Matching Markets and Labor Monopsony: A Comment on the Priest/Roth Debate

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In a neglected but prescient article, George L. Priest argued that the "unraveling" of markets for medical residents resulted from the monopsony power of employers. Because wages were largely fixed, early offers and acceptances of employment became an efficient form of nonprice competition—and efforts to solve the problem of unraveling through market design merely reinforced monopsony power. In a reply, Alvin E. Roth—the leading figure in the market design literature, who was instrumental in perfecting the design of the medical residency matching program—argued that Priest was wrong to believe that unraveling could be a result only of monopsony or that it was necessarily efficient. Roth pointed out that market efficiency often requires enforcement of certain rules for matching buyers and sellers; if people can violate those rules, the market will collapse.

Roth was right that Priest's diagnosis was too simple. But Priest made a plausible case that the matching program sustained a then-illegal and still harmful employer cartel. Priest's article also raises questions about other entry-level application programs that are designed by economists on behalf of employers.

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Introduction

In a 2010 article published in a conference issue of the *Journal of Labor Economics*, George L. Priest argued that early hiring (or "unraveling") of the matching process for medical residencies was a symptom of monopsony.[1] His larger point was that constraints on contracting were unwise.[2] Medical students who seek residencies should be able to contract freely with hospital residency programs rather than through the National Resident Matching Program (NRMP).[3] His article provoked a stinging rebuke from Alvin E. Roth, an economist who had helped design the matching algorithm used in the NRMP.[4] Roth argued that unraveling did not necessarily indicate that employers possessed monopsony power, and that both programs improved outcomes for participants.[5]

Roth was right that market design can improve outcomes for buyers and sellers, but Priest was right to emphasize the anticompetitive risks of market design. If economists are hired by private actors to create or improve market institutions those actors use, and those actors are on only one side of the market, the economists may be asked to reduce competition instead of, or in addition to, improving efficiency. That may well have happened in the case of the NRMP.

While Roth's research on market design has received considerable attention in the economics literature, the antitrust implications raised by Priest have gone almost unnoticed in the antitrust literature.[6] This paper uses the Priest/Roth exchange as a springboard for understanding the antitrust risks of market design—the use of economic principles to construct market institutions. My focus, like Priest's and Roth's, is the design of labor market institutions that match job applicants and employers. These institutions play a significant role in labor markets for highly skilled workers. Yet antitrust challenges are quite rare. The most famous such lawsuit—a challenge to the NRMP—was nipped in the bud by Congress after a lobbying campaign by hospitals.[7]

I focus on market design for employment, but I should note that market design tools have been used in other contexts as well. Indeed, many familiar market institutions—stock and commodities exchanges,

1. George L. Priest, *Timing "Disturbances" in Labor Market Contracting: Roth's Findings and the Effects of Labor Market Monopsony*"", 28 J. LABOR ECON. 447 (2010).

2. *See id. passim*.

3. *See id.* at 466-71.

4. Alvin E. Roth, *Marketplace Institutions Related to the Timing of Transactions: Reply to Priest*, 30 J. LABOR ECON. 479 (2012).

5. *Id.* at 481-89.

6. In the economics literature, possible anticompetitive impacts of the medial residency match have received some attention. See Nikhil Agarwal & Eric Budish, *Market Design*, 5 HANDBOOK OF INDUSTRIAL ORGANIZATION ch. 10 (Kate Ho, Ali Hortaçsu & Alessandro Lizzeri eds., 2021), for a discussion and citations.

7. *See infra* Part III.

brokerages, and auctions—reflect the principles that would be formally developed in the market design literature. Market design also was famously used to develop the auctions that were used by the FCC to repurpose broadcast spectrum. But labor markets create special challenges because of their extreme illiquidity. In the case of a stock exchange, either a single company or a group of companies, often through a nonprofit, set up (formerly) in a physical location or (today) on an internet platform where buyers and sellers meet to conduct trades. The things that are traded are typically standardized so buyers and sellers know what they are, and a large number of buyers and sellers are attracted to the exchange. The entities that establish the exchange usually make money by taking a cut, but they have no incentive to favor one side of the market or the other—the exchange must be attractive to both. Buyers and sellers are mostly sophisticated repeat players. While antitrust problems can arise, they usually take the form of self-preferring (by exchanges) or market manipulation (by large traders).[8]

Employment exchange or "match" systems are usually established by one side of the market that uses them—the employers, operating through employer associations. In the standard case, a relatively small number of employers face a large, unorganized gaggle of applicants. The employers cooperate through a trade association or similar organization, which sponsors and operates the matching system. The employers' bargaining power and their ability to set up the institution allow them to bias the institution in their own favor. Applicants may use the system only once in their life, while employers use it repeatedly. And while employers compete for the best applicants, they have a joint interest in ensuring that labor costs are low. These factors give rise to significant risks of anticompetitive behavior for labor market matching systems and justify treating them as a special case for analytic and policy purposes.

In the remainder of this essay, I discuss the market for medical residents (Part I); the debate between Priest and Roth (Part II); and an antitrust lawsuit that challenged the medical residency system before it was granted an antitrust exemption by Congress (Part III). Market design is a kind of central planning undertaken by market participants who seek to maximize their profits; Roth may have inadvertently supported a cartel, but Priest may have been too optimistic about the efficiency of unregulated employment markets. Part IV draws some morals from this cautionary tale. A conclusion follows.

8. *Chicago Board of Trade* is only the most famous example. Bd. of Trade of Chi. v. United States, 246 U.S. 231, 240 (1918). Many cases are lawsuits against members of an exchange who exploit its structure or game its rules. *E.g.*, Loeb Indus., Inc. v. Sumitomo Corp., 306 F.3d 469 (7th Cir. 2002). Today, an endless stream of litigation has been brought against internet platforms that provide exchanges. See, e.g., United States v. Google LLC, 778 F. Supp. 3d 797 (E.D. Va. 2025).

I. The Market for Medical Residents

A. Background on Matching Markets

In many entry-level labor markets involving professionals, employers develop informal or centralized matching institutions to facilitate hiring. The usual story is that, at an early stage, the market is chaotic.[9] Employers would like to make offers after applicants have finished their studies and can be fully assessed, but some employers hire early in order to snap up the best prospects before they are hired elsewhere. Some risk-averse students accept these offers rather than take the chance that they will not be given offers later on. More employers make early hires in order to avoid losing the best applicants, and more students accept these offers. Eventually, students are hired so early in their education that employers cannot adequately evaluate them, and students are required to make decisions before they would like to. Employers and trade associations call for reforms, which may begin as attempts to delay applications and offers but eventually lead to the establishment of matching programs, which provide a rigid schedule and a mechanism for matching applicants and employers in order of preference. But this system is vulnerable to unraveling. Employers may cheat by making early offers, or they employ subterfuges, like hiring students as summer interns with the promise of a later job offer. A well-designed matching system defeats these subterfuges and produces matches that are sufficiently satisfactory.

B. Medical Residencies

Medical residency matching is the most studied example of this process. In the first half of the twentieth century, hospitals hired residents by making offers to medical students who were close to graduation. As competition for the best medical students heated up, offers were made and acceptances demanded earlier and earlier in the medical student's education. Eventually, industry leaders argued that hiring took place inefficiently early—before the hospitals could adequately assess the applicant's qualifications and medical students could properly choose among hospitals and programs. As a result, contracts would frequently be broken, and then hospitals or students would have to hastily find alternatives at the last minute. Implicit in these arguments is that there is an optimal moment at which hiring should take place—after the applicant and hospital have enough information to evaluate each other—and that earlier hiring is thus inefficient.

