of shifting ad expenditure. Specifically, how willing are businesses to revise ad budgets and explore digital advertising opportunities? And will we see a change in responsiveness among businesses (i.e. how readily a business adopts a new advertising platform)?

We should also consider how traditional media will respond to these changes. We may see continued efforts by traditional media to integrate their offerings into digital formats such magazines on an iPad or online. Additionally, will the increased threat of the Internet in the advertising market bring down prices even in traditional media as they compete with the lower cost of Internet advertising? Given the democratized bidding process that takes place online, advertising agencies may have to reduce what they charge for services such as brokering advertising placements.

Further study could also examine the trajectory of Internet growth in comparison to TV in the 1950's, or to other media. What factors help determine the rate of growth and how soon will we see the rate of growth in online ad spending slow down?

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Appendix 1.1 – Stata Output – Dickey-Fuller test of natural logs of adspend and GDP independently

```
. dfuller  logad, lags (5) trend

Augmented Dickey-Fuller test for unit root         Number of obs   =       105

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -2.186           -4.038            -3.449           -3.149
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.4980

. dfuller loggdp, lags (5) trend

Augmented Dickey-Fuller test for unit root         Number of obs   =       105

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -2.298           -4.038            -3.449           -3.149
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.4350
```

Appendix 1.2 – Stata Output – Cointegration, Dickey-Fuller test of regression residuals of adspend on GDP

```
. reg  adspend gdp

      Source |       SS       df       MS              Number of obs =     111
-------------+------------------------------           F(  1,   109) = 5159.52
       Model |  7.4947e+11     1  7.4947e+11           Prob > F      =  0.0000
    Residual |  1.5833e+10   109   145259508           R-squared     =  0.9793
-------------+------------------------------           Adj R-squared =  0.9791
       Total |  7.6530e+11   110  6.9573e+09           Root MSE      =   12052

------------------------------------------------------------------------------
     adspend |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         gdp |    .020568   .0002863    71.83   0.000     .0200005    .0211355
       _cons |    1130.41   1357.465     0.83   0.407    -1560.041    3820.861
------------------------------------------------------------------------------

. predict e, resid

. dfuller e, lags (5)

Augmented Dickey-Fuller test for unit root         Number of obs   =       105

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -2.992           -3.508            -2.890           -2.580
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0357
```

Appendix 1.3 – Stata Output – VECM output for adspend and GDP

```
. vec  adspend gdp, lags(3)

Vector error-correction model

Sample:  1903 - 2010                              No. of obs      =       108
                                                  AIC             =  44.99055
Log likelihood =  -2416.49                        HQIC            =  45.12145
Det(Sigma_ml)  =  9.32e+16                        SBIC            =   45.3134

Equation           Parms      RMSE     R-sq      chi2     P>chi2
------------------------------------------------------------------
D_adspend              6   5962.36   0.3660   58.88879   0.0000
D_gdp                  6    109460   0.8100   434.9467   0.0000
------------------------------------------------------------------
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_adspend						
_ce1						
L1.	-.1041699	.0212847	-4.89	0.000	-.1458871	-.0624526
adspend						
LD.	.7354404	.1969349	3.73	0.000	.349455	1.121426
L2D.	.927357	.2051054	4.52	0.000	.5253578	1.329356
gdp						
LD.	-.0267816	.0122376	-2.19	0.029	-.0507668	-.0027963
L2D.	-.0523834	.0151703	-3.45	0.001	-.0821167	-.0226502
_cons	369.4823	727.8377	0.51	0.612	-1057.053	1796.018
D_gdp						
_ce1						
L1.	-2.415726	.3907549	-6.18	0.000	-3.181591	-1.64986
adspend						
LD.	14.634	3.615426	4.05	0.000	7.547892	21.7201
L2D.	11.59788	3.765424	3.08	0.002	4.217781	18.97797
gdp						
LD.	-.2564052	.2246635	-1.14	0.254	-.6967376	.1839272
L2D.	-.6526837	.278504	-2.34	0.019	-1.198541	-.1068259
_cons	-15.93266	13362	-0.00	0.999	-26204.96	26173.1

