**Competition in Digital Advertising Markets: How Much Does Digital Advertising Cost?**

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**Motivation**

The adoption of laws such as the DMA, DSA, and CMA, which regulate digital markets, along with data protection laws like GDPR, considers digital platforms as dominant due to network effects and aims to protect users' personal data. Some studies focus on uncovering the factors of digital advertising, but it is defined through a closed algorithmic auction and lacks transparency. Consequently, there is a need to identify how the shift in power of digital platforms affects advertising prices.

Competition in digital markets, particularly in advertising, is at the forefront of all antitrust authorities. Identifying the factors that influence pricing, including changes in market shares of digital platforms and HHI, as well as advertising accuracy metrics, will reveal whether digital platforms possess market power.

**Objective of the research**

The goal is to explain the cost of digital advertising through cross-country empirical comparisons, taking into account market characteristics and competition, and to highlight the specific factors affecting digital advertising prices in Russia.

The aim of this research is not to reconstruct the complex algorithmic pricing process of digital platforms through online auctions and other factors. In this work, we seek patterns for the price of digital advertising CPM. Cost per mile is the price per thousand views. The advertising price in this study refers to the advertising costs on digital platforms like Google Display, YouTube, and Facebook.

**Literature review**

The emergence of digital platforms in the advertising market has an ambiguous effect on competition. These platforms are characterized by network effects, economies of scale, and the use of personal data and algorithms to set pricing recommendations, which provide them with a competitive advantage over traditional businesses (Rochet & Tirole, 2003; Rochet & Tirole, 2006; Ruutu, Casey, & Kotovirta, 2017; Belleflamme & Peitz, 2021). The increase in market power may contribute to rising prices for digital advertising. Conversely, a digital platform's ability to target specific user groups and track their reactions (such as click-through rates) may enhance the cost-effectiveness of advertising campaigns for advertisers (Hoffman & Novak, 2000; Shah & Nasnodkar, 2021).

Due to the lack of a unified approach to assessing the role of advertising, there is no widely accepted method for determining prices in the digital advertising market, which operates in real-time through header bidding systems (MacKenzie, Caliskan, & Rommerskirchen, 2023).

In June 2023, the European Commission released a statement indicating that Google is abusing its dominant position in the digital advertising market. Google controls approximately 90% of the supply side, about 80% of the demand side for ads, and around 50% of the advertising exchange where prices are set. Moreover, Google has access to a vast amount of user data due to its significant share of the search and browser markets. According to Statista, the combined market share of the fourteen largest digital platforms operating in the advertising market—Alphabet, Amazon, Apple, Baidu, Facebook, JD, LinkedIn, Microsoft, Pinterest, Snapchat, Spotify, Tencent, TikTok, and X (formerly Twitter)—reached 78% in 2023 and is expected to continue growing. These examples illustrate the increasing potential for market power among digital platforms.

The Digital Markets Act (DMA), adopted in the EU in 2022, defines criteria for identifying companies like GAFAM (Google, Apple, Facebook, Amazon, and Microsoft) as "gatekeepers" and establishes regulations aimed at eliminating self-preferencing and restrictive conditions while enhancing transparency among digital platforms. Legislative measures are also being developed in the US, UK, and other countries. The primary motivation for adopting the DMA is to mitigate the negative effects of platform market power through regulatory tools.

The demand for digital advertising and its prices are rising alongside the elasticity of demand for advertising (Dorfman & Steiner, 1954). A key mechanism that ensures positive demand elasticity for digital advertising is the accuracy of personalization. It is reasonable to assume that all factors influencing the accuracy of digital advertising personalization—namely, the number of users, traffic volume, and user experience with the recommendation system—are positively correlated with the price of digital advertising (Asdemir et al., 2012; Bajari et al., 2019; Chen Y. J. et al., 2019; Çınar & Ateş, 2022).

**Data and measurement**

Monthly data for Australia, the USA, Russia, and Germany for the digital platforms Google, YouTube, and Facebook\* from January 2018 to March 2024, inclusive, is used for the dependent variable of advertising prices (CPM).

The proposed hypotheses are divided into groups based on the influence of demand factors (duration of visit), supply factors, targeting accuracy factors (through conversion to purchase, traffic), the spread of the Internet and e-commerce on the price of digital advertising.

The methods used include econometric OLS models, panel data analysis models, and the Hausman-Taylor model to account for endogeneity. Two-level econometric models are employed to explain the influence of variables on conversion and conversions on advertising prices simultaneously.

A large set of variables, including traffic, unique users, duration of visit, number of pages viewed, bounce rate, conversion to purchase, share of digital platforms, HHI index, ARPU, Internet penetration, daily online time, and others are used both to explain the price of digital advertising and to conduct two-level analysis, where conversion is first explained and then conversion along with other variables explains advertising prices.

**Preliminary results**

Data and hypothesis testing results show that the number of platform users and the amount of digital traces left by users (due to prolonged use of the platform) increase the price of banner advertising, presumably due to better targeting. At the same time, the data demonstrate that under equal conditions (primarily with comparable audience size), banner advertising prices can differ significantly. For instance, more expensive banner ads on Facebook are not explained by the number of unique users and user attention to the page. The reason is likely a different set of user data collected and more sophisticated predictive algorithms.

In an inter-platform comparison, it is shown that for Google Display, a longer user visit negatively affects advertising prices, which can be interpreted as longer sessions in search indicating deficiencies in search engine algorithm results. Additionally, the spread of the Internet has a significant impact on Google Display. Facebook is the only platform where an increase in the HHI index positively and significantly leads to an increase in CPM advertising prices.

Let us consider some practical results. An increase in per capita consumption by $1 leads to an increase in CPM by $0.1926. This result aligns with classical model predictions that a profit-maximizing seller determines the optimal share of advertising expenses in revenue. An increase in visit duration on a digital platform by 1 minute leads to an increase in the price of advertising per view by $0.05. This result confirms the hypothesis that longer short-term user activity on a digital platform contributes to more accurate targeting and therefore higher advertising prices. An increase in the number of unique users by 1% will lead to an increase in advertising prices by $0.007. This supports the hypothesis that a larger number of users on a digital platform contributes to more accurate targeting and therefore higher advertising prices.

According to the results of the Hausman-Taylor model, an increase in conversion from 0.0001 to 0.0002 would lead to an increase in advertising prices by $0.2418. An increase in visit duration on a digital platform by 1 minute leads to an increase in the price of advertising per view by $0.032. This significant increase indicates that improving advertising effectiveness (i.e., its ability to convert views into actions) directly impacts its price.

**Discussion**

The results explain the policy of digital platforms to expand their user base by offering an increasing volume of seemingly free services. This is a competition for user attention. The more individual users utilize the platform and the more time they spend on it the more expensive banner advertising becomes. The commonly accepted explanation for this phenomenon is better targeting capabilities due to greater information about user behavior (behavioral targeting). The analysis confirms the importance of personal data about users as the primary motivation for the expansion of digital platforms.

Antitrust authorities worldwide are enacting laws to ensure user privacy. Alongside these measures, they could introduce rules and develop guidelines for the ethical use of data for advertising targeting to avoid manipulation of users and ensure fair competition. Furthermore, obtaining disclosure from major platforms regarding the principles behind their algorithms, especially concerning pricing and recommendations, would help advertisers better understand how decisions about ad placements are made.

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