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PHYSICIAN COMPETITION: ENTRY AND SUBSTITUTION

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ABSTRACT

We describe competition in the physician market, focusing on how entry barriers and substitution possibilities have changed in recent decades. Regulatory caps on medical school seats and residency slots—especially for high-paying specialties—continue to ration entry, generate high returns for those who gain these slots, and direct the most academically accomplished trainees toward lucrative fields. But trained physicians increasingly compete with nurse practitioners, physician assistants, and other mid-level practitioners in the market for patients. Training of these substitutes has expanded far more rapidly than physician supply. We present key facts about the physician pipeline, a conceptual framework linking specialty earnings to entry barriers, and describe the rise of mid-level providers. These facts mean that effective competition policy in physician markets must look beyond conventional concentration measures and focus on the institutions and laws that govern who can provide medical care.

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Since at least Milton Friedman's classic dissertation (Friedman and Kuznets, 1945), economists have argued that regulation creates barriers to entry in the health professions, giving physicians market power. When a market is highly regulated, incumbents have an easier time restricting the competitive fringe and maintaining a collusive market structure (Schmalensee, 1989; Ellickson, 2015). In recent years, these barriers to entry in the health professions have been eroded by competing occupations and perhaps new technologies that can substitute for high-priced physician labor. This article offers key facts and frameworks for thinking about competition among physicians and other medical professionals.

We think about physician competition in two stages. First, potential physicians compete to enter medical school and then many of them compete to enter higher-paid specialties. Within the market for physicians, tight regulatory caps on medical-school seats and residency slots—especially for high-paying specialties—continue to ration entry, enable high returns for those who gain these slots, and steer the most academically accomplished trainees toward lucrative fields.

Second, fully trained physicians compete with each other and—as we will emphasize—with other healthcare occupations in the market for patients. Accounting for healthcare providers who can substitute for physicians, barriers have eroded even without major expansion in medical schools. These substitutes—such as nurse practitioners, physician assistants, certified registered nurse anesthetists, doctors of osteopathic medicine, foreign-trained physicians, telemedicine, and even emerging artificial intelligence tools—can expand capacity and mitigate the oft-predicted physician shortage.

The physician profession before 1980 had all of the characteristics that Stigler (1971) argued are favorable for regulatory capture: a large occupation with high income absent licensing; stable occupational membership; operating in a local/state rather than a national market; and where all consumers are customers but they are not aggregated (for example, into large health insurance plans that purchase physician services), so lack strong incentives to oppose entry barriers. As Stigler (1971, p. 14) says, "[A] large occupation serving everyone

will encounter no organized opposition."

But since the late 1980s, conditions for regulatory capture have become less favorable and physicians have lost some control over potential competitors' entry. Healthcare consumers and their agents have stronger incentives to oppose restricting the supply of physician services, now that medical spending constitutes 18 percent of GDP, and they have greater ability to do so because most consumers buy care through a private health insurer that negotiates physician prices on their behalf. The three largest private insurers now cover 122 million people, so the opposition is much more organized than it used to be, in Stigler's (1971) parlance. Furthermore, Medicaid is now the second largest state expenditure after K-12 education (National Association of State Budget Officers, 2025). Even though Medicaid physician prices are usually set rather than negotiated, states have incentives to ensure enough physicians (and physician substitutes) are willing to accept low prices to treat low-income patients. There has been moderate growth of medical school and residency program positions since 2000, as well as substantial growth of mid-level healthcare practitioners who are increasingly allowed to compete with physicians, especially in providing primary care.

To understand competition in the market for physicians, we must therefore go beyond measuring existing levels of concentration through standard concentration metrics such as the Herfindahl-Hirschman Index (HHI). An effective pro-competition policy in the physician market would have two prongs. It would encompass, first, the upstream gatekeeping institutions—accreditation bodies, residency review committees, and state licensure boards—that ration physician entry and, second, the downstream scope-of-practice and technology rules that determine how easily other professionals can substitute for—or complement—physicians in treating patients.

This essay explains the institutions, describes empirical trends, and offers conceptual frameworks to understand competition in physician markets. We emphasize the margins of entry to become a physician, and substitution between physicians and other medical practitioners. We do not cover other medical professionals, such as nurses, except to the

extent that they obtain more training to become mid-levels. Compared with physicians, it is easier to enter and faster to complete training in other health care occupations like nursing. Understanding the dynamics of that labor market, and in particular what frictions might impede nurse training, is an important topic for future work.

1 Preliminary Facts

From 1980 to 2025, the US population grew by 50 percent. The population above age 64 grew by 140 percent, while that above age 80 nearly tripled; these groups use a disproportionate share of healthcare and might thus be a better proxy for demand than total population. Over the same 1980–2025 period, the number of first-year positions in traditional US medical schools that award the Doctor of Medicine (MD) degree increased by only 34 percent. This smaller increase is unlikely to reflect a lack of students interested in becoming doctors; in 2025, there were 2.3 times as many applicants to US MD programs as available positions. This ratio has exceeded 2 every year since 2003.

The relatively small flow of entering physicians shows up in the stock: the United States has 2.7 practicing physicians per 1,000 population versus an average of 3.8 for OECD countries. The average annual growth rate of physicians per capita in the United States between 2000 and 2022 (0.8 percent) is about one-half of the average growth rate for OECD countries as a whole (1.5 percent).

Many organizations and reports have pointed out these patterns and expressed concern about their implications. For example, the American Association of Medical Colleges (2021) predicts a shortage of up to 124,000 physicians in 2034. In 15 large cities, it now takes an average of 31 days to schedule a physician appointment, an increase from 26 days in 2022 and 21 days in 2004 (AMN Healthcare, 2025). In Boston, the average wait to schedule an appointment is 65 days across six medical specialties, with average waits of over 80 days for a dermatology or obstetrics/gynecology appointment.

Economists who study competition in labor markets often measure concentration for specific workers or services within a geographic market. The Herfindahl-Hirschman Index, one common way to measure market concentration, is 10,000 times the probability that two randomly drawn purchases in a market are from the same firm. In the average geographic market, the HHI of physician practices has increased over the past 25 years (Fulton, 2017; Gaynor, 2018; Gaynor, Ho and Town, 2015), and this is associated with increased private health insurance prices (Sun and Baker, 2015; Dunn and Shapiro, 2014; Baker et al., 2014; Koch and Ulrick, 2017; Gaynor, 2018; Clemens and Gottlieb, 2017; Hausman and Lavetti, 2021). Fulton (2017) reports that the average HHI of primary care physician practices increased from about 1850 to 2400 between 2010 and 2016.

In 1983, 41 percent of physicians were in solo practice. Now, only 12 percent of physicians are in solo practice, 55 percent are employed by a health system, and 4 percent are employed by private health insurers such as UnitedHealthcare/Optum (American Medical Association, 2025; Physicians Advocacy Institute, 2024; Adler et al., 2025).

Conventional measures of market concentration for physicians seem increasingly limited. Patients increasingly travel to physicians with more experience, more appropriate expertise, and rare specializations and capital equipment (Dingel et al., 2023). In addition, telemedicine enables physicians to treat patients far away. Dahlstrand (2025) shows how online healthcare can enable better matches of physicians and their patients. Other methods of outsourcing certain elements of healthcare include remote reading of radiology images, centralized pathology centers for analyzing patient samples, and even remote monitoring of intensive care unit patients. All these mechanisms for matching patients and care—potentially across long distances—render measurements of physician competition within a particular geographic location incomplete. Later in the paper, we will also discuss the rise of mid-level healthcare professionals, such as nurse practitioners, as another force shifting the competitive environment for physicians.

