

ASYMMETRIC INFORMATION
IN PROGRAMMATIC ADVERTISING
THREE STUDIES ON ADVERSE SELECTION, MECHANISM CHOICES,
AND FEE STRUCTURES.

Asymmetric Information in Programmatic Advertising

Three studies on adverse selection, mechanism choices,
and fee structures.

Asymmetrische informatie in programmatic advertising

**Drie studies over adverse selection, mechanisme-keuzes en
vergoedingsstructuren.**

Thesis

to obtain the degree of Doctor from
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About the author



Francesco Balocco was born in Ivrea (Turin), Italy. He received a BSc in Economics and Management for Arts, Culture and Communication and a MSc in Management from Bocconi University. After graduating, he joined the Bocconi Center for Research on Marketing and Services (C.E.R.M.E.S.). Here he developed an interest for research at the intersection of Information Systems and Marketing. In September 2016 he joined the department of Technology and Operations Management at the Rotterdam School of Management, Erasmus University as a PhD candidate under the supervision of Prof. Ting Li and Prof. Eric van Heck. Since September 2022, Francesco has joined the KIN Center for Digital Innovation at Vrije Universiteit Amsterdam as tenure-track assistant professor in the Information Systems section.

Francesco's research focuses on asymmetric information in real-time advertising supply chains. His work has been presented at leading international academic conferences including the International Conference on Information Systems (ICIS), the INFORMS Annual Meeting, the Conference on Information Systems Technologies (CIST), the Production and Operations Management Society (POMS) conference, the Workshop on Information Systems Economics (WISE), the Italian Marketing Society PhD workshop, the Marketing Science Conference and the Winter American Marketing Association Conference. Francesco has also served as reviewer for Information Systems Research and a number of conferences such as ICIS, ECIS, AMA Winter and Summer and INFORMS Data Science.

During his time at Rotterdam School of Management, Francesco participated in teaching in the Information Strategy course, the Business Analytics Workshop, and supervised 28 master theses.

Portfolio

Published Proceedings

Balocco, F., Lu, Y., Li, T. (2020). Off With Their Headers: Mechanism Choices in Online Display Advertising

In Proceedings of the International Conference on Information Systems 2020

Balocco, F., Li, T. (2019), LemonAds: Impression Quality in Programmatic Advertising.

In Proceedings of the International Conference on Information Systems 2019

Andrews, M., Li, T., Balocco, F., (2018), Increasing Mobile Search Ad Spend: Cross-Device Effects.

In Proceedings of the International Conference on Information Systems 2018

Selected Working Papers

Balocco, F., Lu, Y., Li, T., Gupta, A, 2022, LemonAds: Adverse Selection in Multi-Channel Display Advertising Markets

Balocco, F., Lu, Y., Li, T., Gupta, A, 2022, Mechanism Choices in Online Display Advertising.

Balocco, F., Lu, Y., Li, T., Gupta, A, 2022, Who Pays Ad Tech Tax and Why?

Teaching

Lecturer:

Business Analytics Workshop (*Graduate Course*) 2021-2022

Information Strategy (*Graduate Course*) 2016-2021

Honors Program Data Analytics Challenge (*Graduate Course*) 2019

Supervision:

Bachelor Thesis (32 students) 2021-2022

Master Thesis (28 students) 2016-2022

Conferences Attendance and Invited Sessions

WISE 2022, Copenhagen, Denmark

CIST 2022, Indianapolis, U.S.A.

SCECR 2021, Madrid, Spain (Online)

INFORMS 2021, Anaheim, U.S.A.

POMS 2021, Online

ICIS 2020, Hyderabad, India (Online)

INFORMS 2020, Online

Marketing Science Conference 2020, Durham, U.S.A. (Online)

Italian Marketing Society Ph.D. Workshop 2019, Rome, Italy

Marketing Science Conference 2019, Rome, Italy

ICIS 2019, Munich, Germany

WEB 2019, Munich, Germany

INFORMS 2019, Seattle, U.S.A.

ICIS 2018, San Francisco, U.S.A.

