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Gender composition in the work environment and physicians' income from Medicare Part B fee-for-service payments: evidence from longitudinal data

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Abstract

Background Despite the rising representation of women in the physician workforce, gender-based income disparities persist. In this study, we explore the role of representation of women in the work environment in physicians' income from Medicare Part B fee-for-service payments and the income gender gap.

Methods Our main analytic sample is a balanced panel of 371,472 physicians over 9 years, obtained from the Medicare Part B fee-for-service (FFS) Provider Utilization and Payment Data (2012–2020) from the Centers for Medicare and Medicaid Services (CMS). We use panel regressions with physician and year fixed effects to quantify how total Medicare Part B FFS payments to physicians patient volume, and per-patient payments respond to gender composition changes at the specialty and practice level, controlling for other practice characteristics. We allow the gender composition to have differential impacts on women and men by interacting it with the physician's gender. In addition, we examined the subsample of physicians who have not switched specialties or practices and explored differences in the effects by practice size.

Results Increasing women's representation in physician work environments impacts men's and women's Medicare Part B FFS payments received differently. We find that for women physicians, a 1% increase in the share of women in the same specialty leads to 1.634% higher annual payment, 1.147% more patients, and 0.297% more per-patient payment. Conversely, these effects are reversed for men. Changes in women's share at the practice level have qualitatively similar effects. Among physicians who have not switched specialties or practices, we still find positive effects for women but no negative effects for men. Furthermore, these effects are stronger in solo or small practices than in large practices.

Conclusions Increasing women's representation in the work environment helps *increase* the amount of Medicare Part B FFS payments received for women physicians but *may* reduce payments received for men physicians. Our findings support the efforts in increasing women's representation in the physician workforce to mitigate gender income disparities and demonstrate the nuanced differences in its impact by gender and the size of the practice to refine policy recommendations.

Keywords Gender equity, Income disparity, Gender composition, Physician specialty, Medicare payment

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Background

The share of women in the physician workforce increased from 28.3 percent to 36.3 percent from 2007 to 2019 [1], and the number of women entering medical schools has surpassed that of men since 2017 [2]. Despite the rising representation of women in the physician workforce, most medical specialties remain predominantly men, and gender-based income disparities persist [3–6]. On average, a woman physician is estimated to earn over two million dollars less than her man counterpart over a 40-year career [7].

Previous studies have suggested various reasons why women are not in the higher-paid specialties, including challenges to work–life balance [8], the scarcity of women leaders in higher-paid specialties [9], greater family responsibilities and fertility decisions [10–12], and adverse working environments [13]. However, even *within* specialties, men have higher incomes than women at all career stages [14–16], even after adjusting for physician demographics, experience, specialty, academic rank, and productivity [17–19]. Gender differences in time use [20, 21] and lower starting salaries for women have also contributed to this income inequality [15, 22].

Recent studies started exploring how women's representation in their medical specialty or practice affected the gender disparity in physician income. While some documented a negative association between women's representation and a specialty's average earnings among faculty physicians [23, 24], others found greater women's representation at the specialty level was associated with more gender salary equity within certain specialties or among faculty physicians [23, 25, 26].

Outside the medical profession, a large body of literature also examines the relationship between gender composition and professional outcomes [27, 28]. Many studies found a negative correlation between occupation-level women's representation and income, for which two prominent theories have been proposed: the "queueing theory" suggests that biased employers favor men when hiring for high-paying occupations, leaving women to work in low-paying ones [29]; the "devaluation theory" suggests that societal biases perceive having more women in a profession as a loss of prestige, resulting in a decline in income for that profession [30, 31].

Meanwhile, the increased representation of women in the work environment may also improve women's outcomes by weakening the gender stereotype of that occupation, especially when the occupation is previously male-dominated. For example, Milner et al. found better mental health for people who work "in occupations where their own gender was dominant" [32]. Hu et al. found that women physicians working in more women-represented specialties receive less harassment from both coworkers and patients [33]. In addition, Sarsons et al. examined the gender difference in credit attribution of group work and found that women are disproportionally less credited when collaborating with men, but are equitably credited when collaborating with other women [34].

Building on yet complementing these previous studies, we employ recent administrative, longitudinal Medicare data on almost the universe of physicians across specialties to examine how the gender composition in the work environment affects their Medicare Part B FFS payments received and gender disparity. Our study has several strengths that add to the literature. First, our panel data from 2012 to 2020 cover all the over 1 million providers submitting at least 11 Medicare Part B FFS claims each year. About 600,000 of these providers are physicians, which is 68% of all U.S. physicians, based on the AMA Physician Masterfile [35] (note that not all physicians provide Medicare Part B services). Hence, this data lends more robustness and generalizability than self-reported or smaller-sample data covering a subset of physicians (e.g., faculty or certain specialties only). Second, the longitudinal nature of the data allows the inclusion of year and physician fixed effects in our analysis to tease out the impact of confounding factors. We follow a long literature that uses fixed effects to control for unobserved heterogeneities, with year fixed effects absorbing universal time trends and physician fixed effects absorbing any time-invariant, physician-specific characteristics that are hard to control for otherwise [36, 37]. Thus, the revealed relationship between women's representation and the outcomes of interest is separated from these confounding heterogeneities, and is thus brought one step closer to causality. Third, we examine both specialty- and practice-level gender compositions separately. Doing so not only allows for, but also compares the potentially different influences of different levels of work environments on gender disparities in professional outcomes. Fourth, we aim to reconcile the contrasting findings on how the increase of women's representation is associated with physicians' Medicare Part B FFS payments received in the existing literature by excluding physicians who switched practices or specialties and allowing for heterogeneous effects across practice size.

Data and methods

Data source Our primary dataset is the publicly available 2012–2020 Medicare Part B FFS Provider Utilization and Payment Data from the Centers for Medicare and Medicaid Services ("CMS data" henceforth). Medicare is the single largest payer for health care in the US and provides health insurance for people 65 or older, people under 65 with certain disabilities and end-stage renal disease. Medicare Part B covers outpatient and physician services,

whereas Part A covers inpatient services. Traditional Medicare Part B uses fee-for-service reimbursement, paying providers for each service billed according to a fee schedule. Medicare Advantage (MA) plans, on the other hand, have more flexible payments, although there is no information on how much they pay providers [38].

Since 2012, CMS, the federal agency administering Medicare, discloses annual payment and utilization information for each physician, including the total Medicare payments received, the number of patients seen, and aggregated patient characteristics. The CMS data cover almost 99 percent of all U.S. non-pediatric providers [39]. For each physician-year, we [1] determine physicians' specialty and practices based on self-reported specialty and address; [2] calculate the share of women (excluding oneself) in the same specialty, and the share of women (excluding oneself) in the same practice; [3] obtain detailed information on total Medicare payment, patient volume, and per-patient payment. We use "practice" to refer to any organization a physician works at, which can be a solo practice, a group practice, a hospital, or other type of facility.

