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Bartering for ‘Free’ Information: Implications for GDP and Productivity

Leonard Nakamura, Jon Samuels
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Seminar 1

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Implications for GDP and Productivity

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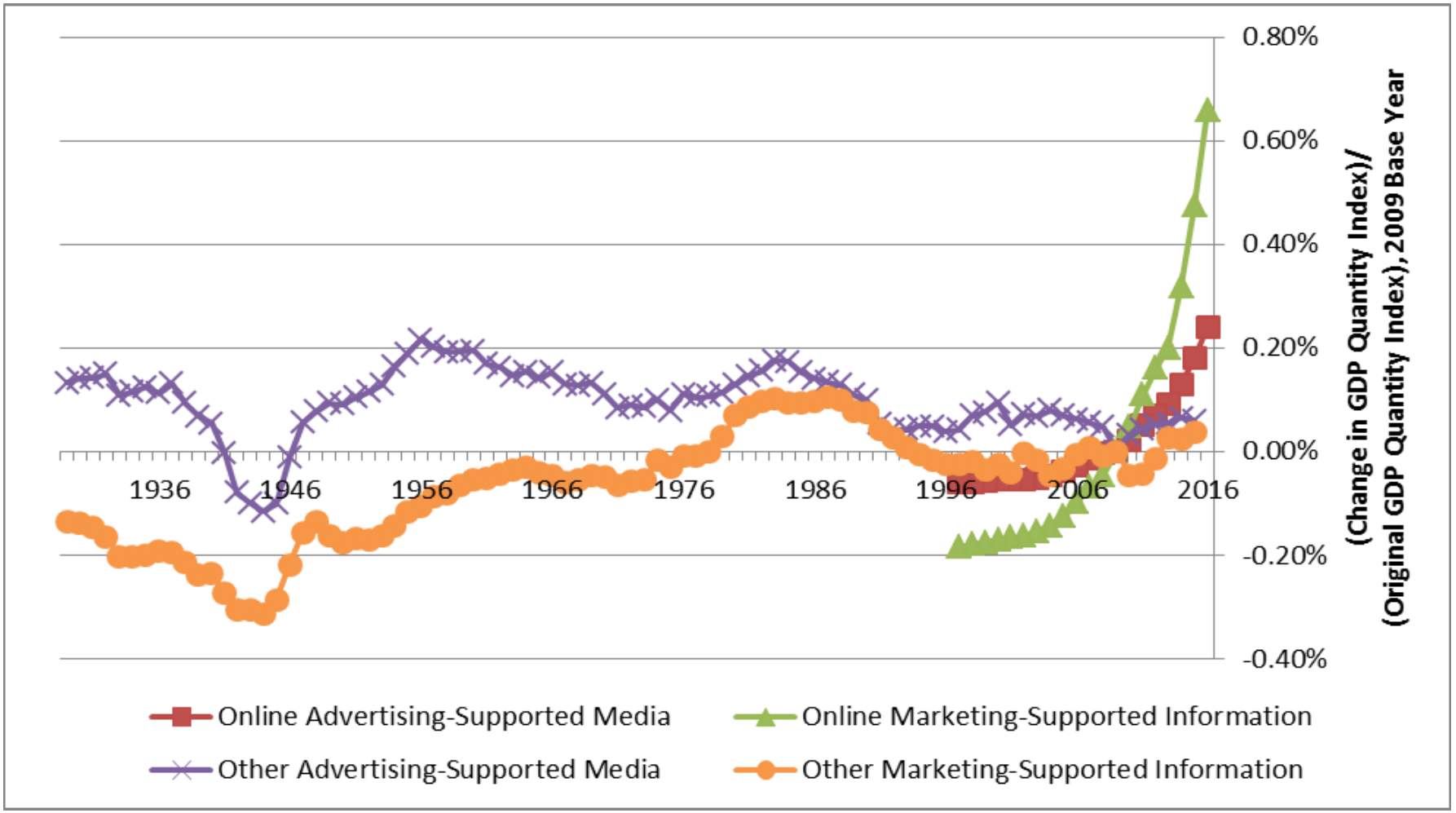
Introduction

- 'Free' content is currently treated as an intermediate input and excluded from final expenditures in GDP.
  - This methodology treats wanted content like Twitter the same as unwanted telemarketing.
  - 'Free' internet and TV may contribute $2 trillion to consumer surplus (Brynjolfsson and Oh 2012).
- We introduce an experimental GDP methodology where 'free' consumer content is included in final expenditures.
  - We value 'free' content based on production cost
- Both advertising and marketing support content
  - Advertising is a three way transaction: users give media companies viewership and get 'free' media in return. Media companies then resell the viewership.
  - Marketing is a two way transaction: users give marketers viewership and get 'free' information in return. Marketers then use the viewership in-house.

