Bartering for 'Free' Information:
Implications for GDP and Productivity

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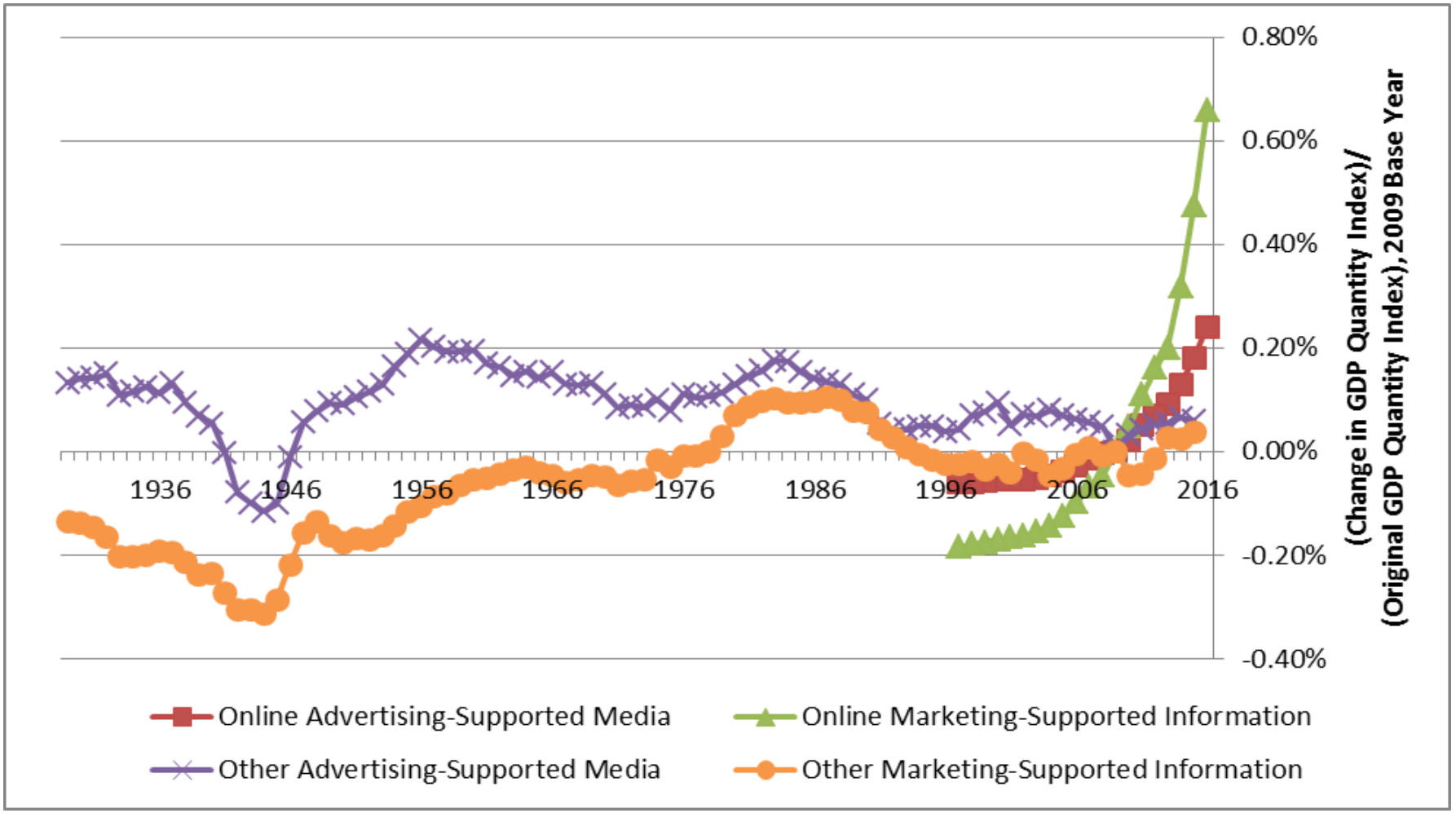
Introduction

- ‘Free’ content isn’t currently included with final expenditures in measured GDP.
  - ‘Free’ internet and TV may contribute $2 trillion to consumer surplus (Brynjolfsson and Oh 2012).
- We calculate a conservative value of ‘free’ content
  - We only track expenditures on content, not surplus
  - We only include ‘free’ consumer content in GDP.
- 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