9. I follow the discussion in Alvin E. Roth & Xiaolin Xing, *Jumping the Gun: Imperfections and Institutions Related to the Timing of Market Transactions*, 84 AM. ECON. REV. 992, 996-98 (1994).

Inefficiently early hiring would tend to accelerate, and this came to be known as "unraveling."[10]

To address this problem, medical schools began refusing to release grades and other information about medical students to employers until late in their education. This reduced the incentive of employers to make early offers. But students could, and did, use offers from one employer to shop for better offers from others. Employers began making exploding offers to deter applicants from using their offers to shop around. Other restrictions were introduced. But these attempts were largely unsuccessful, as hospitals and applicants figured out ways to work around these limitations. In 1952, the NRMP was launched, and proved effective at reducing the extent of unraveling.

The NRMP is a clearinghouse: hospital residency programs and medical students who seek residencies register with it, and then interviews are conducted. After the interviews, applicants rank programs in order of preference, and programs rank applicants in order of preference. Both sides of the market submit their rankings to the NRMP. The NRMP uses an algorithm to match applicants and programs. The algorithm uses an iterative process to tentatively assign applicants to the programs that they prefer, that prefer them, and that have unfilled slots; in succeeding rounds, applicants are displaced to their lower-ranked programs if a program they were matched with ranks a new applicant higher than them. At the end of the process, the matches should be stable—in the sense that there is no program-applicant pair that ranks higher for both program and applicant than any of the final program-applicant pairs. All matches are announced on a designated date.[11]

While programs can and do offer different salaries from one another, they must offer the same salary to everyone within the program. The NRMP's "Match Participation Agreement" requires both applicants and programs to register for the Match, submit rank order lists by the deadline, and accept the resulting match as binding.[12] Programs are prohibited from offering positions directly to applicants, and applicants are prohibited from seeking such offers.[13] Violation of these rules can result in penalties,

10. *Id.* at 995-998.

11. *See Intro to The Match*, NRMP, https://www.nrmp.org/intro-to-the-match [https://perma.cc/Y2FA-BG7T]; *How the Matching Algorithm Works*, NRMP, https://www.nrmp.org/intro-to-the-match/how-matching-algorithm-works [https://perma.cc/2HJQ-5ULG].

12. *Match Participation Agreement for Applicants*, NRMP (2025), https://www.nrmp.org/wp-content/uploads/2024/07/2025-MPA-Main-Match-Applicant.pdf [https://perma.cc/SFE5-HHLW]; *Match Participation Agreement for Programs*, NRMP (2025), https://www.nrmp.org/wp-content/uploads/2024/08/2025-MPA-Main-Match-Programs_.pdf [https://perma.cc/NSH5-WHK2].

13. *See* sources cited *supra* note 12.

including being barred from future NRMP matches.[14] These rules create a strong disincentive for participants to attempt to circumvent the Match, though some cheating continues to occur.[15]

In the 1990s, changes in market conditions introduced new incentives to game the system, resulting in a "crisis of confidence" in the NRMP.[16] In response to new forms of unraveling, driven in part by the increasing frequency with which married couples sought residencies in the same location, NRMP leaders retained Roth to redesign the algorithm, a project that Roth described in a 1999 article.[17] The details of Roth's redesign are technical—the basic structure of the market described above remains in place. Of present interest is Roth's defense of the market design that was put in place decades earlier and modified by his refinements.

II. The Debate

A. Priest's Argument

Priest argues that the unraveling of matching markets both shows that the matching markets are designed to create or protect monopsony power and reflects an efficient type of "cheating" on the cartel design. On his view, hospitals use the NRMP to suppress competition for residents. In a normal competitive labor market, employers and applicants are free to contact one another at any time, negotiate whatever terms they want, and agree by contract to any terms that are mutually advantageous. The NRMP replaces this system with one in which applicant and employer are given incentives to disclose their ordinal preferences but have no way to express the intensity of their preferences—unlike in an unconstrained market, where intensity of preferences is expressed through willingness to pay or accept.

The system suppresses competition in three ways. First, the programs submit a fixed common salary offer for all positions within the program. While programs can compete against other programs by offering higher common salaries, they cannot compete by offering different salaries to specific applicants. Nor can they bargain individually with applicants. These rules reduce the upward pressure on salaries that would prevail in an

14. *Violations of NRMP Match Participation Agreements: Reporting, Investigation, and Disposition*, NRMP (2023), https://www.nrmp.org/wp-content/uploads/2023/08/Violations-Policy_Ver.Aug2023.pdf [https://perma.cc/B9DM-UZ9J].

15. As I have been told by market participants.

16. Roth & Peranson, *supra* note 10, at 748. *See generally* Kevin J. Williams, *A Reexamination of the NRMP Matching Algorithm*, 70 ACAD. MED. 470 (1995); Elliott Peranson & Richard R. Randlett, *The NRMP Matching Algorithm Revisited: Theory Versus Practice*, 70 ACAD. MED. 477 (1995).

17. Roth & Peranson, *supra* note 10, at 751 ("The goal of the design was to construct an algorithm that would produce stable matchings as favorable as possible to applicants, while meeting the specific constraints of the medical market.").

unconstrained market. If a program is tempted to raise salaries to attract the best applicants, it will have to pay more to lower-ranked applicants. Moreover, the hospitals share information on salary with one another, and this facilitates salary coordination.[18]

Second, ordinal rankings do not allow applicants to express their preferences for programs based on salary. An applicant might prefer Program A to Program B if the salaries are equal, but she cannot indicate that she would prefer Program B if it offered a higher salary. This lack of wage-based preference expression can lead to matches that do not optimize for salary, further reducing the pressure on programs to offer more generous compensation.[19]

Third, once the Match results are released, both applicants and programs are bound by the results. This means that applicants cannot negotiate for higher salaries or use competing offers as leverage. The binding nature of the Match removes the possibility of post-Match salary negotiations, which could otherwise put upward pressure on wages. With similar effect, early contracting is prohibited.[20]

To see how these rules interact, imagine that Program A and Program B both offer a salary of $60,000 per year. Anne prefers A over B based on location and training opportunities, so she ranks A first and B second. Program A ranks Anne first, and so Anne and Program A are matched. However, Anne would prefer Program B if it paid her a salary of $70,000, and Program B would be willing to pay that much. That information is disregarded in the matching process, with the result that Anne will end up with Program A. Nor is Anne permitted to abandon Program A if Program B offers her a higher salary; nor is Program B allowed to offer Anne a higher salary before the Match.

While Program B loses its preferred applicant in this example, Program B benefits from the system as well. Imagine that an applicant named Bob prefers Program B but would accept an offer from Program A if A paid Bob $10,000 more than B does. Just as Anne cannot use A's offer to obtain a higher salary from Program B, Bob cannot use B's offer to obtain a higher salary from Program A. The Match is a kind of market division agreement in which the hospitals divide up applicants based on the applicants' nonpecuniary preferences (e.g., location), so that the pressure to raise salaries is reduced.