Preview of Results: Revisions to real GDP

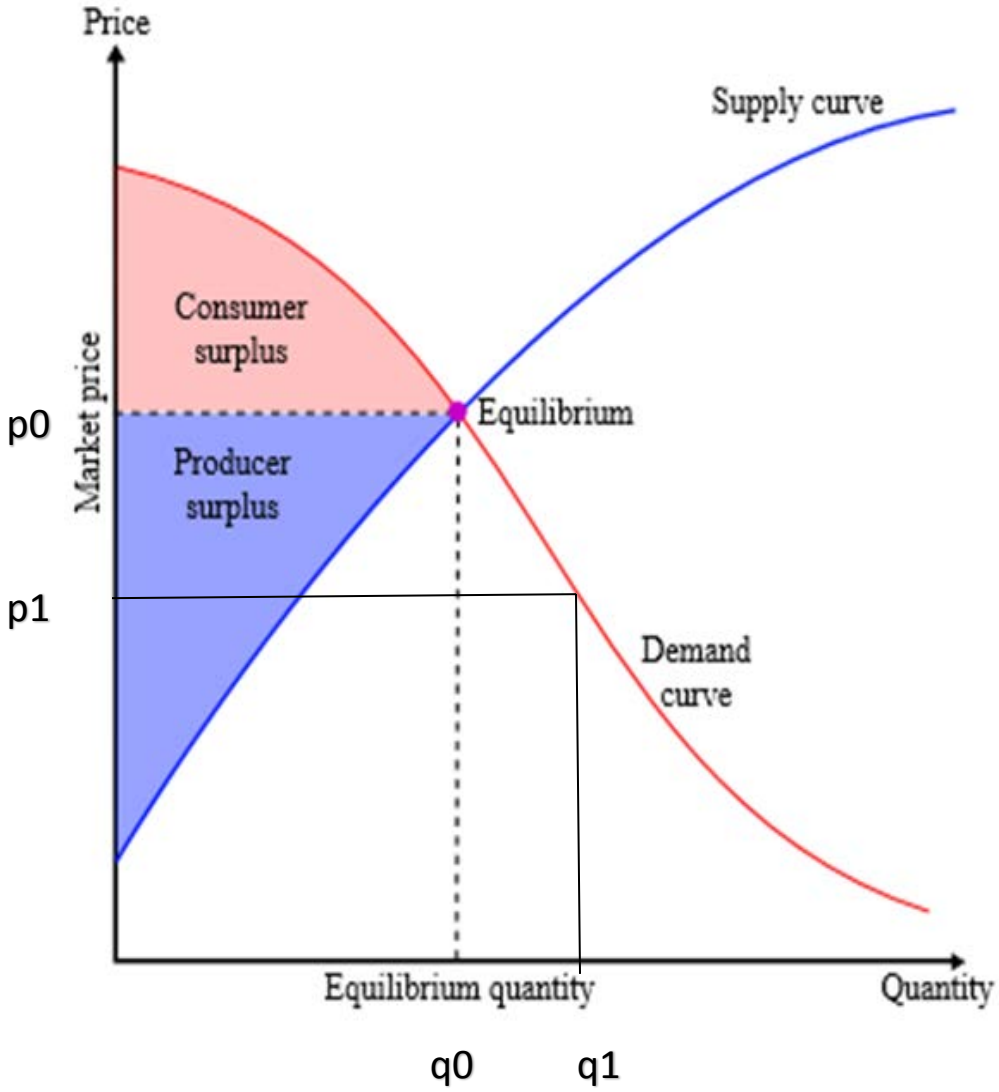


- Digital policy-makers often focus on advertising-supported media companies like Google, but in-house digital marketing actually represents more spending

Outline of Talk

- Review the standard GDP formula.
- Introduce an experimental GDP formula which includes ‘free’ consumer content in final output.
  - Advertising-supported online media added $15 billion to GDP in 2012.
  - Advertising-supported TV, radio and print media added another $41 billion to GDP in 2012.
  - Marketing-supported online information added $71 billion to GDP in 2012.
  - Marketing-supported in-person, audio-visual and print information added another $71 billion to GDP in 2012.
- Discuss further work briefly.

Measuring GDP in Periods 0 and 1



- In Period 0: The rectangle with the dotted lines has an area q_0p_0. It shows **actual** spending and GDP.
- In Period 1: The rectangle with the dotted lines has an area q_1p_1. It shows **actual** spending and GDP.

- Under the current GDP methodology, both q_0p_0 and q_1p_1 are zero for 'free' content.
- Our experimental GDP methodology creates p_0, p_1, q_0, and q_1 so 'free' content can be in GDP.

Current Treatment of 'Free' Content

- In BEA's GDP statistics, sold products and services are the only output tracked.
  - 'Free' content or viewership purchased from outside companies is tracked as an intermediate input.
  - 'Free' content or viewership produced in-house isn't tracked at all.
  - Wanted content like Twitter is treated the same as unwanted telemarketing or junk mail.
- Both Twitter and broadcast TV are positive externalities from viewership production.
  - Conceptually, this is similar to the treatment of negative externalities like pollution.
- Real GDP rises when 'free' content switches to paid.

Our Experimental Treatment

- For advertising, the media company and user engage in barter: the user watches ads in exchange for media.
  - Value of advertising viewership = Value of 'free' media
- For marketing, the marketer and user engage in barter: the user watches marketing in exchange for info.
  - Value of marketing viewership = Value of 'free' information
- SNA 2008 is clear that barter transactions should be included in GDP just like cash purchases (Section 3.79)
- Real GDP is steady when 'free' content switches to paid.
  - When consumers use 'free' content, we include it with personal consumption expenditure and GDP.
  - When businesses use 'free' content, we treat it as an intermediate input and track it in the I-O tables.

Historical Research on 'Free' Media

- Borden (1935) was an early exploration of the proportion of advertising devoted to subsidizing content provision
- Cremeans (1980) proposed a barter mechanism for measuring 'free' media similar to the one we propose and estimate.
  - He followed an extensive discussion in the 1970's: Ruggles and Ruggles (1970), Okun (1971), Jaszi (1971), Eisner (1978), Kendrick (1979).
- Nakamura (2005) modeled consumption gains in an expenditure model
- Soloveichik (2014) revived this approach for US GDP
- Nakamura, Samuels and Soloveichik (2016) calculated GDP and total factor productivity (TFP) by industry.
- The papers above all focused on advertising-supported media. Our new paper focuses on marketing-supported information.