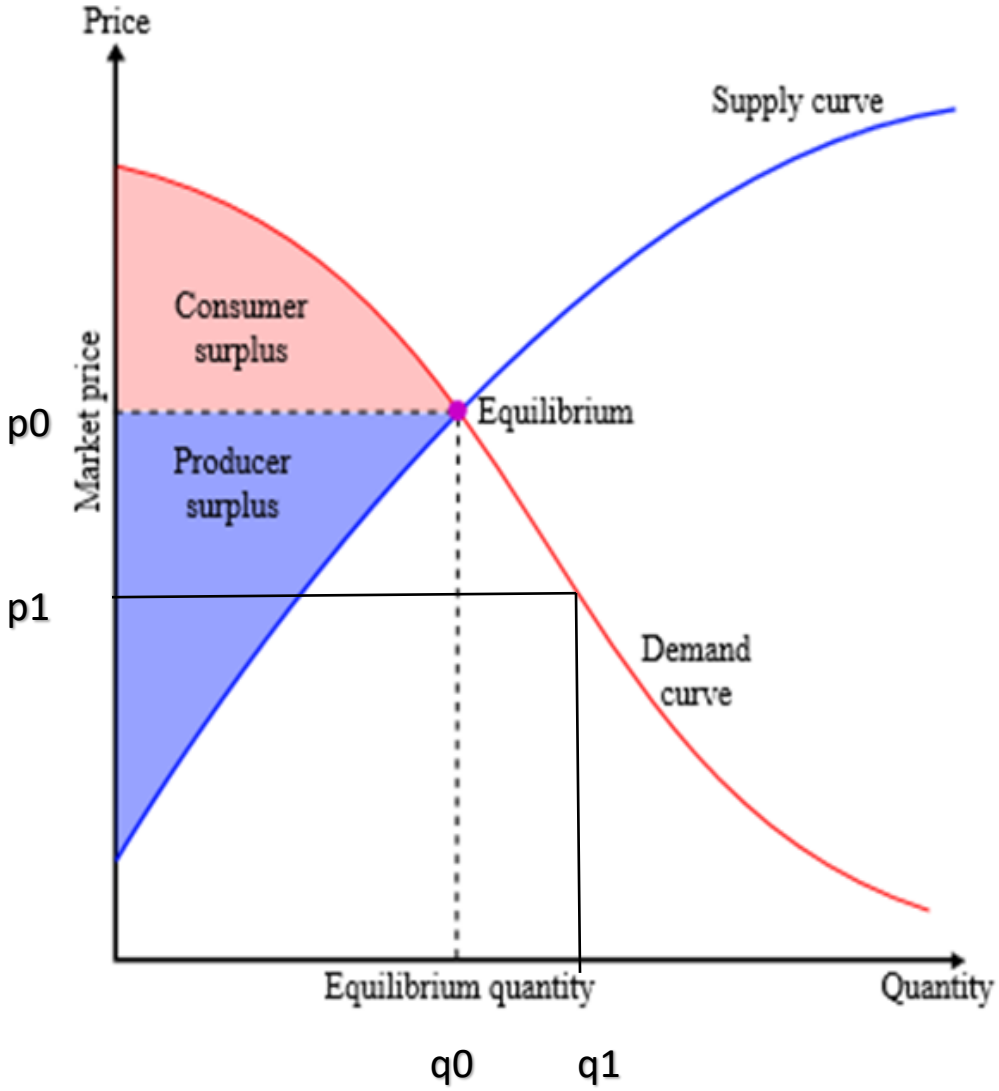


- Digital policy-makers often focus on advertising-supported media companies like Google, but in-house digital marketing actually represents more spending

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.

