

# Exploring the Production and Asset Boundaries in the National Accounts

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# Overview

- I will discuss:
  - Review the production and asset boundaries in *System of National Accounts 2008*
  - Some differences between NIPAs and SNA recommendations
  - Some areas where economists have suggested using a broader boundary:
    - Environmental assets
    - Knowledge assets
    - Human capital
- Rachel Soloveichik will discuss:
  - **Cultivated assets** – within SNA asset boundary, not currently capitalized by NIPAs
    - BEA plans to capitalize in next comprehensive revision
  - **“Free” media** – not within SNA production boundary
    - Research - experimental treatment (not for official accounts)

# SNA Production Boundary

## General Definition of Production

Activity, carried out under the responsibility, control, and management of an institutional unit, that uses inputs of labor, capital, and goods and services to produce outputs of goods and services.

# SNA Production Boundary

- **Production boundary of SNA includes:**
  - Goods or services supplied to units other than their producers
  - Own-account production of goods retained for final consumption or gross capital formation
  - Own-account production of knowledge-capturing products,
    - excluding such products produced by households
  - Own-account housing services by owner occupiers
  - Domestic/personal services produced by paid staff
  - Non-observed economy, including illegal production
- **Production boundary excludes:**
  - Natural process with no human involvement
  - Own-account production for intermediate consumption
  - Most services produced by households for own use
  - Services produced by volunteer labor

# SNA Production Boundary: Household Production

- **All household goods production included**
  - Whether for own consumption or not
  - Important in developing countries
  - Examples:
    - Agricultural products, storage, processing
    - Other processing (clothing/tailoring, pottery, etc.)
    - Forestry, wood-cutting, firewood collection
- **Why does SNA exclude household own-account non-housing services production?**
  - Most are self-contained activities
  - Typically no suitable market prices for valuation
  - Generally don't influence economic policy

# Production Boundary: SNA vs. NIPAs

- SNA boundary more restricted than general definition
- NIPA boundary *slightly* more restricted than SNA boundary
  - NIPAs exclude illegal activities
    - Illegal activities are included by European national accounts in latest revision
  - NIPAs exclude most household goods production for own final use (except food grown and consumed on farms)
    - Examples – home gardens, sewing, etc.

# SNA Assets and Asset boundary

- **Asset:** Store of value that represents a benefit, or a series of benefits, accruing to the **economic owner** by holding or using it over a period of time
- **Asset boundary:**
  - **Ownership criterion**
    - Excludes many environmental assets
    - Residency – Owner of domestic assets must be a resident
  - **Economic benefit criterion**
    - Excludes mineral deposits that haven't been discovered or are unworkable
- **NIPA** asset boundary largely consistent with SNA's
  - Exceptions are **cultivated assets, valuables, and natural resources**

# Asset Boundary Issues: Natural Resources

- SNA includes on balance sheets those natural resources that satisfy the asset definition:
  - Land, mineral deposits, fuel reserves, uncultivated forests
  - Could be private owned or owned by government
  - Does **not** include environmental assets with **no** ownership rights
    - Atmosphere, high seas, undiscovered mineral deposits
- Not included in gross fixed investment or CFC
- NIPAs currently don't cover natural resources
  - Research underway to develop estimates

# Asset Boundary Issues: Knowledge Assets

- Hulten, Corrado and Sichel highlighted the importance and role of knowledge assets
  - Some knowledge assets are now included in GDP (computer software and databases, research and development, entertainment and artistic originals, mineral exploration)
  - Others (e.g., advertising, brand equity, training) are not included
- Measurement challenges
  - Lack of financial accounting data
  - Lack of market transactions
  - Lack of appropriability of returns

# Asset Boundary Issues: Human Capital

- Discussed at May 2010 BEA Advisory Committee meeting and in June 2010 *Survey of Current Business*
  - See paper by Christian, discussant comments by Abraham and McGrattan
- General human capital is created using the educational sector's services and the own time of the students
  - Human capital measures such as Jorgenson-Fraumeni or Christian reflect a very significant expansion of the production boundary
  - Best treated as part of a satellite account

