Making Markets Thick:
How Norms Governing Exploding Offers Affect Market Performance

Muriel Niederle and Alvin E. Roth

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Abstract: Many markets encounter difficulty establishing or maintaining sufficient thickness to allow participants to consider many possible transactions. Often this is because transactions are made quickly and at dispersed times, sometimes inefficiently early. To address such problems, many markets have organizations that try to establish norms concerning when offers can be made, accepted and rejected. Examining some of these markets suggests that it is difficult to establish (or re-establish) a thick market at an efficient time when it is acceptable for firms to make exploding offers, and unacceptable for workers to renege on commitments they make, however early. But this evidence is only suggestive, because the markets differ in many ways other than norms concerning offers. Laboratory experiments allow us to isolate the effects of exploding offers and binding acceptances. In a simple environment, in which uncertainty about applicants’ quality is resolved over time, we find inefficient early contracting when firms can make exploding offers and applicants’ acceptances are binding. Relaxing either of these two conditions causes matching to take place later, in a thicker market. This suggests that elements of market culture may play an important role in influencing market performance. These results have implications for market design, which we explore in the context of two contemporary design problems facing the markets for gastroenterology fellows, and federal court clerks.


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I. Introduction

Different markets have different rules, norms, and expectations about how and when offers will be made, accepted, and rejected. For example, in some labor markets, it is conventional for employers to make exploding offers, to which candidates must reply before receiving other offers, while in other markets it is customary for all offers to remain open long enough for candidates to compare multiple offers. Similarly, norms differ concerning the circumstances under which a candidate may honorably change her mind about an offer she has accepted. These differences—whether they are enshrined in legally enforceable rules, or simply in expected behavior, and whether they are dictated by the larger market environment, or constitute different equilibria within a given market—can influence who makes offers to whom, at what time (and hence in how thick a market), and what outcome is produced.

Many markets that have experienced difficulty in maintaining a thick market in which transactions are made at a time and in a manner that promote efficiency have sought to change their market cultures in these respects, to promote more orderly markets, to control the timing of the market until information is available, and to produce more efficient matches. In over a dozen of these markets we know of, organizations exist that seek to regulate how and when offers are made, accepted, and rejected (see Table 1).

Because these markets are all different, it is difficult to make simple comparisons of the various institutions they have created to shape offers and acceptances. But examining these markets together suggests a pattern. Markets that are thick and in which transactions are made at an efficient time are those in which offers tend to be left open long enough to allow candidates to consider multiple offers, or in which, if exploding offers are made, candidates who have received them can continue to receive offers and may subsequently change their minds.
Table 1: Some Institutions to regulate offers, acceptances, and rejections

<table>
<thead>
<tr>
<th>Market</th>
<th>Institution that tries to regulate timing and other aspects of offers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate School Admissions</td>
<td>Council of Graduate Schools (CGS)</td>
<td>Exploding offers discouraged, and acceptances before April 15 non-binding (see text)</td>
</tr>
<tr>
<td>Undergraduate College Admissions</td>
<td>National Association for College Admission Counseling (NACAC)</td>
<td>Binding early decision, non-binding early action</td>
</tr>
<tr>
<td>U.S., Canadian, and British Medical Residencies</td>
<td>National Resident Matching Program (NRMP), Canadian Resident Matching Service (CaRMS), various regional matches in Britain.</td>
<td>Centralized clearinghouse</td>
</tr>
<tr>
<td>Medical Fellowships</td>
<td>Specialty Matching Services (SMS)</td>
<td>Centralized clearinghouse</td>
</tr>
<tr>
<td>Clinical Psychology</td>
<td>Association of Psychology Postdoctoral and Internship Centers (APPIC)</td>
<td>Centralized clearinghouse</td>
</tr>
<tr>
<td>Lawyers (particularly in large law firms)</td>
<td>National Association for Law Placement (NALP)</td>
<td>Principles and Standards for Law Placement and Recruitment Activities</td>
</tr>
<tr>
<td>Federal Judicial Clerkships</td>
<td>Judicial Conference of the United States (and various ad hoc committees of judges)</td>
<td>Law Clerk Hiring Plan (<a href="http://www.cadc.uscourts.gov/lawclerk/">http://www.cadc.uscourts.gov/lawclerk/</a>)</td>
</tr>
<tr>
<td>Canadian Lawyers (articling positions)</td>
<td>Regional Law Societies (e.g. Law Society of Upper Canada)</td>
<td>Articling Recruitment Procedures (centralized match abandoned for 2004-5 articling term)</td>
</tr>
<tr>
<td>Japanese University Graduates</td>
<td>The Japan Federation of Employers’ Associations (Nikkeiren), Labor Ministry</td>
<td>Establishes guideline dates before which contracts should not be signed, and rules about interviewing.</td>
</tr>
<tr>
<td>Recruitment of MBA graduates</td>
<td>Individual business school recruiting offices</td>
<td>Regulations of on campus interviews, dates and duration of offers, etc.</td>
</tr>
<tr>
<td>US College Graduates—on campus recruiting</td>
<td>National Association of Colleges and Employers (NACE) <a href="http://www.nacwebo.org/about/principlt.html">www.nacwebo.org/about/principlt.html</a></td>
<td>Guidelines for good conduct that discourage reneging of acceptances by students and undue time pressure of acceptance and encouragement to renege on another offer.</td>
</tr>
<tr>
<td>Postseason college football bowls</td>
<td>Bowl Championship Series (BCS)</td>
<td>Confederation of bowls and conferences</td>
</tr>
<tr>
<td>Sororities</td>
<td>National Panhellenic Conference</td>
<td>Regulates bidding procedure</td>
</tr>
</tbody>
</table>
Note that different market organizations may have different degrees of authority. It may not be possible for them to compel members; in many cases these organizations are simply voluntary associations that serve to codify how the majority of members would like to see the market organized. Because of this, it may not be possible to prevent firms from making exploding offers, but it may nevertheless be possible to enable applicants who have accepted such offers to later change their minds, by making clear the circumstances in which applicants can do so. That is, even when it is not possible to enforce rules against exploding offers, it may be possible to establish norms and expectations that will make exploding offers less profitable, and minimize how much they disrupt the market.

This paper reports an experiment designed to investigate the interplay between the rules by which offers are made, accepted, and rejected, and the timing, thickness, and efficiency of the resulting market. We will then examine the experiment’s implications for the design of decentralized markets, including the decentralized markets that precede the start of a centralized market in which participation is voluntary. In particular, we describe a successful intervention in the market for gastroenterology fellows in which we recently took part, and we also consider the market design problem presently arising in the market for federal court clerks.