2 The Physician Education Pipeline

After graduating from medical school, newly minted physicians must receive residency training at an accredited residency program in the United States (or, in some cases, Canada) to practice medicine.[1] Therefore, the market for medical residents essentially determines the flow of new physicians in each specialty practicing in the United States.

Almost all first-year residency positions are allocated through the National Resident Matching Program, referred to as "the Match." After interviewing candidates in autumn, each residency program ranks applicants; each applicant ranks residency positions; and a computer algorithm makes binding assignments which economic theory shows to be stable and Pareto-optimal for applicants (Roth and Peranson, 1999). These results are revealed to much fanfare on "Match Day" in March. A residency program is a combination of a hospital and a specialty, such as "pediatrics at Massachusetts General Hospital." Primary care residencies usually run for three years, while other residencies can take four or five years, and some particularly specialized ones even longer. Some graduating residents subsequently complete a fellowship to further specialize; for example, a specialization in cardiology requires a three-year fellowship following completion of an internal medicine residency. Even further sub-specialization is possible, for instance with a two-year electrophysiology fellowship following a cardiology fellowship.

2.1 From Predicted Surplus to Predicted Shortage

In determining the quantity of students who will enter the physician education pipeline, medical schools, residency programs, and the organizations that regulate them appear responsive to forecasts of future physician supply. In 1976, Congress asked the Graduate Medical Education National Advisory Committee (GMENAC) to estimate the number and specialty

[1] Until 2020, osteopathic (DO) graduates could match to residency positions through a separate system administered by the American Osteopathic Association. Between 2014 and 2020, the two accreditation systems merged, and all residency programs and applicants now participate in a single Match (Almarzooq et al., 2021).

mix of physicians required to meet the nation's healthcare needs (American Academy of Pediatrics, 1981). The resulting 1981 report (McNutt, 1981) predicted a surplus of 145,000 physicians by 2000, or 23 percent of the projected workforce, and recommended restricting enrollment in US medical schools and the flow of immigrating international medical school graduates. Congress responded by eliminating medical school subsidies. This had the intended effect; the number of students graduating from those schools essentially remained constant until the mid-2000s.

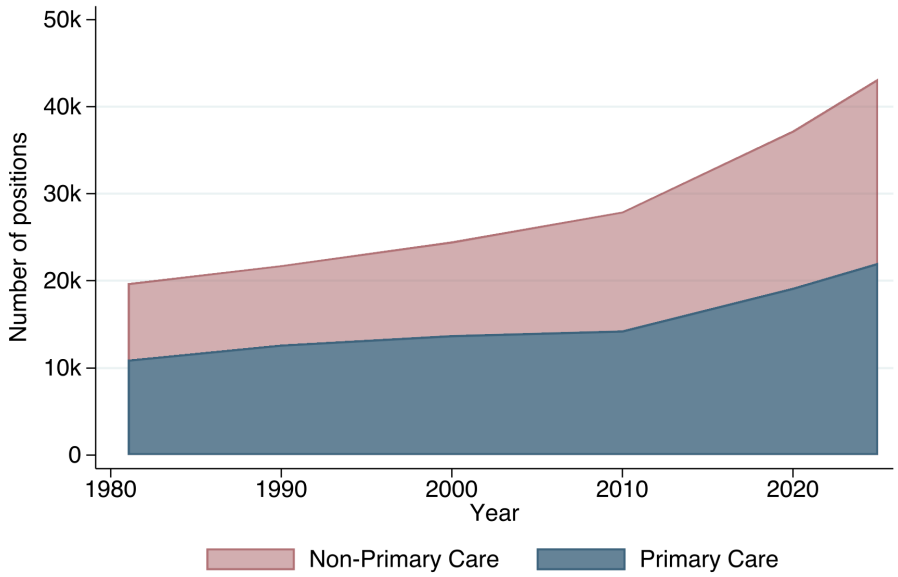
In 2005 the Council on Graduate Medical Education, the successor to GMENAC, updated its forecast model, predicted a shortage of 85,000 physicians by 2020, and recommended that US medical schools expand enrollment. States and specialty societies concurred. Fourteen states issued reports in the 2000s concluding that there was, or soon would be, a shortage of physicians (Iglehart, 2008), and in 2006 the Association of American Medical Colleges (AAMC) recommended a 30 percent increase in MD training capacity.

2.2 Slots and Applicants

These general patterns are illustrated in Figure 1, which shows the number of first-year residency positions offered over the last 45 years. In 1981, a total of 19,700 first-year residency positions were available to medical school graduates in 22 different specialties, with 55 percent of slots in primary care specialties. Given the earlier predictions of physician oversupply, total residency positions grew by only 42 percent between 1981 and 2010, but after that expanded more rapidly.

Residency applicants grew much more quickly than available positions, as shown in Figure 2. Panel (a) depicts the number of residency applicants in 1981, 1990, 2000, 2010, 2020, and 2025 by type of applicant, grouped by four medical school categories: 1) a conventional US-based medical school that grants an MD; 2) a US-based medical school that grants a Doctor of Osteopathic Medicine (DO) degree, which offers similar preparation as an MD but with a different emphasis; 3) US citizens who graduated from a non-US medical school; and

Figure 1: Residency Positions Offered



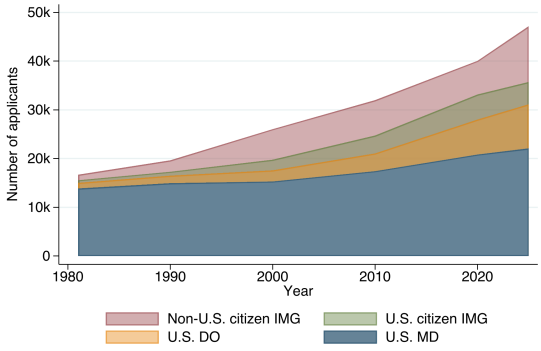
Source: Authors' calculations using data from the National Resident Matching Program (NRMP) and the American Osteopathic Association (Fusco and Wachtler, 1992; Obradovic, Bronersky and Winslow-Falbo, 2002). Before 2020, MD and DO residency programs operated separate match systems; the figure combines positions from both.

4) foreign citizens who graduated from a non-US medical school.

