Price dispersion and legacy discounts in the national television advertising market*

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Abstract

Advertising is an input for many final goods, and broadcast television comprises a significant portion of ad-spending in the U.S. Yet advertisers face different costs when purchasing national television ads. We seek to confirm empirically whether there are differences in firms' costs to advertise nationally. Network-advertiser contracts are secret, so we combine data on ad placements and average prices of program airings to analyze price dispersion. We document that advertisers making larger purchases and (legacy) advertisers with established broadcast relationships receive favorable prices. This may benefit incumbents and soften price competition from newcomers in product markets.

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1 Introduction

Firms often negotiate the prices they face from their suppliers. Indeed, practitioners and researchers often expect that price dispersion in input markets is the rule rather than the exception. We examine how price differentials correlate with observable characteristics of downstream firms in the context of national television advertising. Due to the proprietary nature of contracts in this industry, most analyses assume that advertisers access exposures at uniform prices, à la posted rate cards. We demonstrate how price differences across advertisers can be empirically estimated using new data, and our analyses suggest that firms pay different prices for similar ad spots. The empirical results suggest at least two sources of price dispersion: first, intertemporal price discrimination, by which advertisers are able to purchase at a discount if they buy national ad exposures from broadcasters in advance. Second, price dispersion among advertisers that purchase ads in advance. We find that access to lower advance-purchase prices is associated with both the size of an advertiser's total ad buy and the length of the firm's advertising relationship with broadcast networks. Advertising is a critical input in many markets, necessary to reach new consumers or to compete for existing ones; hence, a lower price of advertising may confer advantages in downstream product markets, and may affect product-market pricing, firm entry and investment decisions, and merger incentives (Tirole (1988), Sutton (1991)).

The major broadcast networks typically sell 80% of their ad inventory before a new season begins through a process known as the 'upfront market.'[1] Remaining inventory is sold a few weeks before a program's airdate in a process known as the 'scatter market.' The networks offer discounts for purchasing through the upfront market, and we confirm in the data that upfront prices on broadcast television are on average 12% lower than scatter prices for the same program airing.

A significant challenge for studying pricing in most input markets is that firms consider contracts to be proprietary, and data on the terms of pricing contracts are rarely available. To overcome this challenge, we combine institutional knowledge of the contracting practices in the market with extensive new detailed data on firms' ad placements, the average transaction prices of ad spots across individual program airings, and historical ad-purchasing behavior. Our main data sources provide information on (i) television viewership and detailed ad placement information for individual program airings ('telecasts') from 23 million cable set-top boxes in 13 million households during the 2011 - 2013 calendar years, (ii) average transaction-level ad prices for each telecast over the same three-year period, (iii) hand-collected historical information on advertising expenditures by parent companies from 1960 to 2017, and (iv) hand-collected data on firms' advertising agencies for the 2011-2013 period. We use the third dataset to track the length of time each firm has participated in the upfront market for national advertising, and we refer to this advertiser characteristic as its legacy status.

By mapping the average upfront prices in each telecast to the set of advertisers who purchased ads in the telecast, we are able to infer price differentials across firms that purchase in advance. We

[1] The three main broadcast networks in the U.S. are ABC, CBS, and NBC. We refer to other networks as cable networks.

interpret the price differentials by projecting them onto advertisers' observable characteristics. We find that prices on broadcast are negatively correlated with an advertiser's size and the length of its advertising relationship in the market. We define advertiser size for a given network as the total ratings-weighted ads shown on all competing networks during the first season for which we observe the advertiser. The results are directly interpretable and allow us to quantify price differentials across advertisers. Our results suggest that a 10% increase in a firm's total ad buy implies a 0.4% price reduction. The estimated coefficient on legacy status suggests that advertisers receive a 0.3% discount per year of earlier entry in the upfront market, implying that, on average, an advertiser who entered in 1960 enjoys a 15.9% discount relative to one who entered in 2013.

All analyses control for unobservable qualities of individual telecasts using scatter prices, and condition on an extensive set of product-category-by-network fixed effects. We also condition on observable characteristics about the quality of a firm's overall ad inventory that is typically not available to researchers, such as whether an ad runs in the first ad break of a telecast, or is the first ad shown within an ad break. Advertisers typically work with a media-buying agency to implement their advertising strategies, and our results also condition on the identity of the media agency for each firm. Finally, our results remain relatively unchanged if we also control for the year in which each firm was established, separately from the year in which the firm entered the upfront market.

While the finding of participation-based, or 'legacy,' discounts may seem surprising at first, it matches industry narratives. Practitioners report economically meaningful price dispersion across advertisers for inventory sold by broadcast networks through the upfront television advertising market, and our analyses document that, on average, lower prices are extended to firms that have long histories of participation. Indeed, industry narratives about price differences due to legacy discounts in the upfront market indicate that they are so significant and prevalent that advertisers as known as either 'good money' (new participants who pay high prices) or 'bad money' (legacy advertisers who receive grandfathered low prices), described in Lotz (2007). A requirement for a firm to keep its preferential upfront pricing is that it maintains consistent business with the network. Although the factors that have led legacy discounts to arise in equilibrium in this market are of both practical and theoretical interest, speculation on the product-market impacts of legacy discounts for advertisers requires only confirmation that the discounts exist. The practical impact of these discounts is to increase an important input cost for firms that have smaller ad buys and are relatively new to national television advertising.

To show this, we describe how industry practices may affect new entrants and young firms. Due to the extensive coverage and detail of our ad placement data, we may describe price differences both across and within various product markets. We divide brands into 96 detailed product markets (e.g., Autos, Insurance, Casual Dining, Cereal), and identify markets with substantial differences in upfront entry between the oldest and youngest advertiser. For example, there are 41 product markets with a greater than 20-year gap between the youngest and oldest entrants (e.g., Casual Dining, Chocolate, and Telecom). We calculate the potential foregone cost savings for the youngest firm within a product category by assigning the discount of the oldest firm to the newest entrant

in each category. On average, the newest brand in a category pays roughly $1.3 million more for the same advertising inventory on a base expenditure of $20.6 million.[2] These data patterns imply that legacy pricing may create significant differences in costs between firms competing in the same product market. Specifically, younger advertisers face higher costs, which may impede their ability to put pricing pressure on dominant (legacy) firms. Similarly, these cost advantages present a reason why legacy firms may be better positioned to introduce new brands than young independent firms, again with the potential to soften competition in downstream product markets. Indeed, all of the sources of price dispersion we document benefit dominant firms, which are typically also larger and characterized by longer advertising relationships: intertemporal price discrimination through lower prices in the upfront market (which is primarily used by large firms), discounts associated with larger ad buys, and the legacy discount.

We expect that advertisers may face different costs if they aim to reach different types of viewers, purchase ads in different markets, or purchase different bundles; e.g. ads reaching households with different demographic profiles, local vs. national ads, purchasing in advance or using the scatter market. We add to this discussion by documenting that larger advertisers and incumbent firms benefit from lower prices even when we condition on participating in the upfront, inventory quality, media agency of record, and product-market category. These differences persist across advertisers with relatively high exposure on national primetime television, which are often firms of interest for researchers, practitioners, and policy makers. Recognizing and quantifying differences in input cost is notoriously difficult because contracts are rarely disclosed either to researchers or even to practitioners. Our empirical analyses and the implied cost differences offer guidance on which product markets may be subject to large differences across advertisers in their returns on ad spend, with the potential to affect competition in downstream markets.

Legacy discounts confer advantages to firms with long-standing relationships, potentially reinforcing the advantages of advertising for incumbent firms à la Sutton (1991)'s endogenous sunk costs. Concerns about unequal access to advertising have been considered previously by both academics and antitrust authorities. Porter (1976) documents that it is cheaper to reach a viewer with a national ad than a local ad, highlighting one mechanism that gives national firms a competitive advantage over regional (smaller) firms, and potentially creating barriers to entry for small local firms. We add to this discussion by documenting that selling practices in the broadcast upfront market confer advantages to firms with large ad buys and incumbent firms even when comparing across large advertisers with large exposure on national primetime television.

The economics and marketing fields have long been interested in investigating how the strategic use of advertising may shape product-market competition and market structure. Empirical analyses have documented that advertising is an important tool for product-market success (some examples include Ackerberg (2001), Dubé, Hitsch and Manchanda (2005), Shapiro (2018), Yang, Lee and Chintagunta (2020)); and generally considered how advertising affects competition (Vilcassim,

[2]These back-of-the-envelope calculations do not take into account the ability of brands to re-optimize their advertising mix if given access to a lower price.

Kadiyali and Chintagunta (1999), Dubé and Manchanda (2005), Qi (2013)).[3]

Due to data limitations, most studies of advertising effectiveness and the effects of advertising on product-market competition assume that advertisers incur the same costs to reach a viewer (measured as posted rate cards).[4] One exception is Moshary (2017) who documents that local television stations price discriminate between Republican and Democratic political action committees according to committees' willingness to pay for ads in contested markets. She considers local (spot) advertising choices, which are important for political campaigns. In contrast, we focus on national advertising, which accounts for the bulk of ad spending in product markets. Yang, Lee and Chintagunta (2020) analyze how differences in advertising costs impact the market for satellite and cable TV. In this industry, the entering satellite providers advertise nationally, and thus benefit from cheaper advertising costs compared to local incumbent cable firms (who advertise locally). In contrast, our results highlight a form of price dispersion for an input that more often has negative consequences for new entrants, and consequently, may soften competition.

The rest of the paper is structured as follows: section 2 describes the market for national television advertising. The novel data sources used in this analysis are presented in Section 3. Section 4 exploits average prices to infer information about legacy discounts and analyzes other underlying conditions for which legacy discounts may proxy. In section 5 we consider the potential effects of legacy deals in advertisers' product markets. Section 6 concludes.

2 Market for national television advertising

National television advertising is sold in two markets: the 'upfront' and the 'scatter.' The scatter market sells ad slots close to the air date of a program. Prices are determined by the market, with little or no price discrimination between advertisers. The scatter market is relatively small, with the top broadcast networks (ABC, NBC, CBS) selling about 20% of their ad inventory in this market. Firms may also purchase ads in specific geographic regions through local affiliates. These ads are heavily used by local advertisers, such as car dealers, professional services, local retailers, or political candidates in state or local elections. Industry participants refer to these local markets as the 'spot' market. We do not observe local advertisements, and our focus throughout is on the national ads sold by the national networks.

The majority of broadcast ad slots are sold through the upfront market. The upfront market dates back to the 1960s and involves selling national advertising for the upcoming season in advance. Each spring, between March and June, networks organize events to preview and promote their

[3]Other papers include Chandra and Weinberg (2018) who use a merger in the U.S. brewing industry to analyze empirically the relationship between market structure and firms' advertising expenditures. Scott Morton (2000)and Ellison and Ellison (2011) analyzed whether firms use advertising as an entry deterrent. Earlier empirical cross-industry analyses of the association between advertising and entry are summarized in Bagwell (2007).

[4]The analysis of advertising markets is further complicated by the two-sided nature of the market; for example Wilbur (2008) finds that advertisers' preferences influence networks' choice of programming more strongly than viewers' preferences. Goettler and Shachar (2001) and Goettler (1999) analyze television networks' scheduling choices. A separate literature measures returns on television advertising by analyzing differences in advertising effectiveness across firms and product markets (e.g. Shapiro, Hitsch and Tuchman (2020)).

programming for the upcoming television season, which begins in the fall. Important benefits to purchasing in the upfront relate to discounts relative to purchasing in the scatter market, availability of programming, and the use of firm-specific discounts. On average, upfront rates on broadcast are about 12% lower than scatter rates for the same program airing.

Cable networks differ from broadcast networks in several ways. Some cable networks are primarily supported by viewer subscriptions (e.g., HBO), and have a much smaller presence in the advertising market. Large ad-supported cable networks (e.g., USA, TNT, and TBS) entered the upfront market in the 1990's. Unlike broadcast networks, however, they sell less than half of their inventory through the upfront market (Bollapragada et al. (2008)), and reportedly do not offer firm-specific discounts on upfront ad buys. On average, inventory on cable commands lower prices than on broadcast television. We evaluate the relationship between firm characteristics and price dispersion separately for broadcasters and cable networks.