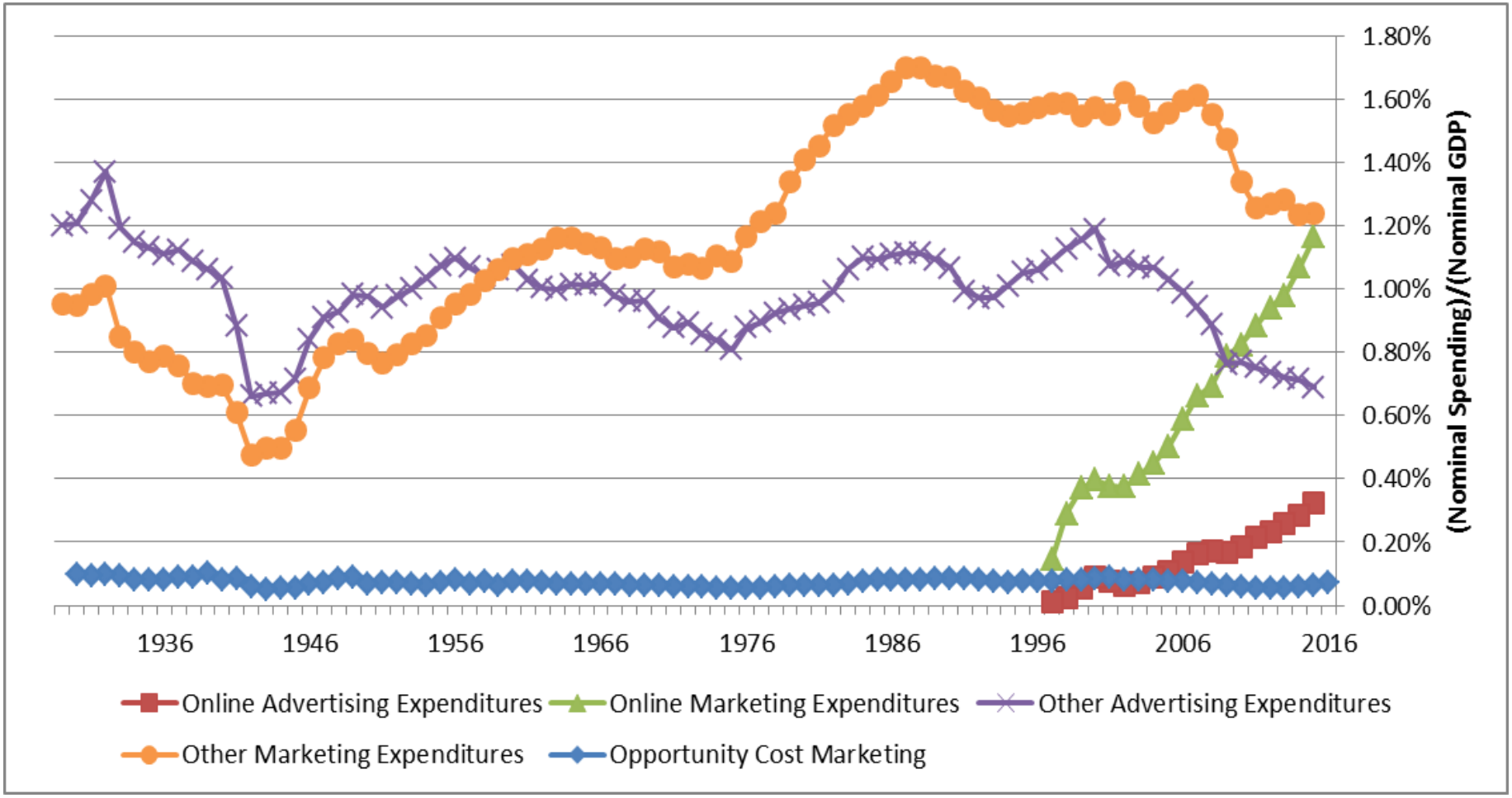
Data Used to Track Advertising

- Our primary source is the 2007 Economic Census, which reports advertising revenue by industry.
  - We include all advertising revenue, regardless of whether consumers pay zero out-of-pocket or a subsidized price.
  - Our annual data is taken from the Service Annual Survey, the CS Ad spending dataset (Galbi 2008) and other sources.
- We split advertising into: a) print newspaper or magazines ; b) broadcast radio or television; c) cable, satellite and other subscription video; d) online media.
  - Each category has its time series of nominal expenditures, media prices and advertising viewership prices.

Data Used to Track Marketing

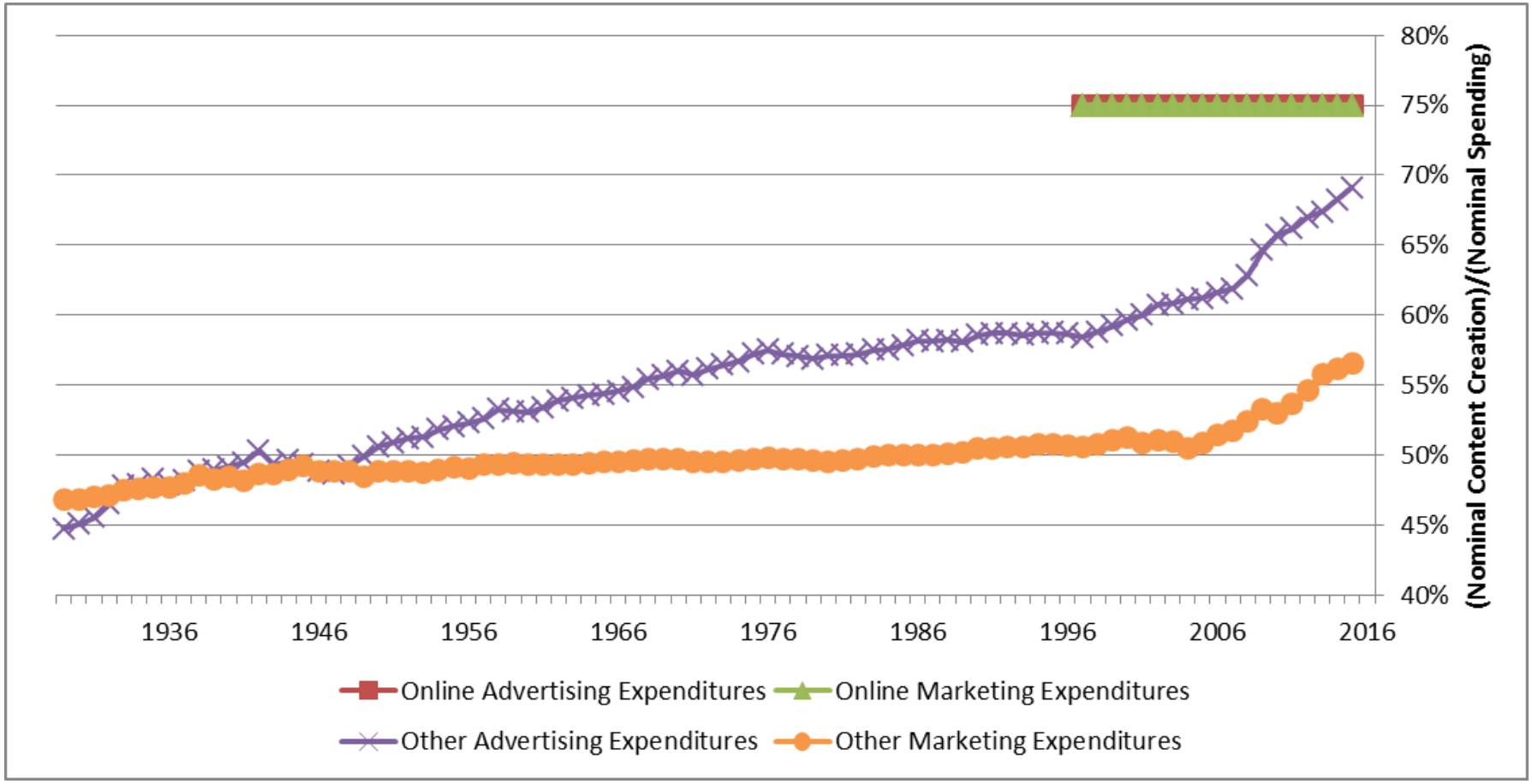
- The Occupational Employment Survey provides indirect data on in-house marketing production.
  - We use occupation to identify marketing professionals
  - For example, a writer employed by a car manufacturer is probably working in the marketing department.
  - Companies also often purchase specialty inputs like multi-media design. The Economic Census provides data on those purchases.
  - We use a variety of sources to track historical data.
- Companies also use their own ad slots for marketing
  - Freemium games like Candy Crush are the best known example.
  - Low out-of-pocket costs, but high opportunity costs.
- We split marketing into four categories: a) in-person; b) print; c) audio-visual; d) digital.

