Competing Trading Platforms: Nash bargainers against Walrasian auctioneers

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Extended Abstract

Recent years have told many stories of the raise (and fall) of a variety of trade institutions. Consumer-to-Consumer (C2C) online auction houses emerged as the new terms-of-trade – accompanied by a downturn of more traditionally organized institutions as e.g., shops for computer equipment or used cars. Similar shocks occurred in Business-to-Consumer (B2C) and the Business-to-Business (B2B) sector. Some platforms managed to attract sufficiently large populations of clients and established themselves as a "market maker", other – comparable – enterprizes had to exit the same market after fierce attempts to compete or restricted themselves to a certain specialization for the time being. Examples are the raise of *eBay* and its competition with *Amazon*, the fall of e-commerce pioneer *CommerceOne* who applied for bankruptcy in 2004, the platform *MetalSite* organized by steel-producers which suspended operations in 2001, multi-commodity exchange *EnronOnline* quitting in 2002, or CheMatch which developed into an important trading platform for the chemical sector. Interestingly, business analysts identify a development from the creation of new platforms (the common business model in the 1990s) to buy-outs, which indicates some degree of maturity of the market (see e.g., Keys (2002)). But still, competing platforms or platforms which survived competition differ in various design aspects. *eBay* and *Amazon*, for instance, differ in the ending rule of auctions (pre-specified end or automatic extension), B2B platforms sometimes conduct

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uniform price auctions (as e.g., *MetalSite*) or discriminatory price auctions (as e.g., *EnronOnline*), and almost all online platforms still face competition by decentralized bilateral trade or bargaining.

In contrast to these observed patterns of institutional *competition*, the literature on market design mainly focuses on the case of revenue or efficiency maximizing *monopolistic* designers or market makers (see e.g., Krishna (2002) for an introduction to the broad literature on auction design or Roth (2002) for a discussion of clearing house design). Compared to this literature, little seems to be known about optimal design strategies in the case of competing platforms. Notable exemptions are Ellison and Fudenberg (2003) and Ellison, Fudenberg and Möbius (2004) who show that markets with competing but *identical* trading platforms can either tip or exhibit robust co-existence of platforms depending on the ratio of buyers and sellers and the price impact of single traders who switch platforms. On a more specific level, it has been established e.g., by McAfee and McMillan (1987) and Milgrom (1987) that auctions have an inherent advantage over bargaining mechanisms as they better manage to establish efficient matchings (i.e., select the highest value buyer available for a given seller). In contrast, Alós-Ferrer, Kirchsteiger and Walzl (2009) show that competing platform designers may well face a trade-off between maximizing the trade-volume through efficient (or market clearing) platforms and favoring one market side through non-market clearing designs that influence the trader's platform choice. Specifically, Alós-Ferrer, Kirchsteiger and Walzl (2009) prove that non-market clearing designs are superior whenever the production side of the economy faces constant returns to scale.

However, platform designs do not only differ in their ability to establish market clearing. Designs may well differ with respect to surplus division and thereby affect the coordination of traders on trading platforms. Kugler, Neeman and Vulkan (2006) experimentally demonstrate that high value traders find it attractive to trade in a centralized market-clearing platform over trading at a decentralized platform that randomly matches traders to negotiate transaction prices. This is because high values are unlikely to determine the final price in the centralized market-clearing platform, while at decentralized one-to-one negotiations, these traders' end up "paying a price" for their higher value. Lu and McAfee (1996) show that for competition between an auction platform (where each seller sets up an English auction for one unit of an indivisible good) and a bargaining institution (where buyers and sellers are randomly matched and split the surplus equally) full coordination of all traders on both platforms naturally establishes a Nash equilibrium. However, only full co-

ordination on the auction platform proves to be stable in a dynamic process with random arrival of new traders who choose the platform which has been superior for their market side in the previous round. As buyers and sellers are identical in Lu and McAfee (1996), it can be concluded that auctions do not only have a competitive advantage over bargaining platforms due to a more efficient match making but also due to a surplus division which is more attractive for new customers.

In this paper, we analyze the co-evolution of a fixed-price platform (i.e., an institution of centralized trade at a uniform, market clearing price) and a bargaining platform (i.e., an institution of decentralized trade at potentially non-uniform prices) where identical sellers and heterogeneous buyers trade units of an indivisible good. We have in mind a market with a very large number of traders who possess limited information about the two platforms. Specifically, we model the trader's platform choice as a dynamic process where in each period a set of traders is selected, observes the uniform price at the fixed-price platform and the average price at the bargaining platform in the previous period, and for the next period, myopically chooses the platform with the more favorable outcome. Absorbing states of this process are states with no active platform (i.e., all sellers are in one platform and all buyers at the other platform such that no trade occurs), states with two active platforms (i.e., both platforms co-exist with identical market prices), and states with exactly one active platform (i.e., at least one market side is only present at a certain platform together with some traders of the other market side).