In the next section we first look in some detail at a market from Table 1 that will be familiar to most of our readers, the market for graduate admissions to American universities. This will motivate the experiment we report, and help explain the new market design for the gastroenterology market that we will discuss later.

II. Graduate admissions

One market in which a good deal of effort has been spent shaping and discussing the timing of offers and acceptances is the market for graduate students. The Council of Graduate Schools has, since the mid 1960’s, attempted to establish norms concerning how graduate students are recruited. Over 350 American universities subscribe to its resolution, which is distributed to applicants by graduate programs, and states in part:
“Students are under no obligation to respond to offers of financial support prior to April 15; earlier deadlines for acceptance of such offers violate the intent of this Resolution. In those instances in which a student accepts an offer before April 15, and subsequently desires to withdraw that acceptance, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept another offer without first obtaining a written release from the institution to which a commitment has been made.”

The resolution is accompanied by some explanatory discussion of how the resolution should be honored in the breach, which reads in part as follows:

“Students may be waiting for offers from several institutions so that they can compare and make a decision. One of the complaints we hear is that some departments make offers quite early and insist that students respond quickly or lose the offer. According to the Resolution, the option available to the student in this situation who wishes to review several offers is to accept each one and then, by April 15, resign from all but one. But this places the student in an awkward position and really violates the spirit of the Resolution, that is, that acceptances should not be made casually.

“A better approach is for institutions to give students until April 15 to make decisions regarding appointments. Students often consider multiple offers, and this option provides a reasonable opportunity for them to do so. This would not preclude institutions asking students to accept or reject offers in a timely manner.”

Note that the resolution attempts to foster a market culture under which exploding offers are discouraged directly, and also indirectly by being made less enforceable. That is, the resolution suggests that a student who accepts an exploding offer with a deadline before April 15, but subsequently declines it before April 15, should not be thought of as behaving badly. This reduces the cost of reneging on (and hence also of accepting) an exploding offer, in a world with opportunities for repeated interactions, in which social norms may have some force.1

1 And by marking acceptances on April 15 as more binding than those made before, it also makes it less attractive for departments to make new offers after the 15th. So, for example, the chair of the graduate student recruiting committee in the Economics department of a competitive New England university wrote of a recent recruiting year that “we do not make any offers after April 15, 5 pm. This year lots happened between 2 and 5 pm of April 15. Nobody on our waiting list had accepted other offers; they were told to wait until the last minute.” Needless to say, in a market with a lot of action near a deadline there may be congestion, with some offers being rejected when there is insufficient time to make new offers (see Roth and Xing 1997 for a discussion of congestion in a labor market).
Similar concerns, and attempts to alter market culture, have played large roles in attempts to organize entry level labor markets for doctors, for lawyers, and college admissions at the undergraduate level. For example, doctors engage in a centralized labor clearinghouse, the medical “match,” that attempts to inculcate certain norms of participation (Roth, 1984, 1991, Roth and Peranson 1999). One of these is that employers are not supposed to ask applicants to make commitments prior to the match, or to indicate how they will record their preferences in the match. Surveys of medical students reveal that when they are nevertheless asked for such indications and commitments, they feel free to answer encouragingly, without constraining their subsequent behavior in the match (see e.g. Anderson et al., 1999; Carek et al., 2000; Pearson and Innes, 1999; Teichman et al., 2000). In the medical resident market, like the graduate admissions market, the rules of the market and the corresponding market culture result in current operations of those markets in which early matches seem not to be very common, and in which participants face a thick market in which they can consider many options.

In contrast, law students who apply for appellate court clerkships are frequently given exploding offers, and are almost never reported to renge on them. And indeed in contrast to the graduate student and medical resident market, the market for law clerk positions has in recent years cleared very early, despite numerous attempts to control and push back the timing of the market (Roth and Xing 1994; Avery, Jolls, Posner, and Roth, 2001).²

Even in a given market, commitments made at different times may have different force. In the undergraduate college admissions process, students who apply in the Fall to a college through a “binding early decision” program are considered to have made a binding commitment to attend that college if admitted, while acceptance of offers later in the year are much less binding.³

² The latest attempt to control dates of clerkship appointments was begun in 2003, and will be discussed in the conclusion.
³ Avery Fairbanks, and Zeckhauser (2003) describing the situation before 2002, note that most selective colleges set a regular application deadline on or about January 1, and an early application deadline on or about November 1. Colleges typically choose one kind of early application program, called either “Early Decision,” or “Early Action.” Students who apply to an Early Decision program can only submit one early application, and sign a contract that they will attend if accepted. Students who apply Early Action do not sign a contract, i.e. they retain the option of applying elsewhere also. These colleges then notify early
These examples, along with those mentioned in Table 1, suggest some support for the hypothesis that markets in which transactions are made early are those in which there are both exploding offers (i.e. offers which must be accepted or rejected before other offers can be considered), and binding commitments. However, all these markets differ in many ways, not only their culture regarding exploding offers and the degree to which a commitment is binding. Some markets are very large (college admission), some are much smaller (law clerks or college football bowls), in some markets monetary compensation plays a big role in clearing the market (new associates of large law firms and college football bowls) in others, wages are set exogenously (law clerkships).4

An ideal test for the effects of rules concerning offers and acceptances and rejections on the timing and thickness of the market would be a set of markets that differ only in how offers are made and responded to, but not in any other way. Markets created in the laboratory offer us the possibility of making just such comparisons.

In what follows, we consider a simple environment, in which early matches are unambiguously inefficient, because information about the applicants’ quality, which determines the efficient matching, is only known in later periods. The efficiency of an outcome in our environments will be measured as the total welfare of market participants.5

We consider three kinds of markets. In the first, firms can make exploding offers, and acceptances are binding. We compare this with two alternative environments. In one applicants of a decision, "Admit," "Reject," or "Defer", by early-to-mid December. Early Decision colleges submit lists of their early admits to rival colleges with a note that those ED admits are expected to withdraw all other applications. The rule that students could submit only one early decision application was enforced in part through actions of the high school guidance counselors, while the binding nature of early acceptances was enhanced by the practice of other colleges not to consider applications from other colleges’ early admits. Many of the rules and customs regulating early admissions have been in flux, since the Fall of 2001, after the National Association for College Admission Counseling (NACAC) suggested changes that had the unintended effect of making binding early decision less reliably binding.