Nominal Advertising and Marketing



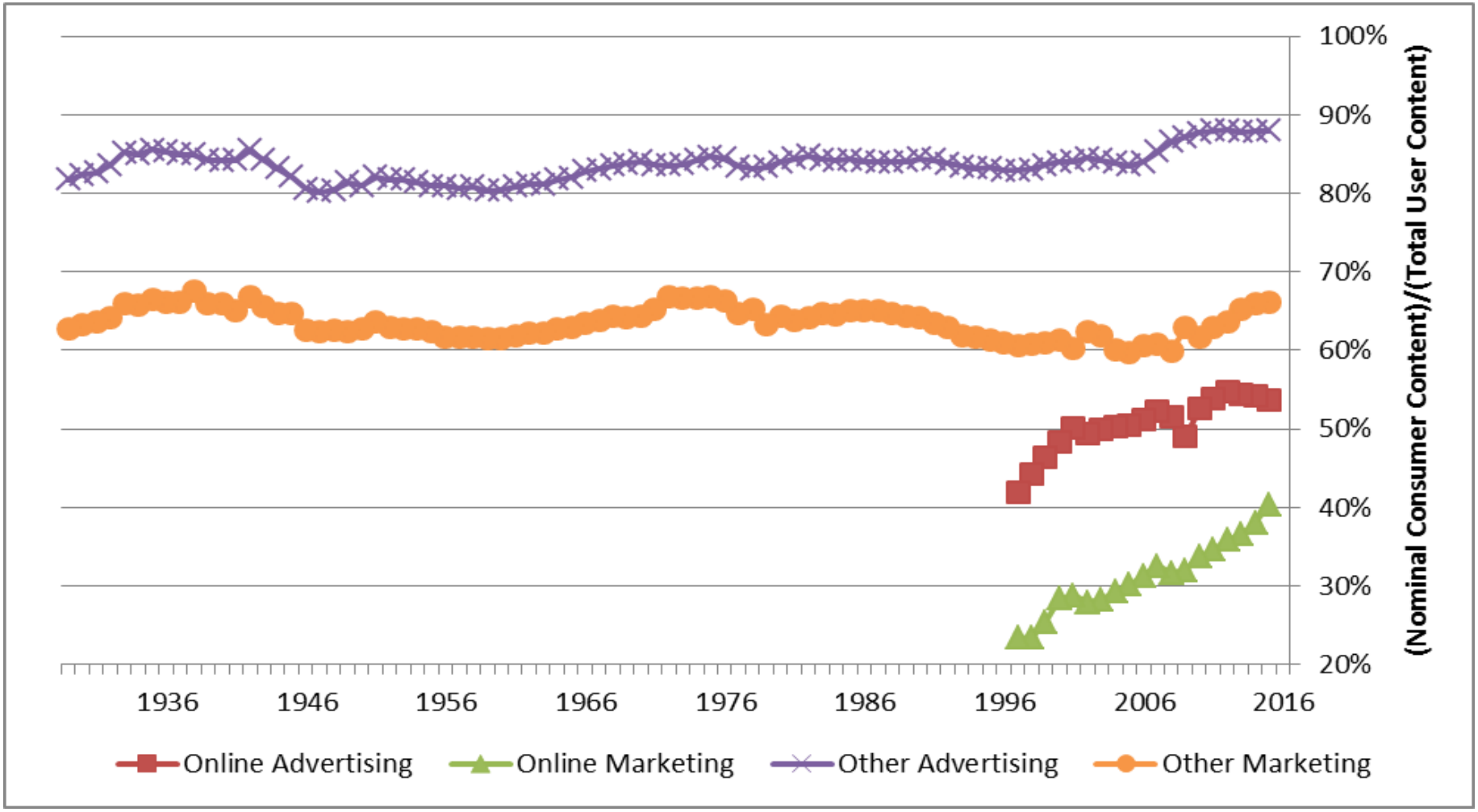
- Despite the popularity of freemium games, they're actually very cheap.
- Both advertisers and marketers have been substituting from print to digital content.

Share of Value Devoted to User Content



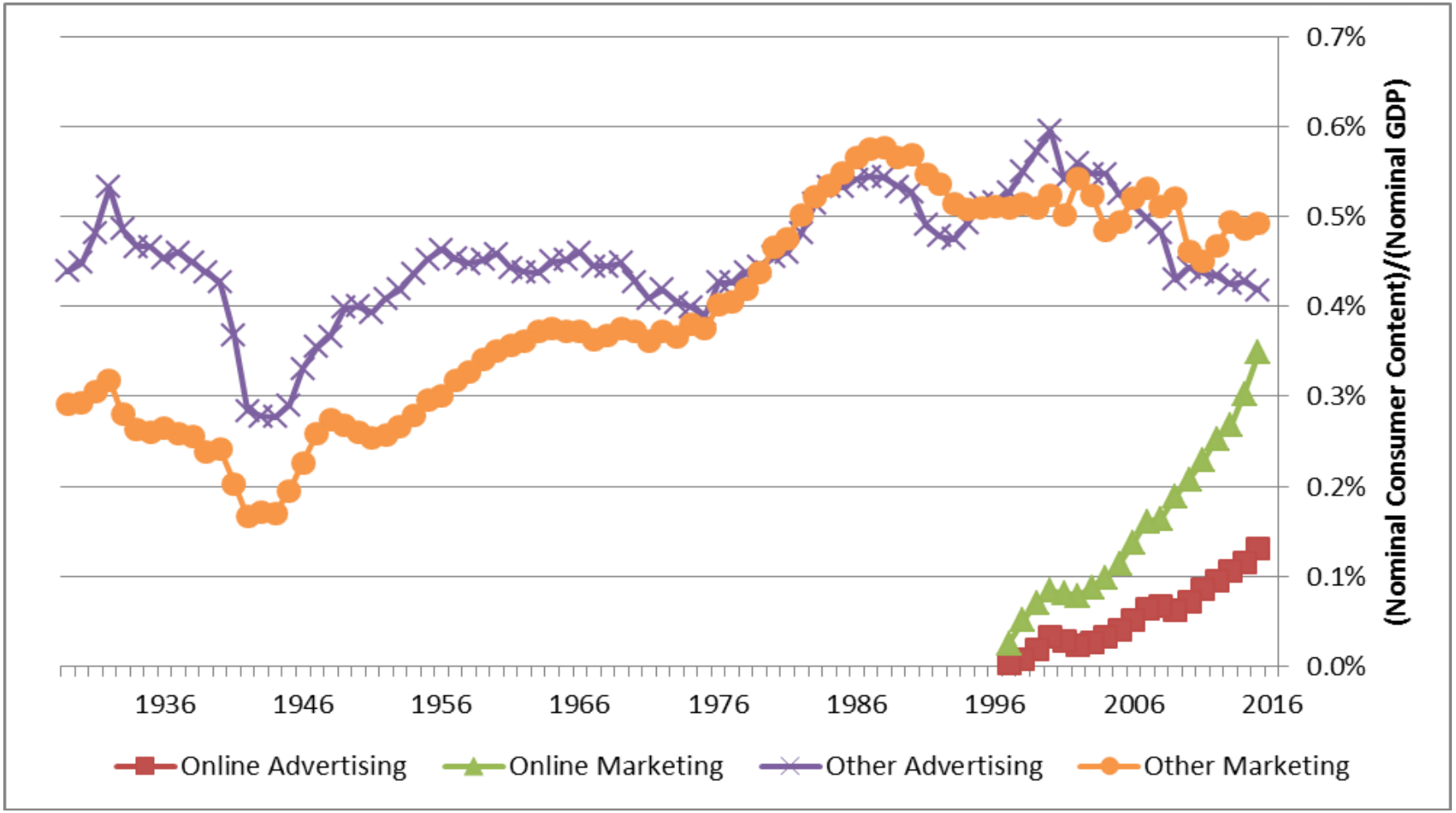
- A large portion of expenditures shown earlier are devoted to producing, printing and distributing the bundled advertising/marketing rather than the useful content.
- (Value to Content User) = (Total Expenditures) – (Ad/Marketing-Related Costs)

Consumer Share for 'Free' Content



- For online advertising, we use Forrester data to split personal and work Internet
- For other categories, we use BEA's published I-O tables and other sources.