We construct our sample by keeping physicians (those having an MD or a DO, potentially including residents or fellows) who (i) are present in the CMS data for *each* of the nine years from 2012 to 2020 (66% of the raw sample), creating a balanced panel; (ii) practice in a specialty with 500 or more physicians in all nine years (98% of the raw sample); and (iii) have non-missing self-reported gender (over 99% of the raw sample). The primary sample includes 3,343,248 observations from 371,472 unique physicians representing 44 unique specialties and 130,630 practices. Our sample provides a good representation of physicians providing outpatient services to the Medicare population. One caveat is that gender is binary in the CMS data, which may inaccurately represent physicians who identify as non-binary.

The key explanatory variables are the gender composition in a physician's work environment, defined as the shares of women (excluding oneself) in the same specialty and in the same practice, respectively. When calculating the shares of women in the same specialty/practice as a given physician, we always exclude the physician herself to avoid having extreme percentage changes that may be triggered by turnovers, especially at small practices. For physicians in solo practices, we set the practice-level share of women to 0. We include the gender composition at both the practice and the specialty levels for each physician-year, thus capturing women's representation in the "macro" work environment (the specialty) and "micro" work environment (the practice), respectively. Previous researchers have used either specialty-level [23, 25, 33, 40, 41] or practice-level representation alone as an explanatory factor for gender disparities [26, 42]. We add to the literature by quantifying the separate impacts of these two indices, which will inform potential policy interventions on which work environment (specialty or practice) to prioritize.

It is important to note that a physician may experience changes in the gender composition of their work environment because they switch specialties or practices. In our study period, 6.7% and 25.4% of physicians reported specialty and practice location changes, respectively. In this study, we want to limit our focus to the impact of the general increase in women's representation in a physician's work environment, rather than that of specialty- or practice-switching decisions by the physician. To distinguish these two sources of change, we supplement our main analysis with an additional set of results using only the subsample of physicians who have never switched specialty or practice ("non-switchers").

The outcomes of our primary interest are (i) the total annual Medicare Part B FFS payment received ("Medicare payment" hereafter); (ii) the number of unique Medicare FFS patients treated per year; and (iii) the Medicare payment per unique patient. When calculating payments, we only include those for physician services, and exclude those for clinical laboratory services, radiology and imaging, radiation therapy and supplies, preventive screening tests, and vaccines. All monetary values are converted to real 2020 US dollars to adjust for inflation. To focus on changes in payments that are solely attributable to *changes* in a physician's practice pattern, we include physician fixed effects to control for any time-invariant differences across physicians, and include year fixed effects to control for any universal time trends such as changes in the Physician Fee Schedule or increasing Medicare Advantage enrollment.

Statistical analysis We estimate panel regression models where the relationship of primary interest is that between the percentage of a physician's women colleagues (at the specialty and the practice level) and their total Medicare payment, patient volume, and per-patient payment. We interact the gender composition indices with a physician's gender, allowing them to affect women and men differently. Note that having panel data enables us to include physician fixed effects, hence any effects we document are driven by changes *within the same physician over time.*

We also control for other potentially relevant practice characteristics such as practice size, defined as the number of physicians working at a practice, and the fraction of Advanced Practice Providers (APPs) among all individuals working at a practice. APPs are non-physicians (such as nurse practitioners and physician assistants) who provide medical services typically provided by a

physician. They are becoming an increasingly important part of the provider workforce and can impact physicians' productivity [43, 44]. We also include aggregate-level patient characteristics, namely the average patient age and the average patient risk score. Patient risk scores are calculated by CMS based on patient demographics, socioeconomic characteristics, and previous diagnoses. They are used for risk adjustment or comparison between groups of patients, where a higher score indicates a greater predicted need for care. All analyses are conducted in Stata16 MP. The AAMC Human Subject Protection Program reviewed our study and deemed it exempt from further IRB review because it does not constitute human subjects research.

Results

Summary statistics We first report the summary statistics of the key variables for men and women physicians separately in Table 1. Substantial disparities by gender are found in all three outcomes. The median Medicare payment for women physicians ($30,430) is only 55% of that of men ($55,350). The gap is only partially driven by the difference in patient volumes, as women's *per-patient* Medicare payment ($152.86) is 87% of that of men ($174.96). This gap in Medicare payment is similar in scale to that in overall income found by other researchers. For example, Nguyen et al. showed that the earnings of women physicians were only 52–57% of those of men between 1990 and 2010.[6]

In terms of work environments, women tend to have more women colleagues: the median share of *other* physicians in the same specialty (practice) who are women is 36% (30%) for a woman and only 26% (22%) for a man. But there's no significant difference in practice sizes: 11–12% of physicians of either gender work in solo practices, 30% in small practices with 2–10 physicians, and 58–59% in large practices with 11 or more physicians.

Finally, the patients of women and men physicians are also different. Compared with men physicians, women physicians' patients are on average lower risk (1.60, compared with 1.71 for men), slightly younger (70.60 years old, compared with 71.5 for men), and more likely to be female (66%, compared with 56% for men). Men and women physicians have similar fractions of non-white (22–24%) and dual-eligible patients who are covered by Medicare and Medicaid (27–28%).

Descriptive evidence Figure 1 illustrates the relationship between gender composition and physicians' Medicare payment received. A higher percentage of women in a specialty is associated with lower payment for both genders. This negative relationship is also stronger for women than men, which highlights the necessity to interact the gender of the physician with the gender composition in the work environment in our analysis, so that men and women are allowed to be impacted differently by changes in the gender composition.

Main results Table 2 reports the estimates from our fixed effect panel regressions. Columns [1] through [3] use the whole sample. First, we find a strong, negative relationship between the share of women in a specialty with the Medicare payment and patient volume for men physicians. Note that the dependent variables are log transformations of the outcomes of interest, so the coefficients below are discussed in terms of percentage changes. First, coefficients on "Share of women within specialty" capture the effect of specialty-level gender composition on the outcomes of men. On average, a 1% increase in the fraction of women in the same specialty translates into a 0.842% decrease (CI: −1.961%, 0.277%) in total annual Medicare payment for men, a 0.542% reduction (CI: −0.991%, −0.094%) in patient volume, and a 0.360% (CI: −0.619%, −0.100%) reduction in per-patient payment.

Second, coefficients on the *interaction term,* 1(women)×(Share of women within specialty), capture the *additional* impacts on women physicians. For example, the coefficient in column [1] indicates that the 1% increase in specialty-level gender composition increases women physicians' total Medicare payment by an *extra* 2.476% (CI: 1.745%, 3.207%) relative to men. Note that, while a relatively small number, the percentage change translates into about $1578 of extra payments (2.476%× $63,740, the latter being the average total Medicare payment for women physicians). Thus, combining the coefficients on the interacted and uninteracted terms, we find a net effect of a 1.634% increase in women physicians' total Medicare payment, or about $1042. Similarly, the net effect on the number of patients is a 1.147% increase, and that on per-patient payment is a 0.297% increase. Taken together, these findings show that the *additional* impacts on women (captured by the interaction terms) are more than enough to offset the negative effects on men, resulting in *net* increases for women.