5 While early matches may benefit some participants (such as lower quality firms that manage to hire higher quality applicants) total overall welfare will be reduced by early matchings in our experimental environment. For a discussion of the problems of measuring efficiency in naturally occurring labor markets, see Niederle and Roth (2003a), which shows that early transactions in the market for gastroenterologists decreased mobility in the market. (See also Niederle and Roth 2003b, 2004). In the market for college football bowls, Frechette et al. (2004) show increased efficiency of late matching as measured by television viewership.
of these, applicants may renege on their acceptance of an exploding offer at a small cost, and in the other, only open offers may be made, that is, offers without a constraining deadline.\footnote{In natural markets, the behavior of participants is often guided both by fixed rules and norms and expected behavior, the whole culture of the market. Formal rules and informal rules often impose equally}

These environments allow for many equilibria, including some in which all matches are agreed upon inefficiently early. However, all environments have a sequential equilibrium that induces efficiently late matches. Nevertheless, the late matching equilibrium is less robust, more fragile to the presence of applicants who deviate from equilibrium behavior when offers are exploding and acceptances are binding. Similarly, early matching equilibria may be less robust in the case of open offers and non-binding acceptances.

Experiments will allow us to make controlled comparisons between these different regimes, and also to investigate issues about which theory is still relatively silent, namely the multiplicity of equilibria. We test the hypotheses that the fragility of late matching equilibria when firms can make exploding offers and acceptances are binding will make late matching less likely in those markets, and the fragility of early matching equilibria when firms can make only open offers or applicants can renege will facilitate efficient late matching in those markets.

We will see that, in the environments we explore, the market results in inefficiently early contracts when firms are free to make exploding offers and acceptances are binding. But both the prevention of exploding offers, and the facilitation of reneges, change the market dynamics in a way that promotes later offers, a thicker market, and greater efficiency.

When we turn from the experiment to the labor market for gastroenterologists, we will see that this conclusion had immediate application in the market design that reversed the unraveling of hiring decisions that market had suffered.
II. Experimental Matching Markets

The experimental markets consisted of 5 firms and 6 applicants. Firms have a fixed quality, from 1 to 5, and applicants will eventually have a quality from 1 to 6. (The qualities of firms are simply their assigned ID number from 1 to 5, the qualities of applicants are revealed over time.) In each market a firm can hire one applicant and an applicant can work for one firm. A matched firm and applicant each earn the product of their qualities, unmatched market participants earn zero.\(^7\)

Each market lasts 9 periods. In periods 1, 4 and 7 each applicant receives an integer signal from 1 to 10 (uniform iid). The quality of each applicant is determined in period 7 through the relative ranking of the sum of their three signals. The applicant with the highest sum receives a quality of 6, the second highest a quality of 5, the lowest a quality of 1 (ties are broken randomly). Firms see all the applicants’ signals as they become available over time, but applicants only receive information about their own signals.\(^8\)

Having three periods in which new information is revealed allows us to observe several “degrees” of inefficiency of early matching.\(^9\)

Each information state lasts for 3 periods in which firms can make offers, and applicants decide whether to accept or reject them. This helps avoid exogenously imposed congestion, which occurs when firms may run out of time to make offers they would have liked to make. In pure strategy equilibria, congestion does not occur, by assumption. However, in laboratory markets, even a small amount of coordination failure would lead to congestion, and potential congestion in late periods would provide an additional reason for firms to make early offers, and an additional source of inefficiency. (In naturally

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\(^7\) There are no monetary transfers between firms and applicants, they each receive the mutual gains of matching, equally.

\(^8\) This feature of the experimental environment is motivated by the situation in many markets, in which firms see a whole pool of applicants, but applicants may have difficulty knowing how they compare with other applicants.

\(^9\) In this environment, it is possible that, after two signals, the applicant of the highest quality, or the applicant of the lowest quality, though not both, can be deduced by the firms, but not by the applicants (who do not see others’ signals). Note that while signals across periods are uncorrelated, because the final quality is determined by the sum of signals, the relative quality after two signals is heavily influenced by the quality of the first signal, that is the relative quality (the sum of signals) is correlated over time.
occurring markets, congestion is common; see the discussion in Roth and Xing 1997. Kagel and Roth (2000) report an experiment in which early matching arises in response to congestion.) Since we are interested here in early matching for reasons other than congestion, the experimental markets will allow 3 periods in which offers can be made and accepted, whenever new information is revealed. 10

We consider two types of offers that can be made by firms:

An *exploding* offer is an offer that the applicant can only accept right away, i.e. in the same period in which it was made; if it is not accepted immediately, it is rejected.

An *open* offer is an offer the applicant can also hold (until period 9). That is, an applicant who receives an open offer may accept or reject it immediately, or may hold it, to accept or reject at a later period. An applicant must reject a held offer if he wishes to hold or accept another offer. 11

In a given period, first all the firms decide what offers they will make. Each firm that is unmatched, and has no open offer being held by an applicant, may decide to make at most one offer. Then each applicant learns of all offers he receives in that period before having to decide how to respond to each of them. If an applicant accepts the offer of a firm, the applicant and the firm are matched, and all market participants are informed about this. Offers are made in private; i.e. until they have been accepted they are not announced to the other firms and workers. We consider three environments, characterized by different rules governing offers and responses.

**Treatment 1: Exploding** and Open offers

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10 While this avoids exogenously imposed congestion, congestion may develop endogenously, if applicants hold offers until late, or firms delay making offers. Roth and Ockenfels 2002 discuss congestion arising endogenously in an auction market, in which bidders delay making bids until near the close of the auction.

11 This is not an onerous constraint for the applicants, since they have strict, unchanging preferences over the firms. In our experimental environment, it reduces the cost to a firm of making an open offer, since it reduces the likelihood that an open offer will be held by an applicant who has no intention of taking it.
Each firm can decide whether to make each offer open or exploding. Once an applicant accepts an offer, the acceptance is binding, and firms cannot make subsequent offers to an applicant who has already accepted an offer.  

**Treatment 2: Open Offers Only**

Firms can only make open offers. Once an applicant accepts an offer, the acceptance is binding, and firms cannot make subsequent offers to an applicant who has already accepted an offer.