Programs A and B can coordinate on the $60,000 salary by using the database of salaries maintained by the American Medical Association. They might use last year's salary plus a cost-of-living adjustment. Although one program may offer a higher salary than another because the hospital is located in an undesirable area or offers limited training opportunities,

18. Priest, *supra* note 1, at 466-67.
19. *Id.* at 467.
20. *Id.* at 452.

the programs can still coordinate around a median or range. Hospitals may also compete over non-price forms of compensation. But the easy availability of salary information for similar types of jobs reduces the incentive to compete.

As evidence that the NRMP has had anticompetitive impact, Priest points out the extraordinary compression of salaries for residents.[21] Compression across productivity levels is evidence of monopsony because monopsony pushes down compensation to a lower bound.[22] In 2001, salaries ranged from $35,930 at the 25th percentile to $39,401 at the 75th percentile in the northeast, $33,445 to $35,300 in the South, and similarly in other parts of the country.[23] It is unlikely that these narrow ranges reflect the actual distribution of talent.[24] By way of comparison, Priest points to salary ranges for new law associates, which exceeded $77,500 in the northeast,[25] for example—a much more realistic representation of range in talent, Priest argues.[26]

In sum, Priest argues that an unconstrained market would match applicants and hospitals better than a centralized matching program because both sellers and buyers can express the intensity of preferences through bargaining. Early efforts to implement matching programs led to unraveling precisely for this reason. Because hospitals cannot offer preferred candidates higher wages, they offer a non-wage benefit that candidates value—an early offer. If the NRMP has solved the unraveling problem, it has done so only by blocking Pareto-improving early offers and imposing centralized planning that results in undercompensation of medical residents. Or so Priest argues.

Some economists writing in the economic literature made observations similar to Priest's. Bulow and Levin observed that the salaries for medical residents were very low, hours were long, and salary compression was "remarkable."[27] Bulow and Levin wrote a model that suggests that, compared to an ideal competitive equilibrium, the Match shifts substantial surplus from residents to hospitals albeit without sacrificing much efficiency.[28] Others have criticized their argument.[29]

21. *Id.* at 463-66.
22. *Id.* at 464-66.
23. *Id.* at 466 tbl.1.
24. *Id.* at 463-66.
25. *Id.* at 464, 466 tbl.1.
26. *Id.* at 464-466.
27. Jeremy Bulow & Jonathan Levin, *Matching and Price Competition*, 96 AM. ECON. REV. 652, 652 (2006).
28. *Id.*
29. *See* Agarwal & Budish, *supra* note 6, at 52-57.

B. Roth's Reply to Priest

Roth's first argument aims at Priest's claim that the narrow range of salaries for medical residents shows monopsony power. Roth accepts Priest's characterization of the lawyer entry-level market as competitive, and then he pounces by pointing out that the market exhibits unraveling itself: law firms employ law students as summer associates and make or signal permanent offers to them well before they complete law school.[30] This evidence suggests, contrary to Priest, that unraveling does not necessarily signify monopsony.

Both Roth and Priest are wrong about the market for lawyers—and their error is revealing. As is widely known, major law firms coordinate wages through a longstanding system of price-leadership by Cravath, Swaine & Moore.[31] While there is no evidence that law firms collude (which is illegal), wage coordination (which is lawful) is an effective method for aggregating bargaining power to monopsony levels, resulting in wages below the competitive level. The existence of unraveling in the law firm market is consistent with Priest's thesis that unraveling occurs when a labor cartel or monopsony controls prices. If law firms coordinate by paying the same salary to entry-level workers, then a firm may cheat by making an early offer to a student who is risk-averse or otherwise benefits from an early decision.

But Roth is right that Priest's argument is too strong. Priest argues that if we observe unraveling in a labor market, then (1) the source must be labor monopsony, and (2) the unraveling itself is efficient because it represents an evasion of the cartel's pricing restrictions and may in any event undermine the cartel—just as cheating on product-market cartels is regarded as benign.[32] Neither claim is true in the abstract, though the claims may accurately characterize particular markets, possibly including the medical residency labor market.

The reasons for market construction are varied, but the most important is related to liquidity. In an unconstrained market that Priest envisions, buyers and sellers may have trouble finding one another. If there are few buyers and few sellers, then prices will vary and transactions will be slow as each side haggles for an advantage. In the absence of price transparency, sellers may end up accepting low prices from buyers who are not the most efficient match, and buyers may end up overpaying, resulting in suboptimal trades. A huge number of institutions—exchanges, clearinghouses, farmers' markets, auctions, and so on—have been established to

30. Roth, *supra* note 4, at 481.

31. *See* Ryan Boone, *Tacit Collusion in Labor Markets: The Case of BigLaw*, *in* ESSAYS ON LABOR DEMAND WITH MARKET IMPERFECTIONS 6-7 (2021) (Ph.D. dissertation, UCLA); Jonathan S. Masur & Eric A. Posner, *Horizontal Collusion and Parallel Wage Setting in Labor Markets*, 90 U. CHI. L. REV. 545, 570 (2023).

32 Priest *supra* note 2, at 450.

improve liquidity, reduce transaction costs, and enhance price discovery in markets, and many firms (banks, for example) offer such services as well, acting as market makers. In an unconstrained market, the timing of transactions will reflect risk preferences and information costs, as Priest argues, and so it makes little sense to talk of unraveling. But agents who rationally transact early to maximize profits impose a negative externality on the group, which benefits when transactions occur in limited settings, at limited times, and in a public way. If the agents establish an institution to enhance liquidity by creating a window in which transactions may occur, the institution "unravels" or collapses when agents cheat by transacting early and when such cheating is indeed harmful.

As an example, consider another market designed by Roth—the kidney exchange system.[33] Federal law prohibits the sale of kidneys, in effect setting their price at $0 (though, in practice, donors may receive some money to cover the pain and inconvenience of surgery). Some people are altruistic, and are willing to donate a kidney, though usually only to relatives, and can do so only if blood types are compatible. Roth designed a matching program that allowed for the creation of kidney exchanges where (as is often the case) a donor and designated recipient have incompatible blood types. For example, the parent of A donates to B, in return for which the parent of B donates to A, where each parent-child pair is incompatible but the crossover pairs are compatible—with the chain of exchanges potentially extended indefinitely. The monopsony power of "buyers" (the recipients, or more likely, hospitals or insurers) created by legal regulation was outside of Roth's control, but he could increase the supply of kidneys by engineering a system for matching willing donors and qualified recipients. Like the NRMP, the system would collapse or unravel if donors and recipients could transact (in this case, on the black market). Roth improved the operation of kidney exchanges without also enhancing the market power of any relevant party.

Exchanges and similar intermediaries can function only if the parties that use them are compelled to follow the rules. These rules limit manipulation and ensure that sufficient transactions occur to maintain liquidity. Priest's and Roth's focus—on early contracting—is just one of the ways in which an exchange can collapse. If an exchange generates value, then design mechanisms—whether they are rules or algorithms—are justified, and that includes design mechanisms that reduce early contracting.

But Roth too quickly dismisses Priest's argument that market design can facilitate collusion.[34] A market can be designed both to improve efficiency and to favor one side of the market at the expense of another.

33. *See generally* Alvin E. Roth, Tayfun Sönmez & M. Utku Ünver, *Kidney Exchange*, 119 Q. J. Econ. 457 (2004).