Higher shares of women at the *practice* level have significant albeit smaller effects. For men, a 1% increase in the share of women within their practice results in a 0.034% decrease in total Medicare payments and a 0.033% decrease in per-patient payments. For women, the *additional* effects are a 0.030% increase in total Medicare payment and a 0.019% increase in per-patient payment, which only partially offset the negative effects on men, resulting in *net* effects for women that are still negative. For both men and women, the effects on the number of patients are statistically indistinguishable from 0.

The impacts of patient characteristics are as expected: physicians with higher-risk-score patients have fewer

Table 1 Descriptive statistics of key variables

	Women $N_{obs}=893,646$ $N_{phy}=99,294$			**Men** $N_{obs}=2,449,602$ $N_{phy}=272,178$		
	Mean	**Median**	**S.D**	**Mean**	**Median**	**S.D**
Key outcome variables						
Medicare payments, all services (thousands)	99.55	50.37	229.78	172.93	91.91	344.07
log(Medicare payments, all services, USD)	10.73	10.83	1.26	11.34	11.43	1.23
Medicare payments, physician services, (thousands)	63.74	30.43	144.69	112.35	55.35	245.11
log(Medicare payments, physician services, USD)	9.81	10.39	2.56	10.45	10.99	2.46
Number of unique patients per year	377.55	230.00	558.00	577.61	358.00	799.49
log(number of unique Medicare patients per year)	5.39	5.44	1.04	5.83	5.88	1.05
Medicare payments/patient, all services, USD	297.42	205.09	494.49	370.57	247.91	619.14
log(Medicare payments/patient, all services, USD)	5.34	5.33	0.77	5.52	5.52	0.83
Medicare payments/patient, physician services, USD	204.94	152.86	299.51	249.45	174.96	415.58
log(Medicare payments/patient, physician services, USD)	4.72	5.04	1.46	4.88	5.17	1.48
Key independent variables						
Share of women in the specialty (excluding self)	0.34	0.36	0.11	0.27	0.26	0.12
Share of women in the practice (excluding self)	0.30	0.30	0.24	0.23	0.22	0.22
Other physician characteristics						
Share of physicians working in …						
… solo practices [1 physician]	0.11	–	–	0.12	–	–
… small group practices (2–10 physicians)	0.30	–	–	0.30	–	–
… large group practices (11 + physicians)	0.59	–	–	0.58	–	–
Share of physicians who have …						
… ever switched specialties	0.05	–	–	0.07	–	–
… ever switched practices	0.28			0.24		
… never switched specialties or practices	0.69	–	–	0.71	–	–
Patient characteristics						
Average patient risk score	1.60	1.38	0.79	1.71	1.53	0.78
Average patient age	70.60	72.00	5.51	71.50	72.00	4.85
Fraction of patients who are female	0.66	0.63	0.15	0.56	0.56	0.12
Fraction of patients who are non-white[a]	0.24	0.18	0.18	0.22	0.16	0.18
Fraction of patients who are dual-eligible[b]	0.28	0.24	0.19	0.27	0.23	0.18

Authors' analysis using 2012–2020 CMS Physician Utilization and Payment Data. Each observation is a (physician, year). N_{obs} is the number of observations; N_{phy} is the number of unique physicians. All variables (payments, patients, etc.) account for only Medicare Part B fee-for-service activities of a physician within a calendar year as reported by CMS. Payments for "all services" include those for all HCPCS service codes; payments for "physician services" only include those for services rendered by a physician, excluding those for laboratory work, tests and imaging, vaccination, and similar services. All monetary values are converted to real 2020 dollars to adjust for inflation. All patient characteristics are calculated by the CMS, included in the source data, and reflect the average values among a given physician's patients in a given calendar year. Patient risk scores are measured using the Hierarchical Condition Category (HCC) risk score. The score for an individual patient can range from 0 to over 50, but the absolute value is not meaningful. This score is constructed for risk adjustment purposes, and only relative values and comparisons are relevant

[a] Variable has missing values in the source data. $N=697,591$ for women physicians, and $N=2,099,731$ for men physicians

[b] Variable has missing values in the source data. $N=750,559$ for women physicians, and $N=2,232,360$ for men physicians

patients but more per-patient payments due to the increased need for care, resulting in an overall neutral effect on total payments. Physicians with older patients have both more patients and higher per-patient payments, thus also higher total payments.

Next, we explore to what extent the results are driven by the changing gender composition *within a specialty/practice*, as opposed to the *changes in specialty/practice* caused by a physician switching practices or specialties. To this end, columns [4] through [6] of Table 2 only use the subsample of physicians who stayed in the same specialty *and* practice throughout 2012–2020 ("non-switchers"). We find that specialty-level gender composition increases women's Medicare payment and patient volume at a similar magnitude to what we find in the whole sample (columns 1–3). However, we no longer find a significantly negative decline in men's Medicare payment and patient volume. The contrast suggests that the negative

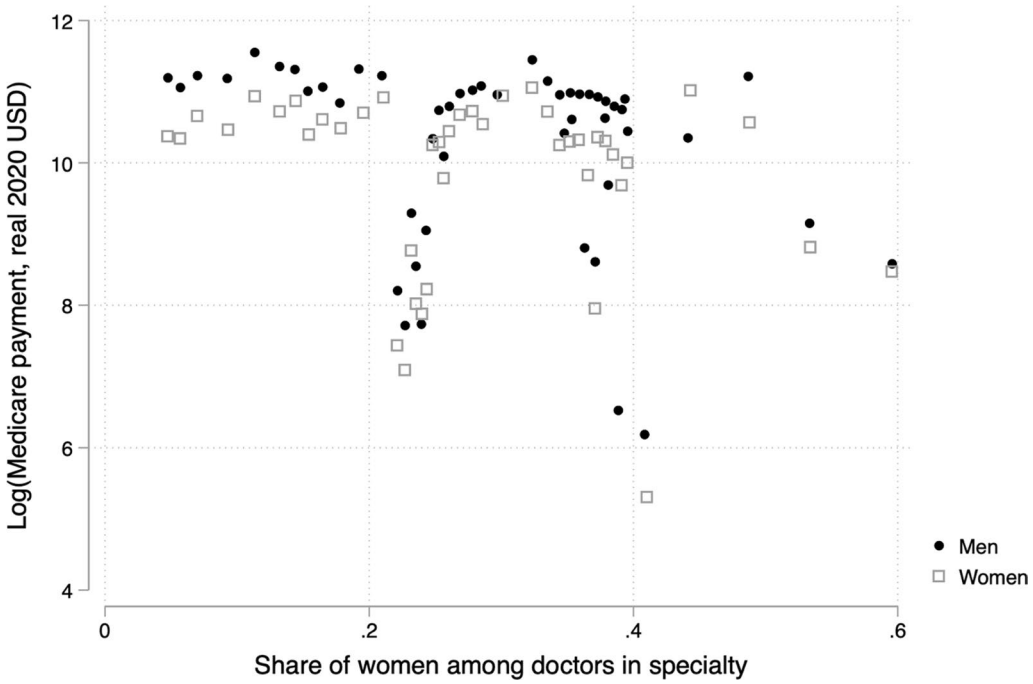

Fig. 1 Binned scatter plot of gender composition in specialty and Medicare income. Note: Binned scatter plot by the authors using 2012–2020 CMS Physician Utilization and Payment Data. Observations in the main sample are ordered by the share of women among doctors in the specialty. They are then grouped into 50 bins, each consisting of 2 percent of the sample and represented by a dot/square in the plot. The vertical coordinate of the dot/square marks the average log annual Medicare payments for physicians in that bin. Medicare payments include only those for Part B FFS services rendered by a physician, excluding those for laboratory work, tests and imaging, vaccination, and similar services that are not necessarily provided by a physician. All payments have been converted to real 2020 dollars before taking logs