Nominal ‘Free’ Consumer Content

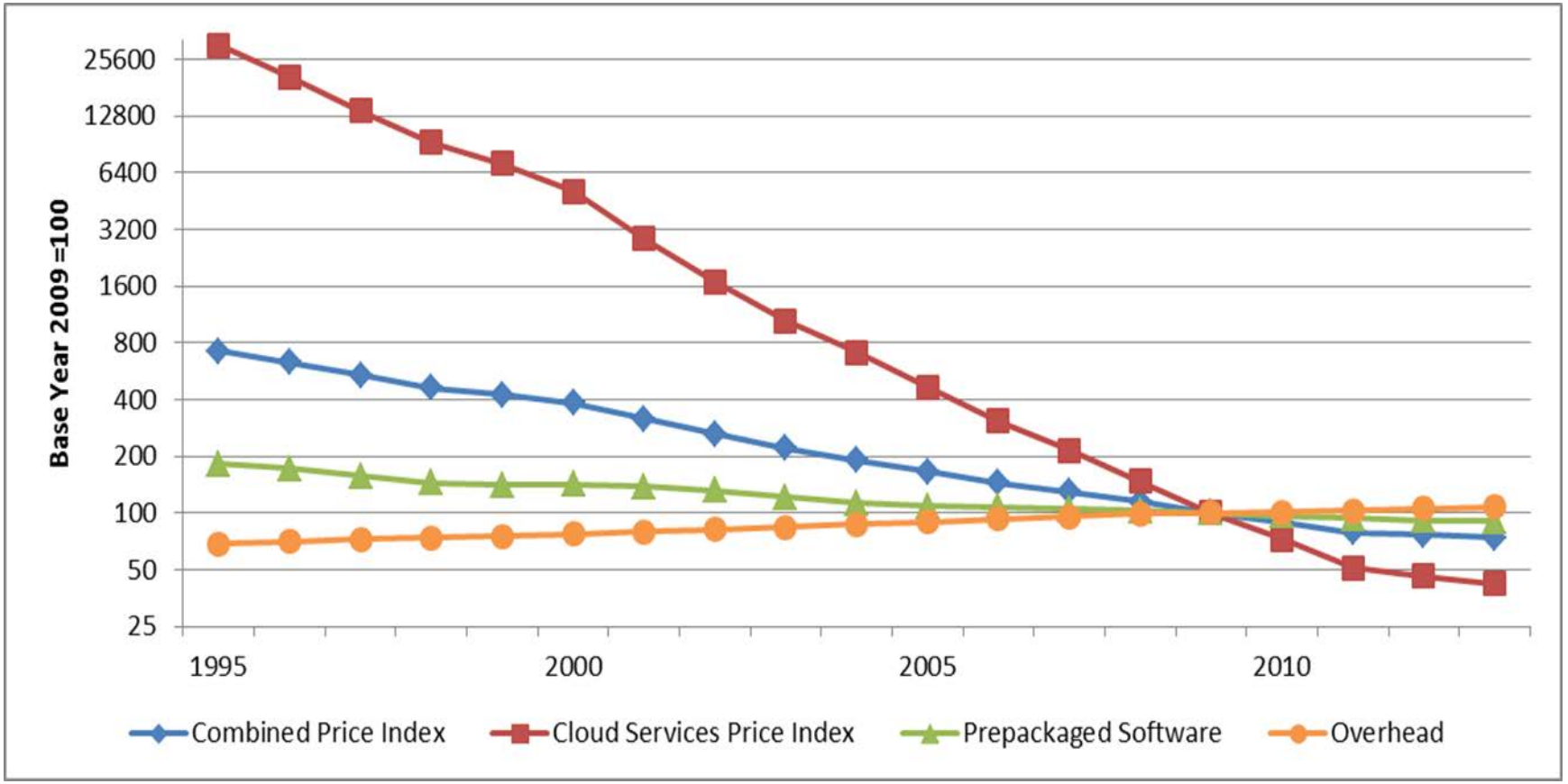


- Advertising-supported content has hovered around 0.5% of GDP since 1929.
- Marketing-supported content has grown faster than GDP since 1955.

Prices for 'Free' Content Are Hard

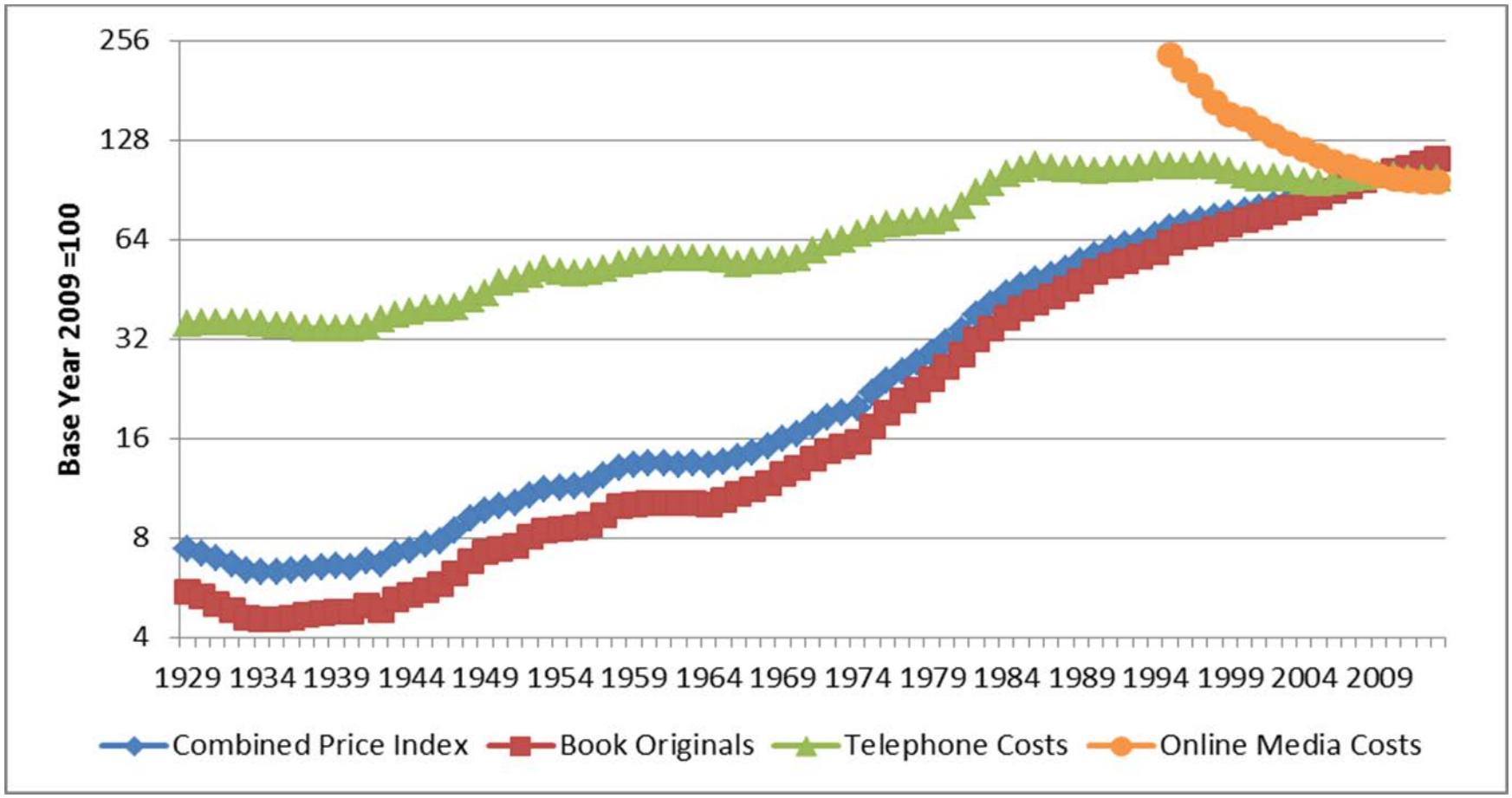
- Quality is extremely difficult to measure
  - The user experience depends on not only the content provided, but also consumer inputs like smartphones.
  - Consumer preferences differ across people and over time.
  - Users generally prefer accurate information, but marketers sometimes provide biased or misleading information
- Our price indexes are based on pre-existing price indexes.
  - Our in-person marketing price index is simply BEA's pre-existing price index for vocational education (Table 2.4.4U, line 291)
  - For the other categories, we use a combination of input prices and output prices for purchased content. We assume that 'free' content is affected by the same trends as purchased content.
  - These price indexes do not account for network effects or other quality change.