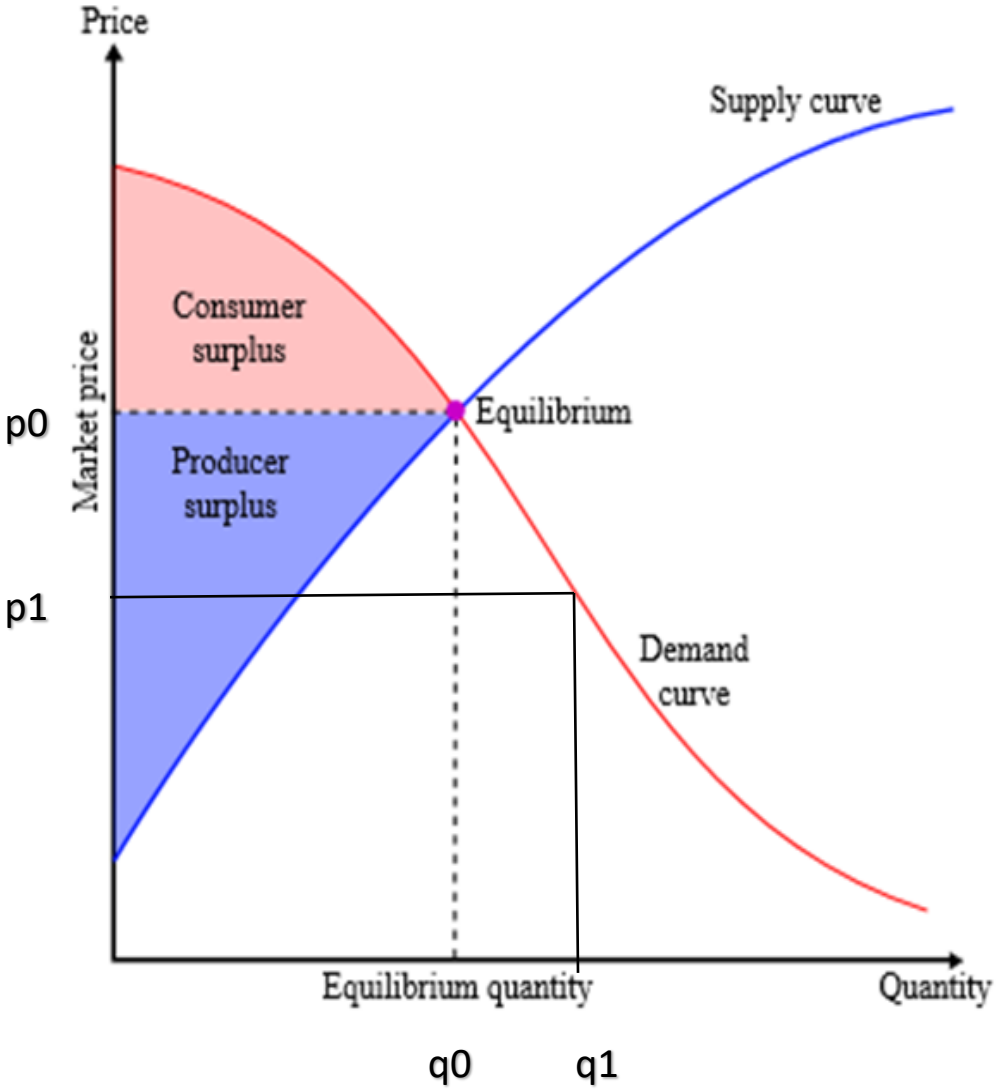
Measuring GDP in Periods 0 and 1



- 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.

Measuring Consumer Welfare



- The red triangle above shows consumer surplus. In other words, how much value does product q give?
  - National accountants can't easily value the red triangle.
  - Between period 0 and period 1, the **increase** in consumer surplus is between $(q_0–q_1)p_0$ and $(q_0–q_1)p_1$.

- Our experimental GDP methodology bounds the **increase** in consumer surplus.
  - Some other researchers have estimated total consumer surplus.

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.
  - Real GDP rises if content switches from 'free' to paid.
- Both Twitter and TV are positive externalities from viewership production.
  - Conceptually, this is similar to the treatment of negative externalities like pollution.

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
- When consumers use ‘free’ content, we include it with personal consumption expenditure and GDP.
  - Real GDP is constant if content switches from ‘free’ to paid.
- 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.