# Exploring the Boundaries of GDP:

Cultivated Assets and Valuing 'Free' Media

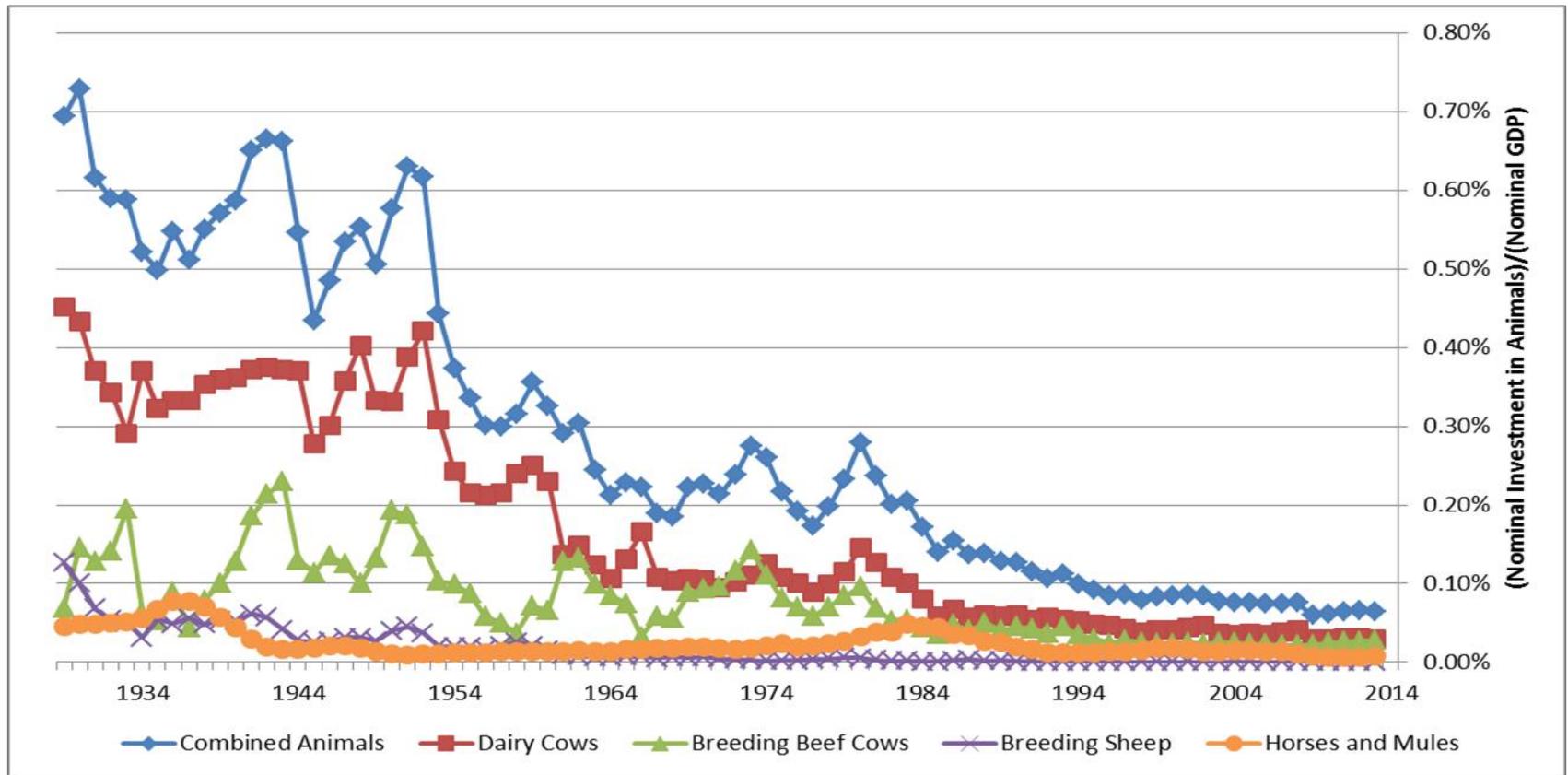
**Rachel Soloveichik**

BEA Advisory Committee 11/13/2015

# Outline of Talk

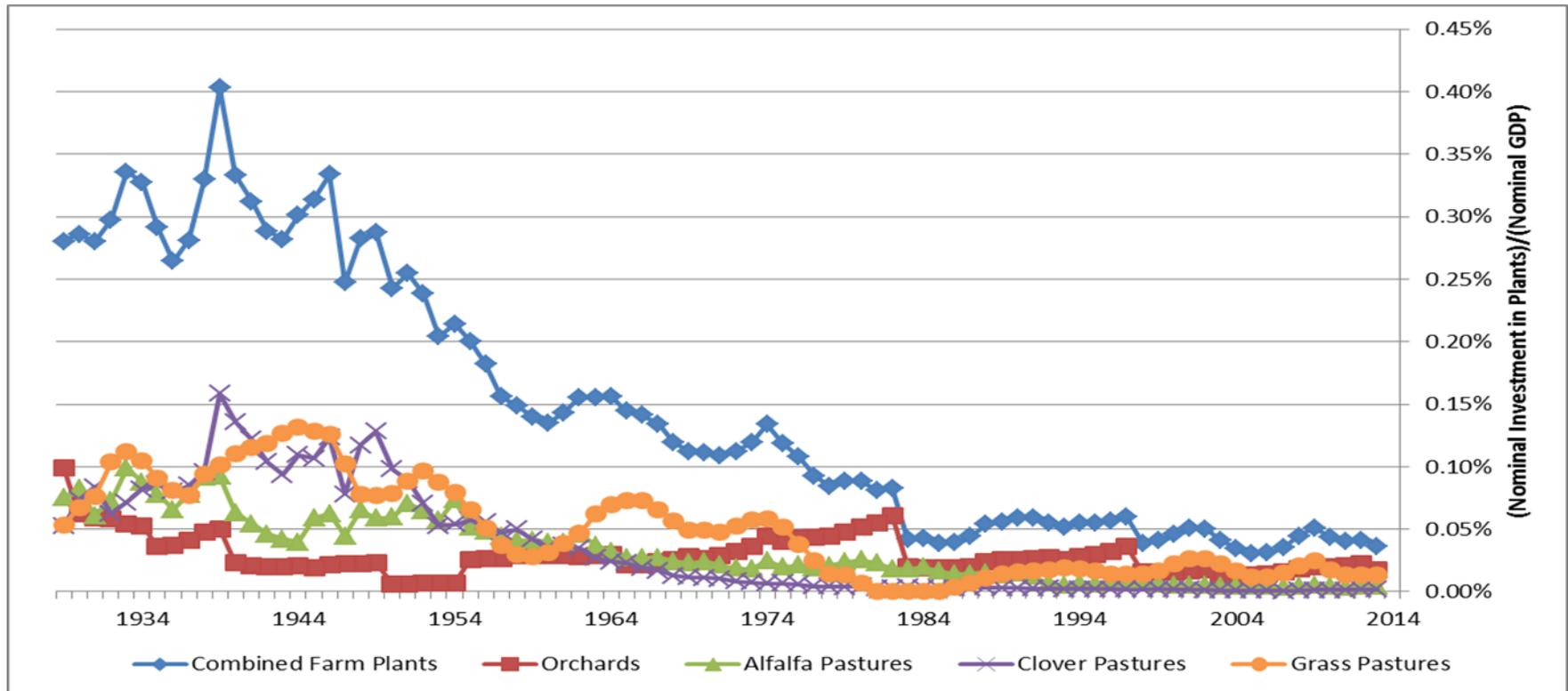
- I'll briefly discuss cultivated assets
  - Long-lived working animals
  - Long-lived farm plants
- Next, I'll discuss 'free' media like Facebook
  - Most 'free' media is not actually free, but supported by ads
    - We study newspapers, magazines, radio, television and online media
  - SNA does not currently include ad-supported media in GDP – but its inclusion has been discussed for decades.
    - On the other hand, BEA does count subscription media, media produced by governments and media produced by non-profits in GDP.
  - I'm working with Leonard Nakamura at the Philadelphia Federal Reserve to study 'free' media.
    - We presented our research at the Society for Economic Measurement and NBER's 'Economics of Digitization' workshop last summer.
    - I've also presented earlier version of this research at NBER's CRIW workshop, IARIW and AEA.

# Long-Lived Animal Investment By Category



- Capitalizing farm animals lowers average nominal GDP growth slightly.
  - BEA currently tracks farm animals as inventory, so the short-term volatility is already captured in the NIPA's. Capitalizing animals won't change short-term GDP growth.
- Animal prices track overall GDP prices, so inflation doesn't change much

# Long-Lived Farm Plant Investment By Category



- The category 'pastures' only includes fields which are deliberately planted and cultivated by farmers. Natural prairie is tracked separately.
- Capitalizing farm plants lowers average nominal GDP growth slightly.
- Plant prices have risen faster than overall GDP prices.
  - Capitalizing farm plants will raise measured inflation rates slightly.