Prices for Online Content



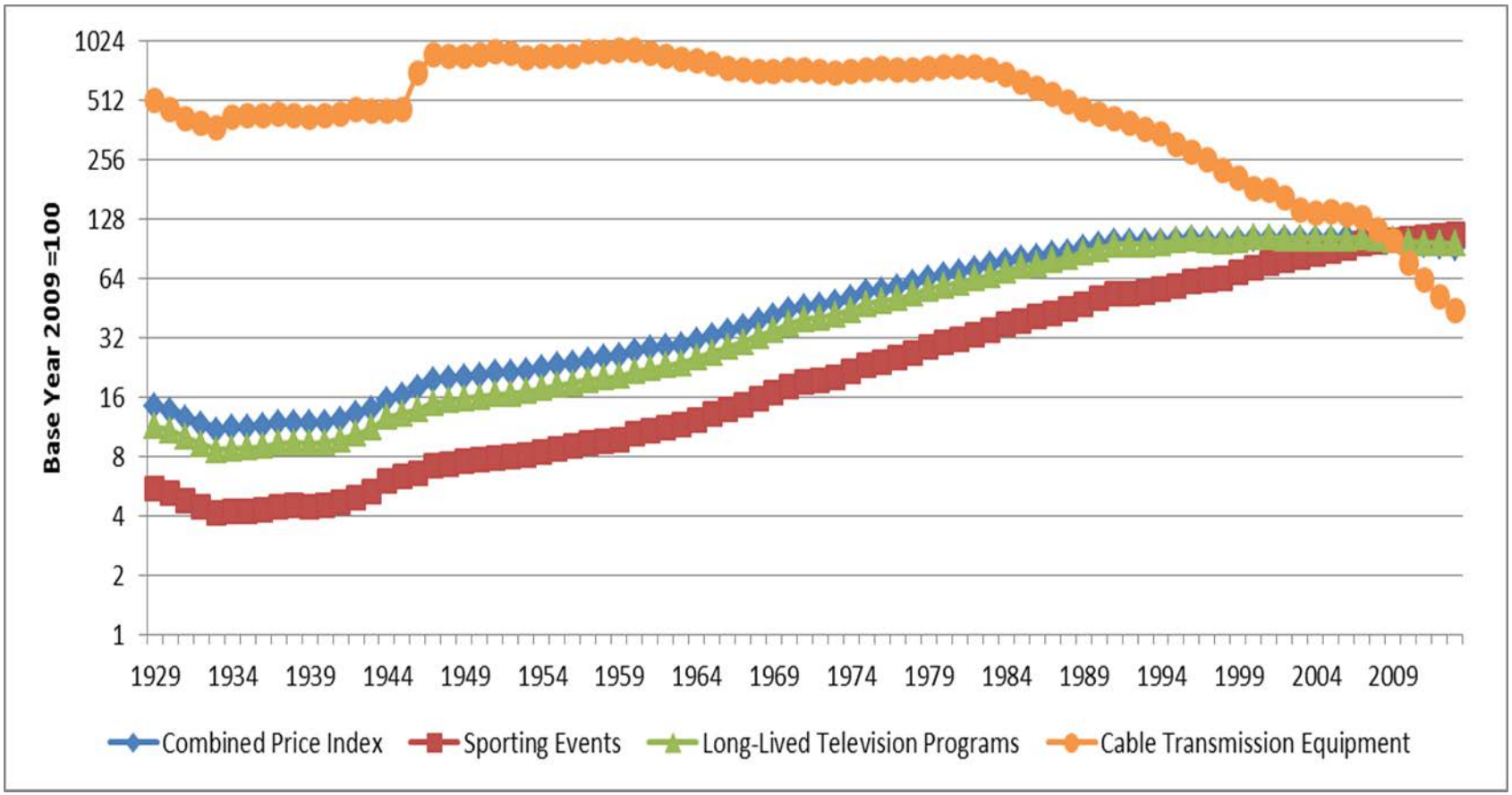
- Software and cloud services are the main input to digital content.
  - Productivity has been rising, so software prices rise slower than programmer wages and cloud services prices fall faster than server costs.
  - We also assume some overhead costs.