relationship between women's representation and men's outcomes likely results from men who have switched specialties or practices.

Interestingly, we also find among the non-switcher sample that more women working in the same practice *positively* affect men's total Medicare payment and patient volume, reversing the results in columns [1–3]. For women, having more women colleagues in the same practice has limited impacts, except for a small effect (0.011%) on the per-patient payment (column 6).

Differences by practice size We also explore potential differences in the effects of gender composition by practice size, which can affect how much physicians interact with their peers and influence each other's practice patterns. We hypothesize that the effects are stronger on physicians working at smaller practices.

Table 3 repeats the baseline panel regression on the three outcomes of interest separately by practice size using the subsample of non-switchers. First, we find that specialty-level gender composition has no significant impact on men but still positively affects women. However, the magnitude of those impacts appears to be the smallest for women working in large practices, supporting our hypothesis. Take physicians in solo practices for example, a 1% increase in the share of women at the specialty level has a mildly negative (though statistically insignificant) impact on men's total Medicare payment, but brings an *additional* 3.061% increase for women physicians. In contrast, the same increase in specialty-level gender composition has a stronger impact (3.789%) on women physicians in small practices with 2–10 physicians, and weaker impacts (2.263%) on those in large practices with 11 or more physicians.

Second, while practice-level gender composition also has stronger impacts among solo or small practices, the differences only affect men. For those previously working in solo practices, adding a woman as a colleague (i.e., a 100%-increase in the share of women at the practice level) is associated with a 5.6% increase in total Medicare payments; the same change for men working in small and large practices, in contrast, is only associated with a 0.7% increase and a 1.3% decrease in total Medicare payments, and neither is statistically distinguishable from 0. Interaction terms do not detect any differential effects on women physicians. The same empirical pattern persists when we look at patient volume (columns 4–6) and per-patient payment (columns 7–9), though the coefficients are not as significant for the latter.

Table 2 Main results from panel regression analysis with physician and year fixed effects

	Whole sample			Subsample of "non-switchers"		
	(1)	(2)	(3)	(4)	(5)	(6)
	Log payments	Log patients	Log payments per patient	Log payments	Log patients	Log payments per patient
Share of women within specialty	−0.842	−0.542**	−0.360***	0.963	−0.077	−0.786
	(0.555)	(0.223)	(0.129)	(2.434)	(0.742)	(0.549)
	[−1.961,0.277]	[−0.991,−0.094]	[−0.619,-0.100]	[−3.945,5.871]	[−1.574,1.420]	[−1.894,0.322]
1(women) x (Share of women within specialty)	2.476***	1.689***	0.657***	2.890***	2.304***	0.900***
	(0.362)	(0.139)	(0.151)	(0.564)	(0.256)	(0.210)
	[1.745,3.207]	[1.408,1.970]	[0.353,0.962]	[1.753,4.028]	[1.787,2.821]	[0.477,1.324]
Share of women within practice	−0.034***	0.001	−0.033***	0.021**	0.029***	−0.002
	(0.006)	(0.008)	(0.003)	(0.009)	(0.004)	(0.005)
	[−0.047,−0.022]	[−0.015,0.018]	[−0.040,−0.026]	[0.003,0.040]	[0.020,0.038]	[−0.011,0.007]
1(women) x (Share of women within practice)	0.030***	0.007	0.019***	0.014	−0.008	0.011*
	(0.010)	(0.007)	(0.005)	(0.011)	(0.007)	(0.006)
	[0.010,0.049]	[−0.006,0.020]	[0.008,0.029]	[−0.009,0.037]	[−0.023,0.007]	[−0.001,0.023]
Average patient risk score	0.019	−0.030*	0.078***	−0.002	−0.033*	0.064**
	(0.059)	(0.017)	(0.028)	(0.060)	(0.018)	(0.028)
	[−0.100,0.138]	[−0.064,0.005]	[0.022,0.134]	[−0.123,0.119]	[−0.069,0.003]	[0.008,0.120]
Average patient age	0.049***	0.033***	0.014**	0.041***	0.028***	0.011**
	(0.007)	(0.003)	(0.006)	(0.005)	(0.003)	(0.004)
	[0.035,0.064]	[0.027,0.038]	[0.003,0.026]	[0.031,0.051]	[0.022,0.034]	[0.002,0.020]
Constant	6.667***	3.240***	3.720***	7.149***	3.530***	4.040***
	(0.535)	(0.282)	(0.489)	(0.675)	(0.333)	(0.358)
	[5.589,7.746]	[2.672,3.808]	[2.733,4.707]	[5.787,8.511]	[2.858,4.201]	[3.317,4.763]
Year FE	YES	YES	YES	YES	YES	YES
Physician FE	YES	YES	YES	YES	YES	YES
Observations	3,343,248	3,343,248	3,343,248	2,353,122	2,353,122	2,353,122
R^2	0.875	0.891	0.925	0.888	0.912	0.937

Authors' analysis of 2012–2020 CMS Physician Utilization and Payment Data. "Whole sample" refers to the entire balanced panel data of 371,472 physicians (3,343,248 observations); "non-switchers" refer to the subsample of 261,458 physicians (also a balanced panel with 2,353,122 observations, or 70.4% of the whole sample) who have never switched specialties or practices during the sample period. Medicare payments include only those for Part B FFS services rendered by a physician, excluding those for laboratory work, tests and imaging, vaccination, and similar services that are not necessarily provided by a physician. All payments have been converted to real 2020 dollars. All regressions also include the share of physicians among all providers at the practice level, the share of physicians among all providers at the specialty level, and the total number of physicians at the practice level. "Year FE" and "physician FE" refer to year and physician fixed effects, respectively. Standard errors clustered at the specialty level are reported in parentheses. 95% confidence intervals are reported in the following row in brackets. */**/*** represent *p*-values below 0.1/0.05/0.01, respectively

Illustrating changes in gender income gaps Having documented the effects of gender composition on individual physicians' Medicare payment and patient volume, we now illustrate the effects on the overall gender differences at the specialty level. Figure 2 plots the gender differences for each specialty in 2020 against those in 2012, separately for total Medicare payment, patient volume, and per-patient payment. Each circle in the plot represents a specialty, with its size proportional to the number of physicians in that specialty in 2012. Circles below the 45-degree line have *shrinking* gender gaps from 2012 to 2020, and those above the line have *widening* gender gaps.

