

17-th Matching in Practice Workshop

Policy Table: Centralized Job Market for Economists

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Speakers

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Transcript

Caterina Calsamiglia:

Always in this matching and practice workshops we have a round table on a practical topic, and this time we wanted to discuss a topic that we have never discussed before. And that is very relevant for us. And if you think about it, so it is the economic job market. If you think about its origins in the 70s basically, there was nothing, no information aggregation of any sort. And over time things have improved with information about posts being centralized, then the application procedure being centralized, and then the signaling procedure proposed in 2005 by Al and the committee. Since then, there has been relatively little action. If you think about it, there has expanded how much we advise on many other markets, and we thought it would be useful to understand why we are not doing more than what we are proposing for others to do. In particular, why are we not centralizing fully the market? And this actually was triggered very much by Andrew Johnston, who was coming from the outside looking at what we are doing and saying. So, we are designing matching procedures for all these other markets. Why are we not doing it for ourselves? It seems like we should do it as well. And he was cautious enough to say: "Maybe we should just supply a recommender system, may be create the right data, and then we can start evaluating how well we can do or not". So, I thought it was an amazing proposal that was worth discussing.

So, I am super happy to have Andrew, but also to have a bunch of very knowledgeable people and people who think carefully. And I am hopeful that the audience will help us also in creating further discussions. So, we just have an initial set of triggers, so that people that have either thought about it or were happy enough to accept the invitation to think slightly about the topic. So, we are going to start with 10 minutes presentation – a little bit of either

presentation or thoughts of the different participants, and then we are going to open the floor, and we can all in an orderly manner discuss the topic. Okay, we are going to start with Andrew Johnston, who was the trigger of the whole issue.

Andrew Johnston:

Thank you so much. I really appreciate it. It is a real pleasure to be with you. I admire matchers so much. And it is a great pleasure to be among you, and to listen to you, and hear your thoughts and your feedback about how you could incorporate potentially matching into the labor market for economists. I think this is just a wonderful group. I should just say that I am coming at it from a slightly different angle, which is I am traditionally a labor economist, so in this area I am a pilgrim to matching rather than a priest of matching. So, I am just very much looking forward to learning from you all. So, today I am just going to outline some of my thinking on a feasible way to incorporate matching principles in the labor market for economists, and my adventures in this area started when I noticed how difficult matching was for both sides of the market.

So, very quickly, it is hard for candidates to credibly signal their interest to departments, and it is very hard for departments to figure out which candidates are attainable, in part, because they just don't have enough of the relevant information, they would need to know what candidate preferences were, and they would need to know the preferences of all of their competitors, all the competing employers. And the main thing that I would like to say is that there is a way to use the principles of matching to form a recommender system that helps to facilitate good matches between employers and candidates. So, you might think of kind of the prima facie question is whether it is a good idea, whether matching could reasonably improve the outcomes of the allocations in the labor market. And, in some ways, it is an empirical question where we would just need to study how those allocations worked with and without matching, and to what extent they were satisfying various goals. But I think that there is some intuitive experience that the ingredients for coordination failure permeate the job market for economists in really predictable ways.

So, in my reading, coordination failure is fundamentally about a lack of information. Candidates cannot credibly signal their interest, and without reliable information on preferences employers have to do a lot of guesswork. And their guesswork is basically this when they're looking at a candidate they really like, they are wondering who else will like this candidate, and will the candidate prefer us to the competitor, that employer. And here mistaken guesswork leads to sub-optimal matching. So, if you imagine the core or the solution, there is basically one candidate who is the best candidate that is actually attainable, that will actually accept an offer from the school. So, that is quite a narrow corridor for optimality, so maybe they are close to optimal, but I don't know. It seems unlikely that they're doing the exact right thing.

So, what could be done about it? You know, in some sense, the ideal answer is a centralized matching mechanism that resolves the coordination failure in full, but in practice markets don't tend to take up this option, because it's quite hard to get all the participants in a labor market to commit to living by the assignment of a match. So, one alternative would be to use the principles of matching to create a recommender system. And the virtue here is that it marries the flexibility of a decentralized market with the information value produced by matching. So, essentially the match recommendation would be aggregating all the information that we get from the preferences of both sides and provide some form of that

information to employers, so they know what is a set of the best attainable candidates, the candidates that the employer likes best, that are unlikely to have a dominating option that the candidate prefers. So, how would you generate these recommendations? This is just a simple way to do it, which is how we did it in our little pilot. Like other matches, we elicited the preferences of candidates for employers and of employers for candidates, and what we want to do is provide a list of recommendations to employers ranked by match quality however defined. And so, the way to do that is to run an iterative match, which is simply to take the preference rankings, run Gale Shapley and produce the typical set of matches, and this first solution would provide the first recommendation to employers. And then you would remove all the solutions from the ring. So, say, I matched with Barcelona, I would be removed from Barcelona's rankings, and Barcelona would be removed from my rankings. Then, we would just rerun the match, and the match there would be the second recommendation to employers. And then we would just iterate that 30 times, perhaps, to recommend candidates for the interview stage, or maybe 5 times to recommend candidates for the fly-out stage.

So, let me just walk through a really simple example, if I have a second to do so. Let's imagine that Pompeo has lexicographical preferences, they just prefer people in alphabetical order, and so this is a simplified kind of universe of five candidates. And so, because their preferences are lexicographical, they prefer Anthony to Benedict, Benedict to Cyrus, Cyrus to Daphne, and Daphne to Eloise. And, say, we put this through the recommender system, and it produces the following list. So, here Cyrus is recommended first because Cyrus is the best candidate that wasn't preferred by a school that he preferred to Pompeo. So, we call him the best available, and then these other candidates are sort of trembling hand recommendations. So, imagine that Cyrus isn't available, his preferences change or the school's preferences change, or he dies tragically. Who are the people that would make likely suitable matches that are not Cyrus and those that came through after removing Cyrus, and then removing Benedict, and then removing Daphne, and then removing Eloise? And I can say a little bit more about that at the end if there's interest in who these backups are. So, it's useful just to think about what's the point of maximal benefit for introducing an intervention like a matching recommendation. So, if you think about the market as kind of a funnel where you start with all the applicants, and you funnel down to the interviews, to the fly outs into the offers, you could provide recommendations any of these arrow points: one, two and three - so kind of between the stages. And later in the process preferences are probably better formed by candidates and employers, but earlier in the process much more selection takes place, and it's kind of permanent selection. If you're not interviewing people at most institutions, it's very difficult to go back and add them to the flyout list, for instance. And it's also important to use nodes at which the market is already coordinated in time. So, there isn't a natural clearing date, for instance, after flyouts and before offers, but there are natural concentrations in time before interviews, because of interviewing at around conferences and immediately after interviews they make a very natural point for intervention. These are kind of very typical good questions about a recommender and whether it's a good idea.