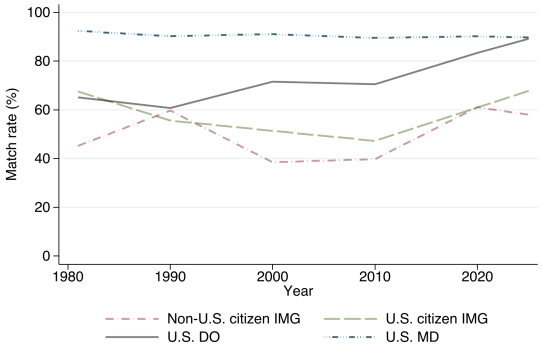
In 1981, graduates of US-based MD-granting medical schools comprised 81 percent of all residency applicants. That year, there were 2,600 fewer applicants than available first-year residency positions, and Figure 2(b) shows that 93 percent of MD graduates in the Match successfully matched. At that time, match rates for other applicant types were below 68 percent because MD graduates were generally perceived by residency programs to be the most qualified.[2]

Figure 2: Applicants and Matches

(a) Types of Residency Applicants



(b) Match Rate by Applicant Type



Source: Authors' calculations using data from the National Resident Matching Program (NRMP) and the American Association of Colleges of Osteopathic Medicine (American Association of Colleges of Osteopathic Medicine, 2024). In Panel (a), the "DO" series shows the number of graduates from DO schools, regardless of whether they entered an osteopathic residency or the NRMP. All other series show applicants participating in the NRMP. (IMG participation in the osteopathic residency match was negligible.) Match shares in Panel (b) are based exclusively on NRMP applicants and matches.

As the forecasts for future physicians shifted from surplus to scarcity, the number of applicants to the Match almost doubled between 2000 and 2025. The number of MD-granting medical schools rose from 125 in 2002 to 155 schools today and existing schools increased their class sizes. But the real growth, as depicted in Figure 2(a), was in the other three applicant types. The number of DO-granting medical school programs has more than

[2]Unmatched applicants and unfilled positions can coexist because some applicants list a limited set of programs and some programs choose not to list all interested applicants. Some positions that are unfilled in the Match are subsequently filled in the post-Match "scramble."

doubled since 2002 from 19 to 43, and DO graduates now represent 19 percent of Match applicants.

Graduates from international medical schools are generally required to complete a US-based residency before they can be licensed, even if they have already completed a residency program or have practiced internationally. (As an illustration of how the landscape is changing in response to physician scarcity, 12 states have recently relaxed licensing laws by allowing foreign-trained physicians to practice without completing a US residency.) We would expect non-US (citizen) international medical graduates to be particularly responsive to US market conditions and policies because they already have a medical degree and could practice in their home country—although immigration policies can affect that mobility (Lo Sasso, 2021). From 2011 to 2016, non-US international medical graduates Match applicants grew by 2.3 percent per year, on average. Those applicant numbers then decreased by 1.9 percent per year between 2016 and 2020, and increased by 10.7 percent per year between 2020 and 2025. This is consistent with different expectations regarding immigration policies during the first Trump administration and the subsequent Biden administration, and with evidence on how the Affordable Care Act and other policies would affect physician earnings. Because US immigration law provides incentives for non-US international medical graduates to practice in medically underserved areas (Hailat et al., 2025), they fill an important role in alleviating problems with access to medical care.

As the number of residency positions available in the Match surged around 2010 (as shown earlier in Figure 1), US-based DO schools and international medical schools have had stronger incentives to open and expand. These two categories of schools also compete for talent. DO programs appear to have the advantage because they have attracted US citizens who might otherwise have attended international programs. Concretely, DO graduates have grown faster than US (citizen) international medical graduates in Figure 2(a). This revealed preference lines up with the much higher match rates Panel (b) shows for DO graduates than US international medical graduates.

The match rates for all three non-US-MD groups rose sharply between 2010 and 2025 to the point where DO graduates are now just as likely to match as MD graduates (Figure 2(b)). By 2010, US-based MD graduates represented only 57 percent of NRMP Match applicants. As the ratio of applicants-to-positions rose well above one, fewer than 50 percent of graduates of international medical schools were able to match. These three non-US MD types of medical graduates—US-based DOs, US citizens who graduated from foreign medical schools, and foreign citizens who graduated from foreign medical schools—tend to focus on specialties with lower average salaries where a residency match is easier.

2.3 Financial Support for Medical Residents

Residents are financially beneficial for hospitals thanks to federal government subsidies. Almost all residents from the mid-1980s through the 1990s were eligible for "direct graduate medical education" and "indirect medical education" payments supported through Medicare reimbursements, and about 74 percent of them today are eligible (Congressional Research Service, 2025; Accreditation Council for Graduate Medical Education, 2024). Through the "direct graduate medical education" payments, available since 1985, Medicare has paid hospitals to cover its allocation of the direct costs (for example, resident and faculty salaries) incurred to train an eligible resident, where share is defined as Medicare's proportion of a hospital's inpatient days. Since 1983, Medicare has also paid teaching hospitals an "indirect medical education" supplemental payment for every Medicare patient admitted to cover the estimated "indirect" costs of training eligible residents, such as their relatively lower productivity. A teaching hospital with 100 eligible residents and 400 beds, for example, currently receives an extra 13 percent for each Medicare patient it admits relative to a non-teaching hospital, with the premium based on a hospital's resident-to-bed ratio. In 2020, the average direct and indirect Medicare payments per eligible resident were $51,000 and $119,000, respectively.

Residents acquire general rather than specific human capital; residency training leads to

a lifetime of physician earnings, whether practicing in the same hospital where a resident trains or elsewhere. As a result, residents should pay for these general training costs by accepting a salary below their marginal revenue product (Becker, 1964).[3] Several studies confirm that residents' salaries, which currently average $67,000 for a first-year resident, are indeed considerably below the value they provide to a hospital (Todd et al., 2004; Green and Johnson, 1995; Thorpe, 1990), especially because residents often work close to the maximum allowed 80 hours per week. With these rules in place, if the Medicare supplemental payments fully cover a hospital's own cost of training a resident, hospitals can make money on residents. In 1998, Medicare capped the number of eligible residents at a hospital's 1996 level, so most residency positions added since 1998 do not generate incremental supplemental payments. Nevertheless, residents can help generate patient care revenue exceeding the hospital's cost of employing them, at least in general surgery (Richards, Seward and Whaley, 2025).

3 A Conceptual Framework for Choosing Specialties

To understand physicians' specialization choices, we summarize a conceptual framework from Gottlieb et al. (2023*b*). This stylized model offers a framework for understanding the relationships between physicians' skill level, incomes, specialty choice, and training difficulty. To simplify the analysis, the model assumes there are just two tracks for physicians—generalist and specialist. Training to become a specialist is long and challenging—but is less arduous for more-skilled physicians.

Consider what happens in this model if pay for specialists rises relative to generalists: more people find the long and arduous training worthwhile and would prefer to specialize. We expect to see an increase in the number of highly skilled physicians choosing that path. So far, such a model could apply to many industries. The distinguishing feature of the physician market is the cap on entry in a particular specialty. As a specialty's earnings

[3] See Nicholson (2002) for a more detailed explanation of the economic rationale for the Medicare Direct Medical Education (DME) and Indirect Medical Education (IME) programs.