Take two specialties, primary care providers (PCP) and cardiologists, for example. While PCP has smaller gender gaps, cardiologists saw a larger reduction in its gender gap over time (it is located further away from the 45-degree line in the figure).

Two patterns stand out in Fig. 2. First, for all three outcomes of interest, there is a gender gap favoring men in most specialties. Second, most specialties experienced a reduction in that gender gap between 2012 and 2020.

Table 3 Extension: heterogeneous effects by practice size (subsample of "non-switchers")

	log(payments)			log(patients)			log(payments per patient)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Solo	Small	Large	Solo	Small	Large	Solo	Small	Large
Share of women within specialty	−0.434	0.283	1.282	−0.155	0.091	−0.065	−1.189*	−0.798	−0.767
	(1.073)	(1.600)	(3.052)	(1.020)	(0.710)	(0.760)	(0.679)	(0.576)	(0.649)
	[−2.598,1.730]	[−2.943,3.509]	[−4.872,7.436]	[−2.211,1.902]	[−1.342,1.524]	[−1.598,1.468]	[−2.558,0.180]	[−1.959,0.364]	[−2.076,0.542]
1(women) x (Share of women within specialty)	3.061***	3.789***	2.263***	2.358***	2.822***	1.942***	0.961***	1.013***	0.783***
	(0.539)	(0.663)	(0.548)	(0.321)	(0.378)	(0.183)	(0.217)	(0.284)	(0.188)
	[1.973,4.148]	[2.452,5.127]	[1.158,3.368]	[1.711,3.004]	[2.060,3.583]	[1.573,2.311]	[0.522,1.399]	[0.440,1.586]	[0.404,1.162]
Share of women within practice	0.056*	0.007	−0.013	0.032***	0.016**	0.019	0.013	−0.003	−0.019
	(0.029)	(0.012)	(0.041)	(0.012)	(0.006)	(0.014)	(0.018)	(0.005)	(0.015)
	[−0.002,0.115]	[−0.018,0.032]	[−0.097,0.070]	[0.008,0.056]	[0.004,0.027]	[−0.009,0.047]	[−0.023,0.049]	[−0.014,0.008]	[−0.049,0.011]
1(women) x (Share of women within practice)	−0.012	0.018	0.058	−0.005	−0.000	−0.013	−0.019	0.014**	0.029
	(0.058)	(0.012)	(0.088)	(0.012)	(0.010)	(0.021)	(0.029)	(0.006)	(0.020)
	[−0.129,0.106]	[−0.007,0.042]	[−0.120,0.237]	[−0.029,0.019]	[−0.020,0.019]	[−0.055,0.029]	[−0.077,0.039]	[0.001,0.027]	[−0.012,0.070]
Average patient risk score	0.053	0.005	−0.012	0.032	−0.045	−0.036*	0.063**	0.070***	0.060*
	(0.075)	(0.042)	(0.066)	(0.020)	(0.028)	(0.018)	(0.030)	(0.026)	(0.030)
	[−0.097,0.204]	[−0.080,0.089]	[−0.145,0.121]	[−0.008,0.072]	[−0.102,0.012]	[−0.073,0.000]	[0.003,0.123]	[0.018,0.123]	[−0.000,0.119]
Average patient age	0.034***	0.043***	0.041***	0.022***	0.023***	0.031***	0.011***	0.016***	0.009**
	(0.003)	(0.007)	(0.005)	(0.004)	(0.002)	(0.003)	(0.003)	(0.005)	(0.004)
	[0.029,0.040]	[0.030,0.056]	[0.030,0.051]	[0.014,0.031]	[0.018,0.028]	[0.026,0.037]	[0.004,0.017]	[0.005,0.026]	[0.001,0.017]
Constant	7.632***	7.271***	7.182***	3.551***	3.895***	3.271***	4.384***	3.950***	4.114***
	(0.471)	(0.661)	(0.826)	(0.412)	(0.313)	(0.320)	(0.299)	(0.429)	(0.373)
	[6.682,8.581]	[5.938,8.604]	[5.515,8.849]	[2.721,4.381]	[3.264,4.526]	[2.626,3.917]	[3.780,4.988]	[3.084,4.816]	[3.361,4.867]
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Physician FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	265,869	726,237	1,361,016	265,869	726,237	1,361,016	265,869	726,237	1,361,016
R^2	0.883	0.883	0.887	0.900	0.911	0.914	0.919	0.912	0.944

Authors' analysis of 2012–2020 CMS Physician Utilization and Payment Data. All regressions also include the share of physicians among all providers at the practice level, the share of physicians among all providers at the specialty level, and the total number of physicians at the practice level. "Year FE" and "physician FE" refer to year and physician fixed effects, respectively. The analysis focuses on *within-physician* variations and thus defines practice sizes based on that of the practice a physician worked at *in 2012*. *Solo* practices are defined as those with only one physician in the CMS data; *small* practices are those with 2–10 physicians; *large* practices are those with 11 or more physicians. Medicare payments include only those for Part B FFS services rendered by a physician, excluding those for laboratory work, tests and imaging, vaccination, and similar services that are not necessarily provided by a physician. All payments have been converted to real 2020 dollars. Standard errors clustered at the specialty level are reported in parentheses. 95% confidence intervals are reported in the following row in brackets. */**/*** represent *p*-values below 0.1/0.05/0.01, respectively

Considering that most specialties also had increasing representation of women during these years, this figure suggests that more women joining a specialty might help mitigate the gender gaps.

Discussion

In the whole sample, as women's representation in a specialty increases, women physicians experience an increase in total Medicare payment, patient volume, and per-patient payment, whereas men physicians experience decreases in these measures. Previous studies documented a negative relationship between women's representation and income either with evidence at the aggregated specialty or specialty-rank level [23–25], or by only focusing on academic physicians or a few specialties [23, 25]. Our study shows a similar relationship between gender composition and average income as in these studies [23–25], but adds robustness and generalizability by using individual-level, longitudinal data representing a broad range of physicians. For example, Bravender et al.