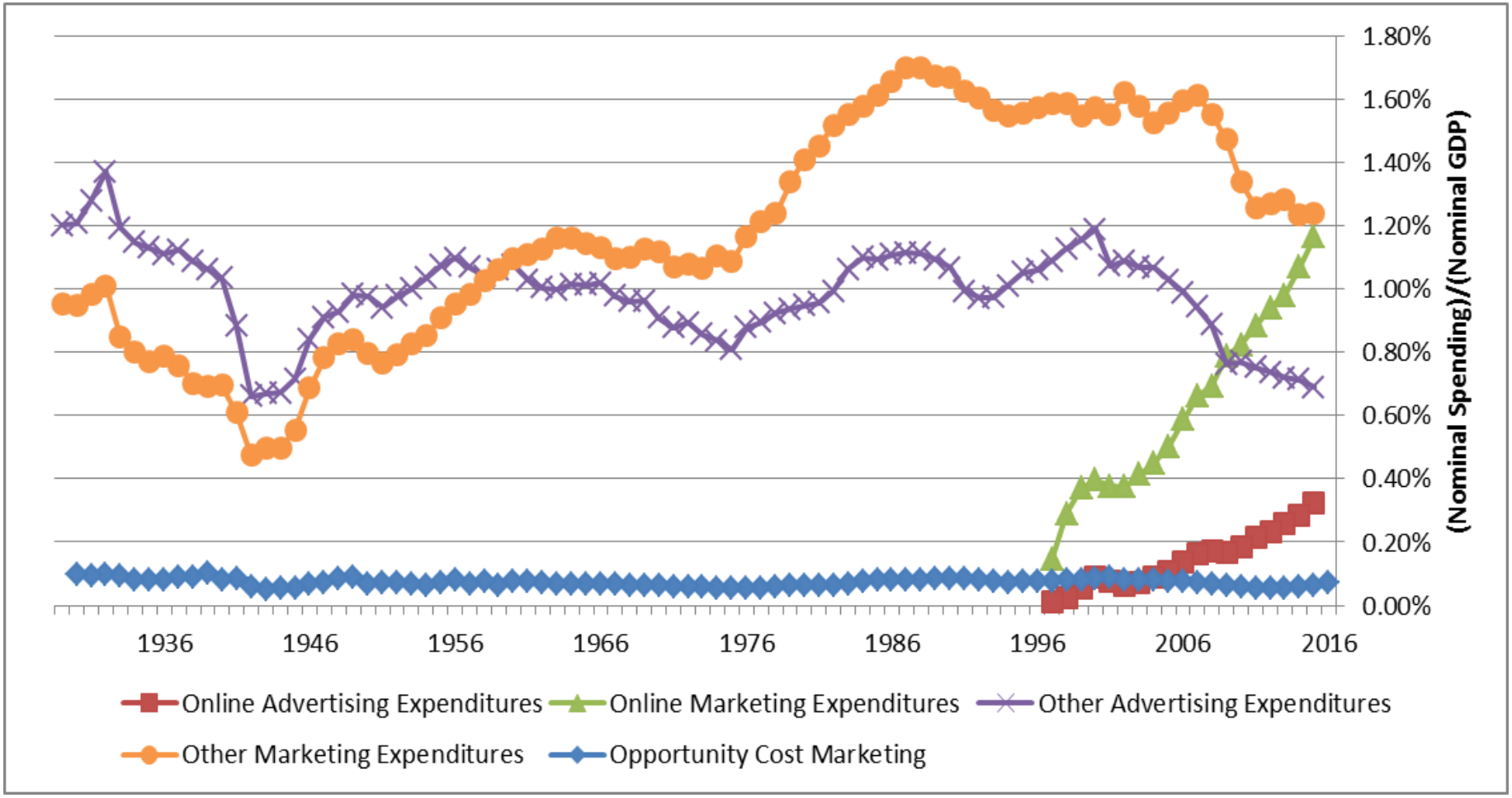
Data Used to Track Advertising

- 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

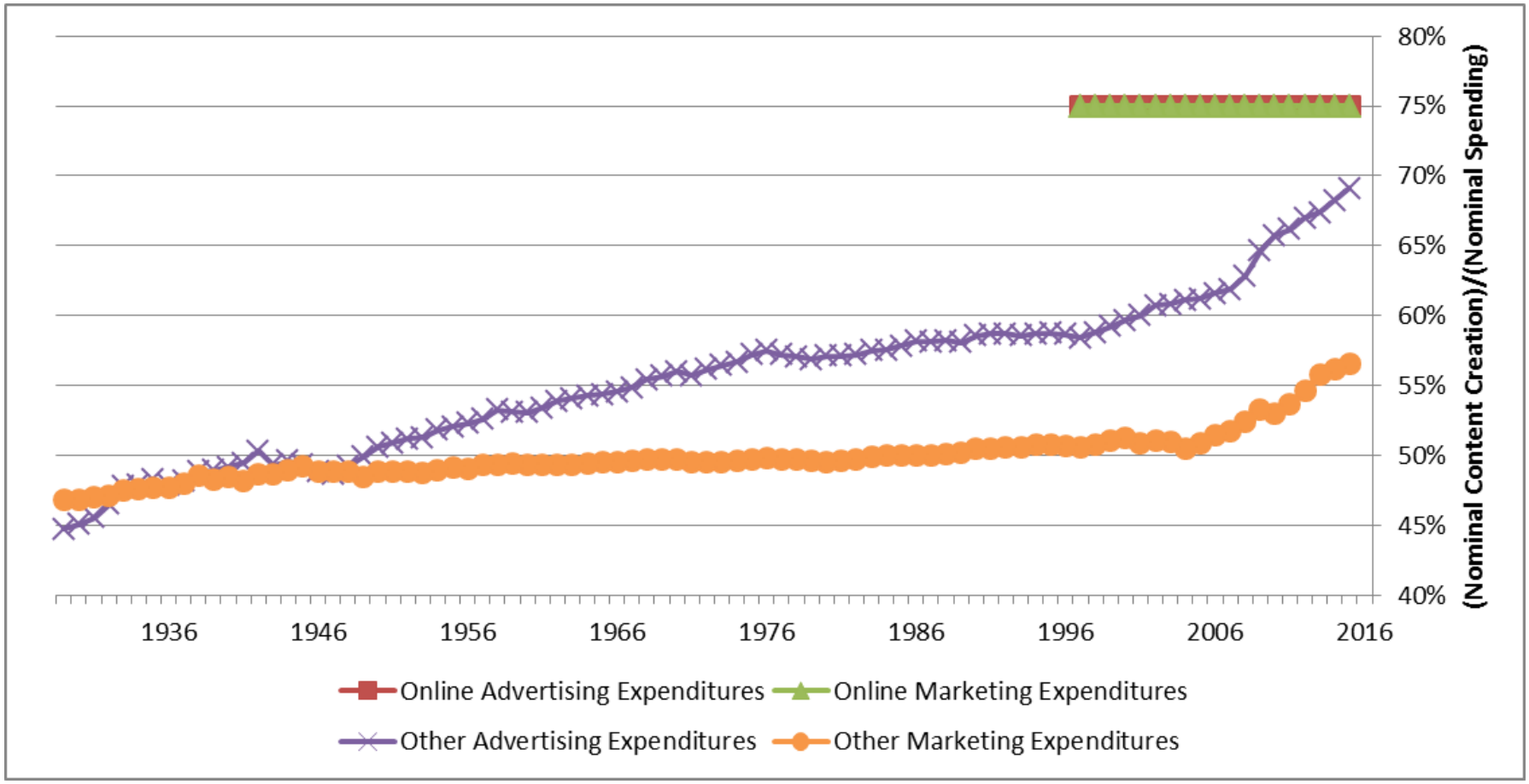
- The Occupational Employment Survey provides data on in-house marketing creation and planning.
  - For example, a writer employed by a car manufacturer is probably working in the marketing department.
  - Companies also often purchase specialty inputs like multi-media design. The Economic Census provides 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