Prices for Print Content



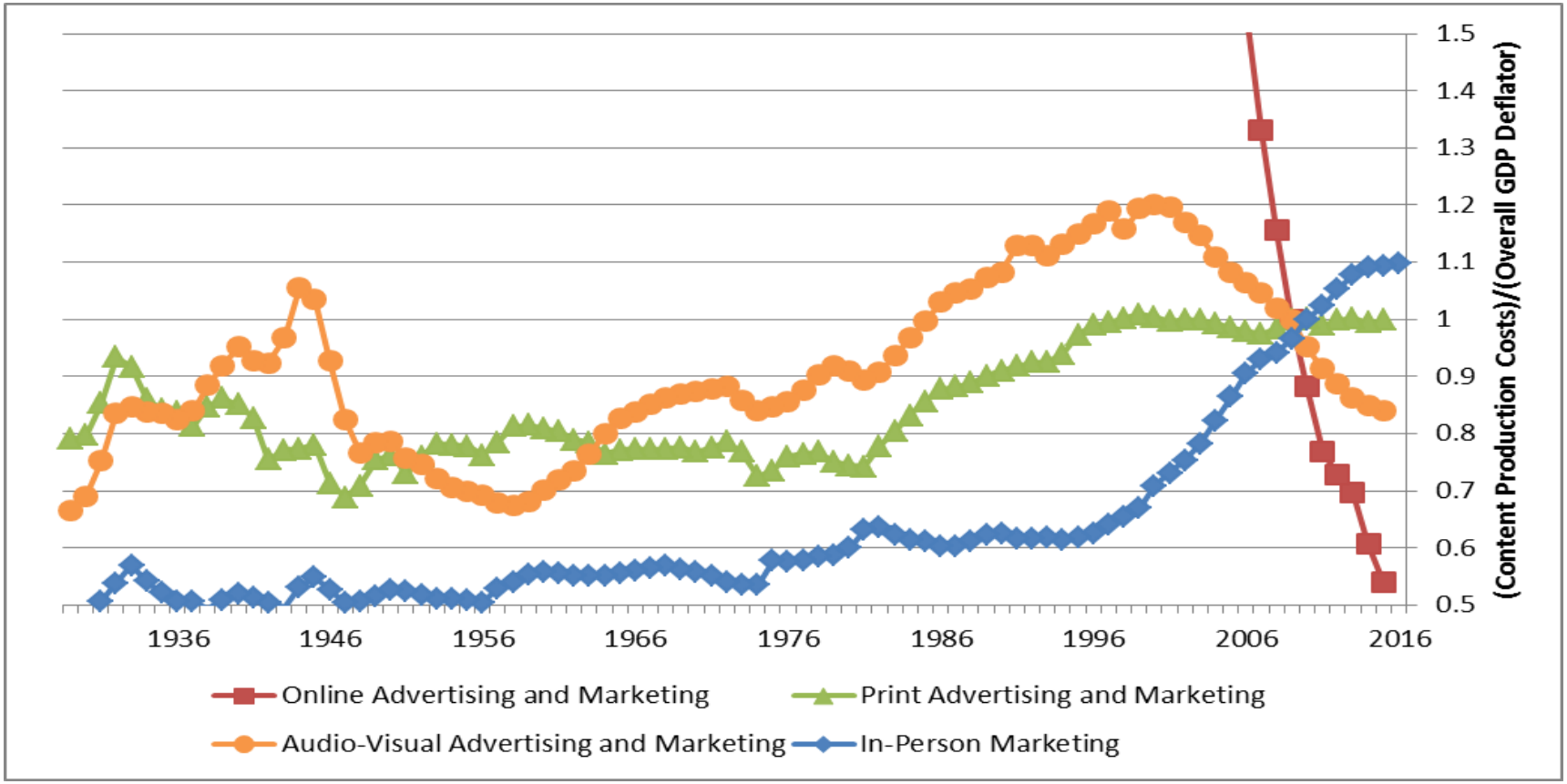
- We use book prices a proxy for newspaper writing costs.
  - Newspapers (typically) require more outside research than books, so we also include a small cost component for telephone service and online media

Price for Audio-Visual Content



- This graph above shows non-broadcast content. This category includes cable television, television commercials and online content like YouTube or Pandora.
  - We also created a separate price index for broadcast radio and television. That price index includes an implicit price index for the airwave rights. To save space, we will not show it.

Prices for ‘Free’ Content vs. GDP Prices



- Online content uses a lot of computers, so its production costs have dropped.
- The audio-visual price is an average of broadcast prices and cable prices. Both categories benefit from digital video cameras and cable uses computers to transmit programs.
- In contrast, print and in-person benefits less from computer technology.

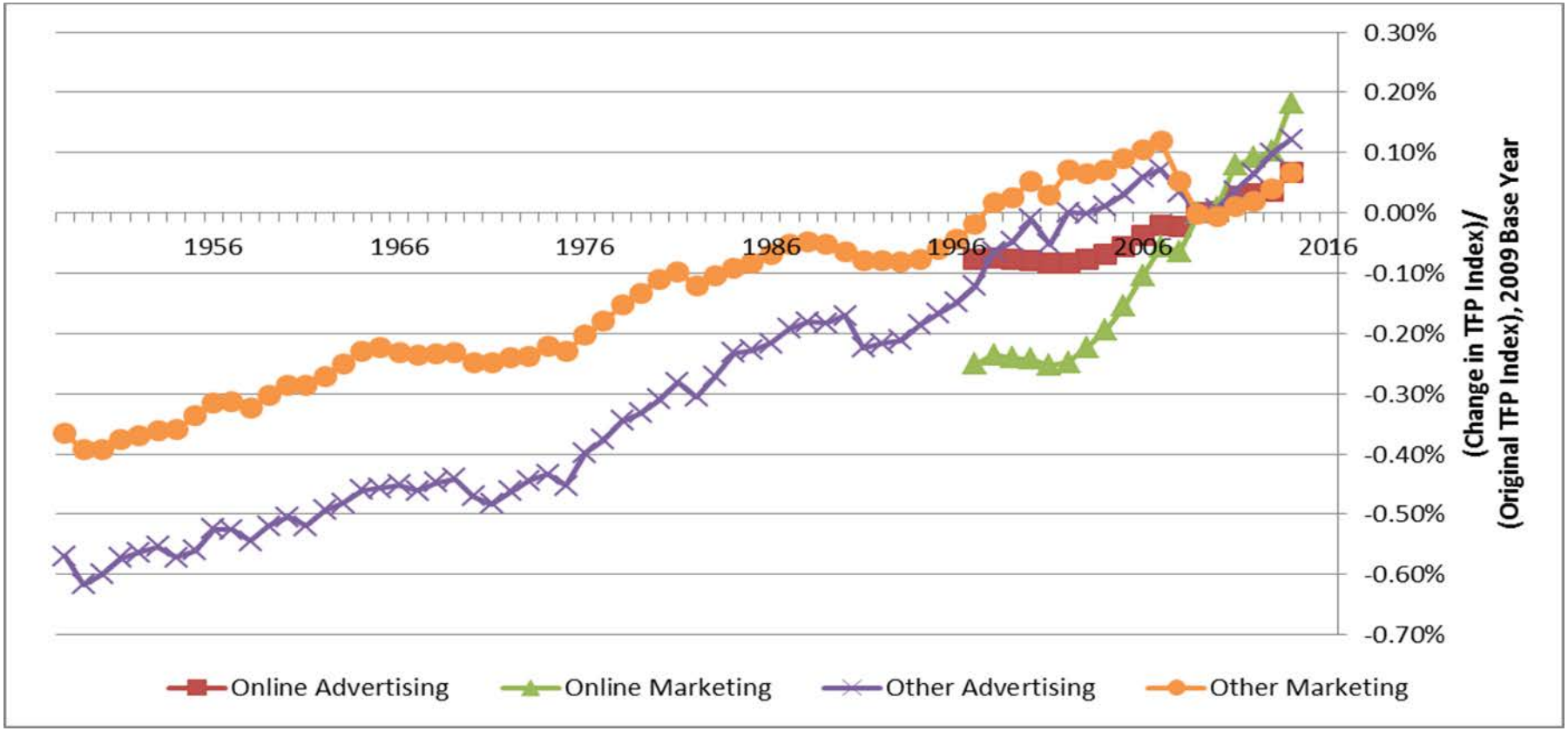
Measuring TFP from 'Free' Content

- As with all labor inputs, neither the price nor quantity of advertising/marketing viewership has any direct effect on measured GDP or final expenditures.
  - Input price and quantities do change measured TFP.
- We calculate viewership prices indirectly:
  - We do not actually observe advertising/marketing viewership, but we believe it tracks media consumption.
  - Viewership Price$_t$ = (Advertising Spending$_t$ + Marketing Spending$_t$)/(Media Consumption Time$_t$).
- We then use those viewership prices to recalculate TFP
  - Our data on labor, capital and intermediate inputs is taken from Jorgenson, Ho and Samuels (2015).