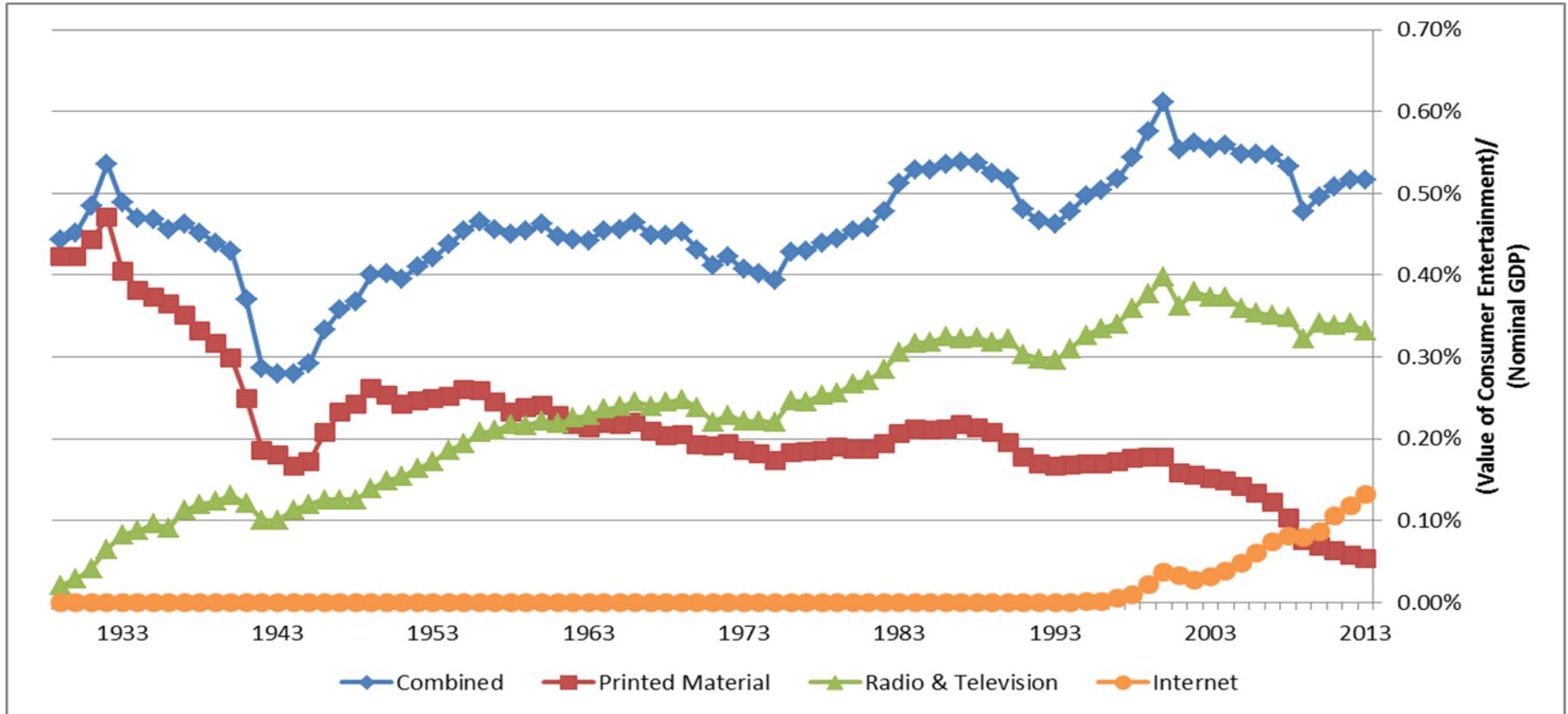
# Overview of 'Free' Media

- How to evaluate 'free' media and its impact on personal consumption expenditures (PCE)?
  - What is the value of TV or Facebook or Google in GDP or PCE?
- Some researchers estimate that 'free' media in the US provided at least \$2 trillion of consumer surplus (Brynjolfsson and Oh 2012)
  - Their estimate is based on time use data for TV and Internet.
  - Popular news sources have written articles echoing these large values (BusinessWeek, Ito 2013), (The Wall Street Journal, Aeppel 2015).
- In 2012, we estimate 'free' media added only \$83 billion to GDP.
- Important for GDP to be tied closely to expenditures
  - Our experimental methodology is in the tradition of valuing products at cost even when the consumption is not purchased (e.g., government or own-account investment) or unpriced (owner occupied housing or financial intermediation services).
  - We exclude amateur media like fan fiction because production cost is zero.
  - We calculate prices and real values by measuring input costs such as actor salaries, software costs, server costs and consumer media costs like TV sets.

