

## DISSERTATION DEFENSE

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### **“Expertise, Attribution, and Ad Blocking in the World of Online Marketing”**

Wednesday, May 2, 2018

8:00 am

388 Posner Hall

In this dissertation, we model and provide insights to some of the main challenges the world of online marketing currently faces. In the first chapter, we study the role of information asymmetry introduced by the presence of experts in online marketplaces and how it affects the strategic decisions of different parties in these markets. In the second chapter, we study the attribution problem in online advertising and examine optimal ways for advertisers to allocate their marketing budget across channels. In the third chapter, we explore the effects of modern ad blockers on users and online platforms.

In the first chapter, we examine the effect of the presence of expert buyers on other buyers, the platform, and the sellers in online markets. We model buyer expertise as the ability to accurately predict the quality, or condition, of an item, modeled as its common value. We show that nonexperts may bid more aggressively, even above their expected valuation, to compensate for their lack of information. As a consequence, we obtain two interesting implications. First, auctions with a "hard close" may generate higher revenue than those with a "soft close". Second, contrary to the linkage principle, an auction platform may obtain a higher revenue by hiding the item's common-value information from the buyers. We also consider markets where both auctions and posted prices are available and show that the presence of experts allows the sellers of high quality items to signal their quality by choosing to sell via auctions.

In the second chapter, we study the problem of attributing credit for customer acquisition to different components of a digital marketing campaign using an analytical model. We investigate attribution contracts through which an advertiser tries to incentivize two publishers that affect customer acquisition. We situate such contracts in a two-stage marketing funnel, where the publishers should coordinate their efforts to drive conversions. First, we analyze the popular class of multi-touch contracts where the principal splits the attribution among publishers using fixed weights depending on their position. Our first result shows the following counterintuitive property of optimal multi-touch contracts: higher credit is given to the portion of the funnel where the existing baseline conversion rate is higher. Next, we show that social welfare maximizing contracts can sometimes have even higher conversion rate than optimal multi-touch contracts, highlighting a prisoners' dilemma effect in the equilibrium for the multi-touch contract. While multi-touch attribution is not globally optimal, there are linear contracts that "coordinate the funnel" to achieve optimal revenue. However, such optimal-revenue contracts require knowledge of the baseline conversion rates by the principal. When this information is not available, we propose a new class of 'reinforcement' contracts and show that for a large range of model parameters these contracts yield better revenue than multi-touch.

In the third chapter, we study the effects of ad blockers in online advertising. While online advertising is the lifeline of many internet content platforms, the usage of ad blockers has surged in recent years presenting a challenge to platforms dependent on ad revenue. In this chapter, using a simple analytical

model with two competing platforms, we show that the presence of ad blockers can actually benefit platforms. In particular, there are conditions under which the optimal equilibrium strategy for the platforms is to allow the use of ad blockers (rather than using an adblock wall, or charging a fee for viewing ad-free content). The key insight is that allowing ad blockers serves to differentiate platform users based on their disutility to viewing ads. This allows platforms to increase their ad intensity on those that do not use the ad blockers and achieve higher returns than in a world without ad blockers. We show robustness of these results when we allow a larger combination of platform strategies, as well as by explaining how ad whitelisting schemes offered by modern ad blockers can add value. Our study provides general guidelines for what strategy a platform should follow based on the heterogeneity in the ad sensitivity of their user base.