34. Roth, *supra* note 5, at 488.

III. The Lawsuit and Congressional Response

That possibility would be highlighted in a lawsuit brought in 2004. Paul Jung and two other physicians brought a class action against defendants who operated or participated in the Match Program. These defendants included 21 hospitals or medical centers and seven medical organizations, including the Association of American Medical Colleges (AAMC) and the Accreditation Council for Graduate Medical Education, which govern the NRMP.[35]

The plaintiffs alleged that the NRMP was a price-fixing conspiracy in violation of section 1 of the Sherman Act. They pointed out that all residents were required to participate in the NRMP in order to obtain board certification. The NRMP suppressed competition by preventing applicants from securing more than one offer from a residency program and negotiating with programs outside the NRMP protocol. The hospitals also shared annual resident compensation information collected through a survey conducted by the AAMC and maintained in a database managed by the American Medical Association. The plaintiffs argued that the narrow range of salaries across hospitals, regions, times, cost-of-living indices, and levels of market concentration indicated price-fixing. The court denied the defendants' motion to dismiss, and it appeared that the case would head to trial.[36]

A fierce lobbying effort spearheaded by the Association of American Medical Colleges (AAMC) and the American Hospital Association (AHA) ended the lawsuit just two months later.[37] Buried in the Pension Funding Equity Act of 2004, a provision entitled "Confirmation of Antitrust Status of Graduate Medical Resident Matching Programs"[38] granted immunity to the NRMP. The purpose of the law was to "confirm that the antitrust laws do not prohibit sponsoring, conducting, or participating in a graduate medical education residency matching program, or agreeing to do so."[39] There were no hearings or debate on a provision that blocked a pending lawsuit, which, as several senators complained, was quite unusual.[40] As the law applied retroactively as well as prospectively, the court granted the defendants' motion for judgment on the pleadings in the *Jung*

35. Jung v. Ass'n of Am. Med. Colleges, 300 F.Supp.2d 119 (D.D.C. 2004).

36. *Id.* at 125-27.

37. *See* Richard Weinmeyer, *Challenging the Medical Residency Matching System Through Antitrust Litigation*, 17 AMA J. ETHICS 147 (2015); Myrle Croasdale, *New Legislation Protects the Match from Antitrust Litigation*, AM. MED. NEWS (May 3, 2004), https://amednews.com/article/20040503/profession/305039954/7 [https://perma.cc/ZYV2-B5AR].

38. Pub. L. No. 108-218, 118 Stat. 596 (2004)(current version at 15 U.S.C. § 37b).

39. *Id.*

40. *See* 150 CONG. REC. S3979 (2004) (statement of Sen. Herb Kohl); 150 CONG. REC. S3981 (2004) (statement of Sen. Russell Feingold); 150 CONG. REC. S3991-S3992 (2004) (statement of Sen. Jeff Bingaman).

case, noting that "Plaintiffs understandably are frustrated. They won a significant victory in court; Congress now has snatched it away."[41]

The judge's comment rang of truth even though the court never was given the chance to evaluate the evidence. The NRMP included several elements that were facially anticompetitive, including the ban on bargaining outside of the protocol. While it was probably not per se illegal because the system facilitated contracting as well as constrained competition,[42] the plaintiffs submitted a report from a respected economist, Orley Ashenfelter, who estimated that the Match reduced residents' salaries by $40,000 per year.[43] The publicly available evidence, including the wage compression data,[44] supports Ashenfelter's estimate, at least directionally.[45]

One striking fact, for example, is that compensation of medical residents has stagnated over several decades, during which spending on medical care skyrocketed. From 1970 to 2022, national health expenditure per capita increased from $353 to $13,493 in 2022 dollars, or by 38 times.[46] During this same period, the ratio of compensation of attending physicians to that of residents increased from 2.2 to 4.4. See Figure 1. In 2023, the mean salary for first-year residents was $63,800.

41. Jung v. Ass'n of Am. Med. Colleges, 339 F.Supp.2d 26, 40 (D.D.C. 2004), *aff'd*, 184 F.App'x 9 (D.C. Cir. 2006).

42. *See* Bd. of Trade of Chi. v. United States, 246 U.S. 231, 240 (1918).

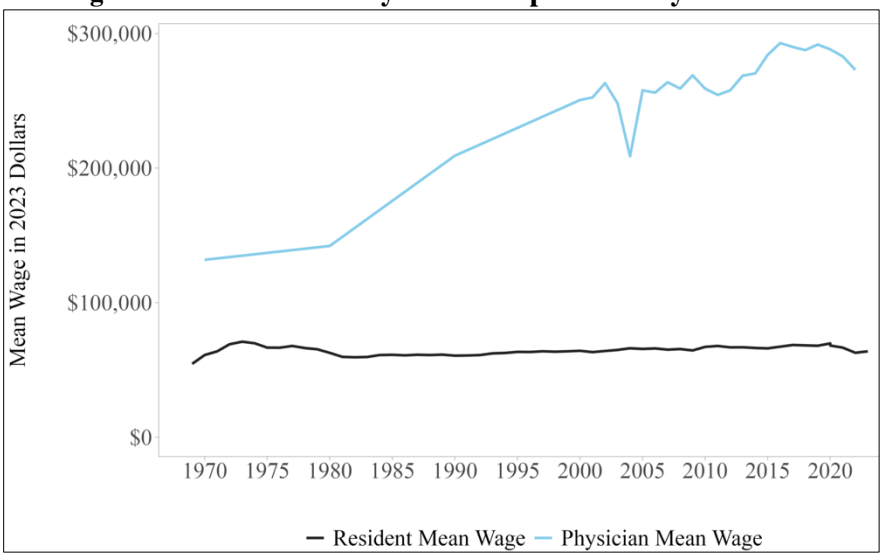
43. According to Agarwal & Budish, *supra* note 6, at 53. However, a redacted version of Ashenfelter's expert report available online does not show any estimate. *See* Orley Ashenfelter, *Expert Report of Orley Ashenfelter: In Connection with Resident Physicians Antitrust Litigation* (Oct. 31, 2003), https://stanford.edu/~alroth/Ashenfelter_Rpt_Redacted.pdf [https://perma.cc/669E-RSWW].

44. *Id.*

45. *See* Bulow & Levin, *supra* note 27, at 17 (supporting this view). *But see, e.g.*, Fuhito Kojima, *Matching and Price Competition: Comment*, 97 AM. ECON. REV. 1027, 1028-1029 (2007); Nikhil Agarwal, *An Empirical Model of the Medical Match*, 105 AM. ECON. REV. 1939, 1974-1975 (2015); Muriel Niederle & Alvin E. Roth, *The Effects of a Centralized Clearinghouse on Job Placement, Wages, and Hiring Practices*, in STUDIES OF LABOR MARKET INTERMEDIATION 235,262-264 (David H. Autor ed., 2009) [hereinafter Niederle & Roth, *Centralized Clearinghouse*]; Muriel Niederle & Alvin E. Roth, *Relationship Between Wages and Presence of a Match in Medical Fellowships*, 290 JAMA 1153, 1153 (2003) [hereinafter Niederle & Roth, *Wages and Presence*].

46. National Health Expenditure Tables, Table 01: National Health Expenditures; Aggregate and Per Capita Amounts, CTRS. FOR MEDICARE & MEDICAID SERVS. (2022), https://www.cms.gov/data-research/statistics-trends-and-reports/national-health-expenditure-data/historical [https://perma.cc/97YV-BEJN].