Dorothea Kübler:

Thanks a lot Andrew. I think it's a very interesting proposal, and I would have liked to see your last slide, but maybe we can see it later on, and I only have a very few comments.

Maybe taking a broader perspective, first. So, first of all, I mean given Covid, I think we are probably undergoing a change in how this market is going to work. I will be interesting to see this. But my impression is that departments will rely more on Zoom interviews in the future, than they had in the past. And because it has, of course, apparently lots of advantages, you can have the right people interview the candidates. Because it's not only the small group of people who goes to the meetings, but it's the experts in a field who can actually be present for a certain candidate. So, it has advantages in that respect, and that might increase the number of interviews, that you can be doing, and that, of course, will aggravate the congestion problem, if you think about whom of these many interviewees should we now fly out. So, I think doing something about this might be very important and might become even more important. Okay, and so I think it's very interesting to think about it.

Now, one thing I was thinking about was from a European perspective of course. We have now established our own job market, which is always run in December, and it is going to take place in Barcelona this year. And one question is, of course, how to deal with this feature, that there are basically two events around which interviews will take place. Now Zoom might make these specific dates less relevant. So, there will be a maybe even longer period over which interviews will be conducted, and, of course, for such a recommender system, that you are thinking of, one should think about how to unify that in some way. And my third point is something I think you wanted to talk about now on your third slide, and that's what are the incentives of people to participate. I think that's a very important issue, and I haven't thought about it enough, I must admit, but I want to stress one aspect.

So, if it's all and this is based on experience with the German system for university admissions, which is based on a DA mechanism, but where participation of universities and of programs is voluntary. Okay, so, what this means is that over time participation has increased, but it's still the case that many programs are not part of it. But this is not a recommender system, but this system produces the matching. Now what happened was that the first-year programs were just making as many offers as they would make not having programs outside of the system, which meant that they could not fill their seats, because lots of people then rejected these offers, because they had outside options, so to save from programs outside of it. So, the universities now had to learn, that in spite of this being a DA mechanism, they have to overbook a lot. Actually, because there are all these outside option programs, right? And this effect of having voluntary participation, making it quite hard actually for participants to learn how to deal with the fact, that not everybody is part of it, is something that I think would be very important also to factor in for this recommender system. What does it mean if only a certain portion of students is actually taking part, so that there are students who are not in it? How should I deal with that? And, similarly, of course, for the students. So, I think this is a practical aspect, that might be quite relevant and, of course, this has to do with the question of what the incentives are, how many people will participate, which is a much deeper issue that I'm not going to address, but I'm sure others will talk about it. So, these are my three comments.

Itai Ashlagi:

So, I think a recommender system is interesting. It's also relevant in other marketplaces now, like in the residency matching, there's a lot of complaints about lots of requests and lots of interviews. But in the residency or fellowship matching what's going on is that lots of

doctors are interviewing in many places, but they don't pay for their interviews. In the academic environment we fly them out, it's a slightly different story, so we have less incentive to invite a lot. I agree with Dorothea that at least, for Skype interviews or like initial interviews, it's gonna change. I think a lot more even American universities will start interviewing online now, and not everyone, but it sounds to me very tempting not to go to the AA meetings and just do the flexible interviewing online, but let's see.

So, in the in the residency managing I have a little bit of so, we wrote a short perspective, and working on something related now, but over there having, for example, a signaling market is not enough to help doctors to decide where to go to interview. I think here the interview match, what it helps is to somehow give confidence for both sides, that both sides are interested. So, in the signaling, when we send us two signals, for example, in the economics job market, that shows interest from the student, from the candidate, but not so much giving the candidate a lot of confidence not to go on interviews that they got invited to. And I think that's the issue of having too many interviews, but now in the academic job market having too many interviews is not so much of an issue, there's a few people who get a lot of interviews, but I don't know if interview recommender system in a job market is gonna necessarily resolve this, if departments should know somehow, whether they have chances or not better than in places like the residences. Yeah, I think it's a good idea for initial interviews maybe to help signal more interest from both sides. For the actual flyouts I think there's a lot more information that departments can figure out beforehand, and maybe a recommender system is less of interest. And definitely there's the issue of competition where it's going to hide to get everyone on board to participate. I don't know, but it could be an interesting experiment. I know also, that in the Israel law market for residencies, they try to do something like this. Saffron has been writing about this, that some sort of recommended, that's all over time different kinds of law firms joined it starting from the most prestigious. I'm for not mistaking but I'm not 100 percent. I think in the academic drama there's just so much more information about both the schools and the candidates, and which would be harder to get everybody on board.

Laura Doval:

Hi. So, thank you for having me here. And hi to everyone. And thank you Andrew for suggesting this and also for the brief presentation. I'm very young to have many opinions on the job market, but I guess Andrew said something that really stuck with me, which is we could potentially be accumulating lots of data on how actually, how bad or good our job market is running. I think we all know someone or have our own version of a horror story or not, but we don't know necessarily how bad the inefficiencies are, the miscoordinations are relative to what we think. And I think that something in quote-unquote intervention, that we could think of doing to understand what parts could use improving, could be just to get data, try to form a database of where people are interviewing, where did they apply, because you could imagine like lots of people applying to places that they would never go to just out of the panic, and because it's free to apply. And even if that doesn't necessarily generate an inefficiency, you could think that for some departments having to go through many applications that potentially they are not going from candidates that are not really interested, that's already like a sign that things we could improve, but it would be good to have a quantitative sense of the degree of congestion or miscoordination beyond the anecdotal evidence. I'm not saying that it's not there, but I think looking at the data might

help us understand what part of the process needs improving. And one thing I agree with Dorothea that there's a practical thing of not only having the schools participate and understand how this works, but also what I would worry is what are the implications for the candidates, because you could imagine that they go to an interview, they interview this person, they are super excited and all of a sudden this person doesn't appear in their recommendation, and they might negatively update, so there's a lot of like signaling and information and like things that we would model best through non-cooperative behavior, that I'm not sure how we could incorporate it, how to make it safe to participate. I had former classmates from the PhD asked me about these aspects of Andrew's proposal, and this was a big concern, like how the message will be, or the lack thereof would be interpreted. And those are my two senses. Thank you.