**Treatment 3: Renege**

In this treatment, firms can again decide whether to make open or exploding offers. However, an applicant who accepted an offer may still receive further offers. An applicant can renege on initial acceptances and accept a new offer at a cost of 1 point (that is subtracted from his final payment).

All three treatments allow for a whole array of Bayesian Nash equilibria. For example, in each treatment, there is an equilibrium in which, after the first period, all the firms are matched. For example, the following strategies constitute an equilibrium in which all firms are matched in Period 1.

*Strategies of firms:* Each firm $i$ makes an open offer in period 1 to applicant $i$. A firm whose offer is rejected never makes another offer.

*Strategies of applicants:* Each applicant $i$ in period 1 accepts an open offer from firm $i$ and rejects any other offers (i.e. exploding offers, offers from other firms, and offers received in other periods).

These strategies constitute an equilibrium, as no firm has an incentive to deviate, given the strategies of applicants and vice versa. However, this equilibrium has the unattractive property of using weakly dominated strategies.

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12 One can think of the applicants’ ability to make binding agreements as an agreement among firms to not make offers to applicants who accepted another firm’s offer. Recall for example colleges’ practice of honoring other colleges’ early decision acceptances (footnote 4).

13 This fee is smaller than the minimum improvement from accepting a match with a higher quality firm, since matches pay each applicant the product of his quality and the quality of the firm to which he is matched.
However, in each of the different conditions, when firms and applicants are risk neutral there is a sequential equilibrium that yields late matching and the efficient outcome. But the possibility of late matching is less robust in the case of exploding offers and binding agreements than in the other two conditions.\footnote{The proofs, and statements of equilibrium strategies and beliefs are straightforward but tedious; they can be found in a technical addendum to the paper at www.stanford.edu/~niederle.}

In particular, since a strategy is a function that specifies an agent’s actions at each of his information sets, we can (even in the renege condition) speak of an agent as adopting a strategy of “locking in” an offer at some point of any of the experimental treatments by accepting (and not just holding) the offer, and not later reneging on it. We can now state the following.

Proposition:

In the open offer and the renege treatments, it is a weakly dominated strategy for applicants to lock in firms early, before period 7. (Applicants always do at least as well, and sometimes better, if they hold the best offer they have received, or remain willing to renge on their acceptance, respectively, as long as better firms remain unmatched.) In the exploding offer treatment, it is not a weakly dominated strategy for the applicant to accept an exploding offer early (before period 7), which means it is not a weakly dominated strategy to lock in a firm early, before period 7.

This suggests that the firms’ behavior may be different in the different conditions. In the case of exploding offers and binding acceptances, (risk neutral) firms are always prepared to make early offers to applicants who have an expected quality that is higher than the one the firm receives in the stable match.\footnote{In the late matching equilibrium, applicants reject such offers.} In the open offer and renege condition, firms are not prepared to make any early offers, as applicants would simply use the offer’s option value, which can only reduce the firms’ profits.

This difference may affect the robustness of the various equilibrium refinements to deviations from equilibrium, e.g. to random or other non-equilibrium behavior of some participants. For example, suppose there are some applicants who do not want to reject offers without a better offer in hand.
In the case of exploding offers and binding acceptances, such applicants will accept early (exploding) offers. This implies that firms will have an incentive to make early offers to applicants with an expected quality higher than the firms’ equilibrium match and there will be early transactions in such markets.

Furthermore these early matched applicants (and firms) impose a negative externality on (higher quality) firms that do not make an early offer, but which may want to hire them later on. The reason is that these applicants irreversibly accepted an early offer from a lower quality firm. If this negative externality is high enough, high quality firms will be well advised to also start making early offers (to applicants whose expected value is lower than the quality they would receive in an assortative match in period 7), only to prevent high quality applicants from being captured early by low quality firms. These early offers are in turn accepted by rational applicants as well, which implies that an even bigger portion of the market moves early. So, a few applicants who do not reject early offers can affect the incentives of all firms and applicants, such that matching late is not an equilibrium any more. By this mechanism a few applicants can affect the timing of a much bigger portion of the market, and cause the market to transact early.16

In contrast, in the open offers and renege treatment, applicants who do not want to reject offers (without having another offer in hand) can merely hold on to the offer, and use it as an option. Such applicants would not differ from rational applicants, who would also use the option value of an offer. So, in the open offers and renege treatments (and again, in contrast to the exploding offer treatment) even when faced with these kinds of applicants, firms do not benefit from making early offers, and indeed have a strict incentive not to make early offers. Furthermore suppose there were a few applicants who would not only hold, but accept early offers in the open offer treatment, or never renege upon accepting an early offer in the renege treatment, that is applicants who “lock in” an offer early. Since other applicants would still use firms’ early offers as an option, the incentives for firms to make early offers are nonetheless considerably weaker than in the exploding offer case.

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16 However, it cannot be the case that in a pure strategy equilibrium all firms match before the uncertainty is resolved, as then, for example, the worst firm among the ones that make offers in the last period in which there are unmatched firms would have an incentive to not make the offer, and rather hire the best of the remaining 2 applicants once the uncertainty is resolved.
Thus, each of the treatments has multiple equilibria, including a sequential equilibrium with efficient late matching. However, the late matching equilibrium appears to be less robust in the exploding offer (with binding agreements) treatment, than in both the open offer and renege treatment.

We conducted 7 sessions of the exploding offer treatment, and 6 sessions of the open offer and 6 of the renege treatment. Subjects participated in only one session, in which they participated in twenty consecutive markets. Participants kept their role, firm or applicant, for the whole experiment, and, for firms, also the firm ID and hence quality (from 1 to 5). The experiment was conducted at the Harvard Business School, with students, using z-Tree software (Fischbacher, 1999). Firms 1 and 2 received an additional amount of $5,\textsuperscript{17} and each participant received $0.10 for each point earned. All participants received a $10 show up fee.

\textbf{III. Results of the Experiment: Unraveling, Thickness, and Efficiency}

First we investigate whether different rules concerning exploding offers affect the timing of the market. How long do firms wait to extend offers, and hence how much information about an applicant’s quality do firms have when extending the offers that were eventually accepted?