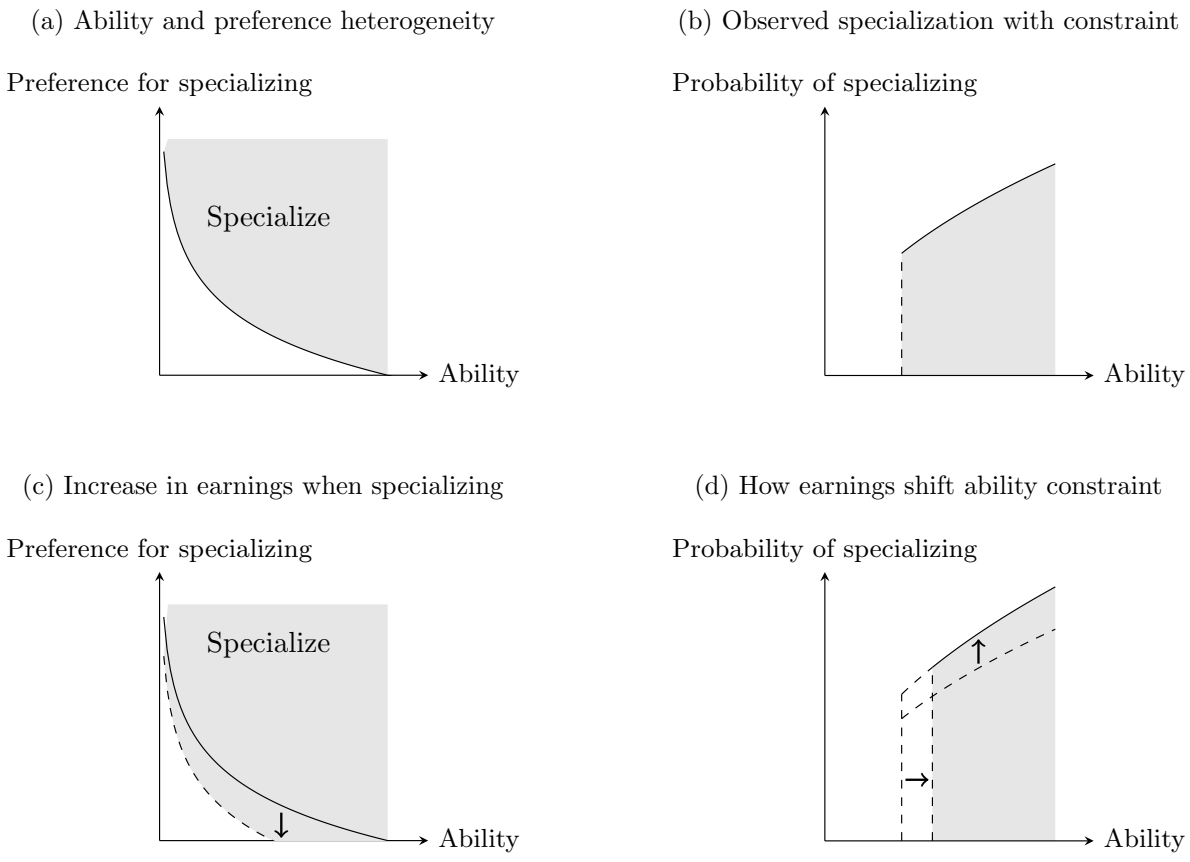
increase, and more-skilled physicians become interested in that specialty, others must be squeezed out to maintain the entry cap. The specialty can become more selective in two ways: increasing the minimum skill level required to enter the specialty or making training harder.

The model features an equilibrium that balances the specialty's earnings, number of trainees permitted, difficulty of training, and minimum skill level. Figure 3 illustrates the patterns that emerge. As more-skilled physicians enter the higher-paid specialty, they displace the least-skilled physicians who would otherwise choose this specialty. With a fixed population of graduates choosing specialties, and fixed training capacity, Gottlieb et al. (2025*a*) find a positive supply response of the higher-scoring graduates—but a negative entry response for the lower-score graduates who are displaced.

Once specialties are chosen, physicians and non-physicians enter the market and compete for patients. While these two types of labor may be complementary within a firm, we abstract away from this and focus on the aggregate labor market, where physicians and non-physicians are likely substitutes in producing care. The stricter the entry barriers for any specialty or type of care, the higher the wages we would expect. These equilibrium wages then feed back into the initial specialty choice decision described above.

Given the many simplifications in this model, an important direction for future work is to generalize it. In reality, there are multiple specialties, heterogeneous training programs within a specialty, and multiple skill dimensions. The simple version presented here has one skill dimension, which drives both individual training preferences and residency applications. This approach has analytical advantages, allowing Gottlieb et al. (2023*b*) to obtain analytical solutions for ability distributions and application thresholds. But in practice, skills and admissions are likely multi-dimensional. Residency programs primarily select based on test scores, medical school performance, and personal statements; these may have little or no relationship to clinical performance or patients' preferences (Lipman et al., 2023). Alexander and Schnell (2026) show that physicians with heterogeneous medical styles enter over the

Figure 3: Conceptual Framework



Notes: This figure illustrates the conceptual framework from Gottlieb et al. (2023*b*). Panel (a) shows the physicians who would prefer to specialize: those with higher ability (who thus find the training and other entry barriers more manageable) and those with a higher idiosyncratic preference for specialization, illustrated in the shaded area. Panel (b) illustrates entry restrictions imposing an ability cutoff limiting specialization to those who match for a residency position. The shaded area illustrates how many physicians end up specializing at each ability level. Panels (c) and (d) illustrate what happens as a specialty becomes more attractive. As specialization becomes more desirable (say, due to higher earnings), the shaded area in Panel (c) expands. In Panel (d), this is illustrated by the probability increasing at any given ability level (the arrow pointing upwards). If there is a restriction on the number who can specialize, the ability threshold to match will increase. This is illustrated by the arrow showing the ability threshold shifting to the right.

business cycle, and that test scores capture little if any of these differences. The next section discusses how key elements of the model fit the context of actual specialty choices by physicians.

4 Barriers to Entry in Choice of Medical Specialties

Compared to primary care, the estimated returns to other specialties were strikingly high between 1951 and 1998—and increasing over time (Nicholson, 2008). Between 1987 and 1998, the rate of return in radiology (relative to family practice) ranged from 47 percent to 105 percent. These returns come from a combination of Medicare payment policies, work hours, and training length (Gottlieb et al., 2025*a*).

How can we determine whether these differences in returns reflect entry barriers, selection, or compensating differentials? The persistence of these high rates of return, combined with a persistent excess of applicants relative to available positions in lucrative specialties, is consistent with the view that entry barriers are a key constraint on physicians' opportunity to specialize. Most visibly, there was much more competition among applicants to secure a non-primary care versus a primary care position in the 1980s, a phenomenon that has increased since then. The unmatched rates for MD graduates in the three primary care specialties in 1985, the earliest year for which data are available, ranged from 1.6 percent to 4.5 percent, versus 11.0 percent to 16.9 percent in four desirable, high income non-primary care specialties.[4] In 1985, pediatricians and family practitioners had mean incomes of about $78,000 versus $140,000 to $200,000 in anesthesiology, radiology, general surgery, and orthopedic surgery.[5]

One might expect medical students who want to enter the desirable non-primary care specialties with high rates of return to bid down the residents' salaries in those specialties,

[4]The unmatched rates that we report are the percentage of applicants who rank programs in a single specialty in the Match, which is the most common strategy, and do not receive an assignment.

[5]Incomes reported in this paper are after all practice expenses, including malpractice insurance. The orthopedic surgery income above is from 1986 because it was not available for 1985.

thereby encouraging teaching hospitals to add more positions—especially before 1998 when the federal resident subsidies were not capped. But this has not happened, and first-year residents were, and still are, almost always paid the same amount by a hospital, regardless of specialty.