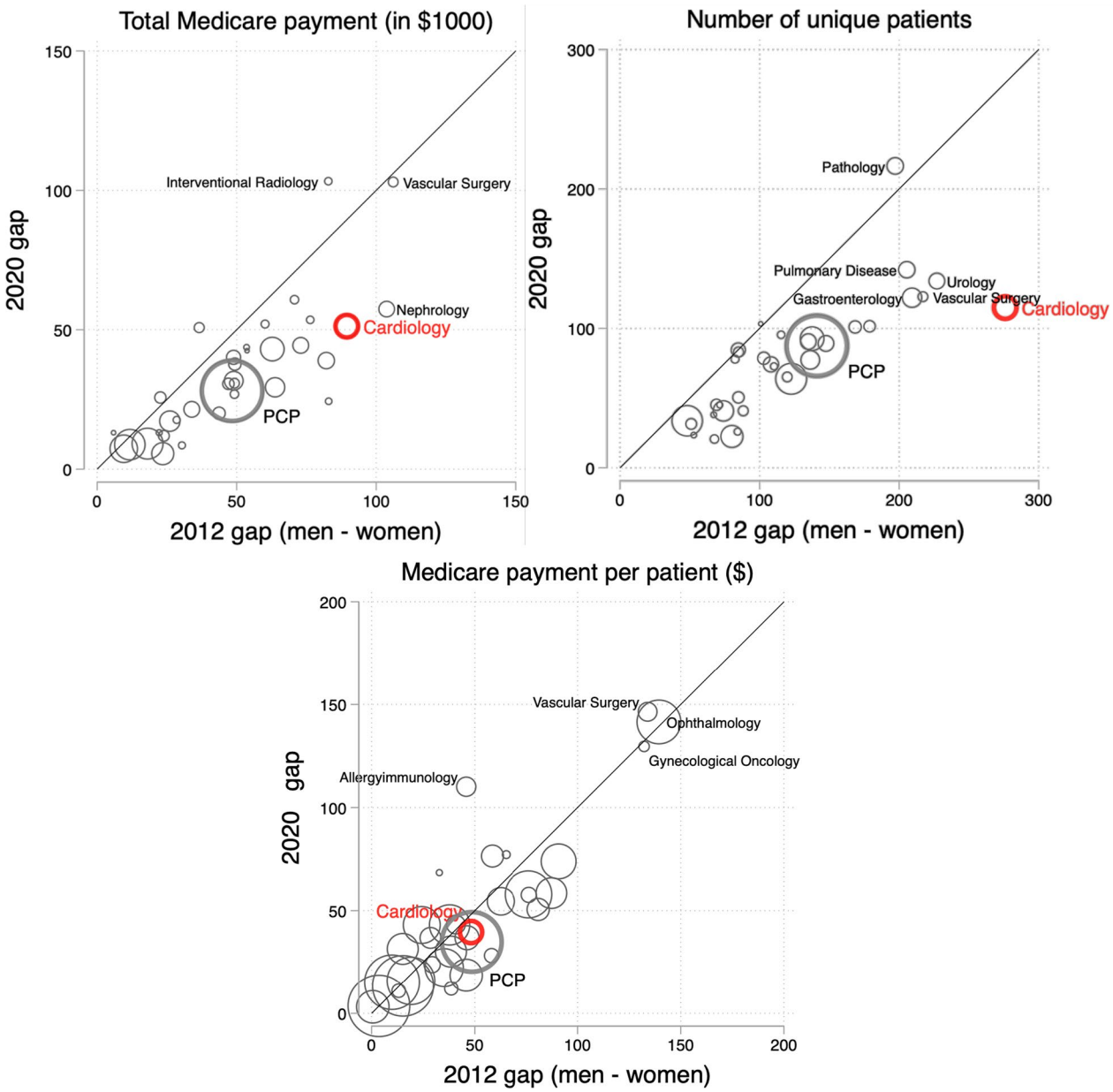

Fig. 2 Gender differences in payments and patient volumes: comparing 2012 and 2020. Note: Scatter plots by the authors using 2012–2020 CMS Physician Utilization and Payment Data. Each observation (circle) is a specialty, with its radius proportional to the specialty's total number of physicians in 2020. For each specialty, its coordinates on the x-axis and the y-axis represent the gender gap (men–women) in 2012 and 2020, respectively. All the measures include only Medicare Part B FFS physician services within a calendar year as reported by CMS. Total payments are measured in thousand dollars; per-patient payments are measured in dollars; all monetary values are converted to real 2020 dollars to adjust for inflation. Cardiology (thick red circles) and primary care (PCP) are highlighted (thick gray circles) as examples of large specialties with low and high shares of women, respectively. The names of specialties with large gaps in either year are also labeled in the plot

found a 10 percent increase in women's representation at the specialty-academic rank level decreased men's salary by $7,465 and women's salary by almost twice as much, which is quantitatively comparable to our results. However, our analysis of the subsample of "non-switchers" showed that the negative effects are no longer present for men physicians who stayed in the same specialty and practice over the years, suggesting that the previous decrease is likely driven by non-random decisions to switch specialties or practices.

We also document sizable impacts of women's representation on Medicare payments. For example, a 1%

increase in the specialty-level share of women is associated with an increase in women physicians' annual Medicare payment by 2.476% on average (or \$1578 = 2.476%× \$63,740, from Table 1). For reference, studies on the labor market in general found that an additional year of work experience increases wages by only 1.9% [45]. Moreover, our finding also implies that re-balancing the gender composition alone can reduce the current gender gap in Medicare payments substantially. If women make up 50% of Medicare Part B FFS physicians, rather than the current 34% (Table 1), this 16-percentage-point increase can increase the average women's Medicare payments by as much as 39.6% (2.476%× 16) to \$88,981 (39.6%×\$63,740, from Table 1), reducing the gender gap to \$23,369 (\$112,350-\$88,981), which is less than half of the current gap (\$112,350-\$63,740).

We propose that these trends can be driven by at least two alternative mechanisms. First, more women in a specialty or practice might improve the productivity of women physicians, given that previous studies found that women receive more credit, more referrals, and therefore better career outcomes when working with other women [34, 46]. Second, increasing women's representation in specialty and workplace goes hand in hand with weakening the gendered stereotype, increasing the shares of women leaders and educators [47–49], and a more welcoming environment [33], which may all boost physicians' productivity. At the same time, women physicians may also receive more trust from both patients and colleagues, and therefore more patients and/or more profitable patients.

Taken together, our findings show that an increase in women's representation at the specialty and practice level has an equalizing effect that helps shrink the current gender disparities in Medicare payment and patient volume. This finding resonates with recent studies discussed previously [23, 25, 26], as well as with evidence from outside the medical profession that the declining gender imbalance is a possible explanation for the convergence of men's and women's earnings in other sectors [50–52]. Moreover, our findings show that merely increasing women's representation alone is not sufficient to close the existing gender gap, as shown in Fig. 2, among other results. Other factors in the care delivery process, including factors that affect patient preferences, must be changed simultaneously to mitigate the observed disparities that have been rather persistent both over time and across specialties.