Alex Teytelboym:

Thank you so much. It's hard to go last, in part because everything interesting has already been said, so I can just repeat the interesting things, but I'm grateful to Caterina for inviting me to this. Let me throw a couple of random intellectual hand grenades and see if they kind of explode or not. So, one is kind of echoing what Laura was saying, which is: do we actually have a problem? I mean compared to other disciplines, we run the most extraordinary job market of anybody, I mean, from physicists to historians. Nobody seems to get it as right as I think we do in economics. We've centralized the things we've thought we could centralize, we've kept some things enjoyable, like going to the AEA's and doing interviews if you've done that. And it seems to work all right. We have about a thousand candidates in a thousand positions, and the markets clear. And so, maybe actually the problem isn't there, so I think it's actually important to know that do we actually have a problem to fix. The way I thought from Andrew's presentation, this thing would work as a recommender system, and, you know, since maybe this is one thing, brainstorm is a kind of a typical way in which a lot of data startups work, which is in order to be able to get access to the data you have to contribute the data, and that typically induces participation quite a bit, right? So, I've worked with a forestry startup, and in order to be able to get data on other people's kind of land you have to contribute data on your own land, and so that's basically the cost of participation is submitting the data to them. Then they get crunch it, and they give you some database product that's on the base of it. This is very similar, right? You can imagine that in order to participate rather than having to pay something what you're doing - you would be paying in data. So, in fact I've just got the email came in 10 minutes ago, which is about the job market placements of candidates from Oxford. David, congratulations. And we could submit that kind of data maybe on the course of the last 10 years, which, of course, most departments collect, we could submit it to Andrew. And then he could crunch it and then actually give us something useful from the bigger database that he would have. So, I think that would work.

And so, here is a couple of things that I think makes this a little bit more complicated. One of them, this is maybe salient to some places though not others, is we actually in Oxford, for example, hire quite a few positions every year. And I know some places only hire one position usually. But I think there's quite a few universities that hire many positions. And with that it's not just our preferences are basically not really responsive. You cannot as much as I wish to hire three perfect brilliant micro theorist every year. You have to hire people in macro, and you have to worry about other constraints, of course, like diversity constraints

and so on. And all of these things, when you have, I think, two or three positions, every university thinks about it as a kind of portfolio problem. And so, actually submission of preferences is very difficult for the universities. But I think it's also difficult for the candidates. It is actually very hard to rank 100 universities, right? When I was on the job market, I made 110 applications, I would find it very hard to rank, you know, the vast majority of these.

And the other issue that comes with it and that's again part of the kind of slight skepticism I have about how easy it's going to make this product fly is the complexity of contracts that you often have. So, Oxford is quite peculiar, if those of you know, we kind of have department jobs, but they're tied to colleges and so very complex contracts, because they're really between two employers. But it more generally right - you bargain with your employer over all sorts of terms, so you might bargain over salary, over research allowance, over teaching reduction, etc. And these things are not typically going to be made public. I definitely do not go around telling people what my research allowance is, because it might be so enormous that it would warf your salaries, right? It was obviously not, but this obviously happens in some universities, that some of our colleagues have research allowances larger than other people's salaries, and so this data is hard to get, and I think that affects the ranking, and that, therefore, affects what you learn from the data, right? And so that's a kind of big source of potential error, and that you get.

And then, the last thing I think it's been raised, but I wrote it down beforehand. Then, I thought I was going to emphasize that kind of the timing is a crucial thing. I think preferences actually change across the job market. I think we like to think of them as being fixed, but I really think that it's not just resolution of uncertainty, I think there's a kind of you start out by thinking or we would like to, you know, get a macro person and a micro person, and a historian one year, and then you realize that maybe this is not the best year to do that, and you start thinking actually maybe I can move some resources and actually end up having a couple of micro theorists instead, right? So, some of it is, of course, resolution uncertainty, but other is just, you know, kind of the universities adapt. So, it's hard to know exactly when this happens, and that's another thing that seems to add the error. So, I hope it was not too pessimistic, because I am trying to problem solve it, right? So, I'm suggesting how it could work, but I think it's actually quite a difficult proposition, and, in any case, we need to kind of definitely know, like Laura said, that we have a problem here to solve. Caterina Calsamiglia: Very good. I think it would be interesting whenever we think about our own market to think about how different is it, how different are the problems that the economist market has, how are they different, what the school choice or any other matching market has, you know, the firms also have multiple positions, and schools definitely have more than positions, and peer effects definitely are a huge problem, that we're sort of ignoring, because it's very convenient mathematically. So, there's other responsiveness and information about the other side you don't have either, so submitting an exam is a problem, so I think many of the problems that we think apply to us - apply to other markets. So, the reason why I'm super interested in just thinking about it is because it will humble us down a little bit more in maybe understanding how the other markets [work]. You know, it will make us better understand what the challenges are, and maybe improve the way we can provide advice. It will make us more sensible to things because many of the problems are just very similar. And just very briefly, when I got out of the market, I was not a matching person, but then I had to choose school for my kids, and it was a centralized procedure, it was the Boston

mechanism, and then I played it, and I saw the papers about it, and I was like “Oh my God, what are these people talking about?”. And then, that’s how I got into it, and that basically all the papers wrote or basically about my experience. Okay, so, I think knowing well the market just makes you more aware of what the problems may be, because you just have all these things very much in you, that basically will not allow you to say that certain things are not important, or will not allow you to make certain assumptions, because you basically know these are too big to do now. So, I think it’s a very-very interesting exercise to do, even to arrive at the conclusion that maybe we should not be recommending matching procedures so abruptly, maybe we should be recommending more recommender systems, and then slowly understand the markets better and have enough data. Do you really have a problem before I come in and say you must have a problem because I am a matching person and I really want you to have a problem, because I want to give you advice. So, I just think, whenever we say anything, it would be really interesting to see why this is not like a big issue in one of the main applications that we tend to provide advice to. So, I think now it’s time we can just participate.

Utku Ünver:

Can I make point about these very interesting things? So, I just saw the screen around it. So, these are very interesting questions. Of course, I’m a bit older than many of you here, so I’ve talked about this problem very early on, because I literally started working on matching through labor markets. And one common issue of those labor markets we see is that where they use centralized matching mechanisms, actually all the entire stages, the things we are right now talking about, centralizing or creating a clear outs, are done in a very decentralized way. There could be some common boards, but these are like I’m thinking about, this NRMP matching or other kind of young professionals to very highly specialized markets like federal clerks etc. in for appellate judges in the United States. So, interviews are not really centralized in those places, but just the matching stage, the last stage, where you rank the people in a list, literally centralized, and under match is created based on that. So, and all this information feature, of course, our market is not as temporary as those matches where it lasts only a couple of years. This leads to a much longer term commitment, maybe lifetime commitment, at some cases after tenure etc. So, there is more information issues literally, maybe that could be a result in even the interview stage in our market. But my thoughts had been that - do we have problems in the coordination clearing stage, in the second stage, where after all the interviews are done, all flyouts are done, I believe that we have issues in that, and the way we make offers in the last minute, there is a problem even in that stage. I believe that because, again, Laura is absolutely right, maybe this is just an anecdotal feeling, but the way how we rank candidates, how we go from candidate to candidate, even if we are going to make three or four offers in a row, there’s this ordering and there is all this timing issue of other people’s offer is going to expire, this happened, that happened. Even that stage has a lot of problems. So, even creating an orderly stage for that, which, due to reasons Alex thought about, are quite difficult, could be a big improvement. And I mean I agree recommendation system is for the whole process, the recommendation system is very nice, very good but I would like... I mean, what do you guys think about, in general, about just the clearing stage, not even the other parts?