Nicholson (2003) discusses two possible rigidities in the market for medical residents which maintain high non-primary-care incomes: cartel behavior by professional associations and wage rigidity. Private organizations that consist primarily of physicians, called Residency Review Committees, restrict the flow of new physicians to non-primary care specialties. The Accreditation Council for Graduate Medical Education (ACGME) is a private organization responsible for overseeing residency training. The ACGME sets overall policies and allows each of the 26 separate specialty-specific Residency Review Committees to review and accredit residency programs in its specialty.

A teaching hospital that wants to open a new residency program or increase the number of residents in their existing program must receive permission from a Residency Review Committee. In most states, medical students must attend a residency program that has been certified by the Accreditation Council for Graduate Medical Education in order to be eligible to take the licensing exam, and thus to practice in that state. Attending an ACGME-certified program is also usually required when physicians seek employment and to obtain admitting privileges at a hospital. Thus, the Residency Review Committees essentially control the flow of physicians into a specialty.

The other possible explanation is that teaching hospitals may not be willing or able to adjust residents' wages to allow the market to clear. The Accreditation Council of Graduate Medical Education (1996) used to require teaching hospitals to pay all residents the same wage, regardless of specialty. But the Federal Trade Commission interpreted the ACGME's policy on residents' wages as a restraint of trade, so the ACGME softened the policy language. Even so, the ACGME still requires that residents be paid an undefined amount—presumably positive—which might prevent the wage from adjusting to clear the excess supply of residents

to certain non-primary care specialties.

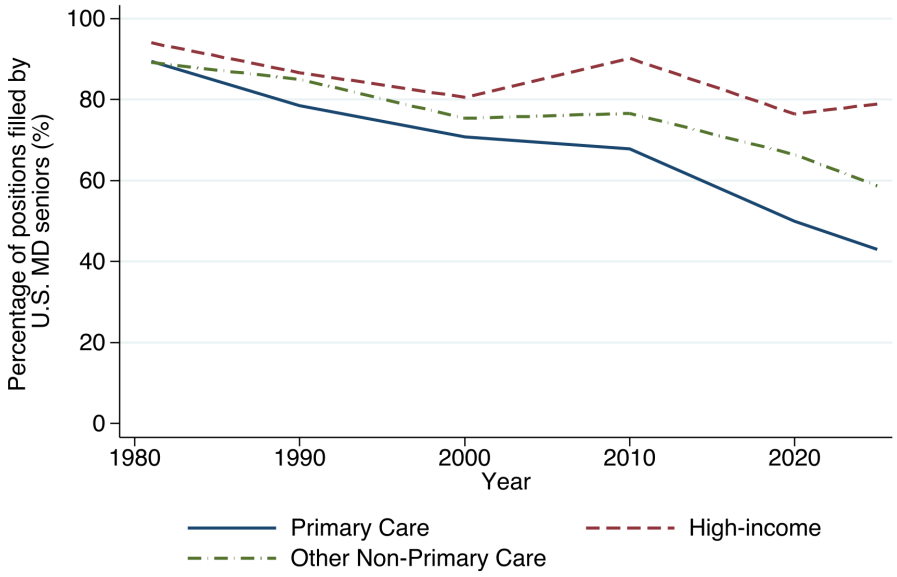
Over the past 30 years, US physicians who train and practice in non-primary care specialties—which usually require four or more years of post-medical school training—have earned substantially more than primary care physicians in family medicine, pediatrics, and general internal medicine, which generally require three years of post-medical school training. This persistent difference, along with barriers to entering non-primary care specialties, directs talent to the high-income specialties. In 2024, the average earnings in non-primary care specialties ranged from $342,000 in psychiatry to $680,000 in orthopedic surgery, compared with $265,000 to $326,000 in the three primary care specialties (Doximity, 2025).

Figure 4 depicts the percentage of residency positions filled by US MD graduates divided into three groups by specialty: primary care, non-primary care specialties with relatively low income, and high-income non-primary care specialties. We define a high-income specialty as one with a mean income greater than $150,000 in 1988 (in nominal dollars) and greater than $475,000 in 2023.[6]

In 1981, when there were relatively few non-MDs in the Match, there was little difference in the residents' medical school type across the three specialty groups. As residency positions expanded, the market has stratified. Non-US-MD applicants are less likely to apply for or be accepted by the high-income specialty residency programs. This is also true, though to a lesser extent, with the lower-earning non-primary care specialties. Among DOs in 2025, for example, 14.5 percent ranked one of the six high-income specialties as their first choice in the Match, versus 25.6 percent for MDs. Conditional on ranking one of those specialties as their first choice, 66 percent of DOs and 81 percent of MDs successfully matched. In 2025, 79 percent of the high-income residency positions were filled by US MDs, although they constituted only 47 percent of the total Match applicants. Conversely, a minority of first-year primary care residents are now US MDs, down from 89 percent in 1981.

[6]The high-income non-primary care specialties in this classification are orthopedic surgery, dermatology, plastic surgery, otolaryngology (ENT), anesthesiology, and radiology. The other non-primary care specialties are obstetrics/gynecology, general surgery, psychiatry, emergency medicine, and pathology.

Figure 4: Share of Matches by Specialty Income



Source: Authors' calculations using data from the National Resident Matching Program.

Because the likelihood of matching, and matching in a desirable specialty, depends on the type of medical school one attends, prospective physicians compete to enter a type of medical school that affords the best opportunity to enter the profession, and to enter a desirable specialty if that is of interest. There have always been at least twice as many applicants as available positions in US-based MD programs, and likewise for US-based DO schools since the data were first available in 2010. The medical school market also stratifies by ability and educational effort. The mean Medical College Admission Test (MCAT) score among MD matriculants in 2024 was 512 (the 83rd percentile among those who took the MCAT exam in 2024), substantially higher than for matriculants to DO programs (503 in 2024, or the 56th percentile among test takers).

Similar patterns exist when comparing different MD-granting medical schools. Students from top-ranked schools do not commonly enter primary care. When NYU eliminated medical school tuition, supposedly to enable students to practice primary care without the burden of tuition debt, its applicant quality spiked—and these more-competitive students were no