A market experiences no unraveling if final offers, i.e. offers that were eventually accepted, are all made after period 7, once all the uncertainty about applicants’ qualities is resolved. In our experiment, subjects participated in 20 markets. Figure 1 shows the timing of final offers for all treatments over all 20 markets. The timing is presented in terms of how many signals had been revealed before the offers were made. So a value of 1 corresponds to offers made when only one signal was available (periods 1-3), 2 denotes offers made after 2 signals, i.e. offers made in periods 4-6, and 3 signals corresponds to the final quality of applicants being known, that is offers made in periods 7-9. For the

\textsuperscript{17} The instructions stated that some participants, already determined in advance, would receive some additional fixed payment (see instructions).
renege treatment, we only consider an offer to be final if it was accepted and not reneged upon. The results are presented in blocks of five markets.

Figure 1. For each treatment, the time at which final offers were made (i.e. offers that eventually result in a match) measured in the number of available signals about the applicants quality.

The first 5 markets in all treatments look similar, there is no significant difference in the average number of signals observed before firms make their final offers (that is offers that result in a match). However, as participants gain experience, matches come to be made later in the open offer and the renege treatments, but not in the exploding offer treatment. In the last five markets (markets 16-20), final offers in the exploding offer treatment are made with significantly fewer signals than in the renege treatment ($p = 0.003$, $n=13$) and the open offer treatment ($p = 0.003$, $n=13$), while the renege and the open treatment are not significantly different ($p = 0.63$, $n=12$). Thus we see that open offers and the applicants’ ability to renege help the market to defer the timing of

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18 A two sided Mann Whitney $U$ test on session averages on the average number of signals observed when making a final offer in the first five markets, gives $p$ values of 0.63 when comparing Open to Renege ($n=12$), 0.32 when comparing Renege to Exploding ($n=13$) and 0.316 when comparing Open to Exploding ($n=13$).

19 Furthermore, we can compute for each of the last five markets in any session the average number of signals the five firms had when making their final offer. The exploding offer market with the highest such number (that is, the one where on average the five firms saw the most signals before making their final offer), is lower than the market with the lowest average number of signals used by the five firms in any of the last five markets in any session of either the open or the renege treatments.
contracts, even when the market begins with early appointments (as in the first five markets of Figure 1).

We now investigate the timing of offers in more detail. Figure 2 shows, for each treatment, in the last five markets, the percentage of offers that were made when one, two or all three signals (3 signals = final quality) about the applicants’ quality were available.

Figure 2. For each treatment, in the last five markets (markets 16-20), the proportion of offers that were made when one, two or all three signals (and hence the final quality) about applicants’ quality were available.

Like Figure 1, Figure 2 shows that unraveling occurs when firms can make exploding offers and acceptances are binding. When firms are forced to make open offers, or when applicants can renege on their acceptance, the markets experience almost no unraveling. Furthermore, it is the high quality firms, firms 4 and 5, that make early final offers. In the exploding offer treatment, only about 20% of firms 4 and 5 make final offers after 3 signals are available (and 34% after 1 signal), compared to 88% and 90% in the open offer and renege treatment.

The fact that the open offer treatment and the exploding offer treatment are so different suggests that firms make exploding offers when they are given the opportunity to do so. Indeed, in the last five markets of the exploding offer treatment, only firm 1 makes an open offer in more than 10% of the markets (while firm 5 makes no open offers at all). Except for firms 3 and 4, every firm made an exploding offer in every one of the last five markets in each of the seven sessions of the exploding offer treatment (and firms 3 and 4 made exploding offers in 34 of these 35 markets). In the renege treatment, firms make
somewhat more open offers, but the vast majority of firms (at least 67%) make an exploding offer in each of the last five markets.

Thus when firms could make open and exploding offers, the majority of offers were exploding. Firms made use of their ability to make exploding offers to put pressure on applicants. However, this effect was more pronounced when acceptances were binding. When applicants can renege on their acceptance the value of making an exploding offer is smaller, and firms made less use of that option.

**Transaction Times and Market Thickness:**

So far we examined the timing of offers averaged across different markets, now we explore the timing within markets. A transaction is made (and announced to the market) only when an offer is accepted. The following table shows for each treatment the timing of first acceptances in the last five markets (where we use only final acceptances that were not reneged upon for the renege treatment).

<table>
<thead>
<tr>
<th></th>
<th>1 Signal (1-3)</th>
<th>2 Signals (4-6)</th>
<th>3 Signals (7-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploding</td>
<td>.71</td>
<td>.29</td>
<td>0</td>
</tr>
<tr>
<td>Open</td>
<td>0</td>
<td>.23</td>
<td>.77</td>
</tr>
<tr>
<td>Renege</td>
<td>.30</td>
<td>.10</td>
<td>.60</td>
</tr>
</tbody>
</table>

Table 1: For each treatment (in the last five markets) the proportion of markets whose first acceptance (which as not reneged upon in the renege treatment) was made when only one signal, 2 signals, or 3 signals (and hence the final quality) about applicants’ quality were available.

Markets with exploding offers not only experience early contracting on average, 71% of the markets have their first acceptance with only signal 1 available. All 35 markets (the last five markets of all 7 sessions of the exploding offer condition) have their first acceptance before the final quality of applicants becomes available. In contrast, when firms can only make open offers, or when acceptances by applicants are not binding, 77% and 60% of the markets, respectively, experience their first acceptance only after all the uncertainty about applicants’ quality is resolved.²⁰

²⁰ Even though markets with different rules concerning exploding offers experience a difference in timing of the first accepted offer, their last accepted offer is predominately in periods 7-9. In the open and renege treatment, not a single market (of the last five markets) ends before period 7, and in the exploding offer treatment, 89% (31 out of 35) of the last five markets finish after period 7. Note that, in each treatment, the last firm to be unmatched has strong incentives to wait and see which of the two remaining applicants is of higher quality.
A further piece of evidence for strategic causes of unraveling comes from examining the length of the market, i.e. the timing between the first and the last acceptance. In the exploding offer treatment, 32 out of 35 markets last for 5 or more periods (with 10 lasting exactly 5 periods). In the open offers only and the renege treatment, the first final offers are made later, and the markets also last for a shorter time. In the renege treatment, 40% of the markets last for 5 or more periods, and for the open offer treatment, the number is 23%. The fact that the markets in the exploding offer treatment last so long shows that unraveling in this treatment is not caused simply by a desire to avoid congestion.

To put it another way, in the unraveled markets the offers are also dispersed, making the market less thick in any period. Figure 3 shows the cumulative distribution of offers that were finally accepted, and makes clear that in the last three periods, when all information is available, the market is much thicker in the open and renege conditions than in the exploding offer condition with binding acceptances.

![Cumulative acceptances within a market](image)

Figure 3: For each treatment, for the last five markets, the average number of final acceptances up to the end of each period.