# Data Sources and Methodology

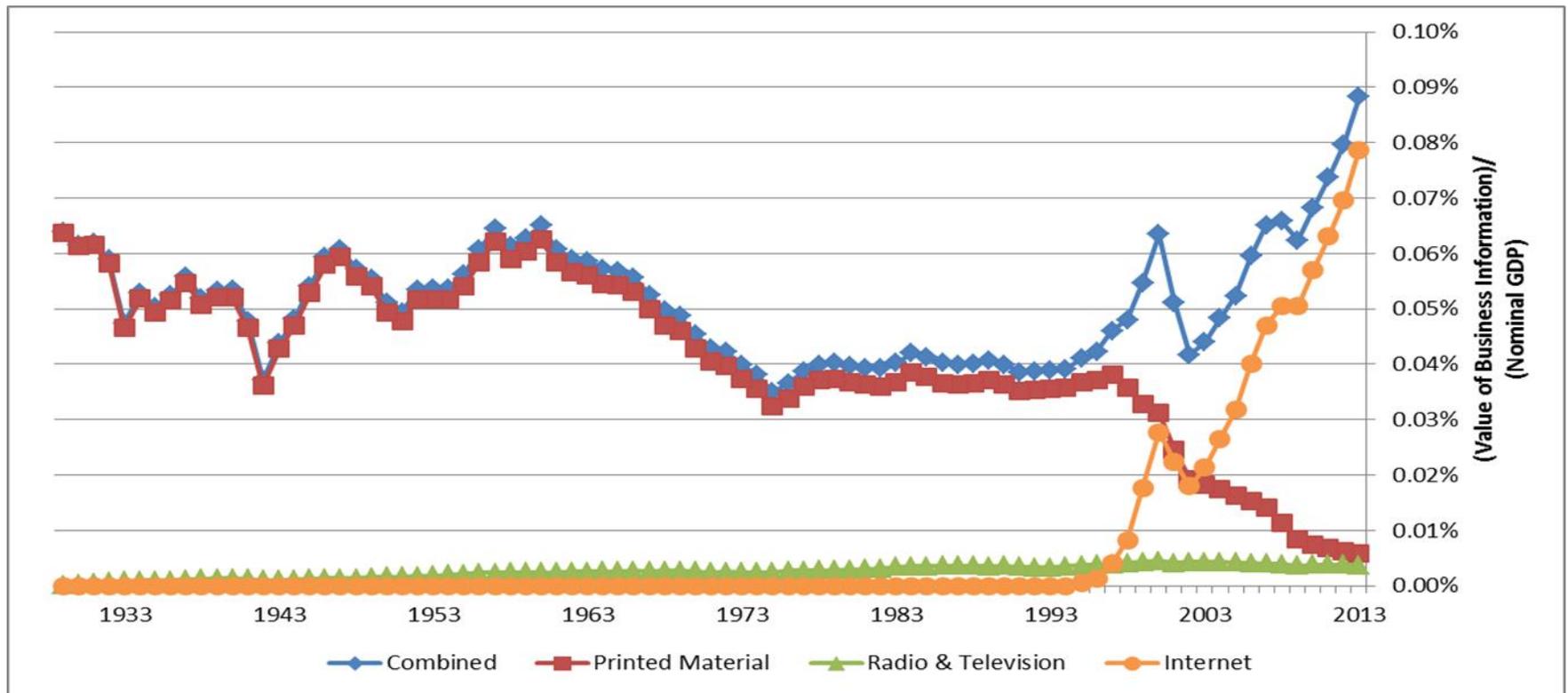
- The 2007 Economic Census provides our primary dataset.
  - The Economic Census reports advertising by media category and industry
  - We study all advertising-supported media, regardless of whether consumers pay zero out-of-pocket or a subsidized price.
  - Our annual data is taken from the Service Annual Survey, the CS Ad expenditure dataset and other sources.
- We then estimate expenditures on media content:
  - $(\text{Media Content}) = (\text{Total Advertising Expenditures}) - (\text{Ad-Related Costs})$
  - Unwanted advertising like telemarketing or junk mail is assumed to have zero media content, so it's excluded from our analysis.
- Our price indexes are based on BLS's PPI's, BEA's pre-existing price indexes and other sources.
- Our research isn't sensitive to the treatment of intangible capital.
  - We use some price indexes developed earlier for entertainment originals (EO) – but none of the results shown here depend on capitalizing EO.
  - Our results wouldn't change if BEA started capitalizing advertising.

# Advertising-Supported Consumer Entertainment



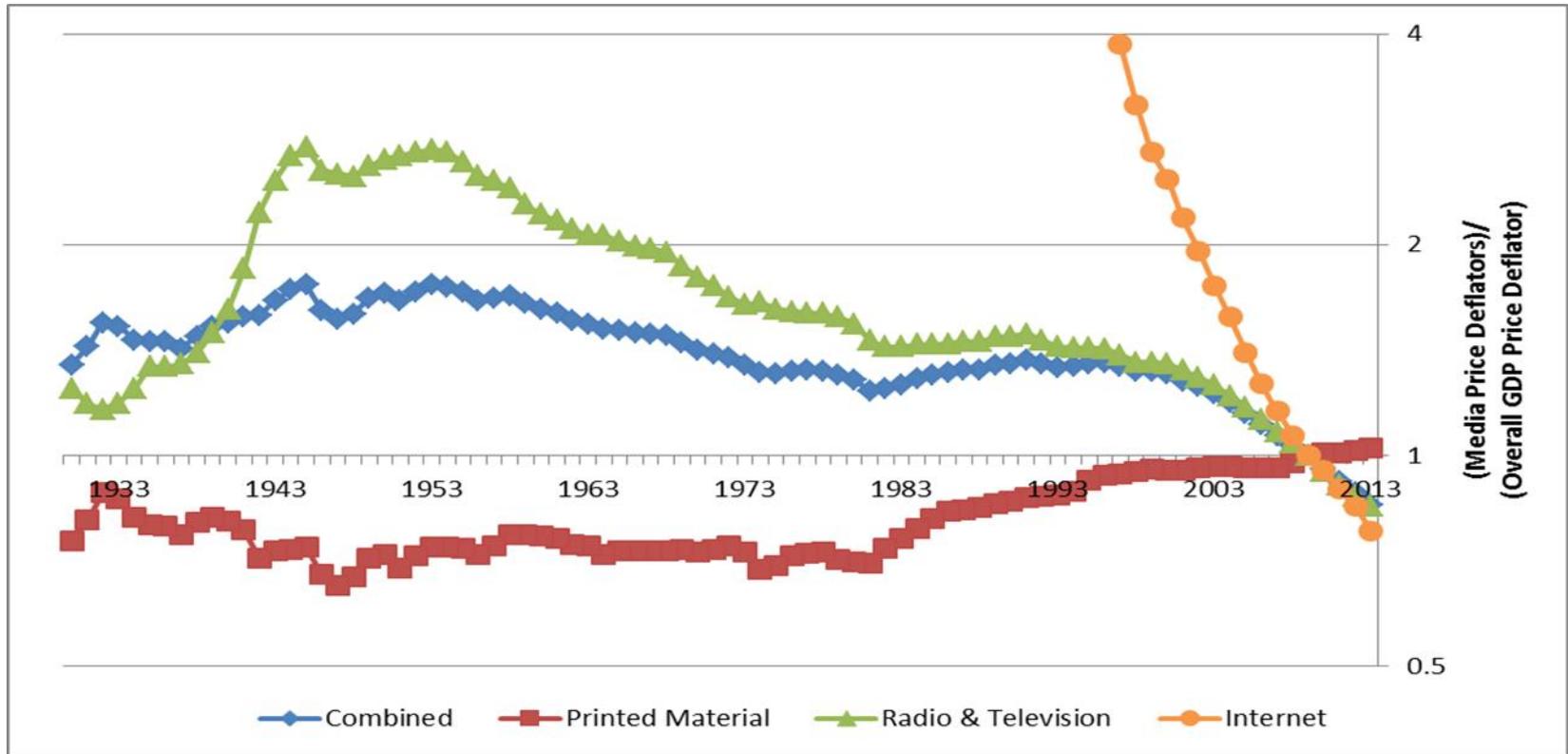
- The explosion in online media is balanced out by drop in print media.
- 'Free' consumer entertainment has hovered around 0.5% of nominal GDP – so the experimental methodology doesn't change growth much.