In practice, most advertisers work with ad agencies to create advertising campaigns for their products, determine advertising budgets, and recommend a programming mix. Media-buying agencies also negotiate on behalf of their clients in the upfront market. The upfront typically proceeds in two steps. First, agencies negotiate the allocation of each client's programming mix in a network. The programming-mix negotiations are over blocks of ad slots that reach audiences with similar demographic profiles, rather than at the level of an individual ad in a specific television show.

Once the programming mix is established, prices are determined. Prices are described as CPM (cost per mille), or the cost to reach one thousand viewers. CPM rates vary by audience size and viewer demographics, by seasonality, by day of the week, and by advertiser. The price determination process differs between new and returning business. In the case of new accounts for a network, the agency negotiates a CPM, which becomes the advertiser's base rate for the following year's upfront. For all returning business, each network negotiates a uniform percent increase (or rarely a decrease) that is applied to each firm's base rate to determine its price. Thus, a base rate reflects the price a firm paid in the previous upfront. For example, if Proctor & Gamble's (P&G) base rate with ABC in 2011 is \$10, and ABC secures a 10% increase in prices in 2012, then P&G will pay a CPM of \$11 in the 2012 upfront market. One may see that if negotiated prices for new businesses have been consistently higher than the prices paid by returning businesses, then this price-determination process implies differences between incumbents and newcomers; and these differences would persist over time. According to practitioners, the incumbent firms maintain their preferential base rates as long as they maintain a continued relationship with the network.

In 2005, an auditor of media spending, Media Performance Monitor America (MPMA), analyzed actual prices paid by major U.S. advertisers. At the time, MPMA's clients accounted for \$3 billion in advertising expenditure. The report documents the presence of price variation across firms for identical time and space in the upfront (Bloom (2005)). The findings show that so-called 'legacy' firms, who have long histories of participation and 'old' base rates, may pay prices that are as much as 50% lower than the prices faced by firms on the other side of the distribution (i.e., new entrants). The report further reveals that these deals are not associated with the size of the firm or

the identity of the firm's media-buying agency. Our empirical analysis suggests that price dispersion across advertisers is correlated with both legacy status and firm size. We find some differences in average prices across media-buying agencies, but these do not explain the negative correlation between legacy status and upfront prices on broadcast networks.

The contracts in the market for national television advertising are further complicated because upfront purchases are granted audience delivery guarantees.[5] If a program's viewership is lower than the contracted expected viewership, then the network provides additional ad spots – typically during other time slots or shows. Alternatively, if a program's viewership is larger than predicted, then the advertiser captures these gains at no additional cost. To fulfill these audience guarantees, networks typically reserve some inventory in advance, which may affect inventory availability and prices in the scatter market. For our analysis, we focus on primetime telecasts to avoid ad placements resulting from audience guarantees. Multi-year contracts may be used in the case of sporting events and other event sponsorships. These practices do not directly affect the price determination process in the upfront market, so we do not use advertising on sports programming for the analysis.

3 Data

The data for the project come from six sources: Rentrak Corporation, SQAD, Winmo, and three sources that report historic information on advertising spending: Kantar Media's Ad$pender, AdSummary periodicals, and Leading National Advertiser periodicals. The data from Rentrak Corporation and SQAD cover a three-year period (January 2011 - December 2013).

In the television market, Rentrak collects viewership (i.e., ratings) data from over 13 million households, or 23 million set-top cable boxes.[6] The demographic detail covers over 100 standard demographic variables for all members of each household (for example, gender, race, education, income, etc.). Rentrak combines these viewership data with information on ad placements. The information about each advertisement is extensive, describing the advertiser, industry, product, ad copy, timing, and placement of each ad. For example, an observation describes that Coca-Cola Co ran the 30-second "Let the World Come to Your Home" ad as the second ad during the first ad break of the 9:00pm showing of "Modern Family" on ABC, on October 16, 2013. The Rentrak data also contain information on the corporate relationships across advertisers, identifying parent companies for brands across products in different industries.

Prices of ad spots are closely guarded by industry participants and are notoriously difficult to observe. We access rarely available data on television ad prices that directly reflect transactions

[5] In addition, advertisers have some flexibility to adjust their upfront commitments. Typically, advertiser commitments for the fourth quarter of the current year are considered 'firm' buys, whereas advertisers may cancel about 25% of their upfront commitments for the first quarter of the following calendar year, and 50% for the second and third quarters. Historically, advertisers have not aggressively exercised this option. Cancellations run between 10% and 15% (Wang, Stabler and Mukherjee (2009)).

[6] Rentrak was acquired by ComScore in February 2016. SQAD is owned by Clarion Capital Partners, LLC. Unlike the Neilsen Company, which tracks 25,000 households using a 'PeopleMeter' to monitor which member of a household is viewing a telecast, Rentrak collects data for a much larger population at the level of each 'tune-in' of a remote control, but does not identify which household member is viewing a given telecast.

between networks and advertisers. These transaction-level data, which SQAD calls NetCosts, report the average transaction price for an ad spot in a specific telecast (for example, "Modern Family" on ABC, shown at 9:00pm on October 16, 2013), where the average is taken over the set of advertisers showing ads in that telecast.[7] The data contain information on reported prices separately for the upfront and scatter markets. Importantly, SQAD's NetCosts do not impute missing prices; hence the data differ from the CPM data provided through Neilsen. To the best of our knowledge, this is the first time the NetCosts data have been used by researchers.

We conducted an extensive data collection project to document historic advertising expenditures, which allows us to infer the length of a relationship between a parent company and television networks. We combine three data sources, each reporting information on advertising expenditures across multiple media outlets (e.g. broadcast television). The distinction between the sources is that they cover different time periods. Kantar Media's Ad$pender reports monthly advertising expenditures for more than 3 million brands for the 1995-2018 sample period. For previous years, we 'digitized' data from printed publications from 1995 to 1960. AdSummary books publish annual expenditures for the top 1,000 parent companies from 1974 to 1995. For the 1960-1973 period, data are collected by hand from Leading National Advertiser publications. The data include information on advertising expenditures starting in 1960, allowing us to track the length of a parent company's presence in the broadcast advertising market.

Last, we collect information on the media-buying agency of record for each advertising firm. We used Winmo as a starting point as the company collects information on media-buying and creative agencies for each advertiser over time. Unfortunately, many of the agency-advertiser pairs have missing information. Advertising media outlets typically report when a major advertiser starts an agency review and the outcome of that review. As a result, we confirmed by hand and updated each reported advertiser-agency pair with news announcements and assigned the appropriate agencies for the 2011-2013 period.

3.1 Sample

The final sample includes three years of pricing and detailed advertising data during the period of January 2011 - December 2013, with the associated advertising histories of each firm. We focus the analysis on 20 networks for which we observe average prices and ad placements in a telecast. These networks include the top three broadcasters (ABC, CBS, and NBC), and 17 cable networks. During the sample period, ABC and NBC are affiliated with cable channels, which we group with the main broadcast network. NBC is combined with Comcast's Bravo, MSNBC, Syfy, and USA channels. ABC is affiliated with ABC Family (Freeform) and ESPN, but we do not use these networks in the analysis.[8] The cable networks are grouped into conglomerates according to their

[7] In order to solve the information revelation problem, the transaction prices are reported as an average transaction price for telecasts for which advertisers from at least two agencies purchased a spot.

[8] ABC Family is not included because we observe very few scatter prices for the network. We drop ESPN and other sport programs because sporting events are often characterized by sponsorship deals and multi-year contracts, which are done separately from the upfront market.

ownership structure during the sample period. They include A&E (A&E, History, Lifetime), Scripps Networks (Food Network, HGTV, Travel Channel), Time Warner (CNN, TBS, TNT, TruTV), and Viacom (BET, MTV, Spike). We refer to network conglomerates as networks.

The analysis is applied to data on primetime prices and advertisers' input-sourcing choices. Primetime refers to the 8:00pm - 11:00pm 'daypart' block of television programming; most television viewership and advertising expenditures are concentrated in prime time. We focus on these programs because primetime advertising reflects firms' ad-placement choices, while ad placements in non-primetime may be the result of audience deficiency guarantees (described in section 2). SQAD reports upfront prices for 30,346 unique primetime telecasts and 11,504 scatter prices for the set of 20 networks. We construct telecast CPM by dividing reported prices by the number of viewers watching within the 18-44 age group, as most networks receive payments only for this age group. We look at the data separately for broadcasters and cable networks because industry participants report that legacy discounts do not apply to stand-alone cable networks. Table 1 summarizes reported prices: media upfront CPM on broadcast TV is \$18.31, on average; and cable upfront CPM is \$15.49. The prices in our data match relatively well with the upfront prices cited in industry reports.[9] On average, upfront prices are lower than scatter prices: the ratio of upfront to scatter prices, p^u/p^s, is 0.89 for broadcasters and 0.95 for cable.

Large advertisers are the main participants in the upfront market; thus, we exploit information from the ad placements of 298 parent companies, which comprise 95% of broadcast primetime ad slots. Parent companies are described by their brands, advertising budgets, and legacy status. We track 1,784 brands produced by these 298 parent companies. For example, the parent company Toyota Motor Corp owns three brands in the data: Lexus, Scion, and Toyota. We assign brands into 96 product subcategories, and then group these into 28 categories to assign an industry to each parent company. Advertising budgets for the 2011-2013 sample period are obtained from Ad\$pender. The average firm budget for an advertising firm across the broadcast networks is \$67.0 million, while cable companies capture \$61.0 million per firm. The analysis focuses on primetime advertising, which constitutes 62.3% of advertisers' annual spending on broadcast television. During the sample period, national television advertising accounts for, on average, 68.8% of firms' total advertising spending, which includes online display advertising, radio, newspapers, and magazines. We evaluate the match between our data sources by comparing the annual primetime spending reported in Ad\$pender with primetime spending constructed using average prices from SQAD and ad placements from Rentrak. We may not directly compare the two datasets because SQAD reports prices only for a subset of telecasts. Still, the correlation between the two variables is 0.98, which confirms the match between our data sources.

The price-determination process in the upfront market for broadcast advertising suggests that ad prices may be correlated with firms' legacy status. To allow for such a relationship, we use annual advertising expenditure at the parent-company level from 1960 to 2013 to track the length

[9] During the sample period, eMarketer.com (2019) reports upfront prices of \$17-\$21 on broadcast, and \$11-\$12 on cable. We likely see higher prices on cable because SQAD tracks prices for cable networks that are relatively popular.

of firm participation in the upfront market. We calculate the legacy status of a firm at the level of the parent company, as base rates in the upfront market are the same for all brands produced by the same company. Two separate legacy-status variables are constructed: one each for the broadcast and cable markets. For the broadcast market, we assume that a firm enters the upfront market in the first year during which the parent company advertises on broadcast television, as long as: (i) there are no gaps in spending greater than two years, and (ii) the broadcast spending by the company accounts for at least 0.01% of total broadcast revenues in that year. Ideally, we would measure a firm's legacy status separately for each specific network. However, our data on historic advertising expenditures aggregate information across networks to the level of broadcast spending and cable spending.[10] We infer that 48 parent companies have uninterrupted relationships with a broadcaster since 1960, and the data track the entry of the remaining companies. The legacy variable in table 1 reports the year of entry in the upfront market prior to 2014. On average, firms entered the upfront market in 1988 with legacy=26 (legacy=1 for firms that enter in 2013, 2 for firms that enter in 2012, etc.).

The legacy variable using data on cable spending follows the same rules, with the difference that cable spending is only observed in the data starting in 1985. For cable companies, we infer that 89 firms have been consistently advertising in cable companies since 1985; and 80 of these firms have entered the broadcast upfront market prior to 1985. For the remaining firms, 35 have longer uninterrupted relationships in the broadcast advertising market; the inferred entry is the same for 59 firms; and 116 firms enter the cable market before the broadcast upfront. The correlation between the cable and broadcast legacy variables is 0.79.