Figure 1: Resident and Physician Compensation by Year



Note: Resident salary data obtained from AAMC Survey of Resident/Fellow Stipends and Benefits;[47] Physician salary data obtained from Integrated Public Use Microdata Series.[48]

Residents face brutal job conditions. Residents endure, on average, 60-hour work weeks, nearly double the national average.[49] Their work brings high rates of burnout,[50] difficulties in their personal relationships,[51] and sleep deprivation.[52] One study found that upon starting residency, the incidence of positive screenings for depression increased five- to six-fold.[53]

47. AAMC Survey of Resident/Fellow Stipends and Benefits, ASS'N AM. MED. COLLEGES '(2023), https://www.aamc.org/data-reports/students-residents/report/aamc-survey-resident/fellow-stipends-and-benefits [https://perma.cc/EF25-7WYV].

48. Steven Ruggles, Sarah Flood, Matthew Sobek, Daniel Backman, Annie Chen, Grace Cooper, Stephanie Richards, Renae Rodgers & Megan Schouweiler, IPUMS USA: Version 15.0 (2024), https://www.ipums.org/projects/ipums-usa/d010.V15.0 [https://perma.cc/6FAS-S2AB].

49. Laura K. Barger, Matthew D. Weaver, Jason P. Sullivan, Salim Qadri, Christopher P. Landrigan & Charles A. Czeisler, *Impact of Work Schedules of Senior Resident Physicians on Patient and Resident Physician Safety: Nationwide, Prospective Cohort Study*, 2 BMJ MED. e000320 (2023); U.S. Bureau of Labor Statistics, *Average Weekly Hours of All Employees, Total Private*, FRED, FED. RSRV. BANK ST. LOUIS (2006), https://fred.stlouisfed.org/series/AWHAETP [https://perma.cc/T4BT-NCRT].

50. *2023 Survey of Final-Year Medical Residents: Many Job Choices, Many Reservations*, AMN HEALTHCARE (2023), https://www.amnhealthcare.com/siteassets/amn-insights/surveys/survey-of-final-year-medical-residents-2023.pdf [https://perma.cc/V64G-6F96].

51. Amir Mian, Dahye Kim, Duane Chen & Wendy L. Ward, *Medical Student and Resident Burnout: A Review of Causes, Effects, and Prevention*, 4 J. FAM. MED. DIS. PREV. (2018).

52. Barger et al., *supra* note 49.

53. Douglas A. Mata, Marcos A. Ramos, Narinder Bansal, Rida Khan, Constance Guille, Emanuele Di Angelantonio & Srijan Sen, *Prevalence of Depression and Depressive Symptoms Among Resident Physicians: A Systematic Review and Meta-Analysis*, 314 JAMA 2373 (2015); *see also* Srijan Sen, Henry R. Kranzler, John H. Krystal, Heather Speller, Grace Chan, Joel Gelernter & Constance Guille, *A Prospective Cohort Study Investigating Factors Associated With Depression*

It is possible that wage stagnation masks other benefits that residents have received, for example, training.[54] The cost of hosting residents varies across hospitals and specialties, but estimates suggest it is just under $200,000.[55] This amount covers resident training, including clinical rotations and educational curriculum. While quantifying the precise value of training is challenging, estimates have been made for certain specialties such as internal medicine (IM).[56] A back-of-the-envelope calculation reveals the wage difference—when accounting for training—between IM residents and first-year practicing physicians to be roughly $98,000.[57]

And while a major justification for the centralized match system was that it reduced the stress and uncertainty of the earlier era of unregulated hiring, the Match has introduced inefficiencies of its own. One study reported that 76% of students felt extreme stress during the interview season for in-person interviews, and 57% did for virtual interviews.[58] To minimize the risk of not receiving an offer, students apply to numerous programs, which involves financial costs, traveling, and other burdens. In 1992, prior to the introduction of Roth's algorithm, medical students applied to a median of 12 residency programs.[59] Today, the average student applies to 78 residency programs (144, in the case of foreign applicants).[60] As students apply to more programs, a feedback loop is created, as the larger number of applications drives the acceptance rate down, pushing students to apply to still more programs.[61] In addition to raising stress, this feedback loop causes financial harm. The AAMC reported this year that students had

During Medical Internship, 67 ARCH. GEN. PSYCHIATRY 557 (2010) (finding suicidal ideation increased, on average, 370% over the first three months of the first year of training).

54. Agarwal, supra note 45.

55. *See* Judith Pauwels & Amanda Weidner, *The Cost of Family Medicine Residency Training: Impacts of Federal and State Funding*, 50 FAM. MED. 123 (2018) (finding $179,353 for family medicine residents); Ron Ben-Ari, Richard J. Robbins, Sailaja Pindiprolu, Allan Goldman & Polly E. Parsons, *The Costs of Training Internal Medicine Residents in the United States*, 127 AM. J. MED. 1017 (2014) (finding $183,138 to $199,486 for internal medicine).

56. Alwin F. Steinmann, *Threats to Graduate Medical Education Funding and the Need for a Rational Approach: A Statement from the Alliance for Academic Internal Medicine*, 155 ANN. INTERN. MED. 461 (2011).

57. Calculated by subtracting annual residency salary (RS) and annual training value (TV) from annual first-year practicing physician salary (PS): PS($198,000) – RS($53,000) – TV($46,713) = $98,287 (wage difference).

58. Dani Zoorob, Kara Richardson, Korina Gaishauser, Benjamin Hinkel, Hind N. Moussa, James Van Hook & Rose A. Maxwell, *Do Medical Student Mental Stress and Burnout Vary with Virtual versus In-Person Residency Interviews*, 7 FUTURE SCI. OA FSO752 (2021).

59. Joshua Allen Cole & Avital Brena Ludomirsky, *The Costliness of US Residency Applications: Moving Toward Preference Signaling and Caps*, 14 J. GRAD. MED. EDUC. 647 (2022).

60. *Residency Specialty Summary ERAS Statistics Data*, ASS'N AM. MED. COLLEGES (2023), https://www.aamc.org/media/39306/download.

61. Steven J. Weissbart, Soo Jeong Kim, Richard S. Feinn & Jeffrey A. Stock, *Relationship Between the Number of Residency Applications and the Yearly Match Rate: Time to Start Thinking About an Application Limit?*, 7 J. GRAD. MED. EDUC. 81 (2015).

median interview costs of roughly $3,000.[62] For competitive specialties, these costs can exceed $10,000.[63]

Roth argues that lower resident salaries aren't caused by the Match program.[64] But contrary to Roth, the statute muscled through by the hospital lobby did not resolve the question of whether the Match was anticompetitive.[65] It prevented courts from making that determination by drawing on evidence that would have been made available during discovery, including hospitals' proprietary data and communications among hospital executives.

Moreover, antitrust litigation would have provided an opportunity to determine whether the Match could have been designed to allow wage competition. Exchanges and clearinghouses in product and financial markets match buyers and sellers without preventing them from negotiating prices—quite the contrary. Suppose, for example, that applicants could submit salary proposals along with their rankings so that those applicants could, for example, stipulate that they will not accept an offer at a salary below a certain level or will accept an offer from choice #2 if the salary exceeds the salary of choice #1 by a certain amount. Similarly, hospitals could be allowed to offer varying salaries within the protocol. If the lawsuit had been allowed to proceed, a court might have ordered a remedy that would have enhanced wage competition while preserving the overall design of the Match, just as courts have done in other litigation involving exchanges.[66]

IV. Lessons

A. Two Perspectives: Antitrust (Free Market) vs. Market Design (Centralized Planning)

Priest and Roth suffer from different blind spots. Priest sees early contracting as presumptively efficient. While he acknowledges that market construction can increase aggregate welfare by improving liquidity, he

62. *The Cost of Interviewing for Residency*, ASS'N AM. MED. COLLEGES (Jan. 26, 2024), https://students-residents.aamc.org/financial-aid-resources/cost-interviewing-residency [https://perma.cc/E2RE-T7H9].