```
Cointegrating equations

Equation           Parms      chi2     P>chi2
------------------------------------------------------------------
_ce1                   1   124.0346   0.0000
------------------------------------------------------------------

Identification:  beta is exactly identified

                 Johansen normalization restriction imposed
```

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
adspend	1	.	.	.	.	.
gdp	-.0501979	.0045073	-11.14	0.000	-.059032	-.0413638
_cons	-9043.342	.	.	.	.	.

Appendix 1.4 – Stata Output – Cointegration, Dickey-Fuller test of regression residuals of LnAdspend on LnGDP

```
. reg logad loggdp
```

Source	SS	df	MS	Number of obs = 111
Model	430.205868	1	430.205868	F(1, 109) =13725.03
Residual	3.41656381	109	.031344622	Prob > F = 0.0000
				R-squared = 0.9921
				Adj R-squared = 0.9920
Total	433.622431	110	3.9420221	Root MSE = .17704

logad	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
loggdp	.9632157	.0082218	117.15	0.000	.9469204	.9795111
_cons	-3.336597	.1089684	-30.62	0.000	-3.552568	-3.120625

```
. predict e, resid

. dfuller e, lags(3)
```

Augmented Dickey-Fuller test for unit root — Number of obs = 107

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-2.855	-3.508	-2.890	-2.580

MacKinnon approximate p-value for Z(t) = 0.0508

```
. dfuller e, lags(4)
```

Augmented Dickey-Fuller test for unit root — Number of obs = 106

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-2.300	-3.508	-2.890	-2.580

MacKinnon approximate p-value for Z(t) = 0.1721

```
. dfuller e, lags(5)
```

Augmented Dickey-Fuller test for unit root — Number of obs = 105

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-2.569	-3.508	-2.890	-2.580

MacKinnon approximate p-value for Z(t) = 0.0996

Appendix 1.5 – Stata Output – VECM output LogAdspend LogGDP

```
. vec  logad loggdp, lags (3)

Vector error-correction model

Sample:  1903 - 2010                              No. of obs      =       108
                                                  AIC             = -4.693668
Log likelihood =   266.458                        HQIC            = -4.562764
Det(Sigma_ml)  =  .0000247                        SBIC            = -4.370818

Equation           Parms      RMSE     R-sq      chi2     P>chi2
------------------------------------------------------------------
D_logad                6     .084826   0.4143   72.16521   0.0000
D_loggdp               6     .069133   0.5174   109.3644   0.0000
------------------------------------------------------------------
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_logad						
_ce1						
L1.	-.1732823	.0543311	-3.19	0.001	-.2797692	-.0667953
logad						
LD.	.1327915	.1062127	1.25	0.211	-.0753816	.3409647
L2D.	-.0830009	.1070643	-0.78	0.438	-.2928432	.1268413
loggdp						
LD.	.1356161	.1389827	0.98	0.329	-.136785	.4080172
L2D.	.0464018	.142761	0.33	0.745	-.2334045	.3262082
_cons	-.0075251	.0164965	-0.46	0.648	-.0398577	.0248074
D_loggdp						
_ce1						
L1.	-.0425011	.0442799	-0.96	0.337	-.1292881	.0442858
logad						
LD.	.0702112	.0865635	0.81	0.417	-.0994501	.2398726
L2D.	-.2086056	.0872576	-2.39	0.017	-.3796273	-.0375839
loggdp						
LD.	.3701931	.1132711	3.27	0.001	.1481859	.5922003
L2D.	.043486	.1163504	0.37	0.709	-.1845565	.2715286
_cons	.0306809	.0134447	2.28	0.022	.0043299	.057032

```
Cointegrating equations

Equation           Parms      chi2     P>chi2
------------------------------------------------------------------
_ce1                   1   1701.148   0.0000
------------------------------------------------------------------

Identification:  beta is exactly identified

                 Johansen normalization restriction imposed
```

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
logad	1	.	.	.	.	.
loggdp	-.9650913	.023399	-41.24	0.000	-1.010953	-.9192301
_cons	3.070432	.	.	.	.	.