Table 2 provides examples of firms with different entry in the broadcast upfront market. To facilitate the visual comparison, the legacy variable is categorized into cohorts. We define cohorts by decade for early entrants and in 5-year periods after 1990. For each cohort, we summarize information from three different parent companies: a company with high, mid, and low levels of advertising expenditure. Average spending over the 2011-2013 sample period is summarized in the last column, reported in millions. For example, AT&T is inferred to have entered the upfront market in 1960 and its average annual advertising spending on broadcast TV in 2011-2013 is $602 million. One of its competitors, T-Mobile enters in 2001 and its average annual spending on broadcast is $180 million. Next, we look at the correlation between legacy status and average annual advertising expenditure by parent company. Table 3 shows that legacy status is positively correlated with the advertising expenditure for all media, obtained from Ad$pender. The correlation between broadcast legacy status and broadcast budget is 0.449, and 0.448 for cable budget. Interestingly, the correlation between legacy status and annual spending at the brand level is -0.045. These

[10]This requires an implicit assumption that if a company's spending is significant for the broadcast (or cable) market, then the company purchases ads in the upfront and it advertises in all broadcast (or cable) networks. We can confirm the plausibility of this assumption for the observed sample period using Rentrak data. On average, parent companies advertise in 6.85 of the 7 network conglomerates in a year. Data show that advertisers are typically present on all three broadcasters: 98% of the firms that show ads on any broadcaster, show ads on all three networks. Similarly for cable companies, 93% of the large advertisers are present in all cable conglomerates for the 2011-2013 sample period.

differences suggest that legacy firms have higher budgets because they have more brands.

Table 4 presents a snapshot of the data used for the analysis. The columns show six specific telecasts (e.g., Big Bang Theory on CBS, airing on three dates – Feb 17, 2011, February 23, 2012, and February 28, 2013). Each row shows the ad placements for a parent company. For example, JC Penney purchased a 30-second ad in the Feb 23rd airing of Big Bang Theory, and 30-second ads in two airings of Grey's Anatomy (on Feb 3, 2011 and Feb 14, 2013). The bottom panel of the table shows summary information at the telecast level: total number of national ad seconds, telecast audience, and average upfront and scatter prices, when we observe these prices.

We supplement the data with information on the media-buying agency of record for each advertising firm for the 2011-2013 period. The Wimno data and news announcements confirmed that advertising firms use the same media-buying agency for all of their brands. During the sample period seven major holding companies provide media-buying services: Dentsu, Havas, Horizon Media, Interpublic Group, Omnicom, Publicis, and WPP. We were not able to map the information for 27 parent companies, and combine smaller agencies for which we mapped fewer than 5 advertisers into "other." Summary statistics are reported in table 5. The first column describes the number of companies mapped to each agency. Then we look at the total budget controlled by each agency: total annual budget under the agency's control and the average annual client budget, both reported in millions. For the sample of 298 advertisers, we find that there is some variation in the types of companies employing each agency with respect to their size. At the two extremes, the average ad spending for firms employing Havas is $119 million, and $311 for Publicis. We did not identify the media-buying agency for smaller advertisers (with average spending of $55 million). The rest of the columns summarize differences in advertisers across agencies vis-à-vis their legacy status. Most agencies work with a variety of advertisers across the legacy spectrum. Apart from Horizon Media, all agencies work with at least one firm that entered the upfront broadcast market in the 1960s.

4 Price dispersion in the upfront market

The descriptive analyses on prices in section 3 confirm that networks use temporal price discrimination. The difference between upfront and scatter prices is, on average, larger for broadcast networks, which sell a larger portion of their ads on the upfront market. Participants in the upfront market are mainly large advertisers; therefore, this type of price discrimination benefits large national firms, in a similar argument as Porter (1976)'s review of price differences between national and local ad spots. Here, we look at price dispersion across the large advertisers participating in the upfront market, and correlate inferred price differences with observable firm characteristics. Advertisers' observable characteristics of interest include the size of their ad buys and the length of their relationships with television networks. We control for the quality of each firm's purchased inventory, its product-market category, and its advertising agency of record.

Importantly, the strategy allows us to quantify the relative size of quantity and legacy discounts across advertisers. We extract that information by matching average prices for each telecast (reported by SQAD) and the universe of firms advertising in each telecast (reported by Rentrak). The

strategy has two steps: first, we construct price differentials across firms by exploiting the nature of averages. Then we project these differentials on company characteristics, including firm size and the length of relationship in the upfront market.

A stylized example showcases the approach behind the first step. Suppose that there are two telecasts with average upfront prices p_1^u and p_2^u, and reported scatter prices p_1^s and p_2^s. Only two advertisers (a and b) show ads in these telecasts and their discounts relative to scatter prices are δ_a and δ_b. These firm-specific discounts are the same across the two telecasts. If firm a advertises in both telecasts, and firm b shows an ad only in telecast 1, then average upfront prices are constructed as

$$p_1^u = \frac{p_1^s * \delta_a + p_1^s * \delta_b}{2} \qquad \text{and} \qquad p_2^u = p_2^s * \delta_a. \tag{1}$$

Rearranging, we get

$$\frac{p_1^u}{p_1^s} = \frac{\delta_a + \delta_b}{2} \qquad \text{and} \qquad \frac{p_2^u}{p_2^s} = \delta_a. \tag{2}$$

Carried out for the full dataset, this strategy maps a vector of the ratio of average upfront to scatter prices for each telecast onto a matrix of advertisers' ad placements

$$\frac{p^u}{p^s} = A\delta + u, \tag{3}$$

where A is a matrix of advertiser-network indicators weighted by the number of ads shown by each advertiser in each telecast. This provides a non-parametric estimate of the price discount for each advertiser-network pair (δ_{in}).[11] Figure 1 provides an illustration using three firms for the telecasts in table 4. The left-hand-side variable tracks the ratio of average upfront to scatter prices of telecasts, e.g. Big Bang Theory program airings tracked as 1-3. These prices are mapped to a matrix tracking advertisers, e.g. JC Penney, Target, and Apple, which is weighted according to each firm's ad buys in each of the telecasts. Thus, if average upfront prices are more discounted relative to the scatter-market price for the shows in which JC Penney advertises than they are for Target, then JC Penney is estimated to have a larger discount than Target.

We allow discount parameters to vary across advertiser-network pairs, δ_{in}. We do not allow firm-specific discounts to change over time. The implicit assumption is that scatter prices capture movements in demand and supply for a given telecast, which leaves the relative discount of each firm in the network unchanged. When comparing discounts across firms, the practice of uniform percent changes each year is consistent with stable differences in price discounts across firms. For example, let P&G's base rate at ABC be \$10 and Netflix's base rate be \$20 in 2011. If ABC secures a 10% increase in CPMs, then this percent increase is applied to all of its returning advertisers. This implies that the updated price for P&G is \$11, which is again 50% lower than Netflix's price of \$22. The uniform price adjustments across all clients imply that the price differentials across firms persist over time.

[11] Equation 3 implies that δ parameters capture price differences in percentage terms relative to scatter prices rather than in dollars. An alternative specification is to use scatter prices (and other observable telecast characteristics) as an explanatory variable. We compare the two approaches in section 4.1.

Our main identifying assumption is that the variation in price ratios (between the upfront and scatter markets) across telecasts is driven by the discounts secured by each firm. If we did not control for scatter prices, then price differences across shows could arise from telecast-specific unobservables. For example, a naïve regression of upfront prices on $A\delta$, without controlling for differences in telecast quality, would impose the strong assumption that a parent company is facing the same CPMs across shows within a network. As a result, the parameter estimates would only inform us of the types of shows in which a firm advertises: a high $\hat{\delta}_{in}$ would imply that firm i's advertising portfolio in network n consists of telecasts with higher-than-average prices. Scatter prices account for 77% of the variation in upfront CPMs, and by using the price ratio, we control for telecast unobservables due to viewership, day of the week, and network or programming unobservables.

The error term in equation 3 may be generally attributed to two sources. The first relates to telecast unobservables that are not captured by scatter prices. Scatter prices control for much of the unobservables that may influence both prices and ad placements. Nevertheless, upfront and scatter prices are determined at different times (i.e., in late spring versus close to the telecast air date). Therefore, the error term accounts for changes in demand conditions or expectations of telecast performance. This may cause a concern if, for example, some advertisers have a better ability to predict telecast performance than others, which leads them to purchase ads in telecasts that 'over perform.' We discuss features of the market and analyze data patterns to explore the potential effects of such selection on unobservables in section 4.2.

The second source of error in equation 3 relates to sampling variation in the SQAD data and sample construction. SQAD reports average upfront prices if at least two agencies disclose transactions. We cannot identify the parent companies SQAD uses to construct reported averages; instead, we assume that the prices reflect an average across all 298 parent companies with inferred upfront presence during the 2011-2013 sample period. Thus, the matrix of parent companies may include firms that are not relevant to the observed SQAD price. Conversely, by focusing only on firms with large advertising spending, it is possible that the sample excludes some parent companies that report upfront costs to SQAD. This second mechanism is of less concern because the sample of parent companies accounts for 95% of broadcast primetime exposure during the sample period.

To interpret the inferred discounts from the first-stage estimation of equation 3, we project the non-parametric estimates of $\hat{\delta}$ onto firm characteristics

$$\hat{\delta} = \beta Z + \epsilon \tag{4}$$

where Z contains information on firm characteristics and controls for other observable shifters that may affect the relative prices that firms pay for their ad placements on average. The second-stage estimates take into account errors introduced in the first stage of the regression, and $\hat{\beta}$ is given as:

$$\hat{\beta} = (Z'V^{-1}Z)^{-1}Z'V^{-1}\hat{\delta} \tag{5}$$

where V is the variance-covariance matrix of the $\hat{\delta}$ estimates.

4.1 Suggestive evidence

The proposed two-step estimation quantifies price differentials across firms by exploiting differences in upfront prices across telecasts with different subsets of advertisers. Before looking at these estimates, we consider data patterns to inform the intuition behind the strategy. For example, if larger firms pay lower prices, then we expect that the (average) upfront price is lower in telecasts where we observe more advertisers with large ad buys. Here we explore the correlation between reported average upfront prices and the profile of the average advertiser in a telecast. The analysis conditions on program characteristics to make differences comparable across telecasts.

Industry participants report that discounts on broadcast advertising are correlated with the legacy status of a firm (in the form of grandfathered base rates), while legacy discounts do not apply to stand-alone cable networks. Consequently, we present the analysis separately for broadcasters and cable networks, with the expectation of finding a relationship only for broadcast networks. A priori, we do not have information on potential differences in size-related discounts across broadcast and cable networks.

An observation is at the telecast level, so we construct a representative advertiser per program airing by averaging over advertisers' legacy status and size. Firm size is measured using ratings-weighted ads in competitors' networks in the first season in which we observe the firm on Rentrak. Table 6 summarizes the variables tracking telecast legacy and advertiser size profiles separately for broadcaster and cable networks. The three major broadcasters (ABC, CBS, and NBC) established the upfront market in the 1960s. The legacy variable for cable companies is constructed based on historical cable spending, which we observe in the data starting in 1985. As a result, differences in the average legacy variable across these network types is by construction.

Table 7 shows the relationship between prices and telecast characteristics; column 1 regresses price ratios on average advertiser characteristics, allowing that the relationships differ across network types. Column 2 adds the following observable telecast characteristics as additional controls: telecast ratings interacted with month and genre fixed effects, detailed viewers' demographics, day of the week, month-season dummies, and network fixed effects. The negative coefficient on legacy for broadcasters is consistent with preferential prices for advertisers with longer relationships in the upfront market. The relationship between average prices and legacy status on cable networks is positive in column 1, implying that cable networks charge higher prices to loyal customers. This is in line with behavior-based price discrimination theories à la Fudenberg and Tirole (2000).[12] The relationship with average size of a firm's ad exposure suggests potential quantity premiums on broadcast; however, this disappears once we include telecast controls.

We repeat the analysis using upfront prices as the dependent variable. The exercise sheds light on the role of scatter prices and observable characteristics as controls. Column 3 does not condition on telecast characteristics, column 4 uses scatter prices, 5 adds observable characteristics, and 6

[12] In their model, if consumer preferences are correlated over time, and firms cannot commit to prices, then a firm will charge higher prices to returning customers because these customers have revealed a preference for the firm's product.

uses all controls. Results are similar to the analysis using price ratios: we find suggestive evidence for grandfathered prices for legacy firms on broadcast and price premiums on cable networks. It is useful to note that scatter prices capture much of the variation in average upfront prices across telecasts, with an R^2 of 0.770 in column 4 and 0.796 in column 6 when we include all controls.