SCECR 2018, Rotterdam, The Netherlands,

AMA Winter Conference 2018, New Orleans, U.S.A.

Summary

The display advertising market has evolved dramatically in recent times. Firms can leverage sophisticated real-time supply chains that go under the umbrella term of *programmatic advertising* to deliver their promotional content to the right customer, at the right moment, and in the right place.

Despite these premises and the ever increasing economic weight of the advertising industry, programmatic still suffers from a diffused lack of transparency that originates from the vast and often confusing competitive and technological landscape that advertisers (buyers), publishers (sellers) and Ad Exchanges (auction platforms) have to navigate. In this dissertation we present three studies that investigate the role of asymmetric information in shaping the relationship between advertisers, publishers and Ad Exchanges.

In the first study (Chapter 3), we use a game-theoretical model and an empirical analysis to investigate the implications of asymmetric information in the relationship between advertisers and publishers. We study the welfare consequences of publishers' heterogeneous adoption of the quality signaling practice of allocating higher-quality impressions to premium contracts (PMP). Our analytical results show that premium contracts lead to adverse selection in the open market (RTB) while not increasing advertisers' utility. Our empirical findings support our analytical framework by providing strong evidence of adverse selection in RTB. Our findings challenge the current understanding of PMPs as an effective signaling device and highlight the threat they pose to the integrity of programmatic.

In the second study (Chapter 4), we examine ad exchanges' (ADX) mechanism choices between the second-price to the first-price auction. We address the effect that mistrust towards the ADXs' commitment to the second-price rules, and the ADXs' fee-setting policies have on their mechanism choices. First, we present descriptive empirical evidence from a large proprietary dataset of bid requests. Then, we construct a game-theoretical model of the interactions between publishers, advertisers, and ADXs. We find that, while publishers generally prefer trading via the first-price auction, ADXs that offer second-price auctions may still conquer a significant market share depending on their competitors' equilibrium fees. Furthermore, we find that the prevalence of second-price auctions depends on the publishers' size and the likelihood that ADXs engage in shill bidding in second-price auctions. Our findings reconcile an ongoing debate on the mechanism switch by clarifying the seemingly problematic timeline of the ADXs' move to the first-price auction.

In the third study (Chapter 5), we investigate the incentives for ADXs in deciding their business model by setting buy-side and sell-side fees. In this study, we use an analytical model to research the impact of recent changes in publishers' strategy for clearing unsold inventory on such incentives of ADXs. In recent years, efficiency concerns have pushed publishers towards abandoning the legacy sequential Waterfall mechanism in favor of the newer parallel Header Bidding mechanism to manage the competition between affiliated ADXs. Despite being commonly viewed as a revenue-increasing move, the publisher's mechanism change eliminates all incentives for ad exchanges to keep sell-side fees low, thereby hurting publishers' revenues. Our findings explain the recent surge in sell-side fees, commonly referred to as the Ad Tech-Tax.

The three studies of this dissertation bring substantial theoretical and practical contributions to the digital advertising literature. From the theoretical perspective, our work brings new insight into how asymmetric information and conflicting incentives shape the relationships between advertisers, publishers, and ADX. From the managerial perspective, our work brings three surprising results that challenge the current understanding of the mechanisms and contractual tools in programmatic.

Samenvatting (Summary in Dutch)

De markt voor display-advertising is de laatste tijd sterk ontwikkeld. Bedrijven kunnen gebruik maken van geavanceerde real-time leveringsketens die onder de verzamelnaam programmatic advertising vallen om hun promotionele content bij de juiste klant, op het juiste moment en op de juiste plaats aan te bieden. Ondanks deze vooronderstellingen en het steeds toenemende economische gewicht van de reclame-industrie, lijdt programmatic nog altijd onder een algemeen verspreid gebrek aan transparantie dat voortkomt uit het enorme en vaak verwarrende, concurrerende en technologische landschap waarin adverteerders (kopers), uitgevers (verkopers) en Ad Exchanges (veilingplatforms) moeten navigeren. In dit proefschrift presenteren we drie onderzoeken naar de rol van asymmetrische informatie bij het vormgeven van de relatie tussen adverteerders, uitgevers en Ad Exchanges.