Itai Ashlagi:

I do think in the clearing stage there are issues, but at the same time it's going to be hard to get candidates who now... Suppose they're getting two offers, whether they still want to make decisions and take the time to figure out to visit. And I don't see, at least, in many universities or many candidates stopping the recruiting and exploring more your options. There may be some way, I'm not sure, if a clearing match will solve this, but there might be a different mechanism to try to speed that process. One thing I want to say about, a little bit cynical, when I look at the successful stories of market design in sculptures, I'm kind of maybe shooting my own brand here, is that the success stories of centralized matching are in places that people really have to match, like kids have to go to school. And then we have a fully centralized system, and I agree with Utku completely that a lot of the information is aggregated much before, in that stage we don't understand a lot. And I think there is a lot of value to see if there's a lot of congestion in the interviewing stage. For a clearinghouse it's not that someone really needs to get to hire a new faculty, a department really has to hire a new faculty. Otherwise, they would just hire someone and figure out, or a student has to get a job. There are all kinds of the outside options. In schools we really need the kids to go to schools, and that's I think a huge difference. And then I think the national residency matching program is similar. They came up with a system because they really needed to place those doctors to fill positions much more than we need to feel faculty positions. But I think there is a lot of still congestion in the interviewing stage that could be.

Bobby Pakzad-Hurson:

Thanks everyone. This is super interesting. I wonder if maybe I could summarize a couple of the things and use that as a question. So, it sounds like there were a lot of concerns kind of by Alex and Laura. Well, you know, the game is maybe a little bit more complicated than we think, it's hard to know how to express preferences fully, so maybe we shouldn't be too hasty, which I guess kind of really persuasive. I guess the concern there is like why are we telling other people what to do. I think Itai's point is a good one, where maybe, you know, we can be a little bit picky in faculty appointments. But the other thing is that it seems that the purpose of all this stuff, and we've kind of moved in the direction of a recommender system in this conversation. It seems like we might be able to use a matching algorithm to centralize information somehow. And I guess if that's the case, why are we doing it this way? Right, so, if our goal is to centralize information, presumably, there are better ways to centralize information than running a matching algorithm, because there are ways that we have, that are specifically based on centralizing information. So, I wonder in a market like faculty admissions, where we have something that looks like very correlated preferences on one side, we have something like a Serial Dictatorship, in that sense, even if we ran a centralized matching mechanism. It doesn't seem like there are too many coordination problems that would arise once we have the information. And so, my question is if the role of everything we're doing is to centralize information, why don't we just forget all about matching practices and then do some kind of information aggregation system explicitly for that, and then let people do very decentralized dictatorship, which I think would lead to maybe a good allocation?

Alex Teytelboym:

Thanks, I guess, it's just a reaction to what Utku said about, you know, is it like the appellate judge's thing, and we can do the centralized matching at the end. It really does feel

like, I mean, maybe my experience is special, but I doubt it, the contracts are very multi-dimensional here. There are so many terms that you do, kind of need to handle over, and it's an issue of both convincing the universities to reveal what you're allowed to bargain over before the bargaining even takes place, and actually for people to try and, to make these contracts explicit. So, as I am presumably with the appellate judges, there isn't too much negotiation. You just get matched to a judge, and there's some salary that comes with it, right? The problem is it we have a lot of terms, and these terms are very employer specific, and maybe even employee-employer match specific, right? So, there are certain things that Stanford wouldn't negotiate with Laura, but they knew what they would negotiate with Itai or whatever.

Utku Ünver:

So, if I may just very briefly, because it's an important point. I guess this for the junior market, so you were an associate professor, you don't count, Alex. So, for junior markets it's kind of, I used to think, it's of secondary nature, of course. Maybe I was so in the bottom of the letter, that it didn't matter for me, but it depends, yeah, I mean I hear you, but again it goes to the ethics point and also Caterina's point. What are the important differences, and how can we even agree what the important differences are. Yeah, anyway, thank you.

Tomás Larroucau:

Thank you, so I went on the market this year. So, I've been thinking about this centralization quite a lot. It was a super tough market, a lot of things didn't work out that well, as you may expect. So, I have some thoughts about this. So, first, I think we're being a bit idealistic with respect to the baseline, even though I agree that implementing this centralization is not going to be exactly DA in school choice. For instance, from the perspective of candidates, I applied to 150 places. And I have classmates who applied to more than 250 places. Some of those interviews were even for practicing. So, they were not even intended to be a final match, it was just a practicing to improve in the end, in the interview stage. Some candidates have more than 50 flyouts, and in the end they are going to go to one job, right? So, there is a lot of waste. And they are going to be winners and losers from the demand side. I suppose top universities maybe don't want to get constrained with the centralization, middle tier universities and low-tier universities could, I believe, benefit quite a lot. My impression is that what we have to avoid at the most is the problem when some students fall through the cracks. People think that they are going to be super successful or whatever, then they don't interview them in the market, and in the end some of them don't even get a job. I have classmates who didn't get a job and I believe there are several universities that could be super happy to get them, but they are locked in already. And, finally, I just want to say that for the offering stage, I believe, that there are two, at least, problems that could potentially be solved. I don't have it completely clear in my mind, but one is this problem of the timing of the offers. So, in this year, for instance, several universities even in the top 20s were waiting 20 days, for instance, MIT to make their first offer. So, if there were some ways of coordination in the ordering of offers, maybe we could resolve something, because there is like a Stackelberg game going on. And, to say that maybe there are incentives to do something, like this in the US, to the extent of my knowledge, is that for the PhD admissions there is an agreement for the universities that actually at the end, I think is April 15th or May 15th, something like that, the offers are valid, so then you

cannot make exploiting offers. That is something that also other universities exploit due to uncertainty. That's all those are my thoughts.