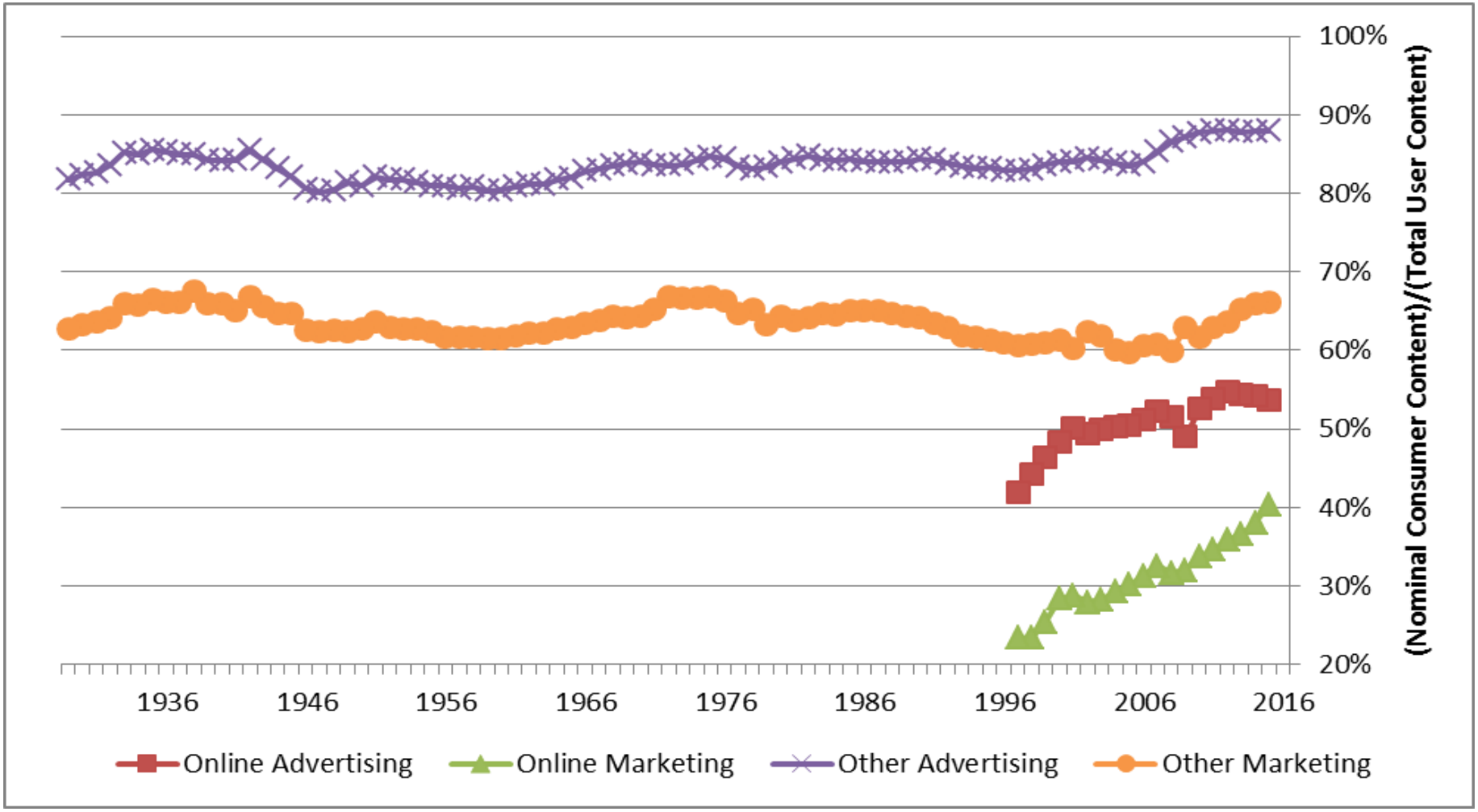
- Despite the popularity of freemium games, they're actually very cheap.
- Both advertisers and marketers have been substituting from print to digital content.

