Games and Economic Behavior ••• (••••) •••–•••

Contents lists available at ScienceDirect

Games and Economic Behavior

www.elsevier.com/locate/geb

Matching and chatting: An experimental study of the impact of network communication on school-matching mechanisms ☆

Tingting Ding [a], Andrew Schotter [b,*]

[a] School of Economics, Key Laboratory of Mathematical Economics, Shanghai University of Finance and Economics, 111 Wu Chuan Road, Shanghai 200433, PR China
[b] Department of Economics, Center for Experimental Social Science, New York University, 19 West 4th St., New York, NY, 100012, United States

ARTICLE INFO

Article history:
Received 7 August 2014
Available online xxxx

JEL classification:
C78
C91
C72

Keywords:
School choice
Matching
Mechanism design
Networks
Chat

ABSTRACT

While, in theory, the school matching problem is a static non-cooperative one-shot game, in reality the "matching game" is played by parents who choose their strategies after consulting or chatting with other parents in their social networks. In this paper we compare the performance of the Boston and the Gale–Shapley mechanisms in the presence of chatting through social networks. Our results indicate that allowing subjects to chat has an important impact on the likelihood that subjects change their strategies and also on the welfare and stability of the outcomes determined by the mechanism.

In recent years there has been a great deal of interest in designing matching mechanisms that can be used to match public school students to schools (the student matching problem).[1] The design of matching mechanisms relies on a combination of economic theory and common sense, and these attempts have proven extremely useful in helping organizations solve this complicated problem.[2] The premise of this paper is that when testing mechanisms we must do so in the environment in which they are used in the real world rather than in the environment envisioned by theory. More precisely, in theory the school matching problem is a static one-shot game played by parents of children seeking places in a finite number of schools and played non-cooperatively without any form of communication or commitment between parents.

☆ Support for this research was funded by the National Science Foundation grant number 1123045. We would like to thank the Associate Editor, anonymous referees, Tayfun Sönmez, Leeat Yariv and Tim Salmon for their valuable comments, and thank the participants of the 2012 International ESA Conference, the 2013 North American ESA Conference, the University of Texas at Dallas Economics seminar, and the Santa Barbara Conference on Behavioral Economics for helpful discussion. We would also like to thank the Center for Experimental Social Science at New York University for their lab support as well as Anwar Ruff for his programming assistance.

* Corresponding author.
E-mail addresses: tingting.ding@mail.shufe.edu.cn (T. Ding), andrew.schotter@nyu.edu (A. Schotter).

[1] See Balinski and Sönmez (1999), Abdulkadiroğlu and Sönmez (2003), Ergin and Sönmez (2006), Erdic and Ergin (2008), Abdulkadiroğlu et al. (2009), Pathak and Sethuraman (2011), Kesten and Ünver (2013), Abdulkadiroğlu et al. (2011), Haeringer and Klijn (2009) for some of the central theoretical contributions, Chen and Sönmez (2006), Pais and Pintér (2008), Calsamiglia et al. (2010), Featherstone and Niederle (2014), Klijn et al. (2013), Chen and Kesten (2013) for experimental studies, and Abdulkadiroğlu et al. (2005a) and Abdulkadiroğlu et al. (2005b) for the summary of school choice reforms in New York City and Boston.

[2] See Toch and Aldeman (2009) for a news article praising the New York City matching scheme, as well as Herszenhorn (2003) "Revised Admissions for High School," New York Times.

http://dx.doi.org/10.1016/j.geb.2016.02.004
0899-8256/

However, in the real world, the school choice program is played out in a different manner. Typically parents choose their strategies after consulting with other parents in their social networks and exchanging advice on both the quality of schools and the proper way they should play the "school-matching game." In addition, parents who have engaged in the matching mechanism in the past may also communicate with parents currently in the match and offer their words of wisdom. We can call these two systems of advice the "horizontal" and the "vertical" advice systems. This paper focuses on horizontal advice networks and a companion paper (Ding and Schotter, 2015) focuses on vertical advice. The question we ask here is whether chat between parents (similar to naive advice defined in Schotter, 2003) affects the strategies they choose, and if so, whether it does so in a welfare-increasing or decreasing manner.[3]

In this paper we compare the performance of the Boston and the Gale–Shapley mechanisms, two often used school matching mechanisms, in the presence of chatting through social networks. In each mechanism subjects must submit rankings over three objects whose values to them are either \$24, \$16, and \$4. We allow subjects in our experiments to play the "matching game" twice, once before (Phase 1) and once after chatting (Phase 2).[4] Because the Boston mechanism is not strategy-proof, we would also like to examine how subjects using the Boston mechanism are influenced by preference intensity. We then test a variant of the Boston mechanism, in which the values associated with subjects' three choices are \$24, \$10, and \$4, respectively. In the text below, we call our two variants of the Boston treatments the Boston 16 and the Boston 10 mechanisms for the ease of exposition, though these two treatments indeed deploy the same matching mechanism. The Boston 16 and the Gale–Shapley mechanisms serve as our dual baselines.

