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Disclosure of information in matching markets with non-transferable utility

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ABSTRACT

We present a model of two-sided matching where utility is non-transferable and information about individuals' skills is private, utilities are strictly increasing in the partner's skill and satisfy increasing differences. Skills can be either revealed or kept hidden, but while agents on one side have verifiable skills, agents on the other side have skills that are unverifiable unless certified, and certification is costly. Agents who have revealed their skill enter a standard matching market, while others are matched randomly. We find that in equilibrium only agents with skills above a cutoff reveal, and then they match assortatively. We show that an equilibrium always exists, and we discuss multiplicity. Increasing differences play an important role to shape equilibria, and we remark that this is unusual in matching models with non-transferable utility. We close the paper with some comparative statics exercises where we show the existence of non-trivial externalities and welfare implications.

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1. Introduction

Sorting patterns have been widely investigated in two-sided matching models where agents are ranked according to a trait (called skill or type) that is publicly visible. One important insight from the literature is that when utility is transferable (i.e., the surplus generated by a matched pair of agents can be freely distributed between them) the sorting of agents depends on comparative advantages. Indeed, if higher types gain relatively more than lower types to be matched with partners of a higher type, then their willingness to pay for such a match will be larger, and this determines positive assortative matching in equilibrium. By contrast, when utility is non-transferable (i.e., the surplus generated by a match is non-contractible) the sorting of agents depends on absolute advantages. This is so because agents cannot compete by offering larger shares of the total surplus, and therefore if utilities are increasing in the partner's type then in equilibrium high type agents match together; this is true even if the total surplus of a match does not exhibit the comparative advantage property.

In this paper we show that, if we remove the assumption that types are publicly visible and we give agents the possibility to costly disclose their type, then comparative advantages become again important to understand the properties of the

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equilibrium matching even in a model where utility is non-transferable. More precisely, we assume that, prior to matching, agents face the following choice: either reveal one's own skill and participate in a standard two-sided matching market together with all agents who disclose their skill, or keep one's own skill hidden and go for a random match together with all agents who do not reveal their skill. We assume an asymmetry in skill verifiability between agents on the two sides. Agents on one side have skills that are verifiable, hence such skills become observable once revealed. Agents on the other side, instead, have skills that are unverifiable, and they must resort to costly certification in order to make their skills verifiable. It turns out that comparative advantages – that we model as the property of increasing differences for utilities – are crucial to assess whether certification costs are worth being paid; indeed, an agent must compare the option to be randomly matched within a pool of low type agents with the option to pay the cost of certification and end up matched with a higher type agent.

Our main modeling innovation with respect to the matching literature concerns the assumption that types are private information, and that agents on one side must rely on costly certification in order to credibly reveal such information. We believe that this assumption can help matching models to get closer to some real applications. The following sketched example illustrates this. Consider the market for a given kind of job, with positions on one side and candidates on the other side. Positions are ranked in candidates' preferences according to some trait, like salary, job duties, working time. Such a trait can be costlessly revealed, and even reported in the job contract. Candidates, instead, are ranked in recruiters' preferences according to a skill level that is directly related to productivity in the kind of job that we are considering; however, candidates' skills are not verifiable, and hence cannot be simply revealed, since uncertified declarations would be non-credible. Therefore, candidates who want to certify their skills need to obtain – depending on the nature of job under consideration – educational or professional qualifications, or other kinds of certificates: for instance, the European Computer Driving Licence (ECDL) can be obtained at different levels and certifies knowledge in the field of information and communication technology, that can be relevant for a position of computer technician; Cambridge ESOL diplomas, like the First Certificate in English, or the Test Of English as a Foreign Language (TOEFL) prove one's adequacy in the English language, that can be useful for jobs that require to interact socially with English-speaking people; similarly, the Graduate Record Examinations (GRE) and the Graduate Management Admission Test (GMAT) measure skills related to verbal reasoning, quantitative reasoning and analytical writing, and are usually employed to discriminate the access to graduate positions; moreover, many other certificates and licences exist that guarantee one's ability as hairstylist, chef, musician, driver, etc. Needless to say, all these certifications are costly to be acquired.

In the paper, we start adapting the standard notion of stable matching – that requires two conditions to be satisfied, i.e., no blocking pair and individual rationality – to obtain a notion of equilibrium that is suited for our model. We provide a characterization of equilibria where matching is positive assortative between agents who reveal their skill, and cutoff types emerge in both populations, separating the agents who reveal information – that lie above the cutoff – from those who do not – that lie below the cutoff. Moreover, the cutoff type in the population whose skills are unverifiable unless certified must be indifferent between, on the one hand, certifying the skill and matching with the same-rank mate and, on the other hand, saving the cost of certification and relying on random matching in the set of mates who have kept their skill hidden.

Interestingly enough, multiple equilibria can emerge in our model. This is essentially due to a kind of “network effect” that is at play when considering the value of the outside option: since only higher types resort to certification, if the pool of uncertified agents gets larger, then the average type therein becomes higher and the value of a random match increases. More precisely, for a higher cutoff type certification means to end up matched with a better mate, and hence it has a higher value; however, the outside option of a random match has a higher value as well, due to the network effect. Therefore, there may be multiple cutoff types that are indifferent to the choice of whether to certify or not, and this means that multiple equilibria exist. Due to equilibrium multiplicity, in the paper we proceed by distinguishing equilibria between stable and unstable – since that plays a role for comparative statics – and we then show that a stable equilibrium always exists provided that certification costs are positive but low enough.

In the final part of the paper we go through some comparative statics exercises and we comment on welfare implications. In particular, we consider the effects of a change in the cost of certification, and in the distribution of skills in the two populations. To have an idea of the kind of results that we obtain, consider the following case. Suppose that skills increase for agents who need certification. Because of increasing differences of their utilities, we obtain that the value of certification increases relatively to the value of a random match with agents having lower skills. We show that this leads to a reduction in the equilibrium cutoff level for stable equilibria, and hence the average value of a random match decreases in the new equilibrium. This nicely highlights the existence of a negative externality on the agents who still choose not to pay the certification cost and to go for a random match.

The paper is organized as follows. Section 2 places our contribution in the relevant literature. Section 3 presents the model, while Section 4 illustrates our main results: the characterizations of equilibria, the possibility of multiple equilibria with different cutoffs, the distinction between stable and unstable equilibria with the proof of existence for stable equilibria. Section 5 describes the comparative statics exercises and provides some comments on welfare implications. Section 6 briefly summarizes our contribution and outlines directions for future research. Appendix A reports a couple of examples which help to illustrate the variety of welfare outcomes that may arise.

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