In het eerste onderzoek (hoofdstuk 3) gebruiken we een speltheoretisch model en een empirische analyse om de gevolgen van asymmetrische informatie in de relatie tussen adverteerders en uitgevers te bestuderen. We onderzoeken de gevolgen voor de welvaart van de heterogene toepassing door uitgevers van de werkwijze van kwaliteitssignalering om vertoningen van hogere kwaliteit toe te wijzen aan premiumcontracten (Private Market Place, PMP). Uit de resultaten van onze analyses blijkt dat premiumcontracten leiden tot adverse selection op de open markt (Real-Time Bidding, RTB) zonder dat het nut voor adverteerders toeneemt. Onze empirische bevindingen ondersteunen ons analytisch kader door sterke aanwijzingen te leveren voor adverse selection bij RTB. Onze bevindingen stellen het huidige begrip van PMPs als effectief signaleringsinstrument ter discussie en benadrukken de bedreiging die zij vormen voor de integriteit van programmatic.

In het tweede onderzoek (hoofdstuk 4) onderzoeken we de mechanisme-keuzes van veilingplatforms (ADXs) tussen de tweedeprijs- en de eersteprijsveilingen. Dit hoofdstuk behandelt het effect dat wantrouwen jegens de inzet van de tweedeprijsregels en het vergoedingsbeleid van ADX'en hebben op hun mechanisme-keuzes. Eerst presenteren we beschrijvend empirisch bewijs aan de hand van een groot dataset van biedingsverzoeken. Vervolgens construeren we een speltheoretisch model van de interacties tussen uitgevers, adverteerders en ADX'en. Onze resultaten zijn dat, hoewel uitgevers over het algemeen de voorkeur geven aan eersteprijsveilingen, de ADX'en die tweedeprijsveilingen aanbieden, nog steeds een aanzienlijk marktaandeel kunnen veroveren, afhankelijk van de evenwichtstarieven van hun concurrenten. Bovendien blijkt dat de wijdverspreide inzet van tweedeprijsveilingen afhangt van de omvang van de uitgevers en de waarschijnlijkheid dat ADX'en shill-biedingen

inzetten bij tweedeprijsveilingen. Onze bevindingen dragen bij aan een lopend debat over de mechanismeverandering door de schijnbaar problematische tijdlijn van de overstap van de ADX'en naar de tweedeprijsveiling.

In het derde onderzoek (hoofdstuk 5) onderzoeken we de incentives voor ADXs bij het bepalen van hun bedrijfsmodel door het vaststellen van koop- en verkoopvergoedingen. In dit onderzoek gebruiken we een analytisch model om het effect te onderzoeken van recente veranderingen in de strategie van uitgevers om onverkochte inventaris bij dergelijke incentives van ADXs op te ruimen. In de afgelopen jaren hebben efficiëntieoverwegingen uitgevers ertoe aangezet het oude sequentiële Waterfall-mechanisme te vervangen door het nieuwere parallelle Header Bidding-mechanisme om de concurrentie tussen aangesloten ADXs te beheren. Hoewel het algemeen wordt gezien als een inkomstenverhogende stap, elimineert de wijziging van het mechanisme door de uitgever alle incentives voor ad exchanges om de verkoopkosten laag te houden, wat de inkomsten van uitgevers schaadt. Onze bevindingen verklaren de recente stijging van de verkoopvergoedingen, ook wel de Ad Tech-Tax genoemd. De drie onderzoeken van dit proefschrift leveren substantiële theoretische en praktische bijdragen aan de digitale reclameliteratuur. Vanuit theoretisch oogpunt biedt ons werk nieuw inzicht in hoe informatieasymmetrie en tegenstrijdige incentives de relaties tussen adverteerders, uitgevers en ADX vormgeven. Vanuit managementoogpunt levert ons werk drie verrassende resultaten op die het huidige begrip van de mechanismen en contractuele instrumenten in programmatic ter discussie stellen.

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