**What are the costs of unraveling?**

From this point on, we eliminate from our main analysis one outlier session of the renege treatment. In that particular session there was one applicant who *never* accepted an offer.
No other applicant in any session of any treatment behaved in this way. In footnotes we will show the analysis that includes all renege sessions.

We have seen that the market unravels and lacks thickness when firms can make exploding offers and acceptances are binding. Now we investigate the costs of unraveling. We evaluate the different treatments according to the quality of the resulting matches. How much use do firms make of the information about applicants that becomes available over time? We consider three benchmarks: assortative matching when only signal 1 is available, assortative matching with 2 signals, and assortative matching once all the uncertainty about applicants’ qualities is resolved (the efficient outcome).

We calculate the value of the assortative match after the 1st signal by producing an assortative match between firms and applicants according to the applicants’ first signal. We use the actual quality of applicants determined during the experiment to compute the value of this match. The value of the assortative match with 2 signals is computed analogously. Let “1 Signal” and “2 Signals” denote the value of the assortative match after the first and after the second signal respectively, and “Efficient” the value of the unique stable and efficient match once all signals are known. Figure 4 shows the averages across sessions and markets of (Actual Profits – 1 Signal)/(Efficient – 1 Signal), and (Actual Profits – 2 Signals)/(Efficient – 2 Signals). That is it shows the relative gains of the actual match towards efficiency compared to assortative matching after 1 signal and after 2 signals.

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21 Of course, these costs would be different in different environments. One way to interpret the results in this section, therefore, is that they demonstrate that unraveling of transactions occurs even when it is quite costly in terms of the information lost.

22 In case of ties in the first signal between two applicants, we take the average of the two possible outcomes.
Figure 4a and 4b. 4a shows for each treatment the value of \((\text{Actual Profits} - 1 \text{ Signal})/(\text{Efficient} - 1 \text{ Signal})\) averaged across sessions. That is it shows the relative gains of the actual match towards efficiency compared to assortative matching after 1 signal. Figure 4b shows the similar results for 2 signals.

Figure 4a shows that all treatments achieve on average a social surplus higher than assortative matching with one signal. Efficiency gains are significantly lower in the exploding offer treatment than in the open (\(p=0.063\)) and the renege treatment (\(p=0.004\)). Assortative matching based on 2 signals (the second signal becomes available at period 4) would have resulted in a higher efficiency than the exploding offer treatment, but both the Open and Renege treatment achieve higher efficiency levels than assortative matching after two signals. Furthermore, both the open offer and renege treatment achieve significantly higher efficiency gains than the exploding offer treatment (\(p=0.007\) and \(p=0.06\) respectively), while they are not significantly different from each other (\(p=0.465\)). When we look at absolute efficiency levels, the efficiency of the exploding offer treatment is significantly lower than of the open treatment \(p=0.03\) and the renege treatment \(p=0.009\), while the renege and the open offer treatment are not significantly different \(p=0.116\) using a two sided Mann-Whitney \(U\) test with session averages.

\(^{23}\) When we include the outlier session in the renege treatment, the value of the proportion of gains from assortative matching after one signal towards efficiency is 0.69 (instead of 0.88). The exploding offer treatment still achieves significantly lower proportionate gains in efficiency starting from the assortative match after 1 signal than all the sessions in the renege treatment: \(p=0.032\).

\(^{24}\) When we include all renege sessions, the value of the proportion of gains from assortative matching after two signals towards efficiency is 0.14 (as opposed to 0.56). The p-value when we include all renege sessions is \(p = 0.25\).

\(^{25}\) All treatments achieve high levels of efficiency (compared to the alternative of no firm being matched). The efficiency in the exploding offer treatment is 93\% compared to 96\% in the open offer treatment and 98\% in the renege treatment. However, even a random allocation of the six applicants to the five firms achieves an efficiency of 75\%. Average efficiency of assortative matching after one signal is 88\% and after
A different way to measure the functioning of a market is to count the number of “disruptive” blocking pairs, these are a firm and a worker, of which one at least is matched, who are currently not matched to each other, but would both prefer to be so, instead of remaining with their current match (or being unmatched).\textsuperscript{27} For the last 5 markets, the exploding offer treatment has, on average, in each market 3 such (firm, applicant) pairs, which is significantly higher than the about 1 such pair in the open (p=0.003) and renege treatment (p=0.004).\textsuperscript{28,29}

**Individual level consequences of unraveling**

We have seen the loss of social surplus when firms can make exploding offers that are binding, compared to when offers have to be open or applicants can renege on their acceptance. Now we investigate the value of the match for each applicant and each firm separately, for the last five markets of each treatment.

**The Firms**

The following graph shows for each firm the average quality of the applicant they are matched to and the average quality of the applicant that remains unmatched.

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\textsuperscript{26} When we include all renege sessions, the comparison with the exploding offer treatment has a \(p\)-value of 0.07, the comparison to the open offer treatment yields \(p = 0.37\).

\textsuperscript{27} These are blocking pairs that would disrupt the outcome of the market, had they the chance. (Blocking pairs that simply involve unmatched participants are much less disruptive, and in naturally occurring markets they often have a subsequent opportunity to match to one another.)

\textsuperscript{28} The open offer and renege treatment, do not differ significantly in the number of blocking pairs (\(p = 0.2245\)). When we use all the renege sessions, the \(p\)-values are 0.002 and 0.46, when comparing it to the exploding and open treatment respectively.

\textsuperscript{29} The maximum feasible number of disruptive blocking pairs is 15 and achieved by anti-assortative matching. Then the matched firm 5 generates 5 blocking pairs (4 of which use matched applicants), firm 4 generates 4, firm 3 generates 3, firm 2 generates 2 and firm 1 generates only 1.
The quality of the firms' matches

The exploding offer treatment significantly lowers the payoff of the highest quality firm, firm 5, by 16% compared to the open (p = 0.0056) and by 15% compared to the renege (p = 0.046) treatment. But the low quality firms, firm 2 and firm 1, achieve a significantly higher payoff in the exploding offer treatment, compared to the open offer treatment (p=0.062 and p=0.07 for firm 2 and firm 1 respectively) and the renege treatment (p=0.001 and p=0.099). In the exploding offer treatment, firm 2 gains 45% compared to the open offer and 34% compared to the renege treatment.