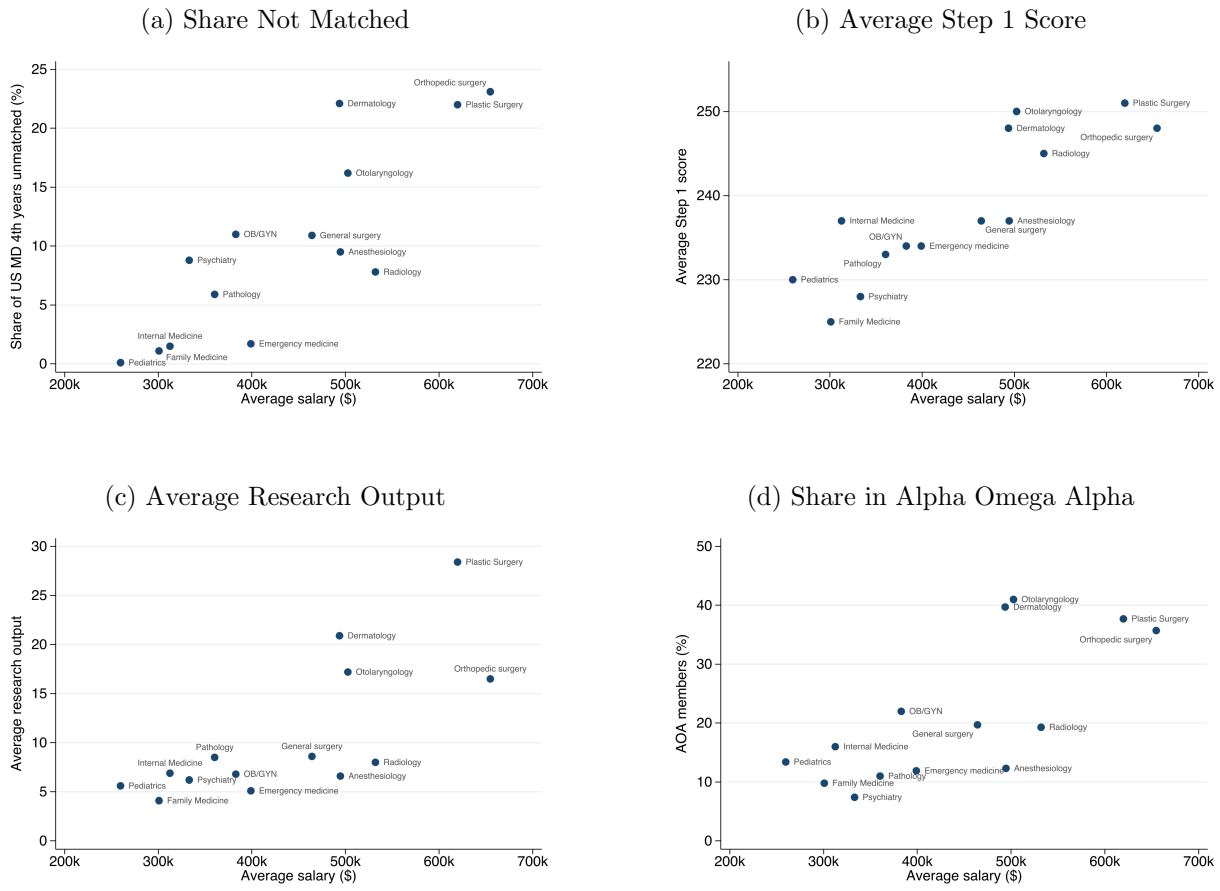
more likely to enter primary care (Horowitch, 2024). Fourteen percent of NYU's 2024 medical school graduates entered a primary care residency program, well below the 30% rate of physicians currently practicing in those specialties (Emanuel and Guido, 2024). This could reflect the high returns, and high barriers, to entering selective specialties; students with the greatest financial resources are most likely to be able to take a year off from medical school to conduct research, thereby expanding their specialty choice set. The differences in perceived opportunity cost of this research time may not change when tuition is free. In a statistical sense, greater access to higher-paid specialties explains around 80% of the earnings gain from attending a top-ranked medical school (Gottlieb et al., 2025*a*, Table E.2), so an NYU student's opportunity cost of pursuing primary care is high, regardless of tuition.

Once in medical school, students compete to develop credentials and skills that will provide them with a broad specialty choice set. In Figure 5, we use data from US MD graduates to depict how positions in the most desirable specialties are allocated. Panel (a) shows that the unmatched rate in a specialty in 2024 was highly correlated with the mean income of physicians practicing in that specialty in 2023. Over 20 percent of US MDs in 2024 who ranked dermatology, orthopedic surgery, or plastic surgery residency programs as their only choices in the Match did not obtain a match and had to scramble for a position (likely in a different specialty) following the Match, or take a year off and enter the Match the following year—a costly outcome in a high-income profession. The students who successfully enter desirable, high-income specialties are those who were aware of this risk, so these unmatched rates certainly understate the probability that the average US MD applicant would be able to successfully enter these specialties.

How does a US MD graduate increase the chance of entering an attractive specialty? Looking at Panels (b), (c), and (d), the answer appears to be excelling in courses and standardized tests while in medical school, and investing substantial time conducting and presenting research. The Step 1 exam, which all students take after the second year of medical school, was scored through 2021, although now it is pass/fail. When the exam was

scored, applicants with higher scores were much more likely to obtain a match in competitive specialties, as shown in Panel (b). Likewise, there is a strong positive correlation between the research credentials (Panel (c)) and overall academic credentials (Panel (d)) of students who successfully match in a specialty and that specialty's income. Each medical school may elect up to 20 percent of its graduating class to be members of Alpha Omega Alpha based on "high quality patient care, leadership, service, and scholarship."

Figure 5: Specialty Earnings and Match Characteristics



Notes: Panel (a) shows the unmatched rate among US MD seniors who rank a single specialty in the Match (2024), plotted against the specialty's mean income in 2023 (from Doximity, 2025). Panel (b) shows the Mean Step 1 score in 2022 among US MD graduates who successfully matched by specialty, plotted against the specialty's mean income in 2022 (from Doximity, 2025). Panel (c) shows the mean number of presentations, abstracts, and publications among US MD graduates who successfully matched in each specialty in 2024. Panel (d) shows the share of students in AOA honor society among US MD graduates who matched in each specialty in 2024. *Source:* Authors' calculations using data from the National Resident Matching Program.

Evidence from international physicians and international medical graduates bolsters this story (Gottlieb et al., 2025*a*; Buehler et al., 2026). US graduates comprise a larger share of matches in higher-paid specialties, suggesting that international graduates face disadvantages when trying to match in competitive residencies. When practicing, physicians in multiple developed countries are generally in the top few percentiles of their countries' respective earnings distributions. This pattern could reflect absolute talent requirements to become a physician—causing salaries to be set high enough to induce talented people to choose this career—or inequality spillovers, or both. Even so, U.S. physicians are more likely to be in the top percentile and in the top decile than physicians in Canada, the Netherlands, or Sweden. Combined with the higher top incomes in the United States, this makes it even more attractive to be a physician in the United States, despite the challenge of obtaining a residency.

Another factor pushing physicians to specialize may be the ability to compete for top-paying patients. Gottlieb et al. (2023*a*) emphasize the value of providing a premium service in an environment with growing income inequality. As income inequality increases, occupations providing services to these unequal consumers can themselves become more unequal. A physician's ability to effectively treat some high-income patients—and charge them a premium for it—can make that physician a high earner in turn. Thus, regardless of any other changes in the market for physicians, greater inequality of incomes might allow some top-earning physicians to retain their high earnings and elite status in the future.

5 Mid-Level Healthcare Providers as Substitutes for Physicians

Even if the quantity of physicians in the US has failed to keep up with demand, the healthcare industry has shown an ability to substitute. In pharmaceuticals, for example, when semaglutide demand exceeded Novo Nordisk's manufacturing capability, compound pharmacies arose

to fill the gap (Mattingly and Conti, 2025).[7] When baby formula was in short supply in 2022, some parents turned to imports while others shared breast milk (Pearson, 2022). When demand for physicians increased, and thousands of medics were being discharged after serving in the Vietnam War, the physician assistant profession was institutionalized and expanded across states (Carter, 2001; Cawley, Cawthon and Hooker, 2012).