63. J. Bryan Carmody, Ilana S. Rosman & John C. Carlson, *Application Fever: Reviewing the Causes, Costs, and Cures for Residency Application Inflation*, 13 CUREUS e13804 (2021).

64. *See* sources cited *supra* note 44.

65. Roth says, "An interesting historical note is that the use of stable clearinghouses has been explicitly recognized as part of a procompetitive market mechanism in American law." He then discusses the litigation and the statute. Alvin E. Roth, *What Have We Learned from Market Design?*, 118 ECON. J. 285, 290 (2008).

66. As this article goes to press, the media has reported a new lawsuit against the matching model used for pharmacy residents. See Katie Arcieri, *Hospitals Hit With Wage Suppression Claims by Pharmacy Residents*, BLOOMBERG (March 3, 2025), https://news.bloomberglaw.com/antitrust/hospitals-hit-with-wage-suppression-claims-by-pharmacy-residents [https://perma.cc/7RG4-3Q9W].

believes that restrictions on contracting outside the constructed market are presumptively anticompetitive—as a constraint on the free market. In his discussion of the Chicago Board of Trade case in an earlier article, one can see this logic clearly. The Board of Trade enhanced market liquidity by providing a time and a place for merchants to gather to transact. The Board of Trade also issued the "call" rule which provided that Board of Trade members who transacted after hours must use the closing price from the previous day. Priest argues that the call rule is anticompetitive by drawing a distinction between limited hours of operation, which he thinks is a procompetitive restraint, and the call rule, which prevents parties from negotiating afterhours prices that they prefer:

> The transactions that the call rule sought to prohibit do not represent free riding on the organized market because, by definition, they were transactions at prices other than those established by the market itself, thus deriving from separately acquired information or prediction.[67]

But the afterhours traders benefit from the prices disclosed a few hours earlier on the exchange, and their trading would reduce the attractiveness of the exchange for others because those who trade afterhours in order to exploit price shifts are no longer in the market while it is open. The call rule helps maintain liquidity in the market by discouraging (though not prohibiting) members from trading outside the trading window. While it is also possible that, on balance, the call rule (and, for that matter, the trading window) reduce rather than enhance competition because liquidity would be adequate without an exchange, one cannot evaluate the rules in the abstract.

Roth argues that early contracting is a "market failure." This is a poor choice of words that likely sent Priest off on his tangent. A market failure normally means a failure of the "free market," typically involving activity that produces negative externalities, resulting in an oversupply of goods relative to the social optimum. For Priest, early contracting is just the free market in action, so it can't be a market failure. But what Roth means is that when the freely operating market operates less optimally than a human-designed market constrained by rules that are enforced by an organization or the government, then early contracting represents the failure of a potentially superior form of constrained contracting. If early contracting occurs, either the market is not optimally designed or the rules are not being enforced. As Roth points out, Priest implicitly assumes that a "free market"—meaning, one in which no one sets the rules for contracting—must always be the most efficient means for exchanging goods and services.

This assumption is plainly wrong. That said, Roth's claim that early contracting is inefficient also is too strong: it may or may not be

67. George L. Priest, *Reexamining the Market for Judicial Clerks and Other Assortative Matching Markets*, 22 YALE J. ON REGUL. 123, 199 (2005).

inefficient. The historical record on NRMP is hazy. Many hospitals and residents expressed dissatisfaction with the NRMP, and worried about gaming, and apparently, there is greater satisfaction now than there was before Roth's modification in 1998. But it does not follow that a modest amount of unraveling, or even complete unraveling, is economically inferior. The chaotic trading may have generated anxiety and distress for some market participants and yet been superior from the standpoint of efficiency than the NRMP. And, as we have seen, the Match has not eliminated anxiety or uncertainty. Neither Roth nor anyone else has proven that any particular rule-constrained employment market for medical residents would be more efficient than an unconstrained market.

Roth expressed little concern in his work in the 1990s that designed markets, including the markets he designed, may be anticompetitive—either relative to an unconstrained market or to another market design. In that work, Roth did not discuss the possibility that by enhancing stability, his algorithm helps maintain a cartel that suppresses compensation of medical residents—a labor monopsony. While Roth did not, of course, design the original matching program, it is possible that he helped keep alive a labor cartel by helping it solve an unraveling problem. Priest did well by drawing attention to this large and surprising lacuna.

B. Labor Matching Programs and Monopsony

Labor matching programs are common for skilled workers. In a paper from 1994, Roth and Xing list dozens of such programs in various countries, including for various medical specialties like thoracic surgery.[68] Every program works differently, but the common element is a central institution that applies an algorithm to a ranking of preferences submitted by applicants and employers. Many programs also restrict contracting outside of the Match.

However, most labor markets do not include such programs. Matching programs for experienced workers who seek lateral offers are rare. The lateral market is probably too illiquid to benefit from a matching program: there are not enough similar employers who seek to hire similar applicants. Instead, employers and applicants contact one another using ad hoc methods or intermediaries like headhunters. Matching programs are also unusual for low-skilled entry-level workers. Employers of low-skilled workers usually post job listings to attract applicants. Job fairs, government employment offices, and other institutions bring together employers and applicants without restricting negotiations between them. An intermediate case is the entry-level application process for professional and other skilled workers, which is often constrained more loosely. The National

68. Roth & Xing, *supra* note 9, at 993. For more recent examples, see Niederle & Roth, *Centralized Clearinghouse*, *supra* note 45.

Association of Law Placement (NALP), an organization sponsored by law firms and law schools, provides guidelines for hiring and recruitment for lawyers;[69] and shares information relating to scheduling of interviews and other recruitment-related activities.[70] It does not, however, administer a formal matching service.

Table 1[71] provides examples of labor market intermediaries that operate centralized matching programs and less formal placement systems like NALP's. At one end of the spectrum, centralized matching programs prevail for medical residents (with different programs for specialties), veterinarians, dentists, pharmacists, doctoral psychologist interns, and some teachers. For other professions—including accountants, engineers, (other) psychologists, and certain government positions—a variety of less centralized systems are used, including job boards, coordination of interview schedules, and computerized search services.

Why might a centralized matching service be used for medical residencies but not for entry-level law firm hiring? The answer is not clear. About the same number of lawyers and doctors graduate every year. The nature of the work does not seem relevantly different—in both cases, students undergo intensive training and obtain specialized skills. But there is an organizational difference. The interests of law schools are closely aligned with the success of their graduates. The more that law school graduates earn, the more likely that law schools will attract good students and be able to charge high tuition. By contrast, medical schools both train doctors and hire them. If entry-level salaries are high, hospitals with medical schools can charge high tuition, but they must also incur high labor costs. The matching system serves two functions—facilitating hiring and suppressing compensation.