Nick Arnosti:

I think there's so many different interesting angles being brought up. I would say for me I'd like to zoom out and go back to some of the questions that Laura and Alex raised, which is basically what are the problems that we would hope to solve with the centralized system. Because I'm very open to believing that there are a number of problems, but at a high level it seems like one concern might be that we're finding the wrong match, say, an unstable match. You know there's a candidate who doesn't get a job even though you know universities would have liked to hire them whether there's a university that doesn't fill its position, because it interviewed the wrong candidates. A separate concern is maybe we're finding a reasonable match, but in an inefficient way that requires candidates to spend a whole year of their life, you know, searching and preparing for interviews and requires many faculties to spend a lot of time interviewing candidates that they're never going to hire. And I feel like the set of solutions that we would want might differ a lot depending on which of these problems we think are most severe and which ones we're trying to solve and maybe that relates to Laura's point of trying to get better data on this first, but I think it's really important to just start with what is the problem.

David Delacretaz:

Cool. So, that gives me the perfect transition, which is to me having recently been on the job market the biggest problem is the timing, the issue that Alex can testify, because he was on the receiving end of some panicked phone calls during my job market. That situation where, as a candidate, you have an offer and there are quite a few, I think, exploding offers. This year to try to take advantage of people's risk aversion you get this exploding offer. It might be a decent option, not to say your favorite one, but your favorite one might not be able to give you an offer until that one explodes, so you have to take those trade-offs depending on how high risk-aversion is. I think you all understand the issue, and to me that's the biggest problem here.

The information aggregation... I found we're pretty good at that, I mean, it's not easy, but we're pretty good. Everyone has a job market paper, you can find everyone's website, we even like the European economic association - is something super cool this year which was the best candidates to do a 10-minute presentation of the job market, the candidate that you can find information about, about departments. To me these are not the biggest issues. To me the hard part is the decentralization problem, the fact that offers come at different times and you might have to make difficult decisions, and so, to me where a centralized market would make sense would be at the very end. We do all of the interviews, we do all of the flyouts, just like we're doing them now, but we have a set time, where you know by a certain date, we finish all of those interviews, all of those flyouts and the AEA has been giving some dates, at least some target dates, for this sort of things. And after these places can make offers, but those offers might not be definite, you could agree on some terms, you could as a department say we're interested in hiring you. Here are the terms that we could offer you, so that also goes back to what Alex was saying about the fact that we need to agree on terms and these terms are important, so we're going to pay you this much, just like we make offers now, but this offer just allows you to compare different offers and rank the departments,

rank the offers in preferences, the departments can rank the candidates, and then centralization might make sense at this point. To me from my recent experience and trying to think about, this is the place where a centralized market would make most sense.

Camille Terrier:

I completely agree with the David's point. I think that was a very good point. But the comment I had is... So, I think one of the differences I see between the job markets and school choice, for instance, is that in school choice all the schools or at least all the public schools participate, because there is a city forcing everyone to participate. And I think a big difference I seem to perceive in the job market or the market for economists is that not all universities have the same incentives to join this kind of centralized scheme. And even if you drop the top 10% of the universities, who do not join the centralized system, then you would run DA on a partial market and the prediction you would have wouldn't necessarily be accurate. And I think this raises some important ethical questions, because either you have the whole market and then your prediction is good and you can use it, but using a prediction which is not so accurate, I think, it seems a bit problematic to me. And from my experience, I think that when I was saying that universities seem to have different incentives to participate, I think that the top universities, American universities, they seem to be pretty happy with the way it works. I mean, they receive applications from the top candidates, and they end up hiring top candidates, and all the top candidates are playing there. I think that we have seen very strategic behavior in the second-tier universities, who need to be strategic, because they cannot have interviews only with other candidates, and they cannot invite only the top candidates. So, I think that there seems to be very clear differences in the incentives that they would have to join this centralized scheme and I don't know if this is something you've considered, Andrew. Yeah, I like Alex's suggestion of how to encourage universities to participate. So, in practice, I think, it's a real question.

Andrew Johnston:

Thanks for all these wonderful comments, they're super helpful and enlightening. I just wanted to respond to a couple of them. Some of them were directed at me or I felt like I had something I could respond to. So, I think the most central one "is there a problem at all?". And I have two kinds of evidence: one is just my private sort of experience, and the other is some survey information that we collected after running the pilot a couple years ago. So, for us, we're always astounded by who was attainable that we had top coated at the end of the market and we're always astounded who we were pretty confident would be interested in us and they had a wonderful market that that just blew us away, so that's from the employer side. From the candidate side, I just know so many kids, especially kids coming from great programs, and they're not good enough for the top departments, but for the middle departments we all think that they're too good. I have a friend, and he had a top publication. He has had two more top publications since he graduated a few years ago and he had no fly-outs. And when his advisor was contacted by the schools that hadn't flown him out, they thought "oh, well, we just knew that we were never going to get this kid". And so, what you know a school that flew them out and they made an offer the same day, because they were, you know, obviously it was very good. I do think that there's just a lot of slippage.

And then, finally, we surveyed departments after and a lot, so I agree that at the top there's less demand. So, Harvard and Princeton and, you know, Chicago, they know, at

Stanford especially, probably because of the weather they know that they can get basically, they can fly out the whole field of people, and someone of those is going to be very interested in their offer. But even a little way down, I've heard of northwestern that they have been surprised by the people that turn them down for preferences that couldn't have been known - geographic preferences or urban / rural preferences or just sort of idiosyncratic preferences for institutions and department structure... I think that probably the best criticism of the recommender is how it doesn't work very well if the top isn't participating and can you plug that hole by inputting synthetic preferences, where you kind of imagine who they would be preferring and just plug them in if they don't participate. So, I can't remember the name of the person, they made a wonderful comment that how do candidates... Should they be in fear if they're not recommended at a place they had a good interview. And in practice if they're not recommended at a place it's because that they had a good interview that they were interested in, and that the other department was interested in them it is only because they were recommended at places that they preferred more, and if you are really worried about the privacy aspect, do I reveal the fact that I wasn't interested by not being recommended it somewhere that was very interested in me, you can implement a differential privacy scheme by which you randomly omit one-fifth or something like that of the recommendations so that a department can't infer that you weren't interested by not being recommended.

The incentives to participate... I think that it all depends on the quality of the information improvement provided by the matching. So, if there's lots of heterogeneous unobservable preferences, then there and I think that's what we learned from the survey was that departments were very interested because they were as we are always astounded by who was attainable that they had top coated and who wasn't attainable that they thought was well within their reach. There was a question about how do you rank 100 schools or 500 candidates. I think this is a very important question. I think the solution would just be that if you can rank them into bins so you can have a first bin a second bin a third bin and you can make those as small or as large as you'd like and then we you know the matcher would just randomly assign the order of those schools or candidates within each bin and there's not much better that you can do about that but if they're indifferent between them, then it shouldn't matter.

