Quantifying the Welfare Effects in Networked Markets

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Abstract

We empirically investigate the welfare implications of a reduction in the level of frictions and price dispersion in online retail markets. Our identification strategy exploits the unique circumstance that, in the online trading platform eBay, we have access to "click-stream" data, that records which listings appear in buyers' searches, which listings buyers click on, and which listings they bid for, even if they do not end up buying that product. Click-stream data provides the information needed to reconstruct the links (which buyers interact with which sellers) in the network. We perform the welfare analysis using a three-step framework. First, we reconstruct the realized network of buyers and sellers using click-stream data. Second, we develop a tractable empirical networks' model, and estimate its the primitives (*i.e.* distribution of buyers' valuations) that characterize the model's underlying demand preferences conditional on the realized network. Third, we use the estimated demand preferences and network structure to perform a "counterfactual" analysis. In the counterfactual analysis we compare the actual outcome (*i.e.* welfare under the actual level of frictions in eBay) to a counterfactual outcome, whereby we will use the estimated demand preferences and the behavioral buyer-seller model to compute the welfare under an alternative policy that would reduce the level of frictions and price dispersion in eBay.

Example of how we reconstruct a network

In Figure 1 we use click-stream data to reconstruct the buyer-seller network for Kinect in week w. Sellers are represented by black nodes; buyers are represented by white nodes. A buyer and a seller are linked if the buyer clicked on the seller's listing at least once, regardless of how many times the buyer clicked on that listing. A buyer and a seller are not linked if the buyer never clicked on the seller's listing. The graph displays the subnetwork of matched buyers and sellers (*i.e.* the subset of buyers and sellers who performed a Kinect transaction in week w). Thick solid lines represent the matches (*i.e.* which buyer bought from which seller). The number above each node represents the total number of links that the buyer or seller in that node has. The left column indicates the price for each transaction.[1] For example, buyer B1 has a total of 3 links (*i.e.* B1 clicked on 3 different Kinect listings). Two of these links are represented in the subnetwork, with sellers S3 and S8. The third link is not represented in the graph because it corresponds to a listing that was not sold (*i.e.* not matched).[2] Buyer B1 bought a Kinect from seller S3 at a price $p(\text{S3}, \text{B1}) = \$105.00$. Seller S3 has 13 links, 5 that are represented in the graph (with buyers B1, B2, B5, B8, and B9) and 8 that are not represented in the graph because they correspond to buyers who did not buy any Kinect.

[1] This price does not necessary reflects the "final price paid by the buyer". The final price paid by the buyer includes the shipping costs and is the relevant price for the analysis. For the final data collection in this proposal we will obtain the final price paid for the buyer from eBay's transactional data. To see why including the shipping costs is important, note that buyer B5 paid \$94.99, but it was also linked to seller S9, that sold the Kinect at \$89.99. To be consistent with pairwise stability the difference (\$94.99 – \$89.99) needs to be accounted by either vertical characteristics or shipping costs. In this case, the Kinects from both sellers have identical vertical characteristics. However, while the price of the Kinect from seller S5 includes the shipping cost, the price of the Kinect from seller S9 does not include the shipping cost. This explains why pairwise stability is not violated and the importance of using the final price paid by the buyer.

[2] In this market there are a total of 31 sellers (a seller is defined as a user how had an active Kinect listing on eBay during week w) and 537 potential buyers (a potential buyer is defined as a user who clicked on one of the 31 Kinect listings during week w). Visualizing a network with all buyers and sellers is unfeasible due to the large number of nodes and links in the market. Only 9 buyers and 9 sellers performed a transaction (the subnetwork of matched buyers and sellers). So we only display graphically the subnetwork of matched buyers and sellers, and summarize the remaining network structure with the total number of links that each matched node has and the price of the transaction (match).

Figure 1: Network of Buyers and Sellers for New Kinect for Xbox 360.