A further distinction helps explain why monopsony is a greater risk in market design for labor hiring than for other forms of exchange like stock exchanges. Matching models appear to be used exclusively for entry-level hiring of professionals with advanced training. These workers are not organized and have no leverage for negotiating a market design that serves their interest—unless, as in the case of law students, they are represented by their schools. These workers will use the matching system just once in their lives. By contrast, financial and product-market exchanges match sophisticated and well-organized buyers and sellers, nearly always repeat players, and in many cases, the buyers and sellers are the same people. Thus, labor matching systems may be designed, organized, and captured by one side of the market, the employers. Other matching systems are

69. *Principles for a Fair and Ethical Recruitment Process*, NALP (2018), https://www.nalp.org/fair_ethical_recruitment [https://perma.cc/YC2X-G7YV].

70. *Directory of Law Schools*, NALP, https://www.nalp.org/nalpdirectoryoflawschools [https://perma.cc/9JDL-KJEP].

71. *See* Appendix A.

designed and operated by independent parties or industry actors who usually cater to both sides of the market.

Employment placement programs, like exchanges and other product-market intermediaries, create both benefits and risks. Centralized or quasi-centralized methods for placing workers with employers improve liquidity, reduce the costs of search, and—all else equal—should improve outcomes for both employees and employers. But all else is not equal. The organizations that sponsor these programs are typically dominated by employers, who have strong incentives to design them so as to suppress competition. The ill-fated *Jung* case stands as the only labor-market example, and it was shut down by the hospital industry through its influence on Congress.

Conclusion

Most markets in a modern economy bear the imprint of the human touch. Unorganized buying and selling rarely is optimal. Firms typically organize markets, either unilaterally or collectively—often under the watchful (or bleary) eye of a government regulator.[72] Exchanges, clearinghouses, market-makers, benchmark providers, asset raters, and other intermediaries have played a dominant role in securities, commodities, and money markets for centuries. In recent years, internet platforms have expanded the available exchange mechanisms, matching merchants and consumers (e.g., Amazon), software developers and app purchasers (Apple), web searchers and advertisers (Google), passengers and rideshare drivers (Uber), diners and restaurants (OpenTable). The earlier wave of antitrust litigation against traditional exchanges has been supplemented by modern litigation against the platforms, many of which have displaced the old brick-and-mortar exchanges.

Economists can and do help design these intermediaries. This mostly happens in-house, away from public scrutiny.[73] But they also do this work for governments. A familiar example is the FCC spectrum auction, which was designed by economists to transfer spectrum from broadcasters to cellular phone companies and broadband providers. Private equity funds gamed the system by buying up licenses from broadcasters ahead of the auction, and then withholding some of those licenses from the auction to push up the prices of the others, which they sold.[74] Some critics argue that the economists who designed the auction were complicit in an

72. Ronald J. Gilson & Reinier H. Kraakman, *The Mechanisms of Market Efficiency*, 70 VA. L. REV. 549 (1984).

73. Lydia DePillis, *Amazon Gets an Edge with Its Secret Squad of PhD Economists*, CNN (Mar. 13, 2019), https://www.cnn.com/2019/03/13/tech/amazon-economists/index.html [https://perma.cc/3VSC-KE4D].

74. *See* Ulrich Doraszelski, Katja Seim, Michael Sinkinson & Peichun Wang, *Ownership Concentration and Strategic Supply Reduction* (Nat'l Bureau of Econ. Rsch., Working Paper No. 23034, 2019).

anticompetitive scheme.[75] While one of them vigorously contests this accusation,[76] the auction could have been designed to minimize this risk, or could have been forgone completely in favor of a forced transfer of the licenses from broadcasters to cellular phone and broadband providers, as the broadcasters did not have property rights in the licenses. The latter approach would have ensured that more of the spectrum would have been repurposed.

If economists are not aware that they may be used by market agents to design anticompetitive markets, the story of the NRMP ought to open their eyes. Where markets are designed by private agents for their own benefit, those agents have strong incentives to use market design principles to enhance market power—and to pay economic consultants to help them. This problem is acute in labor markets where typically only one side of the market—employers—participate in the organization of labor exchanges. Economists, lawyers, and enforcers should be alert to this problem.

75. *See* Glen Weyl, *How Market Design Economists Helped Engineer a Mass Privatization of Public Resources*, PROMARKET (May 28, 2020), https://www.promarket.org/2020/05/28/how-market-design-economists-engineered-economists-helped-design-a-mass-privatization-of-public-resources [https://perma.cc/297V-F52A].

76. *See* Paul Milgrom, *The Market Design Community and the Broadcast Incentive Auction: Fact-Checking Glen Weyl's and Stefano Feltri's False Claims*", DIGITOPOLY (June 14, 2020), https://digitopoly.org/2020/06/14/the-market-design-community-and-the-broadcast-incentive-auction-fact-checking-glen-weyls-and-stefano-feltris-false-claims [https://perma.cc/QK8B-UYFC].

Appendix A

Table 1: Examples of Employment Intermediaries

Occupation	Organization	Program	Description
Medical resident	Association of American Medical Colleges and the Accreditation Council for Graduate Medical Education	National Resident Matching Program[77]	Matches medical students with residency program through a single centralized system
Entry-level law firm associate	National Association for Law Placement	On Campus Interview (OCI) Database[78]	Maintains database of all law schools' OCI schedules
		Principles for a Fair and Ethical Recruitment Process[79]	Releases guidelines on standard practices and ethics to be followed in the legal recruitment process
		Directory of Legal Employers[80]	Maintains a directory of law firms actively seeking new hires
		Reimbursement/Evaluation Forms[81]	Provides forms for students to request reimbursement for interviews with firms, as well as forms for students to evaluate those firms (and vice versa).
Entry-level accountant	Association of International Certified Professional Accountants	Global Career Hub[82]	Maintains an online portal for job-seekers to find accounting opportunities and for firms to recruit candidates.
	Institute of Management Accountants	Virtual Student Career Fair[83]	Hosts event to connect students with companies looking to recruit for internships and full-time entry level positions
	Association of Chartered Certified Accountants	NA	Maintains a job board of entry level accounting positions[84]

77. NRMP, https://www.nrmp.org [https://perma.cc/9WM8-U4E9].

78. *On Campus Recruiting Calendar*, NALP, https://www.nalplawschools.org/on_campus_recruiting_calendar [https://perma.cc/H2GF-VCWU].

79. *Principles for a Fair and Ethical Recruitment Process*, *supra* note 69.

80. *Directory of Legal Employers*, NALP, https://www.nalp.org/nalpdirectoryoflegalemployers [https://perma.cc/6DPN-NZUE]; *JD Job Seekers*, NALP, https://www.nalp.org/jdjobseekers [https://perma.cc/3C5B-D4CV].

81. *Forms*, NALP, https://www.nalp.org/forms [https://perma.cc/FS2E-4KUH].

82. *Global Career Hub*, ASS'N INT'L CERTIFIED PRO. ACCTS., https://mycareer.aicpacima.com [https://perma.cc/57SR-WVJ2].

83. *Virtual Student Career Fair*, INST. MGMT. ACCTS., https://www.imanet.org/newsletters/campus-connection/2022/april/save-the-dates-virtual-career-fair-in-person-student-leadership-conference [https://perma.cc/7HFP-FAHW].

84. *Entry Level Jobs*, ASS'N CHARTERED CERTIFIED ACCTS., https://jobs.accaglobal.com/jobs/entry-level [https://perma.cc/8SJM-B3ES].