The diversity constraint, I think, is really important. What I'd say is that the recommender system is going to tell you which candidates are the best attainable, including which diverse. So, we've gone after diverse candidates and then found out that everyone else was going after diverse candidates, and so if you with the match, if it is a good recommendation, it's going to give you some information, some light about which of your diverse candidates are the best attainable. So, it might actually be successful promote. Instead, I do think there's a coordination failure on diverse candidates. In particular, I think so many people are trying to get them at the same time that it can be that everyone can fail at the same time if they're not coordinated well. I would think that it would be great to coordinate after the flyouts, it's just very... I think all the incentives for participating are especially eroded if you impose a fly-out coordination period, in part because the administrative timing of different institutions is so different across places, and because there would be an incentive to just avoid the match completely and make exploding offers before the coordination date. So, while I think that that's a point where there's a lot of sort of strategy involved. I think it would be really hard to implement.

And then there was one other thing I just wanted to say. With that in a recommender system a candidate is more likely to receive offers from more similar schools, flyouts from more similar schools. So, whereas now you might have a flyout at Princeton, a flyout at Alabama and a flyout at a community college at once, you're much more likely to have sort of flyouts that are concentrated in your best attainable range than all over the map. So, the difference is if one school doesn't come out and the difficulties with timing are actually much smoothed, if all of your flyouts are more similar to one another and there are more and they're all in the in the more attainable range.

Alejandro Robinson-Cortés:

First of all, I was in the market last year and this year was the first time that I was able to see the other side of the coin. It was super interesting when I realized how in my experience, how... My feeling was no one knew anything. As a student, I thought that universities had a lot more information and then since my experiences here I realized that. What I'm hearing now is that universities also struggle to know a lot of information. And then another thing that I experienced in the job market, that I'm experiencing now, is how much we don't know anything about it. So, like there're a lot of rumors and everyone knows stories, so the point I found most interesting was the data. So, there's databases and I had this idea about a way to incentivize schools to give their data, so that someone can look at this data. And I think that's the question, I think it's actually something we should ask and probably answer before thinking on to do something that changed the market and could have very...

There is a terrible unintended consequence that could mess up with people's careers. I mean, it seems to me that there's room for things that seem they're of exhausted right, so like if people have mentioned exploding offers. You know people going through the cracks, you know jumping, you know like typical things we already know about matching markets happening, but something that caught my mind was, for example, that the area already has a lot of this information. So, for example, I got a survey asking I don't even remember what the interviews or flyouts, and here I'm gonna, you know, provide [] a bit transparent, but I decided not to answer, because it was just spam. And then everyone you know, everyone has its own market, and these are things... I mean, many people have said it right like you don't want to tell your research allowance to other people, maybe you don't want other people to know your flyouts, maybe your colleagues you don't want to know, you don't want to be telling people where you declined an offer from... So, this is data that is quite sensitive, and in the profession not everyone is fully comfortable with getting this data out of it. So, I thought that actually just thinking about how to aggregate this information so that someone can actually study and see if there's room for improvement. It's an interesting question, that's it.

Caterina Calsamiglia:

I still think every point that you, guys, have raised, you could still find that case where we're ignoring that for some other market. So, the fact that where there's all these outside options definitely true for any market that we look at, now there're outside options to everything, so even partial seeds are in some, in Cambridge and so on... It's only partial part of the seats that are assigned through a centralized procedure, and we still ignore all of that in the theory. So, the only thing I'm saying is that use all these things, because they can make us better matchmakers in the future. You know, all the things that you like, take it further.

Think about why all these things you know make a difference or not, why are these, why does this lead to us saying we should not use it and what would be the problem of doing so. I think we need to... There're all these things that are coming up and I would like to take each of the ideas and follow it truly. And I think there will be tons of papers that could be written about this. So, I'm super happy about that, so thank you very much for all the discussions.

Laura Doval:

I'm not sure after what Caterina said if I have something really to add, but my concern with the students, welfare was not like privacy percent. And I think that this actually has to do with Bobby's points that in general to aggregate information or to give recommendations, giving point recommendations is not necessarily great, because this might leak more information than we want to. So, there are other ways in which we know there. We know nothing about DA as a mechanism for aggregating information and so it might be that if that's what we're worried about, there are other things to do. And my concern was not privacy, but we're giving a point recommendation to a school in a setting where you might not want to reduce it to that, because that you're not the school's best choice doesn't mean that at the end of the day when we actually find out how many offers we can make and like it could be that my first choice realizes that they cannot make an offer and then I would have been very happy at taking a job at my second choice. But I now accidentally told my second choice that I'm not the best thing attainable for them and these are the things that we should be worried about when we're giving these recommendations. And if these are in the minds of the students, this will affect the reporting and then this will make the system be worse at giving recommendations.

And I guess... I totally agree with Caterina's point that there are some things like outside options that we don't model in school choice, but they potentially should be modeled. But I do think that I won't compare this to the residence matching program, especially because it seems like a lot of the information acquisition that we're doing is what Utku have mentioned this... That it's for a potentially long life matching and this is why this is a way more complicated decision than being going applying to some place to be trained in a particular field, but it will also be that I'm not a doctor, so, I don't understand the big implications. But I think that getting it wrong and it might be that getting... My impression is that getting it wrong now might be more costly than with the residence program, but this might be just talking out of ignorance.

Caterina Calsamiglia:

The other thing is we don't know whether we're getting it wrong, so we may actually be getting it much worse than the doctors, even though it's such high stakes, no? The stakes are super high and we're doing it worse, because we haven't really... Or no, maybe we're doing a very good job and we should just be aware even if the stakes are lower. Do this other way, because it's a better way. I mean, we have a very... Information is centralized, the interviews are centralized, but then there're the signals. It's like such a... I don't think we've recommended any other market to look like ours, no? And so, I think we should use all of that to extrapolate and understand more, like can we do better. Maybe we're just doing excellent, but then maybe there's some learning to be done. So, whoever wants to be in the AEA should submit data. You were talking about enforcing, making all these things compulsory. Maybe we can say something like this. Can you, please, all provide your data, we

really need this. And Andrew is gonna be anonymizing everything to make sure that all the concerns that we always ask everybody who should give us data to ignore, we're not ready to ignore ourselves. So, I think we should just get data and start really thinking about whether we do have a problem. Maybe we don't, but some people seem to be willing to spend some time thinking about whether there is a problem. I think there's a lot of people who think there is a problem, especially the lower-middle tiers of both sides. But in any case, there're people willing to understand whether this is the case, and I think any learning will be having lots of implications for all the other advices that we provide on others.