The two-step approach, described in equations 3 and 4, uses price ratios and captures price differences in percentage terms relative to scatter prices (rather than in dollars). An alternative specification is to use scatter prices (and other observable telecast characteristics) as an explanatory variable: $p^u = A\tilde{\delta} + \beta p^s + \tilde{u}$. This approach would resemble the analyses in columns 3 to 6. In this case, $\tilde{\delta}$ corresponds to average differences in dollar terms (i.e.,, on average, firm i pays $\$\tilde{\delta}_{in}$ more in network n). The analyses in table 7 suggest that both approaches imply similar relationships between prices and the advertiser profile of a telecast. Estimating price differentials as a percentage difference allows for a more intuitive comparison across telecasts and over time; hence, we proceed with that specification.

4.2 Selection

If ad placements in the upfront and scatter markets are uncorrelated with the variables of interest, then the estimated legacy and size-related discounts will be correct. However, if ad placements are correlated with unobservable characteristics of advertisers or ad spots, then selection may bias our estimates of firms' legacy status and/or size. This may occur if, for example, legacy (or large) advertisers are better able to predict a telecast's performance, or prefer to place ads in less desirable time slots (either within or across telecasts).

How important are selection effects likely to be? On one hand, industry practitioners point out that, regardless of legacy status or the size of their ad buy, nearly all advertisers use the same set of media-buying agencies. Thus, they are expected have the same information when selecting their television ad buys, and the same ability to place ads in preferential slots. On the other hand, one cannot entirely rule out the possibility of selection effects, and so one may want to explore the potential scope of these concerns. In this section, we explore these concerns in two ways. First, we introduce additional observable information about the average quality of the inventory purchased by each advertiser, on which our baseline estimates of the effects of size and legacy status will condition. These additional observable characteristics limit the scope for selection. Second, we discuss the potential mechanisms through which any remaining unobservable selection effects might express themselves, and we provide information on whether these are likely to be important.

We have several proxies for the quality of ad inventory from the Rentrak data. For each advertiser, we observe detailed information on the portfolio of their ad buys. The information describes both the telecasts in which their ads ran and details about the ad spots themselves. Specifically, we observe the fraction of advertiser's total ad exposure that ran on Sunday through Thursday evenings, what fraction was shown during primetime, and what fraction was shown on a network's top 20% of programs (by ratings).[13] We also know how many of an advertiser's ads were

[13]We define advertiser's total ad exposure by multiplying its ads in each telecast by each telecast's rating.

shown in a telecast's first ad break, or were shown as the first ad of any given ad break. Both of these characteristics provide additional exposure to viewers because fewer viewers switch away to avoid these ads. Table 8 reports these characteristics at the level of a parent company's total ad purchase from each network conglomerate, summarized separately for broadcast and cable networks. There is significant variation in these measures, indicating the presence of important differences in the characteristics of ads purchased by different advertisers. The variables look similar across broadcast and cable networks. The exception is the share of exposure on primetime, which is lower for cable networks. Table 9 reports the correlation between legacy status and firm size with each of these variables. Negative correlation between some of these variables and an advertiser's legacy status suggests that older advertisers may purchase different types of inventory - perhaps based on their target audiences or other advertising strategies. Our baseline estimates condition on all observable characteristics of firms' purchased advertising bundles. In section 4.4 we show that controlling for the quality of an advertiser's inventory does not materially change our estimated relationship between price and either firm size or legacy status.

In order to evaluate the potential for advertisers to endogenously select ad inventory on the basis of unobservable characteristics, we ask: do legacy and/or larger firms, on average, choose, or receive, ad inventory in telecasts with lower upfront prices (measured ex-post) relative to scatter prices? If so, then such patterns may imply that legacy (or larger) advertisers may be (i) following a different advertising strategy than younger (or smaller) firms (e.g., due to different past investments in reputation), (ii) receiving different inventory offers from networks (i.e., because the networks know that these firms will accept different inventory than newer and/or smaller firms) or (iii) better able to select telecasts that outperform expected viewership ex-post (e.g. due to possessing better information about the future performance of upcoming television series). In all cases, the implication is that legacy and/or larger firms may endogenously choose different advertising inventory than younger/smaller advertisers. One way in which this selection effect might be noticeable in the data is that legacy and/or larger firms might be able to successfully avoid telecasts that are ex-post low-performing or high-priced.

We operationalize these notions of selection on unobservables by regressing the average price ratio between the upfront and scatter markets, as well as the standard deviation of this price ratio, on legacy status and advertiser size. The dependent variables, average(p^u/p^s) and standard deviation(p^u/p^s), are constructed at the advertiser-network level. Table 10 presents these regressions. We allow for a different relationship for broadcasters and cable networks. Columns 2 and 4 condition on category-network interactions considering that there may be differences in the demographic profiles targeted by firms producing different types of goods. Results show no difference in the average or standard deviation of price ratios on broadcast networks across advertisers based on their legacy status or size. For cable networks, the results move against expectations - legacy firms advertise more in telecasts with ex-post higher p^u/p^s.

One way to interpret these results is that legacy and/or larger firms don't differ dramatically in their strategies from younger and/or smaller firms on broadcast. Another way to interpret

them is through the lens of the advertising agencies. Nearly all advertisers use media-buying agencies for planning and buying inventory. If agencies employ the same information about expected telecast performance across their clients, then the upfront market will be characterized by uniform information spread. As shown in table 5, agencies work with a wide variety of clients vis-à-vis entry in the broadcast upfront market. This industry practice alleviates selection concerns that are correlated with the legacy status and/or size of a firm. Finally, Appendix A shows that individual networks do not differ in their exposure across advertisers' product categories or legacy status.

4.3 Quantifying discounts

We proceed with the two-step approach as it allows us to condition on advertiser characteristics in a more flexible way in the second stage of the regression. Reported estimates and standard errors take into account errors introduced in the first stage of the regression. The first stage is based on 10,325 telecasts with prices and has an R^2 of 0.175. Table 11 summarizes our predictions for upfront prices $\hat{p^u}$, which are constructed by multiplying estimated discounts $\hat{\delta}$ and scatter prices p^s. The first two columns show that, on average, predicted upfront prices match closely reported values. Using estimated discounts, we also construct an advertiser-specific price at each network, which is summarized in the second panel of the table.

Table 12 reports the results from the second stage, which regresses the 1,527 firm-network specific $\hat{\delta}_{in}$ on legacy status and additional advertiser and network characteristics. To minimize concerns about current own-network quantities being simultaneously determined with price, we track advertiser size using ratings-weighted ads in competitors' networks in the first season in which we observe the firm on Rentrak; the size variable is logged in the regressions. Column (1) includes network and category fixed effects; and column (2) also adds the interactions. The estimates of the legacy and size effect change slightly across specifications and we focus on the second column with the full set of category-network controls. Results on length of relationship are consistent with grandfathered preferential rates among broadcast networks. The estimates are directly interpretable: for example, the -0.003 estimate implies a discount of 0.3% per year of earlier entry. That is, a firm that entered in 1960 benefits from a 15.9% discount relative to the cost of a new entrant in 2013 ($0.159 = 0.003 * (2013 - 1960)$). We also find evidence of discounts related to the size of the firm: a 0.54% discount associated with a 10% increase in the size of an advertiser's ad buys on competing networks. For cable networks, the data patterns suggest a legacy premium; the relationship with size implies a 0.15% discount for a 10% increase in exposure on competing networks. For completeness, we allow that the legacy and size relationships to vary by network. The estimates, reported in appendix B, confirm that the results for broadcasters are not driven by a specific network: ABC, CBS, and NBC have comparable estimates.

These analyses impose a linear trend for the legacy variable (as a percentage discount) and the size variables is logged. We evaluate this specification by allowing each variable to be related to discounts in a more flexible manner, one at a time. Results in appendix B show that, for broadcast, the discretized versions line up well with the parametrization used in table 12.

4.4 Do legacy status or size proxy for other underlying conditions?

We next consider whether the legacy status or size of the advertiser may proxy for other underlying conditions. These price differences may relate to the potential use of second- or third-degree price discrimination. Under second-degree price discrimination (or non-linear pricing), inventory is offered to all advertisers from a menu of options (i.e., better inventory is offered at higher prices), and advertisers self-select based on their willingness to pay. The specifications below control for the characteristics of the purchased inventory. From the perspective of backing out legacy and/or size discount, non-linear pricing may lead to different firms paying different prices because they purchase different inventory bundles. These details are of specific interest because smaller advertisers or those that are new to the upfront market may adjust the quality of their purchased inventory as long as all advertisers are offered the same inventory at the same price.[14] Alternatively, under third-degree price discrimination (or market segmentation), a network charges different advertisers different prices for the same inventory. This is what comprises the legacy and/or size discounts.

Differences in purchased inventory: It is possible that legacy and/or large advertisers pay lower prices because their ads are placed into lower-quality spots within a telecast. The Rentrak data allow us to construct several variables that describe inventory quality. We use detailed information on the characteristics of each ad, including whether it ran in the first ad break of a telecast, and whether it was the first ad in any ad break. Based on the telecast, we also know whether an ad was run during primetime, on a Sunday - Thursday, or in the top 20% of a network's programs (based on ratings). Each of these characteristics of the purchased inventory is expected to be positively correlated with price. Column 1 in table 13 reports the estimates when we include all inventory controls.[15] The results for broadcast remain unchanged. After controlling for ad inventory, we do not see a relationship between legacy status and prices on cable networks.

Differences in media-buying agency, number of brands, and age of advertiser: Industry practitioners confirm that discounts are honored at the level of a parent company. However, one may worry that the identity of an advertiser's media-buying agency may influence the prices it pays if agencies differ in their ability to extract lower prices for their clients. Similarly to the advertiser size analyses, we track agency size as (the log of) an agency's total exposure in competing networks. Columns 2-4 in table 13 add variables to control for the identity of the media-buying agency, in addition to our category and inventory bundle controls. Column 2 considers the total size of all ad buys under the control of the media agency, column 3 includes agency fixed effects, column 4 allows that agency fixed effects differ between broadcast and cable networks.

Including these additional characteristics only slightly changes the estimates for broadcast. This is consistent with the summary statistics in table 5, which show that media-buying agencies serve a variety of clients with different sizes and legacy status. The size result for cable is now

[14] We also control for media-buying agencies, because if discounts are related to agencies, then young firm may switch agencies and eliminate the advantage of incumbents.

[15] Including each inventory control one at a time does not change the estimates.

statistically insignificant.[16] Under this specification, estimates imply a legacy discount of 0.4% per year of earlier entry, and implies a 21.2% discount for a firm that entered in 1960 relative to a 2013 entrant. The quantity discount for broadcast implies a 0.42% discount for 10% increase in ad buys on competing networks. The estimates on agency size in column (2), show that the size of the agency's exposure in competitors' networks is negatively correlated with prices for both broadcast and cable networks. These patterns may be attributed to unobserved differences in the clientèle of the agency or to differences in the negotiating outcomes between different agencies and networks. Columns (3) and (4) further decompose these effects by including agency fixed effects and then agency-by-broadcast fixed effects, respectively. The excluded media agency in all regressions is Publicis, which has the largest number of clients and the largest total budget in our sample.

We also consider specifications that include the number of brands owned by the advertiser and the length of time since the advertiser entered the product market (rather than the upfront advertising market). These results are included in table 14, and show that our main results remain relatively unchanged. Column (1) shows our main results from the last column of table 13. In column (2) we include the number of brands by an advertiser, and estimates for broadcast remain unchanged. Column (3) adds a variable that tracks the year in which the firm is established. As expected, firms entry in the product market is correlated with its entry in the upfront market: the correlation with upfront entry is 0.502 for broadcast, and 0.538 for cable. Adding the year of product market entry decreases somewhat the legacy and size relationships on broadcast. Under this (most complete) specification, we maintain the 0.3% legacy discount per year of earlier entry, and a quantity discount of 0.4% discount for 10% increase in ad buys on competing networks. The relationships for cable are not statistically significant, as expected.