Share of Value Devoted to User Content



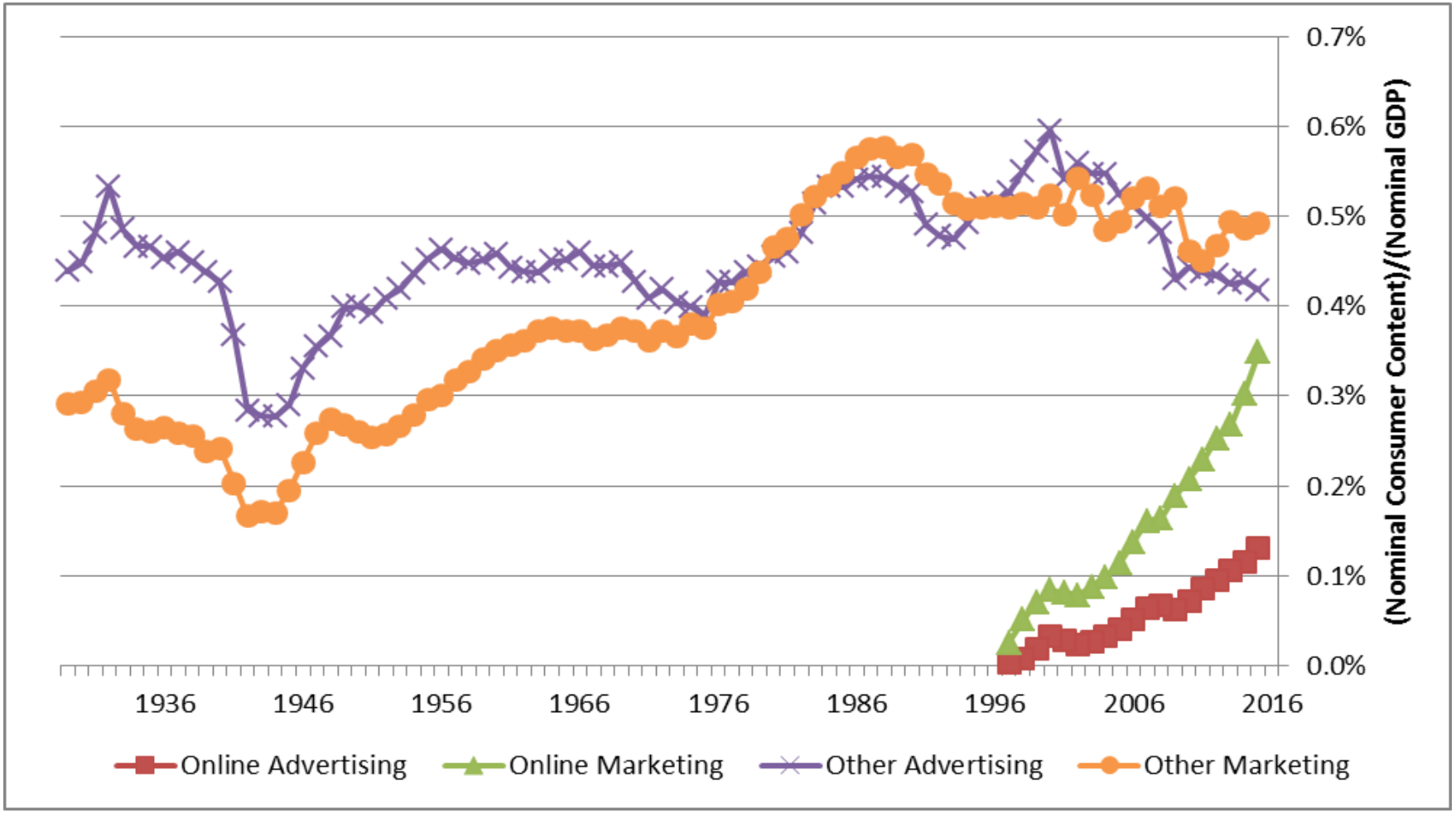
- A large portion of expenditures shown earlier are devoted to producing, printing and distributing the bundled advertising/marketing rather than the useful content.
- (Value to Content User) = (Total Expenditures) – (Ad/Marketing-Related Costs)

