

Analysis of the Human's Matching Preferences in the Market Matching

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ABSTRACT

Matching theory is a branch of economics that has had a significant impact on the world. Economics is a social discipline that studies human behavior and how to allocate limited or scarce resources in an efficient and rational manner. This paper is a specific study of three matching scenarios based on market matching theory: organ donation, matchmaking and job search. Based on the previous study, four factors that influence people's matching preferences are proposed: time, accuracy, cost and rarity. After analysis, it is found that these four factors generally influence people's matching preferences in the following way: when time is urgent, precision is required, matching cost is low, and matching resources are scarce, people favor a wide net strategy. Conversely, when time requirements are more relaxed, precision requirements are not high, matching costs are high, and matching resources are relatively abundant, people tend to choose a more precise matching strategy. Among these four factors, time is the most important influencing factor of matching preference. This paper is an attempt of explaining people's preference of matching strategies in real-life matching scenarios by drawing on concepts developed in various matching theories, and the explanatory power and potential inadequacy of the theories are therefore noted.

Keywords: Market Matching Theory; Two-sided Matching; Matching Preferences

1. INTRODUCTION

Economics is a social discipline that studies human behavior and how to allocate limited or scarce resources in an efficient and rational manner. Traditional economics has long been concerned with the comparative study of "static equilibrium" in the allocation of scarce resources. With the development of society and economy, this kind of research can no longer meet the scholars' exploration of resource allocation and the problems encountered in the allocation of scarce resources effectively. Therefore, since the 20th century, scholars have gradually shifted from the study of this "static equilibrium" to the study of the "black box" in the resource allocation problem, so as to achieve a "dynamic equilibrium" in the allocation of scarce resources, which gave rise to matching theory. "Matching" is a common phenomenon in human societies. In marriage, men and women need to be matched, in the marketplace, buyers and sellers need to be matched, and in the labor market, employers and employees need to be matched.

Matching theory is a branch of economics that has had a significant impact on the world. The theory is used

to solve the matching problem between two parties involved in market matching, in order to improve the matching efficiency of both parties and achieve stable matching. This theory is a branch of game theory and was first studied by Gale and Shapley in their 1962 paper "College Admissions and Marital Stability" [1].

The concept of two-sided matching was first summarized by Roth (1985), where "two-sided" emphasizes the fact that participants in a market belong to two disjoint sets, and "matching" emphasizes the bilateral nature of market exchange, where both parties have stability preferences [2]. Two-sided matching theory is a study of the matching process between two disjoint parties with stable preferences, taking two-sided matching as the object of study. Now, after nearly fifty years of development, matching theory has been widely used in the labor market and public school selection in Western countries. In 2012, the Nobel Prize in Economics was awarded to Alvin E. Roth and Lloyd S. Shapley of the University of California for "their contributions to the theory of stable allocation and the practice of market design. The "two-sided matching theory" is core of the theory. Not long ago, several

experts in mechanism design and matching theory, Pathak, Sonmez, Unver, Yenmez, co-authored a paper on optimizing ventilator rationing mechanisms under the ravages of COVID-19 [3]. Economists in this field are making the world a more efficient place through their own efforts to optimize various real-life matching mechanisms.

Two-sided matching is usually divided into one-to-one matching, one-to-many matching, and many-to-many matching according to the number of bilateral matching objects. A one-to-one (1:1) match is a match where one party is an individual and the other party is also an individual. For example, if a man and woman are matched in a marriage, the final match results in a man being matched to a woman. A one-to-many (1:N) match is a match where one party is an individual and the other party is an organization (recruiting multiple individuals). For example, an employee-employer match ends up with each employer recruiting multiple employees, while each employee is matched to only one employer. Other examples are school-student matches. Many-to-many (N:N) matching is a situation where both parties can match with more than one other party. A common one is customer-e-commerce platform matching, where a single customer can choose multiple e-commerce platforms to purchase goods, and a single e-commerce platform serves multiple customers at the same time.

This paper mainly talks about the one-to-one match. In the market, people tend to adopt different matching strategies in order to improve the efficiency of matching, like shotgun and rifle approach. The shotgun approach is traditionally known as a marketing strategy where marketers try to appeal to a wide market of potential customers by using various (both above the line and below the line) advertising strategies. This situation occurs when the target audience of the business is too diverse to focus on any one segment. However, this paper also talks about “shotgun” and “rifle” approach in the matching markets context, where a shotgun approach means the agents send a relatively large number of matching requests, hoping that at least some would be accepted, while a rifle approach means to calibrate one’s matching targets and only send request to a few well-chosen targets. This paper attempts to explain people’s preference of matching strategies in real-life matching scenarios by drawing on concepts developed in various matching theories. The explanatory power and potential inadequacy of the theories are therefore noted.

2. ANALYSIS OF HUMAN’S MATCHING PREFERENCES

What determines people’s matching preferences in the different scenarios? This paper will go further into the discussion of what factors can affect people’s choices and which factor might be the biggest reason for people to make this choice.

