

Effect of a Match on Salaries for Medical Fellows

To the Editor: In their Research Letter, Drs Niederle and Roth¹ reported that fellowship markets without a match offered similar salaries as those that do. Although the authors acknowledged that “the market for fellowships is not the same as the market for residencies,” they nonetheless concluded that “eliminating the resident match would not necessarily increase residents’ wages.” Their underlying comparison between fellowship and residency, however, is misleading: an applicant for nephrology fellowship, for instance, in which there is no match, is not in the same market as an applicant for pulmonary/critical care, in which there is. The correct comparison from which one could draw conclusions about the effect of a match on fellowship salary would be between the salaries paid to fellows who obtain positions through the match and the salaries paid to fellows who are offered positions in the same fellowship program outside the match. I suspect that the salaries would be found to be identical in this circumstance. The very existence of a residency match allows all programs to pay lower salaries because the participating programs can operate as a cartel.

Amnon Schlegel, MD, PhD
Department of Medicine
Beth Israel Deaconess Medical Center
Boston, Mass

1. Niederle M, Roth A. Relationship between wages and presence of a match in medical fellowships. *JAMA*. 2003;290:1153-1154.

In Reply: Dr Schlegel is dissatisfied that we compared different subspecialties with one another. To test the hypothesis that a match results in lower wages, we looked for a set of comparable markets, only some of which use a centralized match. We compared all internal medicine subspecialties, and found no systematic difference in wages between subspecialties that use a match and those that do not.

Schlegel proposes that the appropriate comparison would be between the wages paid to fellows in the same fellowship program, some of whom are recruited within the subspecialty match and some of whom are recruited outside it. He suspects this test would also fail to detect any wage differences. Without data we cannot tell. But even if wage differences were found, they would be difficult to interpret. If 2 fellows in the same program were hired by different means, there would likely be some difference between these individuals. This, rather than the difference in how they were hired, might account for their different wages. More important, such a test would not be informative about whether the presence of a match systematically raises or lowers wages across the subspecialty as a whole (eg, average wages), which is the question we addressed.

Nevertheless, it is sometimes possible to look at the effects of a match in a single market. For example, because the gastroenterology fellowship market had a match that was discontinued, some of the effects of a match can be inferred by examining that market before the adoption of the match, during

its operation, and afterwards.¹ Similarly, the market for residents can be examined before and after the adoption of the resident match.^{2,3} Those comparisons suggest that the match benefits residents and fellows. Comparisons of related British medical markets also support that conclusion.⁴

Schlegel suggests that the match depresses wages and harms residents and fellows. To date there is no evidence to support this hypothesis. Rather, the wages of fellows and residents appear to be determined by features of the medical marketplace other than the presence or absence of a match.

Muriel Niederle, PhD
Department of Economics
Stanford University
Palo Alto, Calif

Alvin E. Roth, PhD
Department of Economics
Harvard University
Boston, Mass

1. Niederle M, Roth AE. Unraveling reduces mobility in a labor market: gastroenterology with and without a centralized match. *J Polit Econ*. In press.
2. Roth AE. The origins, history, and design of the resident match. *JAMA*. 2003; 289:909-912.
3. Roth AE. The evolution of the labor market for medical interns and residents: a case study in game theory. *J Polit Econ*. 1984;92:991-1016.
4. Roth AE. New physicians: a natural experiment in market organization. *Science*. 1990;250:1524-1528.

RESEARCH LETTER

Oxygenated Water and Athletic Performance

To the Editor: Bottled waters described as “oxygenated” are sold with claims that they confer health benefits. The waters are advertised to contain 7 to 40 times more oxygen (O₂) than ordinary water and to enhance exercise, with statements such as “enhanced sports performance”¹ and “improves cardiovascular and muscle endurance”² commonly used. We measured O₂ in oxygenated water and assessed its effect on maximal performance during exercise.

Methods. We first measured the PO₂ in 5 brands of bottled water advertised as “oxygenated” and compared the values with those of well-stirred tap water. Samples were obtained by inserting a needle into the bottles through the sidewall or cap and drawing water into a gas-tight syringe. PO₂ was measured in triplicate using a blood gas analyzer calibrated into the hy-

Table 1. Results of Water PO₂ Measurements*

Sample	PO ₂ , mm Hg	Calculated O ₂ Content, mL O ₂ per 100 mL Water
Oxygenated water		
Brand 1	133	2.5
Brand 2	505	9.5
Brand 3	555	10.5
Brand 4	637	12.0
Brand 5	1184	22.6
Tap water	127	2.5

*Maximum value of triplicate measurements corrected to 37°C.