But potential substitutes for some of the care provided by physicians—nurse practitioners, physician assistants, certified registered nurse anesthetists, and certified nurse midwives—are also regulated. Indeed, Starr (1982) argued that physicians have traditionally controlled not just the institutions for training doctors, but also the professions that are potential (partial) substitutes for doctors: "In industry, despite the resistance of artisans, the dictates of the market broke up the work of skilled craftsmen into low-skill—and consequently cheaper—labor. In medicine, physicians maintained the integrity of their craft and control of the division of labor. While medicine itself became highly specialized, the division of labor among physicians was negotiated by doctors themselves instead of being hierarchically imposed upon them by owners, managers, or engineers."

There is a large cost difference between physicians and so-called "mid-level practitioners" with advanced training who can increasingly substitute for physicians, which creates incentives for firms to treat patients using these lower-cost workers. For example, anesthesiologists earned $523,000 on average in 2024 versus $232,000 for certified registered nurse anesthetists; nurse practitioners and physician assistants earned $129,000 and $133,000 on average, respectively, less than one-half of what primary care physicians earn (Doximity, 2025; Bureau of Labor Statistics, 2024).

5.1 Expansion of Mid-Level Practitioners

States have imposed restrictions on the care that can be provided by nurse practitioners and other mid-level healthcare professionals. However, recent regulatory changes, often

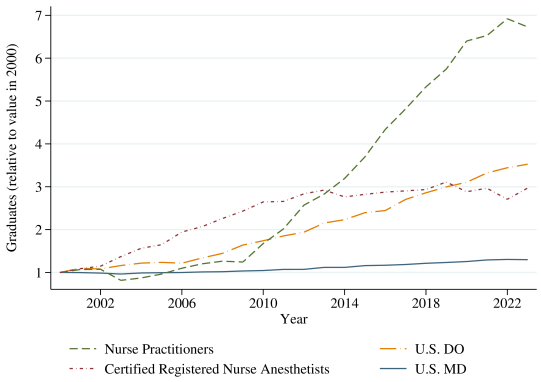
[7] Just as with the need to change healthcare licensing, discussed below, the Food and Drug Administration (FDA) had to designate a shortage for compound pharmacies to be allowed to offer this substitute.

driven by state-level policy initiatives, have relaxed these restrictions. For example, to practice as a nurse practitioner, a registered nurse—who would have already graduated with an undergraduate nursing degree—must complete an accredited two-year nurse practitioner masters (or doctoral) program, pass a national exam, and obtain a license from a state board of nursing. Since 1984, 27 states have passed liberal nurse practitioner "scope of practice" laws, which allow nurse practitioners to diagnose and treat patients independently, including ordering and interpreting tests and writing prescriptions (American Association of Nurse Practitioners, 2025). In the other states, a nurse practitioner can only perform tasks under the supervision of a physician or other healthcare provider.[8] The growth of nurse practitioners and other mid-level providers, even in states with restrictive nurse practitioner scope-of-practice laws, should increase competition among physicians because a physician practice can increase their physicians' income by using lower-cost inputs.

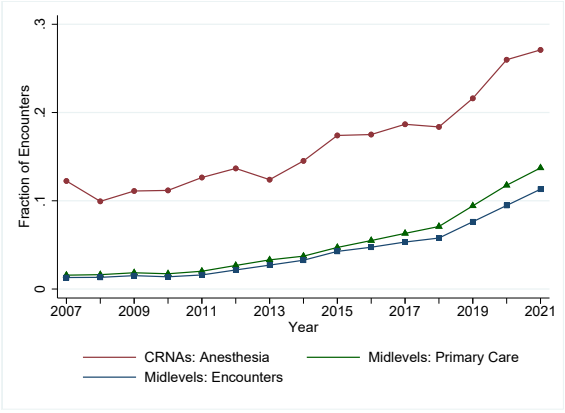
[8]Most health insurers reimburse more for a given episode of care if the nurse practitioner is working with a physician than if the nurse practitioner is working independently. For example, a nurse practitioner working with a physician might be paid at the same rate as the physician for providing a given service, but a nurse practitioner working independently might be paid only 85 percent of that amount.

Figure 6: Training Rates of Physicians and their Substitutes

(a) Providers Trained Per Year



(b) Mid-levels' Share of Care



Notes: Panel (a) reports the number of students graduating in each category listed (MD = Medical Doctor; DO = Doctor of Osteopathic Medicine), based on authors' calculations of data from the Department of Education's Integrated Postsecondary Education Data System (IPEDS), relative to the value in 2000. Panel (b) is reproduced from Gottlieb et al.'s (2025*b*, Figure C.8) calculations based on MarketScan private insurance claims data, and shows CRNAs' share of anesthesia claims, NPs' share of office visits, and NPs' share of broader professional claims.

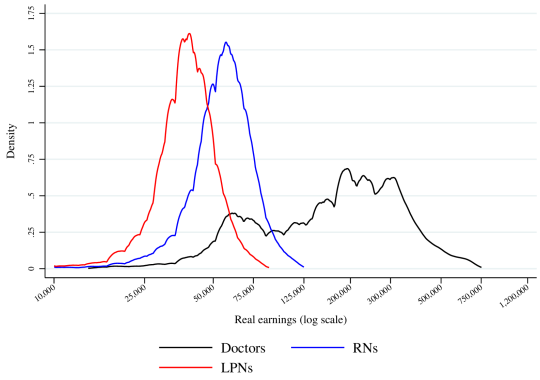
Figure 6 compares key aspects of new MDs and DOs compared with two prominent examples of mid-level healthcare providers: nurse practitioners (NPs), and certified registered nurse anesthetists (CRNAs). As Panel (a) shows, training of non-MD providers—and especially of nurse practitioners—has expanded much more rapidly than that of physicians. Panel (b) illustrates the shifting provision of three specific types of care, as observed in private insurance claims data (MarketScan), with rapid growth in the share of anesthesia procedures provided by CRNAs and an expansion of both primary care and overall professional services provided by NPs. Patel et al. (2022, 2023) show similar patterns in Medicare data. A more detailed breakdown (not shown here) for CRNAs suggests that in 2005, CRNAs were focused on low-severity patients, but by 2021, this was no longer true. However, it remained true that rural areas consistently rely on CRNAs more than urban areas.

5.2 How Mid-Level Professions Fill the Skill Gap

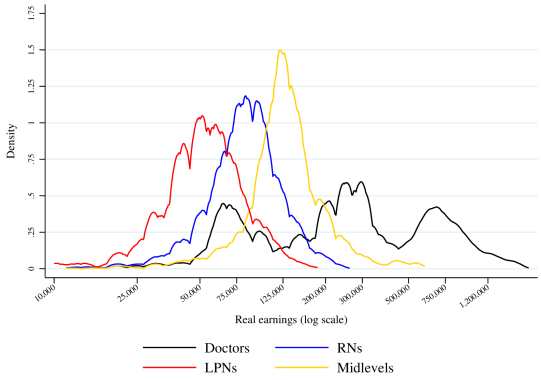
If this broader set of mid-level healthcare occupations is substituting for hard-to-find physicians, in a context of rising demand for care, we would expect their compensation to reflect this high demand. Indeed, Gottlieb et al. (2025*b*) find that employment and earnings have grown faster in all clinical occupations than outside of healthcare. Among these occupations, mid-levels have the fastest employment growth, averaging nearly three times physicians.