Estelle Cantillon:

Thanks a lot for this roundtable, very interesting. So, I just wanted to go back to your earlier point, Caterina, about what in all of these other markets we do have some of the features that people have been using to argue why we want to keep the market as it is. I think that there are two first types of answers that have been given. One is that some of these issues might be first order, and there might be second orders in our market... So, I think Laura's point saying that for residency it's only a short term versus a longer term is one example. The other issue is what's feasible, can you impose participation, what are the outside options, so these are points that have been made. One point maybe that hasn't been made is the issue of path dependency. In some ways these markets have been evolving to fix one problem at a time and once you have a market existing as it is, it may have problem, but it creates winners and losers to any improvement anyway, right? So, when you move from one market organization to the other, there's going to be winners and losers, I think. Tom's also mentioned at this point some of these two, and so maybe there's one optimal organization. But given the way these different markets have emerged in school choice, residency and all of these things, the path may not be leading to the overall optimal outcome, because of this path dependency.

Alexander Nesterov:

So, the question is why don't we start small if we understand the benefits? At least theoretically, it should still remain beneficial for any subset of the market. So, if you hire someone and I hire someone, we better do it collectively. There are many caveats to that. So why don't we actually see any association that does it that way? On the negative side, I see that even with my university there are several departments, several campuses in different cities and it is already difficult here. So, we actually want to hide what we think about the candidates from the others. On the positive side, the schools that are more experienced, the top schools, for instance. I think they are communicating quite frequently, although I don't know, but that's my expectation. So, over a year or so they actually share which candidate they like more, and they share this information. But if there are some, maybe among us, maybe not, if there are some proponents of this centralization and information sharing, let them speak up and then try it next time. And then see if others join. That will be an improvement and an interesting case.

Caterina Calsamiglia:

I think we've thought very much about the dangers, no? Like what if I'm not in the list and like this other department wants me, and I want them, and I'm not on the list, but think about the other cases as well like they really think. I'm never gonna come, but then I'm in the

list, so it you know... I think it can go both ways. I don't think we know; I think we should just really get the data and think about what data is okay to be collected so that we can start learning something. Something that they could start with small questions. I don't know, but I think we don't know, and I think there're possible dangers and there're possible benefits. There're winners and losers for sure, as Estelle was saying, but maybe making explicit who those are is going to make it also... You're going to be a worse citizen if you know this is very good. For like the worst departments and you do not like participating in the data collect. If there's kind of a public good in all of this, then we should really try and each one of us can talk to our institutions and maybe say "look, I don't know if it's good or bad for us". The top, I think, really don't have anything to lose, really lose, no? You don't gain anything, but you don't have anything to lose either, no? So, it's really... I mean, I don't know who the clear losers would be. That would really feel comfortable saying "no, I'm not going to participate", so I don't know. I don't think we can live without doing something. It's like inventing the vaccine and then not wanting to get vaccinated. To me it's a little bit how I'm feeling. I'm like "no, I'm okay, my immune system is pretty good", so I don't need a vaccine and I'd be like little bit not exactly... Because we have a vaccine that we fine-tuned. I mean, we do have like a very elaborate market that is a result of a lot of thinking. But I think that it's a very different process than in others that it's worth thinking about why it's so different.

Utku Ünver:

One other thought which I forgot to mention. From the department's point of view, in a way this is a very common value, kind of an environment, right? Everybody likes the stars in a way if in the perfect market they would hire the star, the star would work for 10 departments at the same time if it's possible. But and then there's this. We, as economists, we over rely on market signals in the sense that... So, I'm worried about actually some kind like middle candidates in a way that if the rankings become public early on, this can create in a way affiliated values, right? If you wish, some people get more value than they really deserve and it will accumulate through this revelation of, and some people will really lose out of this, so I don't know the effect of this. If you don't appear in many recommender lists or etcetera... Of course, the recommender list could be fixed, but based on whose commander lets you appear you may have seen your value is constantly updated by the other departments. And later on, the people may go out of their lists. So, I would like to hear if this is a valid concern. I don't know what you think.

Nick Arnosti:

I haven't thought on that, but one way of thinking about this concern that Laura and Utku and others have talked about is the current system for all of its potential flaws is fairly strategically simple for applicants, right? You apply everywhere, you wait to see what interviews and fly-outs you get, you take them all, every school. You try to make yourself look as good as possible, and then you get some offers and you can make your final decision. So, it's not necessarily efficient, but it's strategically simple. And I think the concerns that are being expressed... I kind of synthesize it saying suddenly it may not be so strategically simple if you're asking me where do I want to interview and interviewing at one place actually means giving up an interview at another place.

Caterina Calsamiglia:

I think for schools it's a lot less clear. I think, for school they have to be a lot more strategic.

Nick Arnosti:

Totally I agree. I think, for schools it's not so strategically simple, but I think for applicants now the current system is fairly simple, and so in some sense a change could shift the burden of strategizing away from schools and towards applicants, or at least to both sides.

Alejandro Robinson-Cortés:

I just thought now, given what someone was mentioning about outside options. I thought that one piece of data that should be simple to recover is like who did the people, I mean, the people for whom the markets failed, right? Because the concern is that you have a mismatch. Like if you have a match, but there are no many blocking pairs, but clearly within the people who are matched that's harder to get right. I mean, I have another school that I would rather want to go, maybe even if they interviewed me or if they flew me out. It doesn't have to be MIT, but if things are working out what probably happened is that they ended up hire someone they liked more than me, right. But in that sense, I think that the big concern would be something that someone mentioned and that would be a very big concern for academia that someone wants to be a professor and they don't find a job by match. And they say, "okay it's going terrible" and they decided to go on banking. And that there was a school that received 300 applications. They saw some, they flew some people out, they couldn't hire anyone, and they would have hired this person, because in a sense that person is already out of academy. I mean, the nice thing about academia is that in a sense there's this feeling that it's meritocratic, even if you're on their place, people publish well, people move more up or down. There's a whole tenure idea, but I think that the one problem that could be severe and people would look at it and will generate interests. So, something we should speak is that if there's a lot of people leading the market and schools that would be willing to hire them but are not being able to find them. The people really fall to the cracks and I just thought that would be a piece of data that doesn't seem that hard to reveal like to find people who really feel that the market failed them.

Caterina Calsamiglia:

I also feel like a little bit the criticisms. So, the analogy to me is when people criticize AI(?) algorithms that make recommendations and they may discriminate, and they may do all these crazy things, but at least you have them. So you can analyze them, and the question is: do the algorithms do a worse job than decision makers in general? So, this whole point about how these ranks are created. We believe that our institutions are our chit talks, and coffee breaks and whatever, where we talk about candidates. That's a better way of aggregating information... But we have no way of really understanding whether that's true or not, because we don't have data. So, I think it would just be amazing even if we didn't do anything, we didn't change anything. Just get some data and see whether what we're doing is discriminatory, whether there's a lot of mismatch, whether there's a lot of... I think, all these things are valid questions that some people feel like may not be a problem. I'm not sure they're not a problem, and I just think having an algorithm puts a lot of structure in our thinking, and even to say that the algorithm is bad, but then we can change it, so I think...