Unobservable proxy relationships: The preceding analyses show that observable differences in advertisers' characteristics does not fully explain the correlation between price discounts and legacy status, firm size, or media agency. Even though we use an extensive list of observable firm characteristics and fixed effects, it is possible that we do not fully control for unobservable demand or cost differences across advertisers. Casting the estimated price differentials as a pass-through of cost differences across advertisers (or agencies) provides another context for interpreting their size. For example, cost savings are often cited as the rationale for offering quantity discounts, which may be related to the size of firm advertising exposure, or that of its agency. Similarly, suppose that legacy firms receive lower prices from broadcasters because broadcasters have a lower opportunity cost when selling to them, e.g. due to differences in creative quality or network-product matches. The estimated discount implies that the cost of serving a 2013 advertiser rather than a 1960 legacy firm is 15.9% higher. Notably, these differences in costs exist within product category and persist over time. Similarly, one may explain price dispersion with unobserved differences in demand for advertising on broadcast across firms.[17]

[16] Including the full set of agency-by-network fixed effects does not change the estimates on legacy and size in any material way.

[17] For example, legacy firms may have brands with better established reputations, which renders their demand for

Note that our analysis uses information for the top 298 advertisers in the U.S. and we condition on product-market categories in the analysis. As a result, we do not expect large differences in broadcasters' opportunity costs or advertisers' demands across firms with different upfront entries. For example, it is not clear why demand (or costs) would differ between, say, AT&T (1960 entrant) and T-mobile (2001 entrant), Wendy's (1977) and Arby's (2010), or Mars (1960) and Lindt (2003). Nevertheless, we acknowledge that there may be unobservable differences across advertisers that are correlated with firm size, legacy status, and media agency. The exact underpinning for price dispersion in this market mainly affects theoretical explanations of why broadcast networks offer discounts. Importantly, the implications for competitive pressures in product markets remain unchanged, as long as advertising is an important input for production of an advertiser's final good. That is, younger and smaller firms face higher costs to access this input market, which may limit their ability to compete with dominant (large and legacy) firms.

5 Discussion - differences in firms' advertising costs

To highlight the potential effects on product-market competition, we use the estimates of legacy discounts and describe how industry practices may affect new entrants and young firms in a product market. In the previous section, we showed that the negative relationship between prices and legacy status remains unchanged after controlling for the quality of the purchased inventory, the media agency for the advertiser, and year of entry in the product market. Even though we may not definitively state what drives the price dispersion in this market, the fact that younger and smaller firms face higher prices may limit their ability to compete with dominant (large and legacy) firms. Here we use our estimates to quantify cost differentials using the estimate for legacy status.

For these descriptions, we consider brands (rather than parent companies) and divide brands into 96 detailed product subcategories. Even though the upfront legacy variable is the same within a parent company, we aggregate the data to the brand level because it allows us to consider more detailed product markets. For each subcategory, we summarize the differences in upfront entry across brands and calculate the implied cost savings. The first panel of figure 2 shows the distribution of average upfront entry across subcategories. For 18 subcategories, we track all parents to a 1960 entry in the upfront broadcast market. For the remaining subcategories, data patterns suggest a relatively uniform distribution of average subcategory entry. The market for national television advertising connects firms across different industries and the patterns imply unequal access to this input in production across product markets. As expected, many of the national advertisers of CPG-style products are 'legacy' firms and these subcategories have low average upfront entry (e.g. Cereal, Laundry Detergents, Deodorants, etc.). On the other side of the spectrum, the subcategories that are 'new' to the broadcast market include both relatively

broadcast advertising more elastic. Combining the estimated legacy discounts with a Lerner index, ($\frac{p_i - mc_i}{p_i} = \frac{1}{-\varepsilon_i}$), implies differences in elasticities (for a calibrated cost). Setting marginal cost equal to 40 percent of the scatter market price implies calibrated demand elasticities on broadcast of -1.66 for a 2013 newcomer and -1.91 for a 1960 legacy firm.

new product markets (e.g. Energy Drinks, Streaming) as well as established businesses that are only new to the upfront (e.g. Education, Pet Stores, Small Appliances (e.g. Dyson, Shark)). This variation across subcategories is expected, as the historical data track entry over a 50-year period, and different industries have developed and entered the advertising market at different time periods.

The most interesting comparison considers implied cost differences within a product market. We start by describing the variation in upfront entry within a subcategory. In panel (b), we plot the difference in entry of the oldest and newest parent companies. The variation in this variable shows that legacy discounts may imply large differences in advertising costs across competing brands and these differences vary across subcategories. Naturally, there is no variation in upfront entry for subcategories with average upfront entry of 1960, explaining much of the zero mass in panel (b); 7 other subcategories are also described by brands that enter at the same time because there is only one parent company assigned to the subcategory.[18] On the other side of the spectrum, we have 41 subcategories where the difference between the youngest and oldest brand is more than 20 years, suggesting large cost differences (examples include Casual Dining, Chocolate, and Telecom).

Some of the variation in upfront entry across subcategories is driven by our definitions of product subcategories. Mechanically, we may infer larger cost savings for subcategories with more parent companies. We assigned brands into subcategories relying mainly on the descriptions provided by Rentrak. Table 15 lists all subcategories and describes the legacy status of each. The subcategories are sorted by the 28 categories used in the 2-step analysis (e.g. the Finance category consists of 4 subcategories: Credit Cards, Finance, Finance Other, and Taxes). We also include columns 2 and 3, which summarize the number of brands and parent companies with national advertising in the subcategory. Examples of subcategories with many parent companies include Finance, Insurance, Cars, Movies, OTC meds, and Pharma. The correlation between the number of parent companies and the difference in upfront entry between youngest and oldest parent is 0.68. As a result, we present this discussion as a descriptive tool and do not compare results across subcategories.

To describe cost differentials within a subcategory, we construct implied cost savings for the newest entrant if it had the benefit of the legacy pricing of the oldest firm in its subcategory. Panels (c) and (d) in figure 2 plot the variation in average annual broadcast spending of newest entrant and its implied annual savings. On average, the newest brand in a subcategory would save roughly \$1.3 million – on a base of \$20.6 million. Advertisers within subcategories with no variation in entry date have an 'equal playing field' and no relative savings; and this is true whether all firms enter early (like Cereal) or late (like Satellite TV). In contrast, subcategories with wide variation in entry dates create the potential for wide cost disparities. For example, we calculate that T-mobile (2001 entry) would save \$22.1 million on its annual spending of \$180 million if it could access the legacy discount of AT&T (1960). Similarly, Lindt (2003) would save \$2.4 million (on \$18.4 million in annual spending) if it were to get the same legacy price as its competitor Dove chocolate, produced by Mars (1960). Arby's (2010 entry) savings add up to \$2.2 million (on \$22.1 million) if it accessed

[18]The one exception is Satellite TV, where both parent companies enter in 1995, when the subcategory is established.

Wendy's (1977) discount, and $3.3 million if compared to Burger King's (1960) legacy deal.

The variation in firms' upfront entry, coupled with our empirical findings, suggests that there is substantial heterogeneity in advertising costs across firms. Our results relate to large firms with high expenditures on the national broadcast market, which are typically of interest for researchers. Importantly, prices are correlated with firm size and entry into the upfront market for broadcast advertising. Therefore, if advertising is an important tool for product-market competition, then large and incumbent firms have a competitive advantage through lower advertising costs.

One may also view the implications of our findings through the lens of returns on ad spend (ROAS) across firms with large national broadcast expenditures and large differences in their upfront entries. Consider two symmetric firms that have the same variable profit increase from an additional ad ($\Delta\pi_j^{var} = \Delta\pi^{var}$), and only differ in their legacy discounts. The change in costs for firm j from an additional ad is $\Delta C_j(ads) = cpm * (1 - \delta * legacy_j)$. Describe the ROAS for each firm as $ROAS_j = \frac{\Delta\pi_j^{var} - \Delta C_j(ads)}{\Delta C_j(ads)}$ and one may easily see that the ROAS increases as the legacy status (and discount) of the firm increases $\frac{dROAS_j}{dlegacy} = \frac{cpm*\delta*\Delta\pi_j^{var}}{(cpm*(1-\delta*legacy_j))^2} > 0$. Our results show that acknowledging cost differences implies different cost-benefit analyses across firms, which may lead to differences in optimal advertising exposures, or the allocation of advertising dollars across different media, all else equal.

6 Conclusion

We analyze dispersion across advertisers in their cost to access advertising inputs. Understanding cost of advertising in 'traditional media' has been a challenge because firms view their contracts as trade secrets, and transaction-level data are rarely available. As a result, researchers typically only have access to list prices or imputed prices. Using new data based on actual transactions, we quantify price differences in the market for national broadcast advertising.

We confirm that broadcasters rely on intertemporal price discrimination. Comparing prices at the telecast level, we find that broadcast upfront prices are, on average, 12% lower than their scatter prices. Additionally, we find price dispersion across advertisers who purchase in advance. Our results also indicate that firms with large ad buys and incumbent firms with long histories of participation in the advertising market benefit from lower advertising prices, within the advanced-purchase market. These price differentials exist even when comparing large advertisers who are purchasing similar inputs (i.e., ads in similar programming). Specifically, results suggest that a 10% increase in firm's ad exposures implies a 0.4% price reduction. We also find that advertisers receive a 0.3% discount per year of earlier entry, implying that an advertiser who entered in 1960 enjoys a 15.9% discount relative to one who entered in 2013. These findings support industry narratives of the use of secret legacy discounts to advertisers, which are based on the length of their ad-buying relationship. We confirm that the discount estimates remain relatively unchanged once we condition on the quality of inventory purchased and the media-buying agencies used by advertisers. Our most complete specification also controls for differences in each firm's number of

brands and its year of entry in the product market.

The analysis documents that large and legacy firms face lower costs to advertise on national broadcast television. One important consequence of these correlations is that they create differences in costs across product-market competitors, which persist even when comparing across large advertisers with relatively high exposure on national primetime television. The direction of these discounts implies that incumbent (and larger) firms have a competitive advantage relative to newcomers and younger/smaller firms. As younger firms face higher input costs, we expect that legacy discounts may soften competition in the downstream market by putting younger firms at a cost disadvantage. Concerns about unequal access to advertising have been considered previously by both academics and antitrust authorities, and we add to this discussion by documenting that selling practices in the broadcast upfront market confer advantages to incumbent firms.

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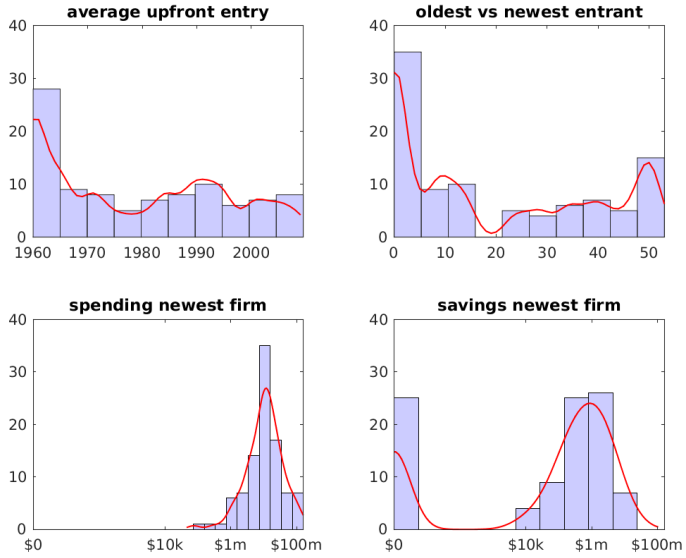
Figures and Tables

Figure 1: Example of δ Construction

$$\begin{bmatrix} p^u_{BBT1}/p^s_{BBT1} \\ p^u_{BBT2}/p^s_{BBT2} \\ p^u_{BBT3}/p^s_{BBT3} \\ \vdots \\ p^u_{GA1}/p^s_{GA1} \\ p^u_{GA2}/p^s_{GA2} \\ p^u_{GA3}/p^s_{GA3} \end{bmatrix} = \begin{bmatrix} \frac{30}{505} & \frac{0}{505} & \frac{30}{505} & \cdots & 0 & 0 & 0 \\ \frac{0}{555} & \frac{30}{555} & \frac{30}{555} & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & \frac{30}{1010} & \frac{0}{1010} & \frac{30}{1010} \\ 0 & 0 & 0 & \cdots & \frac{0}{970} & \frac{30}{970} & \frac{0}{970} \\ 0 & 0 & 0 & \cdots & \frac{30}{1200} & \frac{30}{1200} & \frac{0}{1200} \end{bmatrix} \begin{bmatrix} \delta_{\text{JCP,CBS}} \\ \delta_{\text{Trg,CBS}} \\ \delta_{\text{Apl,CBS}} \\ \vdots \\ \delta_{\text{JCP,ABC}} \\ \delta_{\text{Trg,ABC}} \\ \delta_{\text{Apl,ABC}} \end{bmatrix} + \begin{bmatrix} u_{BBT1} \\ u_{BBT2} \\ u_{BBT3} \\ \vdots \\ u_{GA1} \\ u_{GA2} \\ u_{GA3} \end{bmatrix}$$

Notes: An example of stage 1 of the empirical approach. The left-hand-side variable tracks the ratio of average upfront to scatter prices of telecasts, e.g. Big Bang Theory program airings tracked as 1-3. The right-hand-side matrix tracks the advertisers present in each telecast, which is weighted by the number of ads shown by each advertiser in each telecast. We estimate a separate δ for each advertiser-network pair.