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

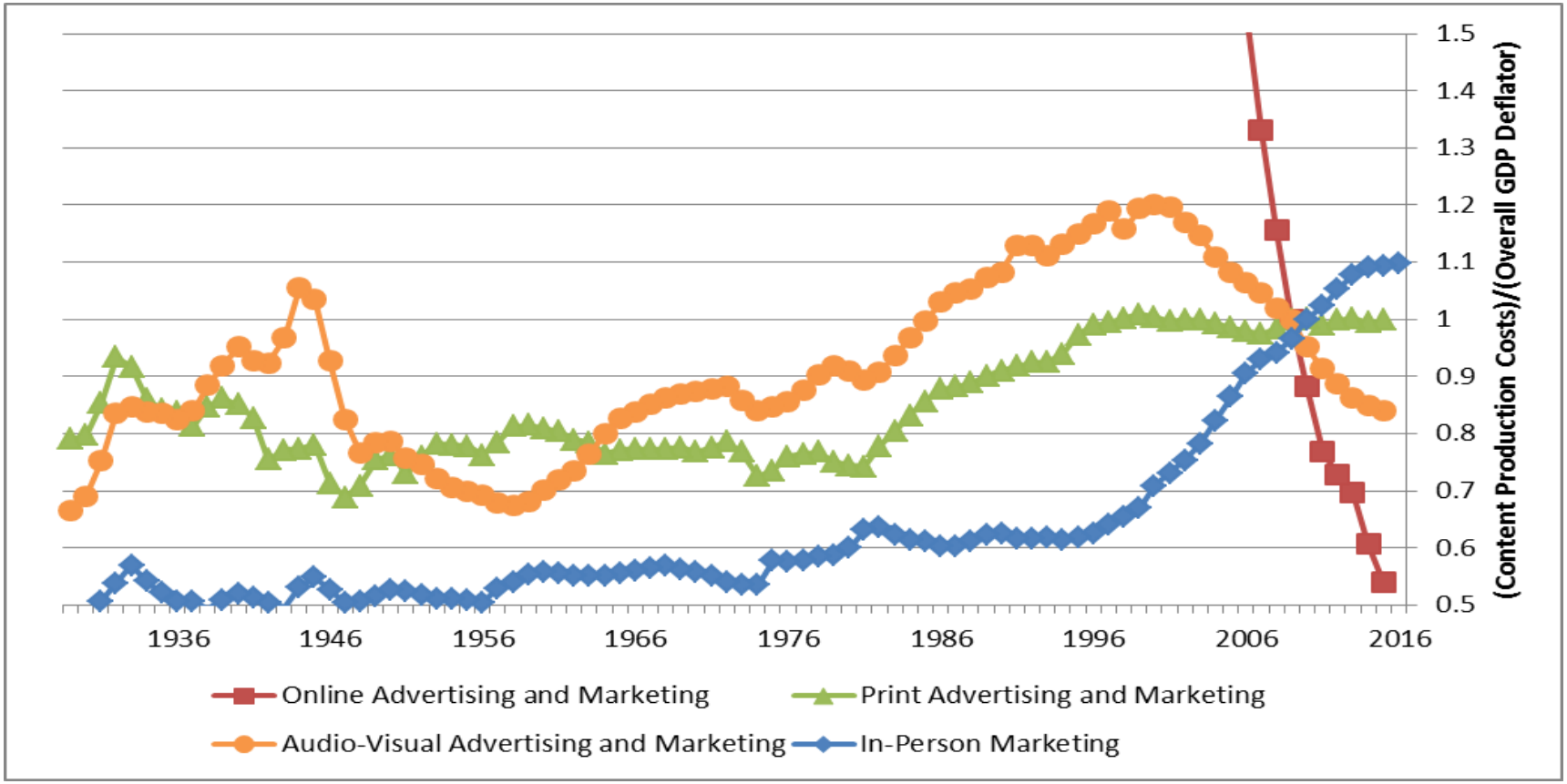


- Advertising-supported content has hovered around 0.5% of GDP since 1929.
- Marketing-supported content has grown faster than GDP since 1955.