Figure 7: Earnings distributions in 1980 and 2024 by occupation

(a) Earnings by occupation, 1980



(b) Earnings by occupation, 2024



Source: Gottlieb et al. (2025*b*, Appendix Figure C.1), updated using IPUMS (Ruggles et al., 2025). Panels (a) and (b) show the earnings distribution by healthcare occupation in 1980 and 2024, respectively. Data come from IPUMS files for 1980 Decennial Census and the 2024 American Community Survey. Wages are inflation-adjusted to 2024 dollars using the CPI-U. We impute physicians' incomes above the public-use censoring threshold using a Pareto distribution. We take the (inverse) shape parameters from Gottlieb et al. (2023*a*), applying their 1980 parameter to our data in 1980 and their 2012 parameter to our 2024 data. We use the censoring threshold for each year and state from IPUMS as the scale parameter. We assign censored incomes by randomly drawing from a Pareto distribution with these parameters.

Moving beyond averages, Figure 7 shows the earnings distribution for four categories of occupations in 1980 and in 2024. In 2024, physicians' earnings are more spread out than in 1980, with much of the distribution in the range of 8–10 times the modal earnings for registered nurses, compared with 4–6 times the earnings of registered nurses in 1980. The earnings of mid-level practitioners slot neatly between the distribution of registered nurses and that of physicians. These facts suggest that an increase in demand is the central force

driving healthcare employment. But the sluggish growth in physician numbers, combined with their compensation, indicates that supply restrictions may be particularly relevant in that market.

Geographic variation shows evidence of mid-level providers substituting for physicians in response to these supply constraints. Physicians seem to prefer living in high-amenity areas (Lee, 2010). Gottlieb et al. (2025*b*, Figure C.7) treat the area's share of college graduates as a proxy for these amenities. They show that the number of physicians per capita increases much faster in areas that are becoming more educated overall; conversely, growth in nurse practitioners per capita is faster in areas with a lower share of college graduates. Moreover, areas with more college graduates have a lower ratio of nurse practitioners per physician, but the wage ratio of nurse practitioners to physicians is higher in these same areas.

Putting these facts together enables an inference about the elasticity of substitution between nurse practitioners and physicians. Suppose the local college graduate share shifts the ratio of nurse practitioners to physicians in a given area, but does not otherwise shift technology or relative demand for nurse practitioners and physicians. Under this assumption, we can compute the elasticity of substitution between the labor of nurse practitioners and physicians. Since the same change in college graduate share associated with relative log wages of nurse practitioners increasing by 1.1 is associated with relative log quantity of nurse practitioner declining by 2.25, the implied elasticity of substitution is around 2.

5.3 Implications for Physician Competition

The rise in employment, scope-of-practice, and earnings for mid-level healthcare providers can help to explain why the dire predictions of physician shortages have not become apparent. As noted earlier, the AAMC has been predicting a physician shortage since at least 2006. Yet the average time to schedule an appointment with a family physician was 20.3 days in 2009 and 20.6 days in 2022 (AMN Healthcare, 2022). Waiting times do appear to have increased recently, reaching 31 days in a 2025 survey, though the longer wait times are driven

by specialists; the same survey reports 23.5 days for family medicine (AMN Healthcare, 2025). This difference is consistent with mid-level practitioners effectively substituting for physicians in the specialties where they can do so best—and with entry barriers remaining high for specialists.

The rapid growth in physician substitutes, whose training is closest to that of primary care physicians, limits the ability of primary care physicians to earn economic rents. Gottlieb et al. (2025*a*) compare lifetime earnings of primary care physicians, all physicians, and lawyers. Gottlieb et al. (2025*a*, App. D) find that, after accounting for length of training and work hours, primary care physicians earn slightly less than lawyers. Other physicians earn substantially more. This finding suggests that primary care physicians may not earn economic rents, at least relative to law—though law has its own barriers to entry.

These results feed back to our discussion in the previous section, as they imply a substantial wage premium that motivates high-achieving physicians-in-training to specialize. Taking a longer historical perspective, Nicholson (2008) summarizes eight studies that estimate the rate of return to a medical school education in the United States between 1929 and 1990. Averaged across all specialties, the general conclusion is similar: there were financial returns from entering medicine through 1966 relative to alternative professions like dentistry, presumably due to barriers to entering the profession. But between 1966 and 1990, the estimated overall rates of return for physicians compared with plausible alternatives have been modest, although they were large for non-primary-care specialties (Nicholson, 2003).

Besides competing directly with primary care practitioners, mid-level providers may buttress the value of specialization in a second way. Within a practice, mid-level practitioners may be complements to specialists, for example, by handling the low-fee patient office visits and freeing the specialist up to perform more high-fee procedures. If they enable surgeons and medical specialists to increase productivity, the existence of mid-levels may contribute to the specialization premium.

6 Conclusion

Despite high per capita levels of US health spending compared to other countries, the United States does not always appear to have an abundance of providers available when needed. This may reflect limits to competition in the healthcare market, which traditional antitrust remedies do not appear to address. We argue that analysis of competition among physician, provider group, and health insurer should also consider the fundamental questions about entry barriers: who becomes a physician, and which types of workers are allowed to compete in healthcare provision?

The traditional justification for regulation is to address asymmetric information: consumers may not be able to determine the quality of services provided by the medical workforce (Arrow, 1963). From this perspective, the regulator seeks to assure consumers that inputs into the health production function exceed a minimum acceptable quality level.

Regulating the physician market can hamper market functioning by placing constraints on the health production function and raising costs, reducing product variety, increasing wages due to restricted entry, and restricting access to physicians. Diminished product variety—specifically through the absence of lower-quality and lower-price medical services in the market—is likely to be most detrimental to low-income consumers. Furthermore, other mechanisms can help to address asymmetric information; in the healthcare context, Nicholson and Propper (2012) discuss providing consumers with information about provider-specific expected health outcomes, and making health professionals legally liable for poor quality, and thus willing to purchase malpractice insurance.

But this quality regulation is in tension with competition policy. Quality is generally regulated by the profession in question—and not very effectively, according to Allensworth (2025). The regulation may be more effective at maintaining entry barriers. This shows up in at least three distinct levels: medical school capacity, specialty regulation, and scope of practice.

The difficulty of entering medical school, and the various types of workarounds to these

entry barriers, suggests that slot limitations may be binding and creating rents for those who succeed. Specialties represent more concentrated interests, who may have even stronger incentives to limit training and competition. This occurs through Residency Review Committees, board certification, and maintenance of certification. Finally, state scope of practice laws regulate the training required to provide particular types of care. When evaluating physician competition, all of these policies should be considered rather than focusing exclusively on downstream organization of firms.

This essay has not sought to address competition between physician practices once those practices are assembled with the available labor inputs, bargaining between the resulting practices and private health insurers, or the monopsony power that Medicare and other insurers may have with respect to physicians and related professions. These questions are all downstream of our focus—but the upstream competition to enter these professions, and downstream competition in care provision, are connected. In one direction, changes in the output market for physician services will affect prospective physicians' occupational and specialty choices. In the other direction, changes in entry barriers affect downstream competition, the availability of medical care, and prices. Further, competition within the physician profession—and between physicians and related professions—affects the labor that is available in the output market for medical care, and which can in turn be assembled to form medical practices.

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