Figure 2: Category analysis: 96 subcategories



Notes: Panel (a) shows the average upfront entry of brands within each subcategory. Panel (b) shows the maximum difference in the legacy status (between 'oldest' and 'youngest' brand) for each product market. Panel (c) plots broadcast spending of the newest entrant in each subcategory. Panel (d) plots cost savings for newest entrant, which applies the estimated legacy discount (for the maximum difference in each product category) to the broadcast spending of the newest brand.

Table 1: Summary statistics

	mean	sd	med	min	max
broadcast					
cpm upfront	18.31	10.78	16.00	1.16	76.28
cpm scatter	21.02	12.16	18.42	2.13	119.38
cpm upfront/cpm scatter	0.89	0.21	0.87	0.16	2.03
cable					
cpm upfront	15.49	9.39	13.15	1.10	78.48
cpm scatter	17.23	10.01	14.80	0.89	93.87
cpm upfront/cpm scatter	0.95	0.39	0.90	0.05	7.81
Annual firm spending ($ 1,000s)					
total spending	186000	254043	91426	9312	2421780
broadcast spending	67024	99913	26994	0	642150
broadcast primetime spending	41781	66863	14495	0	441047
cable spending	60959	78842	32057	937	817822
digital spending	21144	38267	7547	1	289345
newspaper spending	3035	8594	254	0	112564
magazine spending	31778	79852	7859	0	883938
legacy (broadcast, vs 1960)	26	19	20	1	54
legacy (cable, vs 1985)	20	9	20	1	29

Notes: Summary statistics of CPMs reflect the (average) telecast price from SQAD divided by the number of viewers in the 18-44 age group reported by Rentrak. Ad$pender data, 2011-13, is used to construct advertising annual spending for the sample of 298 parent companies. Entry in the broadcast upfront market is constructed by authors using Ad$pender, AdSummary, and LNA data from 1960 to 2013 at the level of a parent company. The legacy variable reports the year of entry in the upfront market prior to 2014: e.g. legacy=1 if entry in 2013. Cable spending is only observed in the data starting in 1985 so the earliest entry on cable is 1985.

Table 2: Sample of firms by legacy 'cohort'

cohort	firm	upfront entry	spending (millions)
≤1970	at&t inc	1960	602
≤1970	burger king holdings inc	1960	99
≤1970	hillshire brands co	1960	7
1971-1980	toyota motor corp	1972	352
1971-1980	wendys co	1977	78
1971-1980	ace hardware corp	1974	14
1981-1990	apple computer inc	1981	423
1981-1990	toys-r-us inc	1985	39
1981-1990	nintendo co ltd	1986	6
1991-1995	microsoft corp	1992	349
1991-1995	h&r block inc	1991	60
1991-1995	office depot inc	1994	6
1996-2000	capital one financial corp	1998	152
1996-2000	staples inc	1996	26
1996-2000	quiznos master llc	2000	6
2001-2005	t-mobile	2001	180
2001-2005	dyson inc	2003	16
2001-2005	overstock.com inc	2003	2
2006-2010	amazon.com inc	2009	96
2006-2010	arbys restaurant	2010	19
2006-2010	kayak.com	2009	6
2011-2013	novo nordisk as	2011	29
2011-2013	petco	2011	10
2011-2013	eharmony.com inc	2013	1

Notes: Column 1 notes legacy 'cohorts' by decade for early entrants and in 5-year periods after 1990. Firms with inferred entry before 1970 are grouped into one cohort. In each cohort, we list three examples of parent companies with high, mid, and low levels of advertising expenditure. Average spending over the three-year sample period for each firm is reported in millions of dollars.

Table 3: Correlation table for legacy and firm spending

	legacy	spending	broadcast	broadcast PT	cable	digital	news	magazines
legacy	1.000							
spending	0.449	1.000						
in broadcast	0.448	0.900	1.000					
in broadcast PT	0.394	0.853	0.974	1.000				
in cable	0.451	0.913	0.763	0.700	1.000			
in digital	0.204	0.682	0.611	0.599	0.549	1.000		
in newspapers	0.063	0.342	0.372	0.405	0.234	0.360	1.000	
in magazines	0.306	0.775	0.510	0.459	0.661	0.334	0.106	1.000

Notes: Calculations by authors using Ad$pender, AdSummary, and LNA data at the level of a parent company.

Table 4: Data snapshot: sample ad placements across telecasts

parent	upfront entry	Big Bang Theory, CBS 2/17/11	2/23/12	2/28/13	Grey's Anatomy, ABC 2/3/11	2/24/11	2/14/13
Estee Lauder Cos Inc	2006		30				30
L'Oreal Sa	1973				30	60	60
Eli Lilly & Co	1993				60		
Procter & Gamble Co	1960	30					
Sanofi	1960			30			
Dennys Corp	1999			30			
Subway	1991					30	
McDonalds Corp	1966	30					30
Amazon.com Inc	2009						30
JC Penney Co Inc	1972		30		30		30
Target Corp	1993			30		30	30
Apple Computer Inc	1981		30	30	30		
Google Inc	1991		30				
Microsoft Corp	1992	60			60		30
Netflix Inc	2005						30
Bank Of America Corp	1995				30	30	
E-Trade Financial Corp	1997	30	30				
total ad seconds		405	505	555	1,010	970	1,200
audience		6,997,435	9,140,281	8,813,363	6,628,356	5,447,443	5,778,520
price (upfront)		178,900	179,631	245,500	176,008	163,321	161,112
price (scatter)		221,900	276,900		207,244	262,575	170,533

Notes: The table reports a selected sample of ad placements from the Rentrak data for 6 telecasts (3 airings of Big Bang Theory on CBS and 3 airings of Grey's Anatomy on ABC). The year of upfront entry is calculated from the Ad$pender, AdSummary and/or LNA data. Total ad seconds comprises all ads for a telecast (not just the ads purchased by the example firms). Audience reflects Rentrak ratings data for the telecast. The upfront-price measure is the SQAD-reported average upfront price for the telecast.

Table 5: Summary statistics of agency-holding companies

holding	# of firms	annual budget	client budget	"average" entry	st. dev. entry	"oldest" advertiser	"youngest" advertiser
Dentsu	10	2102	210	1990	17	1960	2006
Havas	11	1304	119	1983	23	1960	2011
Horizon Media	16	1743	109	2000	10	1974	2012
Interpublic Group	39	7970	204	1991	18	1960	2011
Omnicom	49	8354	170	1990	18	1960	2013
Publicis	62	19259	311	1980	19	1960	2011
WPP	57	10905	191	1981	18	1960	2011
other	27	2887	107	1994	17	1960	2013
unmatched	27	1498	55	2003	8	1985	2012

Notes: For each holding company, the table summarizes the number of advertisers, the budget under its control (annual budget from all advertisers and average client budget, in millions), and the legacy status of the advertisers for each holding company. Upfront entry years reflect firm's entry in the broadcast upfront market. "other" combines smaller advertising agencies for which we mapped less than 5 advertisers. We were not able to map the information for 27 parent companies.

Table 6: Summary statistics

	mean	sd	med	min	max
broadcast					
average legacy	35.32	17.89	41.00	1.00	54.00
average size	1512.82	350.54	1515.04	290.50	3411.88
cable					
average legacy	23.14	7.70	29.00	2.00	29.00
average size	1658.13	727.42	1581.58	4.13	6534.34

Notes: An observation is a telecast. Average legacy status varies across network 'type' due to differences in entry in the upfront market. Average firm size is constructed as ratings-weighted ads placed in competitors' networks.

Table 7: Reduced-form evidence

	(1) p^u/p^s	(2) p^u/p^s	(3) p^u	(4) p^u	(5) p^u	(6) p^u
legacy (broadcast)	-0.003***	-0.003**	-0.531***	-0.108***	-0.310***	-0.097***
	(0.001)	(0.001)	(0.036)	(0.017)	(0.029)	(0.018)
legacy (cable)	0.007***	0.003	0.169***	0.096***	-0.031	0.001
	(0.002)	(0.002)	(0.040)	(0.022)	(0.034)	(0.021)
size (broadcast)	0.038*	0.031	11.572***	1.392***	4.701***	1.120***
	(0.016)	(0.019)	(0.624)	(0.303)	(0.534)	(0.340)
size (cable)	-0.031**	-0.007	0.979***	-0.309*	0.285	-0.058
	(0.010)	(0.010)	(0.230)	(0.121)	(0.198)	(0.118)
p^s				0.787***		0.698***
				(0.008)		(0.010)
controls	no	yes	no	no	yes	yes
Observations	10325	10325	10325	10325	10325	10325
adjusted R^2	0.008	0.074	0.059	0.770	0.480	0.796

Notes: An observation is a telecast. Legacy status and firm size track the profile of the average advertiser in the telecast. Average firm size is constructed as ratings-weighted ads placed in competitors' networks; the variable is then logged. Columns (1) and (2) use price ratios (of upfront/scatter prices) as the dependent variable; for (3)-(6) we use upfront cpm. Telecast controls used in estimates (2), (5), and (6) include ratings interacted with month and genre fixed effects, demographics, day of the week, month-season fixed effects, and network fixed effects.

Table 8: Summary statistics on ad inventory

	mean	st. dev.	median	min	max
on broadcast					
share in prime	0.429	0.221	0.399	0.029	1.000
share in top 20%	0.202	0.157	0.178	0.000	0.903
share in Sun-Thur	0.753	0.108	0.754	0.022	1.000
share in 1st break	0.180	0.039	0.178	0.047	0.324
share as 1st ad	0.157	0.079	0.143	0.031	0.510
on cable					
share in prime	0.240	0.104	0.241	0.030	0.590
share in top 20%	0.212	0.211	0.156	0.000	1.000
share in Sun-Thur	0.702	0.077	0.699	0.434	1.000
share in 1st break	0.229	0.037	0.227	0.100	0.387
share as 1st ad	0.098	0.050	0.090	0.003	0.368

Notes: Author calculations from Rentrak data for 298 parent companies with an upfront presence in any of the 7 network conglomerates. An observation is at the parent-network conglomerate level. The variables summarize the ad inventory quality for each firm using five dimensions: (1) share of ad exposure on prime time, (2) share in top 20% of the network's programming based on ratings, (3) share of ads on Sunday through Thursday; the last two variables look at the average ad placements within a telecast: (4) share of ads in the first ad break, (5) share of ads shown as the first ad in an ad break. We use all national ad placements in Rentrak to construct these variables.

Table 9: Correlation of legacy status and firms' quality of inventory

	legacy	size	share in top 20%	share in prime	share in Sun-Thur	share in 1st break	share as 1st ad
on broadcast							
legacy	1.000						
size	0.437	1.000					
share in top 20%	-0.119	-0.047	1.000				
share in prime	-0.200	0.029	0.211	1.000			
share in Sun-Thur	-0.051	0.068	0.098	0.376	1.000		
share in 1st break	0.025	0.072	-0.229	0.040	-0.006	1.000	
share as 1st ad	-0.120	0.022	0.149	0.150	0.124	-0.143	1.000
on cable							
legacy	1.000						
size	0.400	1.000					
share in top 20%	0.004	0.003	1.000				
share in prime	-0.053	-0.004	0.028	1.000			
share in Sun-Thur	-0.109	-0.061	-0.103	0.335	1.000		
share in 1st break	0.035	0.090	0.078	-0.306	-0.150	1.000	
share as 1st ad	0.016	0.075	-0.221	0.246	0.172	-0.261	1.000

Notes: An observation is at the parent-network conglomerate level. Firm size is constructed as ratings-weighted ads placed in competitors' networks. The share variables summarize the ad inventory quality for each firm using five dimensions: (1) share of ad exposure on prime time, (2) share in top 20% of the network's programming based on ratings, (3) share of ads on Sunday through Thursday; the last two variables look at the average ad placements within a telecast: (4) share of ads in the first ad break, (5) share of ads shown as the first ad in an ad break.