# Advertising-Supported Media as an Intermediate Input



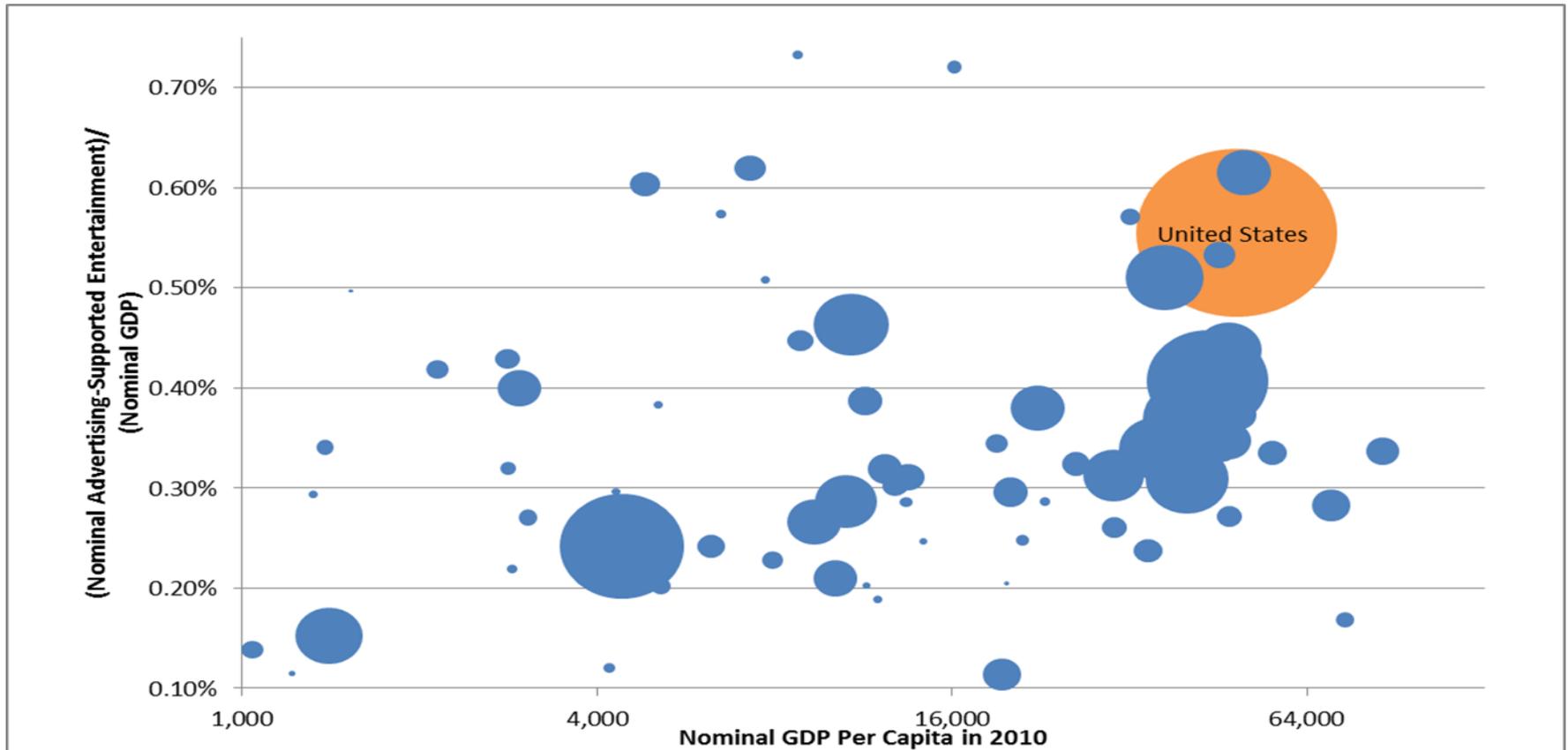
- Measured GDP only depends on final output, so ‘free’ media used by businesses has no direct effect on GDP.
  - ‘Free’ media will show up in the input-output tables and productivity statistics.
- BEA treats owner-occupied housing as a business, so we treat housing-related media as an intermediate input.