Background on TFP Calculations

- When calculating TFP, we added new output and new input for each industry.
  - Media companies produce ‘free’ media and barter them for advertising viewership.
  - Marketers in every industry produce ‘free’ content and barter it for marketing viewership
  - The household sector produces both advertising and marketing viewership, and then barters it for ‘free’ consumer content
  - The business sector also produces both advertising and marketing viewership and then barters it for ‘free’ business content.
- We calculate industry-level TFP for each of the 63 business sector industries tracked by BEA and BLS in their joint production accounts.
  - Our historical data is taken from Jorgenson, Ho, Samuels (2015)
  - We do not calculate TFP for the government sector or the newly introduced household viewership sector.
  - When calculating aggregate TFP, we weight each industry based on gross output.
- We calculate the TFP impact for each advertising or marketing category separately.

Change in Business Sector TFP from 'Free' Media

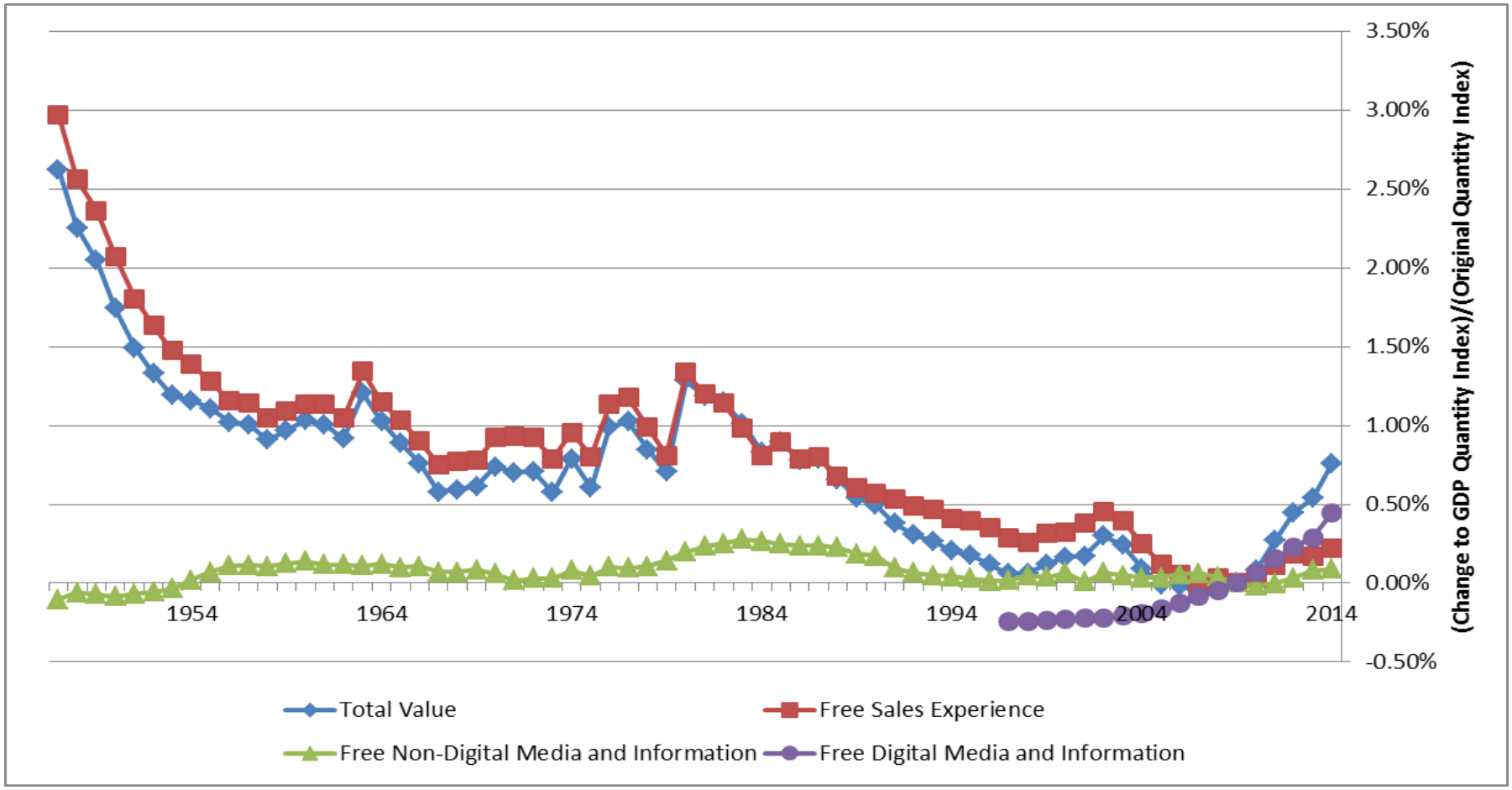


- The TFP changes from advertising-supported media are calculated using the new viewership price indexes, and don't match our previous paper.
- Consistent with previous research, measured TFP growth would be higher if 'free' online content was included in the I-O accounts.

An omission from our model: 'Free' Shopping Experiences

- Most Sellers Provide Shopping Experiences Without Charge
  - For example, grocery stores might offer 'free' samples of new products.
  - Similarly, an auto purchaser might test drive vehicles at the dealership.
  - We exclude bundles like 'buy one, get one free' or credit card rewards.
- By law and custom, shopper can enjoy the 'free' experience and then leave without buying anything.
  - Rational shoppers will only buy an item if their value exceeds the price.
  - Accordingly, 'free' shopping experiences are not included in the buyer's value for a good or services and must be tracked separately.
- We experimented with including 'free' experiences in GDP
  - Just like 'free' media and 'free' information, 'free' shopping experiences are currently tracked as an intermediate or omitted entirely from the I-O tables.
  - We treat shopping as a barter transaction: shoppers get a valuable experience in return for listening to a sales pitch.

Real GDP Impact of 'Free' Shopping



- These results are very preliminary, but they suggest that 'free' sales experiences may impact real GDP more than 'free' Internet
  - There may also be distributional impacts from each 'free' category

Conclusion

- We recalculate GDP when ‘free’ content is included in final expenditures.
- We find a small increase in recent GDP growth, but not enough to fix the recent stagnation.
  - This GDP result is not inconsistent with papers finding huge consumer surplus from the Internet. (Brynjolfsson and Oh 2012, Varian 2011, Ito 2013, Aeppel 2015).
- Before 1998, long-term GDP growth is nearly unchanged.

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