The difference in the quality of applicants between firm 2 and firm 5 is 0.92 in the exploding offer treatment, which is significantly lower than in the open offer treatment, 3.07 (p=0.0025) and the renege treatment, 2.76 (p=0.026).

The Applicants

The following figure shows for each applicant the average quality of the firm they are matched to in the last five markets for each treatment.

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30 When we include all renege sessions, the p-values for firm 5, when comparing the exploding offer to the renege treatment is p=0.023, while it is p=0.025 for firm 2 and p=0.05 for firm 1.
31 When we include all renege sessions the p-value is p = 0.014
32 In all treatments higher quality firms hire higher quality applicants, on average, but not in each session.
Figure 6: The average quality of the firm the applicant is matched to in the last five markets of each treatment, where UM is unmatched. “Efficient” shows for each applicant the quality of the firm in the unique stable and socially efficient match.

As for the firms, it is the high quality applicants, applicant A6 and A5 that receive a significantly lower match in the exploding offer treatment than in the open offer treatment (by 10% and 11% with p=0.045 and p=0.049 for applicant 6 and 5 respectively) and the renege treatment (by 17% and 13% with p=0.019 and 0.023). And it is a medium quality applicant, applicant 3, who significantly gains from unraveling (by 49% and 57% with p=0.026 and 0.041 compared to the open and renege treatment respectively). In all treatments higher quality applicants are hired by higher quality firms, on average. The difference in the quality of firms between applicant 3 and applicant 6 is 1.2 in the exploding offer treatment, which is significantly lower than in the open offer treatment, 2.9 (p=0.0034) and the renege treatment, 3.04 (p=0.0044).

The inefficient matchings in these markets are costly for the highest quality firms and applicants, while some lower quality firms and applicants tend to gain from early matches. (This suggests why it is sometimes difficult to achieve consensus in markets that suffer from unraveling about what steps, if any, to take to address the problem, see

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33 When we include all renege sessions, the p-values are for firms 6, 5 and 3: p=0.009, p=0.108 and p=0.037 respectively.
34 When we include all renege sessions, the p-value is p = 0.0026.
e.g. Niederle and Roth (2005) for discussion of the situation facing gastroenterologists as they started to consider whether to organize a centralized clearinghouse.)

**IV. Implications for market design: Gastroenterologists and Law Clerks**

**Gastroenterology Fellows**

From 1986 to the mid 1990’s, the labor market for gastroenterology fellows (i.e. entry level gastroenterologists) was organized through a centralized match that operated one year before employment would begin. The match collapsed following a shock to the market that caused fellowship programs and applicants to make early contracts before the match (McKinney, Niederle, and Roth, 2005). Following the collapse of the match, the market unraveled, and the hiring of fellows became increasingly early and dispersed, with exploding offers, eventually moving almost two years before employment would begin (Niederle, Proctor, and Roth, 2006). One consequence was that the scope of the market collapsed, and what had been a national market was replaced by more local markets, in which gastroenterologists were more likely to be recruited from the local pool of applicants (Niederle and Roth 2003a).

As these facts became increasingly well known to gastroenterologists, there was a growing interest in reestablishing a match, to move the date of hiring nearer the date of employment, and to make the market thicker. However, doing so would require fellowship directors to refrain from early hiring prior to the first use of the match (as well as in subsequent years). With the memory of the collapse of the match clearly in mind, many program directors who were themselves interested in participating in a well organized market at a later date were concerned that their competitors would gain an advantage over them by making early exploding offers in an effort to “capture” promising candidates before the match.35

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35 In June 2005, our colleague Debbie Proctor, the gastroenterologist who took the lead in reorganizing the match, sent us an email saying, in part “I’m answering 3-4 emails per day especially on this issue. ‘I want to make sure MY competition is in the match and that they don’t cheat.’ Well, this is another way of saying that if they cheat, then I will too!...Have you ever seen this before? The distrust amongst program directors? I find it hard to believe that we are unique. Maybe this is [a] social science phenomenon?”
When we were approached with this concern, we related the experience of the market for new Ph.D.’s, and shared the result of the experiment reported above. The American Gastroenterology Association subsequently published a policy statement (Niederle, Proctor, and Roth, 2006) containing a resolution modeled after that of the Council of Graduate Schools. A modified version of this was adopted by all four major Gastroenterology professional organizations, the American Gastroenterological Association (AGA), the American College of Gastroenterology (ACG), the American Society for Gastrointestinal Endoscopy (ASGE) and the American Association for the Study of Liver Diseases (AASLD), regarding offers made before the (new) match. It states, in part

The general spirit of this resolution is that each applicant should have an opportunity to consider all programs before making a decision and be able to participate in the Match. ... It therefore seeks to create rules that give both programs and applicants the confidence that applicants and positions will remain available to be filled through the Match and not withdrawn in advance of it.

This resolution addresses the issue that some applicants may be persuaded or coerced to make commitments prior to, or outside of, the Match. ... Any applicant may participate in the matching process ... by ... resigning the accepted position if he/she wishes to submit a rank order list of programs ... The spirit of this resolution is to make it unprofitable for program directors to press applicants to accept early offers, and to give applicants an opportunity to consider all offers ...

The gastroenterology match for 2007 fellows was held June 21, 2006, and succeeded in attracting 121 of the 154 eligible fellowship programs (79%). 98% of the positions offered in the match were filled through the match, and so it appears that the gastroenterology community succeeded in changing the timing and thickness of the market.

Part of the success of the gastroenterology match was due to the fact that early movers couldn’t impose a big negative externality on those who waited for the match, since pre-match exploding offers would not necessarily remove candidates from the market. This made it easier for everyone to wait for the match. Not every attempt to facilitate a thick market by constructing an orderly marketplace takes this approach, and the market for
new law clerks is instructive in its similarities and differences from the market for gastroenterologists.

Law Clerks

The market for clerks for Federal appellate judges has periodically suffered serious market failures in which clerks are sometimes hired two years in advance, i.e. at the beginning of the second year of law school (Avery et al. 2001). Roth and Xing (1994) discussed 5 attempts to fix this market, starting in the 1970’s, in which organizations of judges and law schools attempted to control the time at which offers could first be made. This is a market in which exploding offers are the mode, and in which verbal acceptances seem to be completely binding (law students are reluctant to renege on promises to Federal judges). In the most recent (8th) effort to repair the market, in March of 2002, a large majority of Federal appellate judges voted to approve a proposal stating that “…the hiring of law clerks in the Fall after the first year of law school is an unacceptable practice,” and that they therefore endorsed “a moratorium on law clerk hiring during the Fall of 2002…” 36, with hiring to resume only after Labor Day 2003, and be restricted to third year law students. That is, like the gastroenterology fellows market, the law clerk market sought to replace early and diffuse hiring with hiring at a specified time a year later than had become customary.