# Prices for Advertising-Supported Media



- Since 2000, prices for 'free' entertainment have grown much slower than overall prices. Accordingly, the experimental methodology lowers inflation and raises real growth slightly.
- BLS's PPI for Internet publishers provides our price index after 2010.
  - Before 2010, we use BEA's prices for computer (5.3.4, line 11) and software (5.6.4, line 3)

# Nominal Advertising-Supported Media Across Countries



- The United States has more 'free' media than most other countries. Accordingly, the experimental method raises relative US GDP.
- It's very difficult to compare quality-adjusted prices across countries.

# Current SNA Treatment of 'Free' Media and Our Experimental Treatment

- In the SNA and the US NIPA, 'free' media is simply an intermediate cost of the firms whose products are advertised
  - A soap opera is a free byproduct of the sale of soap
  - Conceptually, this is similar to the treatment of pollution and other negative externalities. The only difference is that soap operas are positive.
- Our Experimental Treatment:
  - Measure the cost of the consumers' desired content (soap opera) that is subsidized by advertising (the sale of soap)
  - The content is consumption, valued at the cost of producing the soap opera
  - The advertiser and the consumer engage in a barter transaction in which the consumer agrees to buy the TV content (computer, radio, newspaper) and watch (listen to, read) the advertisement in exchange.
    - SNA counts other barter transactions in GDP (Section 6.102).
  - There is a balancing whereby the income paid to the consumer is exactly equal to the consumption of the advertising (as in any barter transaction)
    - Thus the consumption of the soap opera doesn't come out of nowhere.