2.1. Four factors affecting human’s choices

There are four factors that can affect people’s choices: time, accuracy, cost and rarity. Three different scenarios will be analyzed in the market matching: job search, dating and organ donation, respectively. When it comes to organ donation, due to the extremely high and restrictive requirements for matching, people will tend to match by casting a wide net to maximize their exposure to potential organ resources in order to get a suitable organ. And when it comes to job hunting, job seekers will filter suitable companies based on their personal educational background and work experience. They tend to match precisely but less frequently. Companies also prefer to receive precisely tailored job applications rather than a wide net of submissions. In the matchmaking market, people’s matching preferences fall somewhere in between these two. Why do people’s matching preferences differ in these contexts? What are the specific factors that determine matching preferences in different contexts? This paper will discuss these three different tendencies respectively below.

2.2. Matching of organ donations

In all three scenarios, matching of organ donations is geared to the greatest scope. China uses a centralized approach to organ allocation. This mechanism consists of a centralized system (China Organ Transplant Response System or COTRS) that matches according to regional priority, disease priority, age priority, waiting time priority, and relative priority, then filters out the five candidates with highest priority. The organ donor hospital will contact these five patients in turn within one hour to determine whether the patient will accept the match according to the highest to lowest match, and only if the previous patient has declined will the next one take his turn, and so on until someone accepts the procedure [4]. This matching appears to be efficient. The time, labor, and financial costs required for matching are relatively low, requiring only searching the database and then contacting a limited number of patients. However, organ matching requires a very high degree of precision in all physical indicators, making it extremely difficult to match. Moreover, the need is often urgent and the time for matching is short. Only through extensive search and mobilization of broad market resources is it possible to complete such a difficult match in a limited time.

2.3. Matching in the dating market

Matching in the dating market can be better explained by Two-Sided Matching Theory, which is a discipline that specializes in matching two groups of individuals. The allocation of the matchmaking market is far less urgent compared to organ matching, but there are still high requirements for the suitability of both men and women. This paper illustrates this in two cases: social

apps and real-life blind date. The online dating app Tan Tan (similar to Tinder in the US) sorts and matches users and then recommends them to other users. Users who swipe left are pass and swipe right are match, and if two users swipe right with each other, the app will set up a chat platform for them to get to know each other further. When matching, the app will take into account the distance between the two parties (to facilitate future offline meetings), combining the basic personal information of both men and women, as well as their preferences for spouses, etc. for appropriate matching. Data shows that the percentage of women sliding right is about 6%, while the rate of men sliding right is as high as 60% [5]. This indicates that women are in an advantageous position in the dating market. Moreover, they will carry out a strategy that might be compared to "truncation" [6], that is, when they have more choices, they will take the initiative to narrow down the matching range and screen more high-quality matchmakers. In reality, people usually look for their preferred candidate in the "dating corner" and decide whether to make further contact after a period of time, and the time cost of this process is very high. If the elders decide on a blind date, they will generally arrange for the man and woman to meet directly, and only after the meeting will they decide whether they want to have further contact. Often in such cases, both parties are mostly very awkward and can see each other in the right light very rarely. This matching scenario is a little more lenient in terms of time requirements, and the accuracy is greatly reduced compared to organ donation. The range of options available to both men and women is larger and the scarcity is not as high. However, the time cost of preliminary communication and understanding between men and women is relatively high. Therefore, the matching strategy will be much narrower in scope than casting a wide net.

2.4 Matching in job searching

In these three scenarios, the job search match, especially the job search with high professionalism has the smallest selection range. There are two kinds of job search process, one is that job seekers widely submit resumes, and then the company selects people to interview for suitable positions; or the company first issued a recruitment demand to attract talent, potential job seekers submit resumes to apply for jobs. Different types of occupations determine the way to match the job search is also different. For low professional positions, often the company will have a wider range of choices. They will compare the work experience, professional skills and salary requirements of a large number of candidates to strengthen their options and ultimately choose the most cost-effective candidates. And for highly professional positions, both job seekers and companies, are in a very small range of precise selection. High professional requirements need to have enough

work experience and ability to get on board, so the job seekers who meet the requirements are destined to be a small group of people. And for those job seekers who meet the requirements and have high ability, the positions they are willing to choose to match their skills are also few. This two-way selection process is done on a very small scale. So, job seekers and companies often hire headhunters who use their premium resources to make precise matches between a small number of positions and candidates. These positions and candidates all share a common characteristic: a high degree of professionalism. Compared to the other two scenarios, this matching process is the most costly in terms of time and money spent.

Through the specific analysis of market matching in the above three contexts, this paper summarizes the following four factors that influence matching preferences: time constraints (urgency), precision, matching cost, and scarcity. The specific influence of these four factors on matching strategies is as follows: when time is urgent, precision is required, matching cost is low, and matching resources are scarce, people favor a wide net strategy, such as the organ donation scenario. Much more study is needed to explore the effect of matching cost due to its intricacy. For example, we may distinguish application cost from screening cost, and the two, themselves interrelated, could have different effect on the agents' matching strategy. He and Magnac discussed the relationship between application costs and "congestion" in screening, but certainly there are many more aspects to this question that is worth further exploration [7].