We show that only states with exactly one active platform can be stochastically stable. Thus, neither no trade nor co-existing platforms are likely outcomes of co-evolution. If the total number of sellers is higher than the total number of buyers in the market, both types of states in which only the fixed-price platform or only the bargaining platform will be stochastically stable. However, if the total number of buyers is higher than the total number of sellers in the market we observe an asymmetry in the evolution of fixed price and bargaining platforms.

While prices in the fixed price platform are at least the valuation of the highest loosing buyer by construction of the market-clearing price, the average price in the bargaining can well be lower. Suppose, for instance, that all m sellers and $m+1$ buyers with the highest valuation are at the fixed-price platform. Then, any such state is an absorbing state of the dynamic process regardless of the affiliation of the remaining buyers because the market-clearing price is (weakly) above the valuation of any remaining buyer, who then prefer not to trade. However, if all sellers are at the bargaining platform together with the $m+1$ buyers with the highest valuation, the

corresponding state is only absorbing if the average price at the bargaining platform is above any valuation of buyers who are on their own at the fixed price platform. If buyers are sufficiently homogeneous and/or they receive a sufficiently large part of the surplus from trade, the average price at the bargaining platform will indeed be below the valuation of (some) buyers at the fixed price platform and the corresponding state is therefore not absorbing. We show that this asymmetry is decisive with respect to the stochastic stability of the fixed price platform. If prices at the bargaining platform leave a sufficient proportion of the surplus to buyers even though buyers belong to the long market side at this platform, the bargaining platform will be the only active trade institution in any stochastically stable state.

We show that the definition of a fixed price platform is satisfied by auction platforms (with English auctions or proxy auctions with soft ending rule) or uniform price auctions, while the bargaining platform can be also interpreted as a discriminatory price auction or a platform for proxy auction with hard ending rules. Our results therefore demonstrate a yet unrecognized competitive advantage of bargaining platforms, discriminatory price auctions or proxy auctions with hard ending rule in institutional competition. In particular, we demonstrate a superiority of bargaining over auctions in contrast to Kugler, Neeman and Vulkan (2006) and Lu and McAfee (1996). The crucial difference between Lu and McAfee (1996) and our model is that they analyze stability with a dynamic process of randomly arriving *new* traders and one-shot interaction in the market, while we analyze a dynamic process of frequent interaction and learning of traders *in* the market. This indicates that fixed price platforms (or uniform price auctions or proxy auctions with soft ending rule) may well be a superior design tool in emerging markets where platform success is determined by the attractiveness to new customers while bargaining platforms (or discriminatory price auctions or proxy auctions with hard ending rule) possess a competitive advantage in mature markets where loyalty or the attractiveness to traders in the market is decisive.

References

Alós-Ferrer, C., Kirchsteiger, G., Walzl, M., 2009. On the Evolution of Market Institutions: The Platform Design Paradox. Economic Journal, forthcoming.

Ebay, 2006. Q1 Report. Retrieved on 01-06-06 from www.ebay.com.

Ellison, G., Fudenberg, D., 2003. Knife-edge or Plateau: When do Market Models Tip? The Quarterly Journal of Economics 118, 1249-1278.

Ellison, G., Fudenberg, D., Möbius, M., 2004. Competing Auctions. Journal of the European Economic Association 2, 30-66.

Keys, S., 2002. Online Trading Platforms: To Build or To Buy? Mimeo retrieved from www.commodities-now.com/content/market-areas/technology/maarticle-1.pdf.

Krishna, V., 2002. Auction Theory. San Diego: Academic Press.

Kugler, T., Neeman, Z., Vulkan, N., 2006. Markets versus Negotiations: An Experimental Investigation. Games and Economic Behavior 56, 121-134.

Lu, X., McAfee, P., 1996. The Evolutionary Stability of Auctions over Bargaining. Games and Economic Behavior 15, 228-254.

McAffee, P., McMillan, J., 1987. Auctions and Bidding. Journal of Economic Literature 25, 699-738.

Milgrom, P., 1987. Auction Theory. In Bewley, T.F. (Ed.), Advances in Economic Theory. New York: Cambridge University Press.

Roth, A. E., 2002. The Economist as Engineer: Game Theory, Experimentation, and Computation as Tools for Design Economics, Fisher-Schultz Lecture. Econometrica 70, 1341-1378.