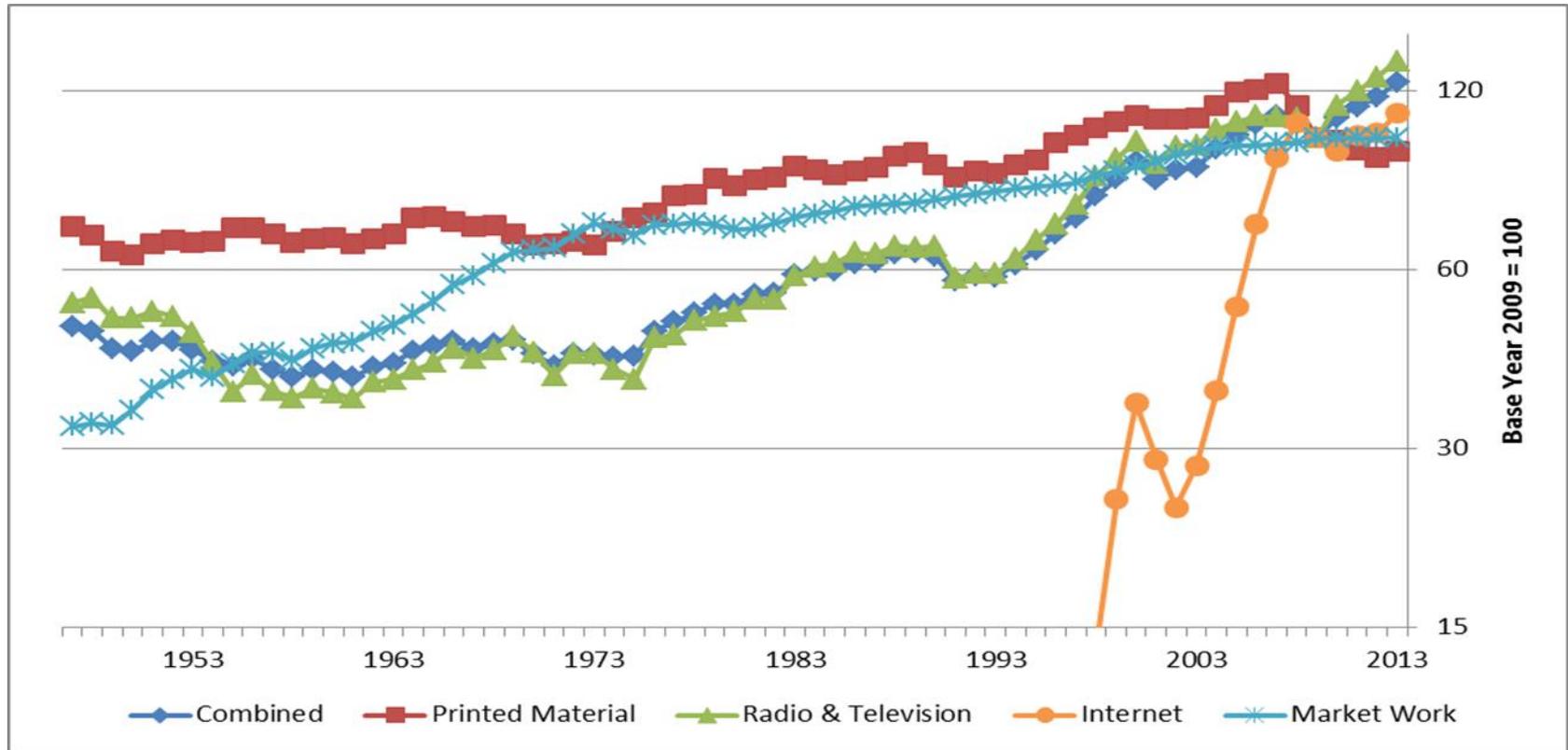
# Historical Research on 'Free' Media

- Borden (1935) was an early exploration of the proportion of advertising devoted to subsidizing content provision
- Extensive discussion of measuring 'free' media in national accounts in the 1970s
  - Ruggles and Ruggles (1970), Okun (1971), Jaszi (1971), Eisner (1978). Kendrick (1979)
- Cremeans (1980) proposed a barter mechanism for measuring free media similar to the one we propose and estimated it
- Vanoli (2000) discussed the issue in a review of the history of national accounting
- Nakamura (2005) modeled the consumption gains from an expenditure model
- Soloveichik (2014) revived this approach for US GDP
- Soloveichik and Nakamura (2015) calculated 'free' media across countries.

# 'Free' Media and Consumer Welfare

- Real GDP only depends on nominal output and prices.
  - An increase in work hours can raise GDP but lower welfare.
  - On the other hand, workers unambiguously benefit from an increase in real wages.
- We treat ad viewership as a type of labor input:
  - 'Hourly earnings' = (Imputed Value of Media Content 'Earned')/(Time Spent Viewing Advertising)
  - Consumer welfare increases when real 'hourly earnings' rise.
- Market work pays much better than watching ads
  - TV ads are probably the most rewarding – yet we calculate that viewers earned only \$0.55 per hour of ads in 2012.
    - Viewers enjoyed \$0.16 of content per hour and 28% of air time was ads.
  - In comparison, employees averaged \$31 per hour in 2012.

# Real Ad-Supported Content Per Unit of Ad Viewership



- Real 'hourly earnings' growth per year from advertising viewership:
  - 0.62% from 1947 to 1995; 3.63% from 1995 to 2012
- Real earnings growth per year from market labor:
  - 1.96% from 1947 to 1995; 1.12% from 1995 to 2012

# Measured Productivity with 'Free' Media

- Input-Output tables with the current method:
  - Media companies produce advertising viewership.
  - TFP decreases if users demand more content per ad.
- Input-Output tables with the experimental method:
  - Media companies produce content and then barter the content for advertising viewership.
  - Input costs rise if users demand more content per ad.
- Many companies use 'free' media. For example, a restaurant might use Waze for delivery directions.
  - Under the current method, improved directions and faster delivery is treated as a TFP increase for the restaurant.
  - Under the experimental method, improved directions are treated as better intermediate inputs.
- Leonard Nakamura and I are still working on this

# Conclusions for 'Free' Media

- Based on time use, previous researchers have argued that 'free' media accounts for a large and growing fraction of utility.
  - In 2012, they estimate that consumers enjoy \$2 trillion of utility from 'free' TV and Internet (Brynjolfsson and Oh 2012)
- We develop an experimental methodology that uses payments to content providers to value advertising-supported media.
  - We study newspapers, magazines, radio, television and online media.
  - In 2012, we estimate 'free' media added only \$83 billion to GDP.
- We find 'free' media has little impact on the aggregate NIPA's
  - 'Free' entertainment has hovered around 0.5% of nominal GDP, so nominal GDP growth is almost unchanged when we include 'free' media.
  - Measured inflation falls slightly and real GDP growth rises slightly.
  - We are still working to re-calculate productivity using the experimental methodology, but we believe aggregate TFP won't change much.