While the first two years of operation of the market under the new proposal succeeded in substantially moving back the hiring date, it appears that there has been substantial cheating on the precise opening time of the market, and an increase in offers that explode immediately (Avery et al. 2006). Some of this can be traced to the fact that the proposal calls for no changes regarding exploding offers, and in fact a FAQ accompanying the letter by Judges Becker and Edwards included the following question and answer.

“Q Are judges forbidden from making "exploding offers," i.e., offers that require an applicant to respond promptly to an offer?
A The Plan does not purport to address how an offer is given by a judge. This is for each judge to determine. However, no applicant is obliged to act on an

offer if the terms are unacceptable, nor is an applicant obliged to accept the first offer that he or she receives.”

Given that law students are almost never reported to renege on promises made to senior Federal judges (Avery et al 2001), the results of the present experiment give us a clear prediction: the problem of early contracting will not be solved by the current attempt to change the date of the market while leaving the market rules and customs intact. Rather, more fundamental changes in the market culture of judges and law clerks will be needed.\textsuperscript{37}

V. Discussion
A striking feature of many markets is that market participants spend a good deal of effort addressing how and when offers are made, accepted, and rejected. The formal and informal rules, customs, and norms that result, are a critical element of the widely different ways that the matching processes in these markets are organized. In some markets, exploding offers are the norm, and applicants for positions find themselves faced with offers that must be accepted or rejected before other offers may be considered or even received. In others, exploding offers are discouraged, or made more difficult to use to advantage.

Observation of these markets suggests the hypothesis that exploding offers with binding acceptances are potent causes of inefficiently early matching. But because these many markets are also quite different from one another in other respects than their norms concerning offers and acceptances, it is natural to look to the laboratory for an investigation that seeks to isolate the effects of different rules and customs concerning exploding offers.\textsuperscript{38}

The laboratory environment makes it easy to manipulate these factors. In naturally occurring markets, making it possible for applicants to renege on acceptances of early exploding offers involves a whole complex of behaviors; for example firms need to be

\textsuperscript{37} On this point, see also the discussion in Haruvy, Roth, and Unver 2006, concerning other aspects of the market culture in the law clerk market.

\textsuperscript{38} Also, different rules and customs concerning how offers are made and received need not exhaust the reasons why markets differ in the incidence of exploding offers, etc. But in the laboratory, we can isolate the effect of different rules involving only how offers are made, and whether acceptances are binding, which in the natural markets that motivate this study appeared to be important variables.
willing to make offers to applicants who have already accepted exploding offers. This is one of the reasons that it is often difficult to model the detailed rules of a natural market, since they are typically a mix of formal and informal rules and customs. (And not all written rules are really obeyed, while some unwritten ones may be quite binding, which is what makes the study of markets both challenging and fascinating.)

The results of the experiment confirm the hypothesis motivated by the natural markets, that in environments in which early transactions involve a significant loss of efficiency, exploding offers together with binding acceptances promote early and dispersed transactions. In the same environment, late and thick markets are achieved by either allowing only open offers, or allowing applicants to renege on early acceptances.

The problem facing applicants who receive early exploding offers when acceptances are binding is that, to reject such an offer, an applicant must hope for a better offer later in the market, hence hope not only that he will be highly ranked in the later market, but also that high quality firms will not fill their positions early. Once some applicants are ready to accept early offers, they impose a negative externality on high quality firms, making the whole market move early. We have seen in other environments that to successfully halt unraveling, a major factor is that applicants must be willing to reject early offers (Kagel and Roth 2000, McKinney, Niederle and Roth 2005, Unver 2001, Haruvy et al. 2006). When offers are open, or when applicants can renege on their acceptances, then the market does not have to depend on applicants’ willingness to reject early offers to have most of its transactions happen efficiently late. This is why such markets work more efficiently.\footnote{Although early transactions are inefficient in the environments we study because of the information about match quality that is lost, we do not mean to imply that there are no circumstances in which early matching, and even exploding offers, may be efficient. Prominent among these would be markets in which there is congestion, so that there isn’t enough time to make many open offers, but in which exploding offers might allow more possible transactions to be considered.}

In this respect, the design of the rules for offers and acceptances in the market for graduate students, discussed in the introduction, seems exemplary. Because graduate programs admit relatively large numbers of students, and are not too sensitive to the precise number who enroll, the successful control of the dates of appointment via policies that prevent exploding offers goes a long way towards establishing the orderly and stable
decentralized market that has persisted for many years (despite the congestion around April 15 which may make the size of entering classes uncertain).

Decentralized markets have fared less well for medical residencies and fellowships, in which it is harder to tolerate uncertainty about the number of residents and fellows. (Accreditation requirements generally prevent fellowship and residency programs from offering even one more than their target number of positions.) So the market for gastroenterology fellows was faced with a particularly acute problem as it sought to reverse the market failure that had followed the collapse of the gastroenterology match in the 1990’s.

To move from a decentralized early market, to a centralized one that would operate a year later, market participants had to feel confident that other participants would not move early, or if they did, that this would not have negative effects on those who waited. That is, before the gastroenterology market could once again enjoy the benefits of a centralized match operating at a relatively late time, they first had to find a way to control behavior in the decentralized market that had replaced the match, when fellowship programs started defecting from the match in the 1990s. And they had to do this at a time when the memories of those defections, and the ripple effects throughout the market, were still fresh, so that mutual trust was not high.

The gastroenterologists solved this problem by adopting a policy, modeled on the market for new Ph.D.s and on the results of the experiments reported here, that (in the words of their joint resolution), made it “unprofitable for program directors to press applicants to accept early offers.” In contrast, federal appellate judges are presently trying to control the timing of their market without interfering with the profitability of exploding offers. The results of the present experiment suggest reasons to believe that the gastroenterologists will succeed, and the judges will fail.

More generally, market design is about the details of how markets work, and so designs for different markets may sometimes be quite different. But it appears that there may be quite a bit of generality across markets about some kinds of details that are important. In particular, the details of the sometimes informal rules and practices governing how offers are made, compared, and accepted or rejected are can be critical elements of a market’s design.
Bibliography:


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