Table 10: Relationship between legacy status and price ratios

	(1) average p^u/p^s	(2) average p^u/p^s	(3) st dev. p^u/p^s	(4) st dev. p^u/p^s
legacy (broadcast)	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
legacy (cable)	0.001***	0.002***	0.002***	0.002**
	(0.000)	(0.000)	(0.001)	(0.001)
size (broadcast)		0.001		0.003
		(0.004)		(0.006)
size (cable)		-0.004		0.006
		(0.003)		(0.005)
network fe	yes	yes	yes	yes
network*category fe	no	yes	no	yes
observations	1527	1527	1527	1527
adjusted R^2	0.360	0.396	0.217	0.246

Notes: An observation is at the advertiser-network conglomerate level. The dependent variables, average p^u/p^s and st dev. p^u/p^s, summarize the price ratios for the telecasts in which we observe the advertiser.

Table 11: Quantifying legacy discounts: Stage 1

	per telecast		per advertiser	
	reported	predicted	average	st. dev
top 3	18.32	18.76	22.73	20.66
cable	15.49	15.89	24.30	33.46

Notes: Estimates are based on 10,325 telecast observations with reported upfront and scatter prices. R^2 is 0.175.

Table 12: Quantifying legacy discounts: 2-step estimation

	(1)	(2)
legacy (broadcast)	-0.002***	-0.003***
	(0.001)	(0.001)
legacy (cable)	0.003***	0.003***
	(0.001)	(0.001)
size (broadcast)	-0.091***	-0.054***
	(0.011)	(0.016)
size (cable)	-0.011**	-0.015**
	(0.006)	(0.006)
network fe	yes	yes
category fe	yes	yes
category*net	no	yes

Notes: Firm size is measured as advertiser exposure (ads*ratings) in competitors' networks, and the variable is logged. First stage is based on 10,325 price observations. First stage R^2=0.175. Second stage projects 1,527 discount estimates on variables of interest. Reported estimates and standard errors take into account errors introduced in stage one of the analysis.

Table 13: Controlling for agency holding company

	(1) inventory	(2) agency size	(3) agency FE	(4) agency FE*broadcast	
legacy (broadcast)	-0.003***	-0.003***	-0.003***	-0.004***	
	(0.001)	(0.001)	(0.001)	(0.001)	
legacy (cable)	0.002	0.002*	0.000	0.001	
	(0.001)	(0.001)	(0.001)	(0.001)	
size (broadcast)	-0.061***	-0.056***	-0.061***	-0.043***	
	(0.016)	(0.016)	(0.016)	(0.017)	
size (cable)	-0.017**	-0.011	-0.006	-0.013	
	(0.007)	(0.007)	(0.008)	(0.008)	
agency FE			*all*	*broadcast*	*cable*
Dentsu (Carat)			-0.025	-0.093	-0.001
			(0.039)	(0.064)	(0.049)
Havas Media			0.155***	0.264***	0.115**
			(0.043)	(0.091)	(0.048)
Horizon			0.014	0.146	-0.005
			(0.039)	(0.096)	(0.043)
IPG			-0.075***	-0.079**	-0.073***
			(0.023)	(0.039)	(0.028)
Omnicom			-0.023	-0.099***	-0.002
			(0.019)	(0.038)	(0.023)
WPP			-0.083***	-0.027	-0.104***
			(0.021)	(0.037)	(0.025)
other			0.020	0.148**	-0.001
			(0.026)	(0.061)	(0.029)
unmatched			-0.065*	-0.187**	-0.042
			(0.035)	(0.085)	(0.040)
agency size (broadcast)		-0.025**			
		(0.012)			
agency size (cable)		-0.014**			
		(0.006)			

Notes: All regressions control for product category-network (conglomerate) interactions. We add controls describing inventory bundles at the advertiser-network level in column (1); and keep these controls when adding the variables describing the media agency for each advertiser. The excluded media agency in columns (3) and (4) is Publicis. Firm size is measured as advertiser exposure (ads*ratings) in competitors' networks, and the variable is logged. First stage is based on 10,325 prices. First stage R^2=0.175. Second stage projects 1,527 discount estimates on variables of interest.

Table 14: Additional control variables

	(1)	(2)	(3)
legacy (broadcast)	-0.004***	-0.004***	-0.003***
	(0.001)	(0.001)	(0.001)
legacy (cable)	0.001	0.000	-0.002
	(0.001)	(0.001)	(0.001)
size (broadcast)	-0.043***	-0.051***	-0.040**
	(0.017)	(0.018)	(0.017)
size (cable)	-0.013	-0.027***	-0.015*
	(0.008)	(0.009)	(0.008)
# brands (broadcast)		0.001	
		(0.001)	
# brands (cable)		0.002***	
		(0.000)	
entry year (broadcast)			-0.003**
			(0.002)
entry year (cable)			0.002***
			(0.001)

Notes: All regressions include the following controls: characteristics describing inventory bundles, product category-network (conglomerate) interactions, and agency-broadcast interactions. Column (1) presents the base specification. Column (2) adds the number of brands for which a firm advertisers, column (3) ads the year in which the firm is established. First stage is based on 10,325 observations. First stage R^2=0.174. Second stage projects 1,528 discount estimates on variables of interest.

Table 15: Category analysis: Inferred differences in upfront entry across brands

category	subcategory	# brands	# firms	legacy status mean	legacy status newest	legacy status oldest	legacy status diff.	spending net (ave)	newest entrant spending	newest entrant savings
Auto Other	Auto Trading	2	2	2003.50	2008	1999	9	14172.62	11803.80	318.70
Auto Other	Gas	9	3	1979.78	1990	1960	30	9989.70	4010.98	360.99
Auto Other	Tires	3	2	1965.00	1975	1960	15	13559.85	14942.37	672.41
Beer	Alcohol	7	1	2001.00	2001	2001	0	672.59	672.59	0.00
Beer	Beer	16	5	1971.44	2001	1960	41	26608.24	2013.80	247.70
Beer	Energy Drink	3	2	2004.67	2010	2002	8	7093.26	9686.20	232.47
Cars	Cars	33	16	1976.03	2013	1960	53	89838.43	3774.43	600.13
Finance	Credit Cards	8	8	1979.12	1998	1960	38	84608.30	1.6e+05	18225.55
Finance	Finance	15	11	1993.20	2009	1960	49	37041.75	24202.80	3557.81
Finance	Finance Other	2	1	2005.00	2005	2005	0	979.07	979.07	0.00
Finance	Taxes	3	2	1999.67	2004	1991	13	37052.72	22775.60	888.25
Beverages	Beverages	9	4	1971.00	1993	1960	33	30075.55	11702.78	1158.57
Beverages	Coffee & Tea	8	7	1976.00	2008	1960	48	11886.52	13057.00	1880.21
Beverages	Juice	9	6	1963.67	1993	1960	33	13625.53	8030.70	795.04
Beverages	Water	6	3	1960.00	1960	1960	0	12716.40	12716.40	0.00
Breakfast Food	Cereal	6	4	1960.00	1960	1960	0	32528.67	32528.67	0.00
Breakfast Food	Cookies	4	2	1960.00	1960	1960	0	4715.05	4715.05	0.00
Breakfast Food	Food Other	13	8	1969.38	2004	1960	44	7326.98	75.37	9.95
Breakfast Food	Yogurt	4	4	1984.00	2011	1960	51	23845.39	14434.80	2208.52
Prepared Dinners	Prepared Dinners	33	8	1966.27	1983	1960	23	6174.59	2960.32	204.26
Prepared Dinners	Soups	4	3	1960.00	1960	1960	0	22407.44	22407.44	0.00
Prepared Dinners	Weight Loss	5	3	1969.20	2006	1960	46	11577.26	39935.07	5511.04
Sweets & Snacks	Chocolate	6	4	1983.67	2003	1960	43	7717.32	9178.47	1184.02
Sweets & Snacks	Confectionery	21	4	1965.24	1970	1960	10	7864.98	8524.38	255.73
Sweets & Snacks	Gum & Mints	6	4	1965.50	1983	1960	23	5229.44	300.53	20.74
Sweets & Snacks	Snacks	13	7	1967.31	2009	1960	49	7342.16	12664.33	1861.66
Home Improv.	Appliances	3	3	1974.00	2002	1960	42	39473.21	28187.07	3551.57
Home Improv.	Home Improvement	6	6	2000.17	2013	1974	39	51482.81	1381.27	161.61
Home Improv.	Home Other	5	4	1988.20	2000	1960	40	6415.63	6174.57	740.95
Home Improv.	Office Supplies	2	2	1995.00	1996	1994	2	13957.52	25242.50	151.46
Home Improv.	Small Appliances	4	2	2009.00	2011	2003	8	5988.73	2808.63	67.41
Household Supp.	Air Fresheners	3	3	1960.00	1960	1960	0	13340.00	13340.00	0.00
Household Supp.	Batteries	2	2	1960.00	1960	1960	0	15939.15	15939.15	0.00
Household Supp.	Cat Litter	2	2	1964.50	1969	1960	9	4994.85	3887.00	104.95
Household Supp.	Cleaner Other	3	2	1966.00	1969	1960	9	3575.46	4212.48	113.74
Household Supp.	Cleaning Products	10	5	1964.00	1971	1960	11	7858.31	4173.47	137.72
Household Supp.	Household Supplies	2	2	1964.50	1969	1960	9	9134.85	11403.83	307.90
Household Supp.	Laundry	9	5	1961.22	1971	1960	11	6919.33	12418.50	409.81

Household Supp.	Paper Supplies	14	4	1977.43	1995	1960	35	9321.16	5860.52	615.35
Household Supp.	Personal Hygiene Other	4	3	1962.75	1971	1960	11	5548.52	3156.10	104.15
Household Supp.	Pest Control	2	2	1960.00	1960	1960	0	1351.80	1351.80	0.00
Pets	Pet Food	13	3	1960.00	1960	1960	0	9009.00	9009.00	0.00
Pets	Pet Stores	2	2	2007.50	2011	2004	7	23731.53	10798.87	226.78
Insurance	Apparel	3	3	1992.33	1994	1991	3	46182.18	2614.40	23.53
Insurance	Health Insurance	3	3	1988.00	2004	1968	36	47699.12	50678.07	5473.23
Insurance	Insurance	16	12	1984.06	2010	1960	50	51049.64	57232.63	8584.89
Motion Pictures	Motion Pictures	23	13	1981.57	2011	1960	51	58118.34	10084.31	1542.90
Streaming	Streaming	3	2	2007.67	2009	2005	4	14634.66	8529.40	102.35
Other	Dating	2	2	2006.00	2013	1999	14	1412.68	1469.67	61.73
Other	Delivery	2	2	1981.50	1984	1979	5	36154.68	38621.07	579.32
Other	Education	2	2	2009.50	2012	2007	5	20003.17	3296.73	49.45
Other	Other Services	6	5	1991.00	2009	1960	49	10644.03	8635.00	1269.34
Other	Rental	3	3	2002.67	2011	1998	13	10447.34	13573.17	529.35
Personal Care	Contact Lenses	1	1	1960.00	1960	1960	0	11718.93	11718.93	0.00
Personal Care	Cosmetics	5	3	1965.20	1973	1960	13	49860.52	93515.34	3647.10
Personal Care	Deodorant	3	3	1960.00	1960	1960	0	9692.05	9692.05	0.00
Personal Care	Deodorant men	2	2	1960.00	1960	1960	0	10598.50	10598.50	0.00
Personal Care	Diapers	4	2	1960.00	1960	1960	0	8107.32	8107.32	0.00
Personal Care	Dishwasher	3	2	1960.00	1960	1960	0	7627.67	7627.67	0.00
Personal Care	Feminine Hygiene	3	2	1960.00	1960	1960	0	4274.70	4274.70	0.00
Personal Care	Hair Products	17	5	1963.29	1973	1960	13	15577.67	76946.37	3000.91
Personal Care	Ice Cream	5	2	1960.00	1960	1960	0	4308.77	4308.77	0.00
Personal Care	Laundry Softner	1	1	1960.00	1960	1960	0	1220.23	1220.23	0.00
Personal Care	Oral Hygiene	12	4	1960.00	1960	1960	0	13489.08	13489.08	0.00
Personal Care	Perfumes	6	4	1995.33	2007	1973	34	5410.08	14341.98	1462.88
Personal Care	Razors	2	2	1960.00	1960	1960	0	22501.30	22501.30	0.00
Personal Care	Skin Care	10	5	1970.50	2006	1960	46	20843.28	29804.27	4112.99
Personal Care	Toiletries	4	2	1960.00	1960	1960	0	18939.55	18939.55	0.00
Pharma	OTC meds	50	13	1962.00	2000	1960	40	9887.96	12138.57	1456.63
Pharma	Pharma	24	16	1973.42	2011	1960	51	43557.88	31843.23	4872.02
Casual Dining	Casual Dining	10	7	1989.00	2012	1960	52	40560.41	20122.20	3139.06
Fast Food	Fast Food	16	13	1984.75	2010	1960	50	72746.10	22103.13	3315.47
Apparel	Apparel Other	3	1	1989.00	1989	1989	0	8096.01	8096.01	0.00
Apparel	Shoes	3	2	1991.33	2007	1960	47	6898.77	2897.95	408.61
Apparel	Sports Apparel	3	2	1984.33	1985	1984	1	12208.26	25971.60	77.91
Apparel	Underwear	6	3	1971.50	1995	1960	35	11982.55	43830.47	4602.20
Depart. Stores	Depart. Stores	5	5	1990.00	2009	1960	49	95609.14	4546.80	668.38
Discount Stores	Discount Stores	9	7	1994.22	2010	1960	50	56387.41	9844.63	1476.69
Discount Stores	Drug Stores	2	2	2005.00	2006	2004	2	34624.00	56434.77	338.61
Jewelery	Jewelery	3	2	1995.00	1996	1993	3	56879.11	78459.66	706.14

