Consumption Externalities and Competing Sellers: Efficiency Ranking of Market Structures *

Summary

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Abstract

The efficiency ranking of market structures is qualitatively affected by the nature of buyer side peer interactions. To show this, I formulate a model for a two-sided market with competing sellers and a network of buyers whose willingness to purchase varies according to their peers’ purchases. Examples of such markets include competing small businesses, on-line music and video streaming services and publishers in advertisement exchanges. I allow for the joint presence of positive and negative peer influences and define overall positive and overall negative peer influence based on a vector aggregate of the exerted marginal influence on others’ choices. I show that typical market structures (here competition in prices, competition in fees and price setting by a centralized platform) do not internalize the efficiency distortions caused by the externalities. In particular, with overall positive peer influence competition in membership fees dominates competition in prices while with overall negative peer influence this conclusion reverses.

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1 Introduction

Market structures, as I argue here, are critical for buyers whose consumption choices positively and/or negatively affect their peers’ consumption choices. Peer effects of this type represent non-pecuniary externalities, they cause market failures or efficiency distortions, therefore they require market design consideration. Peer effects can motivate centralized or decentralized solutions to internalize externalities such as Lindhal prices or bilateral contracting, in which case the problem of externalities requires no further market design attention.\(^1\) Yet, these solutions require pricing in the externality while many contemporary markets with significant peer effects, such as the entertainment industry or advertisement exchanges, can hardly accommodate pair specific or peer-to-peer transfers. In the broader practical context, studying sellers’ competition in the presence of externalities is relevant for market design insights, for antitrust policy and for the evaluation of self-regulatory efforts.

Here I clarify, for competing sellers,\(^2\) the extent to which typical market structures can or cannot internalize peer externalities and the impact of buyers’ peer interactions on the efficiency ranking of typical market structures.

To show that insights for market design are qualitatively affected by the nature of buyer side peer interactions, I formulate a model for a two-sided market with competing sellers and with a network of buyers whose willingness to purchase is influenced by their peers’ purchases. The peer effects constitute a network of bilateral externalities where I allow for a rich set of externalities; the joint presence of positive and negative peer

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\(^1\)The view that externalities find their own solution within typical market structures has been most influentially noted in Liebowitz and Margolis (1994). The authors argue that as much as the problem of externalities and network effects are emphasized in economics it is ‘theoretically fragile and empirically undocumented’ thus irrelevant from a policy perspective. Both deeper theoretical understanding such us in this paper and recent econometric tools applied to provide empirical evidence cast reasonable doubt to this view.

\(^2\)The study of markets with buyer side externalities focused, so far, on one good and a monopolist, see for example Candogan et al. (2012); Chen et al. (2011), for positive externalities Fainmesser and Galeotti (2015); Hartline et al. (2008) and for negative externalities Belloni et al. (2015); Deng and Pekec (2013).
influences with heterogenous strenghts. In a two-stage game, sellers simultaneously set the payment rules, then buyers simultaneously choose their purchases. Such a formulation sensibly illustrates the rich consumption effects in many emerging markets in the entertainment industry, e.g competing video or music streaming services, and in advertisement exchanges, e.g. competing publishers selling advertisement space, and in web-based services, e.g. competing car or house sharing platforms, and in telecommunications, e.g. competing messaging services.

I compare efficiency of different typical market structures; competition in prices, competition in fees and price setting by a centralized platform. I define a measure for overall peer influence based on a vector aggregate of the exerted marginal influences on others’ choices. I show that the typical market structures do not internalize the efficiency distortions due to the externalities. Moreover, the efficiency ranking of these market structures with overall positive peer influence reverses with overall negative peer influence. A centrally set unit price by a profit-maximizing platform exploits externalities more intensively than price competition in that it extracts more revenue for the seller side regardless of the nature of peer effects. However, such centrally set unit price does not internalize externalities and contrary to monopoly intuition, it lowers welfare when externalities are overall positive.

Two benchmarks to consider are the consumption of buyers when choices reflect low unit prices, i.e. non-binding budget, and the consumption of buyers when choices reflect efficiency, i.e. maximal utilitarian welfare. The low-price benchmark, in the case of externalities, is different from the efficient benchmark. In particular, overall positive peer influence among buyers leads to underconsumption in the low-price benchmark compared to the efficient benchmark. This inefficiency is not alleviated by a competitive market structure, rather it is amplified by the interaction of higher prices and overall positive externalities through the buyers’ budget. Membership fees provide a partial solution in that they resolve the amplified inefficiency yet they do not internalize externalities beyond the low-price benchmark. However, conventional marketing strategies such as seeding and peer promotions improve upon a competitive market structure and to some extent internalize the positive externalities. Furthermore, buyer side platforms, which are prevalent in ad exchanges and raise questions for competition, improve upon a competitive market structure. On the contrary, overall negative peer influence leads to overconsumption. A competitive market structure
limits buyer purchases thereby partially alleviates the effect of negative externalities. A profit-maximizing platform that sets a uniform price further improves buyer side efficiency. I also consider mixed peer influences, that is neither overall positive nor overall negative. I illustrate in a ‘two group’ example that depending on cross-group externalities, membership fees may or may not dominate price competition. In comparison to price competition, if cross-group externalities are not too negative then membership fees improve efficiency, yet lower the welfare for buyers who belong to the smaller group. Thus, although outperformed by membership fees in terms of efficiency, price competition may still be preferable for fairness considerations.

Regarding optimal pricing strategy of competing sellers, my framework shows that ignoring buyer side externalities, i.e. pricing based on local demand elasticity, is suboptimal. This is so as equilibrium pricing reflects both the network of buyer relationships and the availability of different products to specific buyers. As I show in the more general framework with constraints on seller availability, the buyers’ reach of sellers, the strength of buyer side externalities and the amount of buyers’ budget provide additional sources of buyer power and identify the critical relationships for price competition. In turn, they explain profit opportunities from costly informative advertisement.

To highlight the contribution, the literature on social interactions (see Durlauf and Ioannides (2010) for a review) is limited to non-market contexts beyond which only monopoly pricing has been considered (see for example Candogan et al. (2012), Fainmesser and Galeotti (2015)). Here I provide a general framework, to study oligopolistic price competition and markets’ efficiency with buyer side externalities. Further, my results have implications for the literature on two-sided platforms which often assumes away one-sided externalities, to study cross side effects (see Weyl (2010)) with the argument that intra-side externalities can be internalized via relationship specific transfers. Here I show that without link-specific monetary compensations price competition does not resolve the problem of externalities, furthermore, regulatory insights depend on whether the interactions are overall positive or negative.

References


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