Given our design, the behavior in Phase 1 is a test of the static mechanisms, while the difference between Phase 1 and Phase 2 defines the impact of chat. Among the questions we attempt to answer are:

1. In the absence of chat (Phase 1), is the performance of our baseline Boston 16 and Gale–Shapley mechanisms equivalent? I.e., are the strategies employed across subject types and the welfare of the mechanisms the same?
2. Do subjects who chat change their Phase-1 submitted rankings more than those who are isolated and do not chat?
3. How are the behavior and welfare of subjects using the Boston mechanism influenced by the preference intensity?
4. Is chat stability increasing? I.e., does chat lead to an increase in stable outcomes?
5. If chatting is beneficial, does it matter to whom you chat? I.e., does it matter whether your social network is populated by people like you or different from you?
6. Does chatting influence welfare differently when subjects have priority rights or not? (In school matching programs some students (subjects) have priority for admission to some schools (objects).)
7. Does the content of chat change as we look across mechanisms and subject types?

While we will not discuss the answers to these questions in detail in this introduction, as a preview we find that chatting has many beneficial characteristics. More precisely, over all, allowing people to chat not only increases their welfare but also the stability of the matches created. This is interesting since we find that there is no difference in subject behavior or subject welfare between our baseline Boston 16 and Gale–Shapley mechanisms in the absence of chat in Phase 1, which may lead to the conclusion that these two mechanisms are equivalent.[5] After chatting is introduced, however, behavior and welfare diverge across these mechanisms. The implication, therefore, is that including chat into an experimental design on matching enhances its external validity since in the real world chatting is ubiquitous.

If chatting is beneficial, it might make sense to ask if it matters with whom you chat. We find that, those subjects who communicate with people of their own experimental type (i.e., who have the same induced preferences and priorities) tend to change their submitted preference rankings more between phases but their payoffs increase less, indicating that sometimes the beneficial aspect of chatting is to persuade subjects who are already using good strategies not to change.

With respect to welfare, chatting appears to influence welfare differently between subjects with priority rights and those without. Though there is little welfare change among subjects with priority rights between phases, chatting does significantly change the welfare of those without priority rights. If one equates subjects without priority rights with people living in disadvantaged areas (where they may have priority rights but in the least desirable schools), our results indicate

[3] In other work (Schotter and Sopher, 2003, 2007; Nyarko et al., 2006; Iyengar and Schotter, 2008), advice received by chatting has proven to have a very powerful influence on decision makers in the sense that advice tends not only to be followed but typically has a welfare increasing consequence.

[4] For the subjects who are not allowed to chat, we ask them to write down the logic of their strategies by introspection when the others chat.

[5] Previous experimental papers on school matching present mixed evidence on the performance of various mechanisms. In terms of efficiency, for example, Pais and Pintér (2008) and Calsamiglia et al. (2010), find no difference across all of their treatments. Other papers have mixed results. Chen and Sönmez (2006) find in their "designed environment" that the efficiency of the Gale–Shapley mechanism is greater than that of the Boston mechanism, though in their "random environment" no such difference is found. Featherstone and Niederle (2014) and Klijn et al. (2013) find under some circumstances the efficiency in the Boston mechanism is greater than that in the Gale–Shapely mechanism. The results on strategy differences are also unclear. Klijn et al. (2013) find differences in strategic behavior in all their treatments. Pais and Pintér (2008) find that when subjects have zero information (only know of their own preference rankings) there is no difference in the fraction of subjects submitting truthful preferences while, when subjects have more information about school priorities and others' preferences, they are more likely to tell the truth in the Gale–Shapley mechanism. Featherstone and Niederle (2014) find that while in their "uncorrelated preference environment" there is no difference in truth-telling across the Boston and Gale–Shapley mechanisms, in their "aligned preference environment" subjects are more likely to tell the truth in the Gale–Shapley. In contrast, Chen and Sönmez (2006) and Calsamiglia et al. (2010) show in all their treatments the fraction of truth-telling in the Gale–Shapley mechanism is greater than that in the Boston mechanism. Because the designs of these experiments are so different and the number of subjects in a typical session varies so widely, it is hard to compare these results or reach any definite conclusions.

Please cite this article in press as: Ding, T., Schotter, A. Matching and chatting: An experimental study of the impact of network communication on school-matching mechanisms. Games Econ. Behav. (2016), http://dx.doi.org/10.1016/j.geb.2016.02.004