Conversely, when time requirements are more relaxed, precision requirements are not high, matching costs are high, and matching resources are relatively abundant, people tend to choose a more precise matching strategy. For example, in both the dating market and the job search process, the time urgency is greatly reduced, the range of options available is wider, and scarcity decreases; the degree of precision for matching is also much lower than that for organ donation. However, both are greater than organ donation in terms of time, effort and monetary cost. Therefore, the strategy of precision matching is adopted more often in matching. Among these four factors, time appears to be the most important factor that influences people's matching strategy. People will even compromise on a few other factors if they are in a very urgent situation. For example, in the two time-insensitive situations we mentioned above, spousal selection and job search, people's matching strategies change when the urgency of time rises. If women are not married when they have passed their "optimal" childbearing age, they are in a time crunch. They also tend to end up with marriage partners who are not as well suited. If a person urgently needs to find a job to make ends meet, his requirement for professionalism is much lower.

3. THEORETICAL DOUBTS AROUND MATCHING STRATEGIES

Although the conclusions drawn are largely consistent with the influencing factors of matching strategies in the previous studies, a few theoretical doubts have risen from the above application of matching theories to real-life matching cases. This paper will discuss these doubts as an additional remark.

The first doubt involves the “centralized” vs. “decentralized” dichotomy as is often seen in matching markets studies. It is understandable that game theory models should be kept simple for the sake of mathematical proof or simulation, but matching markets in the real world are often neither fully centralized nor decentralized. The boundary is blurred, as in the examples of the dating app and job search mentioned above. Often there is a platform which offers recommendation on matching targets, but agents are also free to contact his/her preferred targets. Therefore, such platforms neither run on the logic of centralized allocation or complete free-match, which raises serious questions as to whether theories featuring a dichotomous approach to “centralized” and “decentralized” settings could be truly helpful in predicting real-life matching behavior.

A second doubt involves the applicability of certain theories of matching in the explanation of matching behavior in reality. “Truncation” is one example. Despite the theoretical importance of this strategy as demonstrated in some recent articles [8], it is hard to apply truncation-related theories in real-world settings. This is because many matching markets simply do not involve preference lists. When agents use a rifle approach, narrowing down the scope of their targets in order to optimize the use of their time and energy, it is hard to argue that this strategy equals to “truncation”. Although both involve shortening the list, the rifle approach user does so not in fear of being allocated to a less-preferred partner, but rather acts actively to hunt for a better partner with the given limit of time and matching costs.

4. CONCLUSION

To summarize, people’s preferred strategies (shotgun or rifle approach) in matching markets depend on four factors: time limit, requirement for accuracy, matching costs, and rarity. It is expected that when there is an urgent need to match, or the difficulty of matching is well recognized by the agents on the apply side, the agents tend to take a shotgun approach to optimize their chance of getting matched. On the other hand, matching costs – whether of application or of screening – would tend to encourage the applicants to tailor and shorten their target lists. These theoretical expectations are in line with the conventional wisdom on matching markets derived from

researches with more advanced methods, such as mathematical derivation and computational simulation. However, there remains some doubts as to where current theories of matching markets can be directly used to analyze real-life matching markets. The applicability of the centralized-decentralized dichotomy and the notion of truncation are discussed as a final remark. This paper could be seen as an attempt of explaining people’s preference of matching strategies in real-life matching scenarios by drawing on concepts developed in various matching theories. The explanatory power and potential inadequacy of the theories are worth noting and knowing them may help us develop matching theories more applicable to real social settings.

AUTHORS’ CONTRIBUTIONS

This paper is independently completed by Zhaoguo Wang.

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REFERENCES

- [1] David Gale and Lloyd S. Shapley. College Admissions and the Stability of Marriage. *The American Mathematical Monthly*, 1962, 69(1):9–15.
- [2] E. Roth Alvin, Common and conflicting interests in two-sided matching markets. *European Economic Review*, 1985, 27(1):75–96 .
- [3] Haibo Wang. *The Current Situation of Organ Allocation and Sharing in China*, 2016. <http://www.cotdf.org.cn/index.php?m=content&c=index&a=show&catid=121&id=186>.
- [4] Sina News (website). *Connecting Algorithmic to Real-world Socializing: an Interview of Pan Ying, Co-founder of Tantan*, 2020

<https://finance.sina.com.cn/stock/usstock/c/2020-12-08/doc-iiznezxs5868684.shtml>.

- [5] Yinghua He and Thierry Magnac. Application Costs and Congestion in Matching Markets. CEPR Discussion Paper No. DP15082, 2020.
- [6] Janine Balter, Michela Rancan and Olena Senyuta. Truncation in the matching markets and market inefficiency. European University Institute EUI Working Paper RSCAS, 2014(07).
- [7] Peter Coles, Yannai Gonczarowski and Ran Shorrer. Strategic Behavior in Unbalanced Matching Markets. Working Paper, February, 2014.
- [8] Marco Castillo and Ahrash Dianat. Truncation strategies in two-sided matching markets: Theory and experiment. *Games and Economic Behavior*, 2016, 98:180–196.