Veterinary intern/ resident	American Veterinary Medical Association	Veterinary Internship & Residency Matching Program[85]	Matches applicants with veterinary internships / residency programs through a single centralized system
Dental resident	National Matching Services Inc.[86]	Postdoctoral Dental Matching Program[87]	Matches dental students with postdoctoral / residency programs through a single centralized system
Pharmacy resident	American Society of Health-System Pharmacists / National Matching Services Inc.	ASHP Match[88]	Matches pharmacy graduates with residency programs through a single centralized system
Court law clerks, interns, and externs	National Center for State Courts	Court Opportunity Recruitment for All[89]	Maintains an online dashboard to connect applicants with state and local court opportunities
Doctoral psychology Intern	Association of Psychology Postdoctoral and Internship Centers / National Matching Services Inc.	APPIC Match[90]	Matches doctoral psychology students with internships through a single centralized system
Post-doctoral trainee	Association of Psychology Postdoctoral and Internship Centers	APPIC Psychology Postdoctoral Application[91]	Facilitates the application, interview, and selection process for postdoctoral training positions in psychology, though applicants ultimately have the choice where to work.

85. VIRMP, https://www.virmp.org [https://perma.cc/6KYU-8EJ9].

86. The matching process is overseen by eight sponsoring organizations: American Association of Oral and Maxillofacial Surgeons; Special Care Dentistry Association; American Association of Orthodontists; American Academy of Pediatric Dentistry; American Academy of Periodontology; American College of Prosthodontists; American Society of Dentist Anesthesiologists; and American Student Dental Association.

87. *Postdoctoral Dental Matching Program*, NAT'L MATCHING SERVS. INC., https://natmatch.com/dentres [https://perma.cc/6AVQ-5MTA].

88. *Overview of the Match: The 2025 ASHP Match*, NAT'L MATCHING SERVS. INC., https://natmatch.com/ashprmp/overview.html [https://perma.cc/QFY5-DRDT].

89. *New Online Portal to Expand Recruitment for Law Clerks, Interns, Externs*, NAT'L CTR. FOR STATE CTS. (June 14, 2023), https://www.ncsc.org/newsroom/at-the-center/2023/new-online-portal-to-expand-recruitment-for-law-clerks,-interns,-externs [https://perma.cc/EX8Q-DM88].

90. *Introduction and General Information About the APPIC Match*, ASS'N PSYCH. POSTDOCTORAL & INTERNSHIP CTRS. (July 31, 2024), https://www.appic.org/Internships/Match/About-The-APPIC-Match/Match-Overview [https://perma.cc/6XJ8-QUQ5].

91. *APPA CAS Postdoc Application Information*, ASS'N PSYCH. POSTDOCTORAL & INTERNSHIP CTRS., https://www.appic.org/Postdocs/APPA-CAS-Postdoc-Application-Information [https://perma.cc/T2LN-WRQ6]; *Postdocs*, ASS'N PSYCH. POSTDOCTORAL & INTERNSHIP CTRS., https://www.appic.org/Postdocs/Universal-Psychology-Postdoctoral-Directory-UPPD%E2%80%9D [https://perma.cc/2F38-6RMX].

Entry-level engineer	Institute of Electrical and Electronics Engineer	IEEE Collabratec[92]	Maintains an online network for workers to find job opportunities and connect with other technical professionals
	American Society of Civil Engineers	ASCE Career Connections[93]	ASCE, AIChE, ASME, and NSPE all maintain their own online job boards
	American Institute of Chemical Engineers	CareerEngineer[94]	
	American Society of Mechanical Engineers	ASME Career Center[95]	
	National Society of Professional Engineers	NSPE Job Board[96]	
Entry-level psychologist	American Psychological Association	Psyc Careers[97]	Maintains an online job board and hosts career fairs
	Society for Industrial and Organizational Psychologists	Career Planning Portal[98]	SIOP, APS, and NRHSP all maintain an online job board
	Association for Psychological Science	APS Employment Network[99]	
	National Register of Health Service Psychologists	N/A[100]	
Entry-level government positions	Office of Personnel Management	Presidential Management Fellowship[101]	Both OPM & USDC facilitate the application and selection process to apply for entry-level government agency positions, though applicants ultimately choose where to work.
	US Digital Corps	US Digital Corps Fellowship[102]	

92. IEEE COLLABRATEC, https://ieee-collabratec.ieee.org/?gad_source=1&gclid=CjwKCAjwvIWzBhAlEiwAHHWgvQM-ScqFu1z_yvY3LUYdjANZM7UfY2uomvpITkxM5-BPuMqmXIOkUjxoClfIQAvD_BwE# [https://perma.cc/9XMP-69JF].

93. ASCE Career Connections, *Jobs*, AM. SOC'Y CIV. ENG'RS., https://careers.asce.org/jobs [https://perma.cc/Z7AN-7NBX].

94. CareerEngineer, AM. INST. CHEM. ENG'RS., https://careerengineer.aiche.org [https://perma.cc/2R2V-LTLW].

95. ASME Career Center, AM. SOC'Y MECH. ENG'RS., https://careercenter.asme.org [https://perma.cc/6327-7N38].

96. *NSPE Career Center*, NAT'L SOC'Y PRO. ENG'RS., https://www.nspe.org/resources/career-center/job-board/job-board [https://perma.cc/XWJ6-PPTS].

97. PSYC CAREERS, https://www.psyccareers.com [https://perma.cc/CA28-5MCQ].

98. *Career Planning Portal*, SOC'Y FOR INDUS. & ORG. PSYCHS., https://jobs.siop.org [https://perma.cc/UBG6-NDCF]

99. *APS Employment Network*, ASS'N PSYCH. SCI., https://jobs.psychologicalscience.org [https://perma.cc/5N3Z-R473].

100. *National Register Career Center Connecting Talent with Opportunity*, NAT'L REG. HEALTH SERV. PSYCHS., https://jobs.nationalregister.org [https://perma.cc/UZZ7-SMYL].

101. PRESIDENTIAL MGMT. FELLOWS PROGRAM, https://www.pmf.gov [https://perma.cc/2DE7-TNZP].

102. U.S. Digital Corps, U.S. GEN. SERVS. ADMIN., https://digitalcorps.gsa.gov [https://perma.cc/NJT6-MXUC].

Entry-level teachers	Teach for America	N/A[103]	Both TFA and TNTP have centralized application programs which match teachers with schools based on regional preferences
	The New Teacher Project	TNTP Teaching Fellow[104]	
	Teach Boston	Boston Teacher Residency[105]	Matches applicants with residency teaching positions in Boston public schools. Other cities have similar programs, including Chicago[106] and New York.[107]

103. TEACH FOR AM., https://www.teachforamerica.org [https://perma.cc/J5EE-L8F8]; *How It Works*, TEACH FOR AM., GREATER CHI.–NW. IND., https://www.tfachicagonwi.org/hiring-how-it-works [https://perma.cc/HD8Z-SXJU].

104. TNTP TEACHING FELLOWS, https://tntpteachingfellows.org [https://perma.cc/8XQP-MTR5].

105. *Boston Teacher Residency*, BOS. PLAN FOR EXCELLENCE, https://www.bpe.org/boston-teacher-residency [https://perma.cc/MM5D-632M].

106. Teach Chi., *CPS Teacher Residency*, CHI. PUB. SCHS., https://www.teach.cps.edu/career-changers [https://perma.cc/P8QE-PMSX].

107. NYC TEACHING FELLOWS, https://nycteachingfellows.org [https://perma.cc/V2DL-4SCD].