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 mostly based on BEA’s pre-existing price indexes for inputs to ‘free’ content and output prices for purchased content.
  - These price indexes 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 ‘Free’ Content vs. GDP Prices

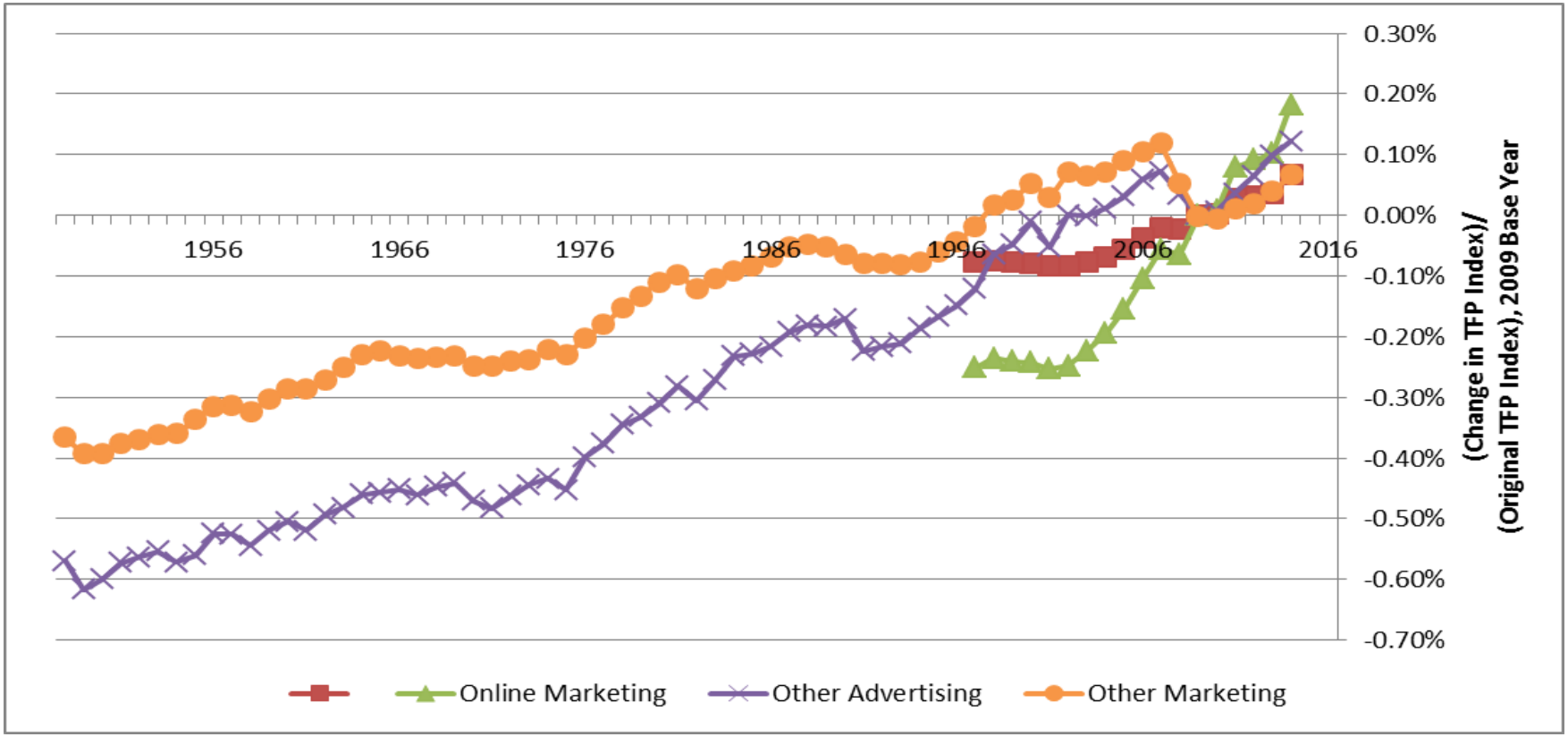


- Online content uses a lot of computers, so its production costs have dropped.
- The audio-visual price is an average of broadcast prices and cable prices. Both categories benefit from digital video cameras and cable uses computers to transmit programs.
- In contrast, print and in-person benefits less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

Measuring TFP from 'Free' Content

- As with all inputs, neither the price nor quantity of advertising/marketing viewership has any direct effect on 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).

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.

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.