Toys	Toy Stores	2	1	1985.00	1985	1985	0	21647.75	21647.75	0.00
Toys	Toys	9	2	1961.33	1962	1960	2	2899.76	1450.76	8.70
Technology	Cameras	2	2	1989.00	2002	1976	26	22300.17	23578.90	1839.15
Technology	Computers	3	3	1993.67	2005	1981	24	28356.76	15000.57	1080.04
Technology	Software	5	2	1991.60	1992	1991	1	87983.22	98505.02	295.52
Technology	Tablets & Phones	7	7	2000.57	2010	1981	29	1.6e+05	36944.35	3214.16
Technology	Tech Stores	2	2	1985.00	1998	1972	26	68769.63	1.3e+05	9758.39
Technology	Technology Other	2	2	1996.00	2000	1992	8	17246.90	6938.13	166.52
Technology	V/A Equitment	5	5	1999.60	2011	1973	38	89952.33	15964.00	1819.90
Technology	Video Games	8	6	1992.12	2002	1973	29	15763.80	12284.03	1068.71
Technology	unassigned	69	33	1970.83	2010	1960	50	6522.22	6779.90	1016.98
Satelite TV	Satelite TV	2	2	1995.00	1995	1995	0	78645.98	78645.98	0.00
Telecom	Telecom	12	6	1990.25	2010	1960	50	1.4e+05	9480.17	1422.03
Travel	Hotels	5	5	1972.00	1988	1960	28	18267.91	28887.47	2426.55
Travel	Travel	6	4	2001.33	2009	1994	15	13862.76	5769.47	259.63
Travel	Travel Other	3	1	1988.00	1988	1988	0	17244.06	17244.06	0.00

Notes: 'Mean legacy' is the average entry of a parent company within the product category. The maximum difference in the legacy status reports the 'oldest' firm less the 'youngest' firm for each product category.

Network spending and savings are in 1,000's. Average spending is calculated for each product category using spending on broadcast networks reported by Ad$pender. Average cost savings applies the estimated legacy discount for the maximum difference in each product category. Similarly, the spending for the newest entrant is the average budget for the advertiser over the 3 years sample period (or the subset of years when an advertiser enters in 2012 or 2013).

A Additional summary analyses

Tables A1 and A2 summarize the exposure of each of the three broadcast networks, plus the cable networks as a whole, across different product categories and legacy cohorts. They look remarkably symmetric on both dimensions.

Table A1: Networks' exposure across product categories

category	ABC	CBS	NBC	cable
Apparel	2.38	1.00	1.41	1.26
Auto Other	0.17	0.67	0.41	1.45
Beer	0.07	0.00	0.16	1.74
Beverages	2.73	2.29	2.26	1.63
Breakfast Food	2.09	1.60	2.39	2.61
Cars	12.73	12.17	13.58	10.11
Casual Dining	3.02	2.54	2.69	2.46
Depart. Stores	4.58	4.57	3.97	1.78
Discount Stores	5.22	3.81	3.35	2.91
Fast Food	4.10	3.92	5.21	4.59
Finance	4.45	5.70	4.76	3.78
Home Improv.	2.50	2.88	4.14	3.82
Household Supp.	2.24	1.44	2.19	2.11
Insurance	2.82	4.27	3.81	6.57
Jewelery	0.97	1.08	1.11	0.47
Motion Pictures	8.12	4.89	6.58	7.01
Other	1.15	1.49	1.17	3.39
Personal Care	10.26	8.13	10.84	12.18
Pets	1.51	1.64	1.34	1.70
Pharma	5.03	13.02	5.56	8.22
Prepared Dinners	2.85	3.18	3.02	3.33
Satelite TV	0.01	0.37	0.57	1.26
Streaming	0.62	0.24	0.13	0.05
Sweets & Snacks	1.38	1.02	1.31	2.94
Technology	8.43	9.06	7.95	5.36
Telecom	9.14	7.85	9.04	5.43
Toys	0.63	0.49	0.33	0.27
Travel	0.81	0.67	0.74	1.58

Notes: Author calculations from Rentrak data for network conglomerates. 'cable' reports an average across all stand-alone cable networks.

Table A2: Networks' exposure across cohorts

cohort	ABC	CBS	NBC	cable	# firms	# brands
≤1970	34.27	36.58	34.81	32.80	70	554
1971-1979	6.80	5.33	7.83	5.44	16	48
1980-1989	7.75	8.56	8.58	5.93	27	81
1990-1994	8.94	9.93	10.68	8.91	31	91
1995-1999	3.84	5.25	4.22	4.68	27	47
2000-2004	4.70	6.84	4.98	5.12	33	65
2005-2009	4.41	4.82	3.91	4.06	37	71
2010-2013	0.70	0.76	1.28	1.90	19	24
small firms	4.25	2.96	5.50	14.61	1692	1692
promo videos	24.34	18.96	18.22	16.53		

Notes: Author calculations from Rentrak data for network conglomerates. Cohorts are constructed using firms' entry in the broadcast upfront market.'cable' reports an average across all stand-alone cable networks.

B Additional results

We confirm that the results are not driven by a specific network. In table A3 we use the specifications from table 12 and interact all variables with network fixed effects. Both the size and legacy estimates are comparable across broadcast and cable conglomerates, respectively.

The main analyses impose a linear trend for the legacy variable and the size variables is logged. We evaluate this specification by allowing each variable to be related to discounts in a more flexible manner, one at a time. Specifically, we discretize each variable into cohorts.

We construct the following cohorts for legacy status: cohort 1 includes firms with upfront entry of 2011-2013, cohort 2: 2006-2010, cohort 3: 2001-2005, 4: 1996-2000, 5: 1991-1995, 6: 1981-1990, 7: 1971-1980, 8: 1970 (or prior). Firms are combined into larger cohorts in the 1980s and 1970s because we do not observe many current advertisers entering the upfront during that period. The excluded cohort is 1970 (or prior) for broadcasters; and 1985 for cable. Legacy estimates are plotted in panel (a) of figure A1 separately for broadcast (solid line) and cable networks (dashed line). The estimation uses the controls used in column 2 of table 12: firm size and product category×network interactions. On broadcast we see a linear relationship between discounts and legacy status; consequently, the rest of the analysis continues to parametrize legacy status linearly. Results for cable suggest that these networks do not follow the price-determination process for broadcasters.

To evaluate the size effects, we split the size variable into 10 groups and estimate a separate relationship for each group of firms. Panel (b) of figure A1 plots the estimates separately for broadcast (solid line) and cable networks (dashed line). The excluded group for each consists of the largest advertisers in the market (90-100th percentiles). The log estimate for broadcast networks lines up well with the discretized estimation.

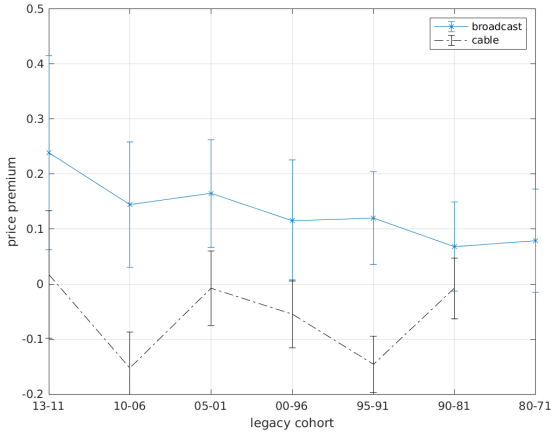
Table A3: Quantifying legacy discounts: by network

	(1)	(2)
legacy ABC	0.000	-0.003
	(0.001)	(0.002)
legacy CBS	-0.005***	-0.004***
	(0.001)	(0.002)
legacy NBC	-0.002*	-0.003**
	(0.001)	(0.001)
legacy A&E	0.003**	0.006***
	(0.001)	(0.002)
legacy Scripps	0.004**	0.004**
	(0.002)	(0.002)
legacy Time Warner	0.022***	0.011**
	(0.004)	(0.005)
legacy Viacom	0.013	0.021*
	(0.010)	(0.013)
size ABC	-0.044*	-0.046
	(0.024)	(0.036)
size CBS	-0.084***	-0.047*
	(0.019)	(0.027)
size NBC	-0.122***	-0.060***
	(0.015)	(0.022)
size A&E	-0.021**	-0.047***
	(0.009)	(0.011)
size Scripps	0.022***	0.036***
	(0.007)	(0.009)
size Time Warner	-0.198***	-0.193***
	(0.018)	(0.025)
size Viacom	-0.240***	-0.318***
	(0.054)	(0.083)
network fe	yes	yes
category fe	yes	yes
category*net	no	yes

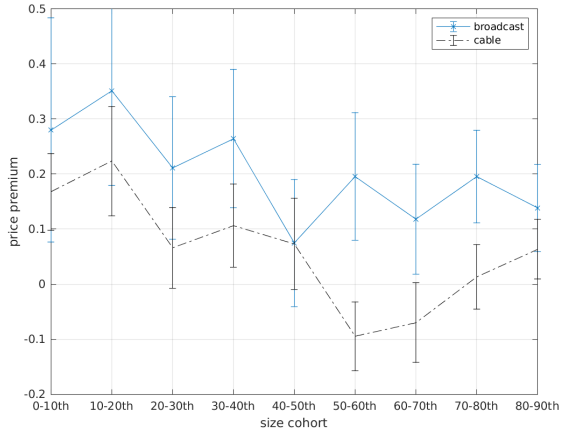
Notes: All regressions control for firm size using advertiser exposure (ads*ratings) in competitors' networks. First stage is based on 10,325 prices. First stage R^2=0.175. Second stage projects 1,527 discount estimates on variables of interest. Reported estimates and standard errors take into account errors introduced in stage one of the analysis.

Figure A1: Quantifying legacy discounts: discretized legacy variable

(a) Discretized legacy variable



(b) Discretized size variable



Notes: The plots report estimates from the two-step approach. First stage is based on 10,325 price observations. Second stage projects 1,527 discount estimates on variables of interest. Both regressions control for legacy status, firm size, and product-category-by-network interactions. Panel (a) discretizes the legacy variable into 8 cohorts for broadcast and 7 cohorts for cable (where the excluded cohort captures entrants in 1985). Panel (b) splits the size variable into 10 groups, where the excluded group consists of the largest advertisers in the market (90-100th percentiles).