Alex Teytelboym:

I just want to come back to a point that Nick made which I think was a really good one that in a way it is actually very simple for candidates. And I think that all the inefficiency and all the problems are created by the departments, because we... And especially I think when this point has come back like if you're at the very top it's all great and if you're very maybe if you're at the bottom also things are just not very great in general. But if you're in the middle that's exactly where Alejandro's stories of this mismatch happen, right. You overestimate how good a candidate might be, and that's where it happens, and so in a way right we're really creating this product not for the candidates. I think it's really very much from the perspective of universities and so in a way I was just chatting to Andrew in the chat. You can imagine trying to figure out what is the price as it were for every candidate who's coming in and roughly figuring out which sort of prize band you should be operating in, right. I mean this is just another way of trying to summarize what DA is going to give you. But this is what I think the departments need, they need to kind of have a decent idea about whether they're going for some people who are going to be quote-unquote very expensive. Or some people who are going to be kind of if you're reasonably cheap, right. And I think sometimes we just make pretty bad mistakes, and we make these mistakes collectively. Now it would be a bit... Of course, it has the potential to go really badly wrong, precisely for the reasons that Laura pointed out. So, well, which is that if everyone gets the same signal that somebody's not very good and it's just because the algorithm is crap, we can do worse for this candidate. Then they would have been absent of this sorry. Maybe I've just repeated a ton of things people have said already, but it's just kind of synthesized a bit in my head.

Dorothea Kübler:

I just wanted to add. So, I don't agree with your point that it's easy for the candidates. I have had many young people who had exploding offers at some point, had to accept them, tried to renew, but it didn't work and then they got more offers later on. And then you try to tell them that it's not so bad, that the other offer was good too and sometimes it's not so clear, but this happens. So, it's not... I don't think it's that simple. I mean I agree up to the point that you describe. Yes, that's easy to apply as much as you can and tell everyone you like them best, but then the difficult choices come later on, and the market clears very slowly in the end. And then you know these things happen a lot, so there is scope for improvements and also for the candidates. So, I'm also a little bit on Caterina's side that we shouldn't... Of course, it would be great to have evidence, but we have lots of anecdotal evidence that things go wrong. And that's already something, and of course there is a question of who's gaining and who's losing, and there will be both. But I think looking a little bit in a more structured way at what's going on and the data and exactly at who's winning and who's losing, that would be very interesting by itself to figure that out, so I think that would be worthwhile, thanks.

Laura Doval:

I just had like a quick thought, because the issue with the exploding offers has been brought up several times. And I agree with Dorothea, that makes decision-making difficult, but I'm not sure how a recommender system or any like the discussion that we're having now changes that, because my understanding is that many... Like there're some constraints institutions have that come from the econ department doesn't own the university and it has

to do with how offers are being processed through. For instance, the school the economics department is sitting on, like I was when I was in Caltech, we had basically control over. Like we were given a set of things we could do and it never goes back to the school until we're done, but I know some other schools, where every time someone says "no" to your offer, the offer goes back to, let's say, the social sciences division, and then that division has to decide do you get the slot back for econ or it goes somewhere else. So, I think that it's not that schools necessarily are making exploding offers because they're trying to push people if that's happening. That is an inefficiency that we can address, but there are some things that are institutional constraints of this operating on a larger labor market that the university cares about that I don't know how we can address with the things that we're discussing now.

Utku Ünver:

I'm more optimistic about that. I think over time institutions will adjust. They already know that economists are weird. We already have this centralized market which is kind of unheard of in some disciplines in, let's say, arts and sciences colleges, etc. So, over time I think that will be a move, yes. Initially, I agree with you, Laura, it would be bad some for some places, but over time I'm more hopeful it can just push everybody to be more punctual and timing can matter, because otherwise they will be totally shut out. Once their deans know this, it will work out in their favor.

Tomás Larroucau:

I just want to complement, maybe, a bit what Catherine and Dorothea said. I also agree with that the point that Nick made that strategic simplicity is a good. It's a good property, but that does not mean at all that candidates are not going to be willing to move to a different match where there is some strategy. But they could get way better matches in expectation, so just one example of this is that the problem that happens when American students try to apply to the European institutions. It is super hard, especially for top 20 candidates to actually make it credible to the European institutions that you really want to go to Europe unless you are from Europe or you have a finance in Europe, or something like that. So, then advisors start calling, so there are a bunch of signals that they're already doing and there is that breaks a bit the simplicity, right, because it's not only where do we apply to, but also where do we put our efforts, in which departments to call and so on and so forth. And the other point that I wanted to say is that maybe there is something that we can do even with the current data. We can extract, maybe, some information about the notion of the mismatches by analyzing the signaling mechanism. I know that the AEA has done some analysis, but nothing too deep here. I just know that students, at least from the top 20s, they seem to take this seriously. The signaling mechanism... I don't know from your side, from the side of the universities if you actually look at the signals or not, but there the student has to balance a bit preference intensity with probability of the match, right. So, maybe there is something to get there.

Caterina Calsamiglia:

I also wanted to say about the strategic simplicity on the demand side. And it's also personal experience. When I was on the market I wanted to go back to Barcelona, but then if I just apply to Barcelona, Barcelona people would be like "no she's not being and you know she's not looking, she's not being ambitious she just wants to retire or whatever you want to

call it". So, I had to go through everything and make sure that you know and so probably wasted a lot of people's time pretending that I wanted to go to all these different places that I really did not want to go, but just so that I could get the right offer so that I could just say to Barcelona "okay I'll come back", but I don't think it's that simple. I think it's all about really the middle grounds. I think that the people that are very top. Both department and candidates, they have an easier time, but it's those in the middle that you have to be...

Alex Teytelboym:

But, Caterina, the issue that you and Dorothea raise... The only way in which we can fix the exploding offer is by centralizing the match in the final stage. But if we centralize the match in the final stage, then we don't need a recommender system, because then we just go to what's kind of...

Caterina Calsamiglia:

I wasn't saying exploding offers which I agree that's more like deadlines than like organizing deadlines and in school choices something happens. You get an initial match, but then you get free seeds and then there's more and more... And it takes forever, and schools have to start in September.. But then my daughter was accepted the day before school started and that was because of free seat and then we simplify everything else except our world. So, I think everything that happens there... I'm just not taking the point about the exploding offers. Just the information like the fact that our side is easy, like looking for a job is an easy task that you just need to be honest, and everything will be fine. Well, you cannot say "I want to go back to Barcelona", because then the professor is gonna think maybe I don't know what, and you have to pretend and then like pretend to Florida and Miami that you will be going. I don't know... So, it's not as simple, it's not only the exploding offers. I think there're other things.