There are a few caveats in interpreting our findings. First, our analysis is restricted to examining physicians' Medicare payment received and patient volume due to data limitations. We do not observe, for example, physician income from Medicare Part A, managed care, Medicare Advantage, or other payers. For example, Medicare Advantage enrollment grew from 27% in 2012 to 42% in 2020 [53], becoming an increasingly important source of physician income. While the year fixed effects in our regressions account for universal time trends and the physician fixed effects account for differences in income composition across physicians, not being able to observe other sources of income is still a limitation of our study. That said, the Medicare payments data still have several appealing features. Notably, it is an administrative, panel data set that is free of self-reporting or sampling biases; it also has a clear, universal pricing schedule and is therefore independent of confounding factors such as physician negotiation skills and local market characteristics. Because Medicare reimbursement rates uniformly apply to physicians regardless of gender, we can take prices as given and be confident that the gender gap in Medicare payments uncovered in the data is primarily driven by disparities in the volume and type of patient care.

Second, we based our measure of gender composition on the actual count of men and women physicians instead of a full-time equivalent. Thus, we may have overestimated the share of women at the specialty and practice levels since, on average, women physicians have lower total work hours and are more likely to work part-time [54]. Third, although we controlled for the degree of presence of APPs within each practice, we were unable to detect APPs that bill entirely under a physician's NPI (e.g., incident-to billing). Although this is a common problem with Medicare data, we believe that APPs who bill exclusively under physicians are a relatively small group and not likely to be systematically correlated with the prominent factors driving the relationship of interest.

Third, the effect of gender composition could have different impacts on physicians of different races, ethnicities, or age groups. Due to the lack of information on physician demographics in the CMS data, our findings are silent on such heterogeneities, which can be an interesting analysis for future research. Fourth, our data has a large sample size, which increased the statistical power of the regressions, enabling us to precisely estimate the underlying effects of interest. However, precisely estimated effects do not necessarily translate into the magnitude or the importance of the effect. Finally, while our longitudinal data and empirical design greatly mitigate the contamination of confounding factors compared to previous studies, we do not claim a causal relationship between the change in women's representation and the outcomes of interest.

Conclusion

Contrasting the negative relationship between women's representation and specialty income in the literature [24], we found that an increase in women's representation in either the specialty or the practice has a positive impact on women physicians' patient volume and per-patient Medicare payment received. Our study provides new empirical support to the new path for mitigating the gender disparity in physician income proposed in the recent literature [7]. Beyond supporting efforts in improving women's representation across the medical profession, more nuanced measurement and heterogeneity analysis enable us to offer more refined policy recommendations. In particular, specialty-level efforts to increase gender representation can produce larger effects than at the practice level. Similarly, efforts targeting smaller practices may work better compared to larger practices.

Abbreviations

CMS Medicare and Medicaid Services
FFS Fee-for-service
PCP Primary care providers
APP Advanced practice provider

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Author contributions

Concept and design: Gong and Hu. Acquisition and statistical analysis of data: Gong. Drafting of the manuscript: Gong and Hu. Critical revision of the manuscript for important intellectual content: Gong and Hu. Administrative, technical, or material support: Gong and Hu. Supervision: Gong and Hu.

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Availability of data and materials

The datasets generated during and/or analyzed during the current study can be made available upon request.

Declarations

Ethics approval and consent to participate

The Association of American Medical Colleges (AAMC) Human Subject Protection Program reviewed our study and deemed it exempt from further IRB review.

Consent for publication

Qing Gong and Xiaochu Hu give our consent for information about myself/my child or ward/my relative (circle as appropriate) to be published in BMC Human Resource for Health.

Competing interests

None.

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References

1. 2020 Physician Specialty Data Report Executive Summary [Internet]. Association of American Medical Colleges; 2020 [cited 2021 Sep 21]. Available from: https://www.aamc.org/data-reports/data/2020-physician-specialty-data-report-executive-summary
2. 2020 Fall Applicant, Matriculant, and Enrollment Data Tables [Internet]. Association of American Medical Colleges; 2020 Dec [cited 2021 Oct 14]. Available from: https://www.aamc.org/media/49911/download
3. AAMC [Internet]. [cited 2021 Aug 12]. Active Physicians by Sex and Specialty, 2019. Available from: https://www.aamc.org/data-reports/workforce/interactive-data/active-physicians-sex-and-specialty-2019
4. Murphy B. American Medical Association. 2019 [cited 2021 Nov 22]. These medical specialties have the biggest gender imbalances. Available from: https://www.ama-assn.org/residents-students/specialty-profiles/these-medical-specialties-have-biggest-gender-imbalances
5. Shih YCT, Konrad TR. Factors Associated with the Income Distribution of Full-Time Physicians: A Quantile Regression Approach. Health Serv Res. 2007;42(5):1895–925.
6. Le Nguyen TA, Lo Sasso AT, Vujicic M. Trends in the earnings gender gap among dentists, physicians, and lawyers. J Am Dent Assoc. 2017;148(4):257-262.e2.
7. Whaley CM, Koo T, Arora VM, Ganguli I, Gross N, Jena AB. Female physicians earn an estimated $2 million less than male physicians over a simulated 40-year career. Health Aff (Millwood). 2021;40(12):1856–64.
8. Nakayasu A, Kido M, Katoh K, Homma Y. Survey on specialty preference and work-life balance among residents of Japanese red cross hospitals. JMA J. 2020;3(2):118–24.
9. Lehmann C. Why Aren't More Women Doctors in the Top-Paying Specialties? Medscape http://www.medscape.com/viewarticle/956397. Accessed 12 Aug 2021
10. Sasser AC. Gender differences in physician pay tradeoffs between career and family. J Hum Resour. 2005. https://doi.org/10.3368/jhr.XL.2.477.
11. Lewin MR. Pregnancy, parenthood, and family leave during residency. Ann Emerg Med. 2003;41(4):568–73.
12. Fletcher KE, Underwood W, Davis SQ, Mangrulkar RS, McMahon LF, Saint S. Effects of work hour reduction on residents' lives: a systematic review. JAMA. 2005;294(9):1088–100.
13. Stratton TD, McLaughlin MA, Witte FM, Fosson SE, Nora LM. Does students' exposure to gender discrimination and sexual harassment in medical school affect specialty choice and residency program selection? Acad Med. 2005;80(4):400–8.
14. Shah KN, Ruddell JH, Scott B, Reid DBC, Sobel AD, Katarincic JA, et al. Orthopaedic surgery faculty: an evaluation of gender and racial diversity compared with other specialties. JB JS Open Access. 2020. https://doi.org/10.2106/JBJS.OA.20.00009.
15. Catenaccio E, Rochlin JM, Simon HK. Addressing gender-based disparities in earning potential in academic medicine. JAMA Netw Open. 2022;5(2):e220067.
16. Wiler JL, Rounds K, McGowan B, Baird J. Continuation of gender disparities in pay among academic emergency medicine physicians. Acad Emerg Med Off J Soc Acad Emerg Med. 2019;26(3):286–92.
17. Jena AB, Olenski AR, Blumenthal DM. Sex differences in physician salary in US public medical schools. JAMA Intern Med. 2016;176(9):1294–304.
18. Dandar V, Lautenberger D, Garrison G. Promising Practices for Understanding and Addressing Salary Equity at U.S. Medical Schools [Internet]. Washington, D.C.: Association of American Medical Colleges https://store.aamc.org/promising-practices-for-understanding-and-addressing-faculty-salary-equity-at-u-s-medical-schools.html. Accessed 22 Sep 2021
19. Apaydin EA, Chen PGC, Friedberg MW. Differences in physician income by gender in a Multiregion survey. J Gen Intern Med. 2018;33(9):1574–81.

20. Ganguli I, Rivara FP, Inouye SK. Gender differences in electronic health record work—amplifying the gender pay and time gap in medicine. JAMA Netw Open. 2022;5(3): e223940.
21. Ganguli I, Sheridan B, Gray J, Chernew M, Rosenthal MB, Neprash H. Physician work hours and the gender pay gap — evidence from primary care. N Engl J Med. 2020. https://doi.org/10.1056/NEJMsa2013804.
22. Lo Sasso AT, Armstrong D, Forte G, Gerber SE. Differences in starting pay for male and female physicians persist; explanations for the gender gap remain elusive: an examination of how the gender gap in total starting pay has evolved and the extent to which preferences over work–life balance factors affect the gap. Health Aff (Millwood). 2020;39(2):256–63.
23. Bravender T, Selkie E, Sturza J, Martin DM, Griffith KA, Kaciroti N, et al. Association of Salary differences between medical specialties with sex distribution. JAMA Pediatr. 2021;175(5):524–5.
24. Pelley E, Carnes M. When a specialty becomes "women's work": trends in and implications of specialty gender segregation in medicine. Acad Med J Assoc Am Med Coll. 2020;95(10):1499–506.
25. Wang T, Douglas PS, Reza N. Gender gaps in salary and representation in academic internal medicine specialties in the US. JAMA Intern Med. 2021;181(9):1255–7.
26. Whaley CM, Arnold DR, Gross N, Jena AB. Practice composition and sex differences in physician income: observational study. BMJ. 2020;30(370): m2588.
27. Macpherson DA, Hirsch BT. Wages and gender composition: why do women's jobs pay less? J Labor Econ. 1995;13(3):426–71.
28. Harris J. Do wages fall when women enter an occupation? Labour Econ. 2022;1(74): 102102.
29. Goldin C. Career and Family [Internet]. Princeton, New Jersey: Princeton University Press; https://press.princeton.edu/books/hardcover/9780691201788/career-and-family. Accessed 26 May 2022
30. Goldin C. A Pollution Theory of Discrimination: Male and Female Differences in Occupations and Earnings [Internet]. National Bureau of Economic Research https://www.nber.org/papers/w8985. Accessed 2 July 2021
31. Levanon A, England P, Allison P. Occupational feminization and pay: assessing causal dynamics using 1950–2000 U.S census data. Soc Forces. 2009. https://doi.org/10.1353/sof.0.0264.
32. Milner A, King T, LaMontagne AD, Bentley R, Kavanagh A. Men's work, Women's work, and mental health: a longitudinal investigation of the relationship between the gender composition of occupations and mental health. Soc Sci Med. 2018;1982(204):16–22.
33. Hu X, Conrad S, Dill M. Specialty gender composition and prevalence of physician harassment. J Womens Health. 2022. https://doi.org/10.1089/jwh.2022.0380.
34. Sarsons H, Gërxhani K, Reuben E, Schram A. Gender differences in recognition for group work. J Polit Econ. 2021. https://doi.org/10.1086/711401.
35. 13–047 State Physician Workforce Data Book 2013 https://www.aamc.org/media/35396/download.
36. Matta S, Chatterjee P, Venkataramani AS. Changes in health care workers' economic outcomes following medicaid expansion. JAMA. 2024;331(8):687–95.
37. Chen Z, Zhang Y, Luo H, Zhang D, Rajbhandari-Thapa J, Wang Y, et al. Narrowing but persisting gender pay gap among employees of the US Department of Health and Human Services during 2010–2018. Hum Resour Health. 2021;19(1):65.
38. Cottrill A, Cubanski J, Published TN. What to Know About How Medicare Pays Physicians https://www.kff.org/medicare/issue-brief/what-to-know-about-how-medicare-pays-physicians/. Accessed 12 Sep 2024
39. Ochieng N, Schwartz K, 2020. How Many Physicians Have Opted-Out of the Medicare Program? https://www.kff.org/medicare/issue-brief/how-many-physicians-have-opted-out-of-the-medicare-program/. Accessed 25 Aug 2022
40. Pelley E, Carnes M. When a specialty becomes "women's work": trends in and implications of specialty gender segregation in medicine. Acad Med. 2020;95(10):1499–506.
41. Sekimitsu S. Advancing health workforce equity, diversity, inclusion and belonging. Work Pap.
42. Kabat-Farr D, Corina LM. Sex-based harassment in employment: New insights into gender and context. Law Hum Behav. 2014;38(1):58–72.
43. Mafi JN, Chen A, Guo R, Choi K, Smulowitz P, Tseng CH, et al. US emergency care patterns among nurse practitioners and physician assistants compared with physicians: a cross-sectional analysis. BMJ Open. 2022;12(4): e055138.
44. Chan J David C, Chen Y. The Productivity of Professions: Evidence from the Emergency Department [Internet]. National Bureau of Economic Research; https://www.nber.org/papers/w30608. Accessed 7 Nov 2022
45. Goldsmith AH, Veum JR. Wages and the composition of experience. South Econ J. 2002;69(2):429–43.
46. Sarsons H. Recognition for group work: gender differences in academia. Am Econ Rev. 2017;107(5):141–5.
47. Germann F, Anderson SJ, Chintagunta PK, Vilcassim N. Frontiers: breaking the glass ceiling: empowering female entrepreneurs through female mentors. Mark Sci. 2024;43(2):244–53.
48. Chattopadhyay P, Tluchowska M, George E. Identifying the ingroup: a closer look at the influence of demographic dissimilarity on employee social identity. Acad Manage Rev. 2004;29(2):180–202.
49. Joshi A, Liao H, Jackson SE. Cross-level effects of workplace diversity on sales performance and pay. Acad Manage J. 2006;49(3):459–81.
50. Mandel H. A second look at the process of occupational feminization and pay reduction in occupations. Demography. 2018;55(2):669–90.
51. Mandel H, Semyonov M. Gender pay gap and employment sector: sources of earnings disparities in the United States, 1970–2010. Demography. 2014;51(5):1597–618.
52. Gupta N, Balcom SA, Singh P. Gender composition and wage gaps in the Canadian health policy research workforce in comparative perspective. Hum Resour Health. 2022;20(1):78.
53. Freed M, Biniek JF, Damico A, Published TN. Medicare Advantage in 2024: Enrollment Update and Key Trends [Internet]. KFF. https://www.kff.org/medicare/issue-brief/medicare-advantage-in-2024-enrollment-update-and-key-trends/. Accessed 12 Sep 2024
54. Frank E, Zhao Z, Sen S, Guille C. Gender disparities in work and parental status among early career physicians. JAMA Netw Open. 2019;2(8): e198340.

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