

Health Womanpower

The Role of Federal Policy in Women's Entry into Medicine

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Abstract

During the 1970s, women's representation in medical schools grew rapidly from 9.6% of all students in 1970 to 26.5% in 1980. This paper studies the role of federal policy in increasing women's access to medical training through two distinct channels: pressure to curb sex discrimination in admissions and a massive expansion in total enrollment through Health Manpower policy starting in 1963. To study this, I construct a novel school-by-year data set with enrollment and application information from 1960 through 1980. Using a continuous difference-in-differences design, I find that medical schools respond to the threat of losing federal contracts by increasing first year enrollment of women by 4 seats at the mean, which explains 27% of women's gains between 1970 and 1973. Further, I provide evidence that year-to-year expansions explain around 40% of women's gains from 1970 to 1980; I verify this result in a synthetic control case study to identify the increase in women's enrollment resulting from large jumps in capacity.

JEL codes: I28, J16, J78, N32

Key words: women in medicine, women and affirmative action, health manpower policy, medical school enrollment

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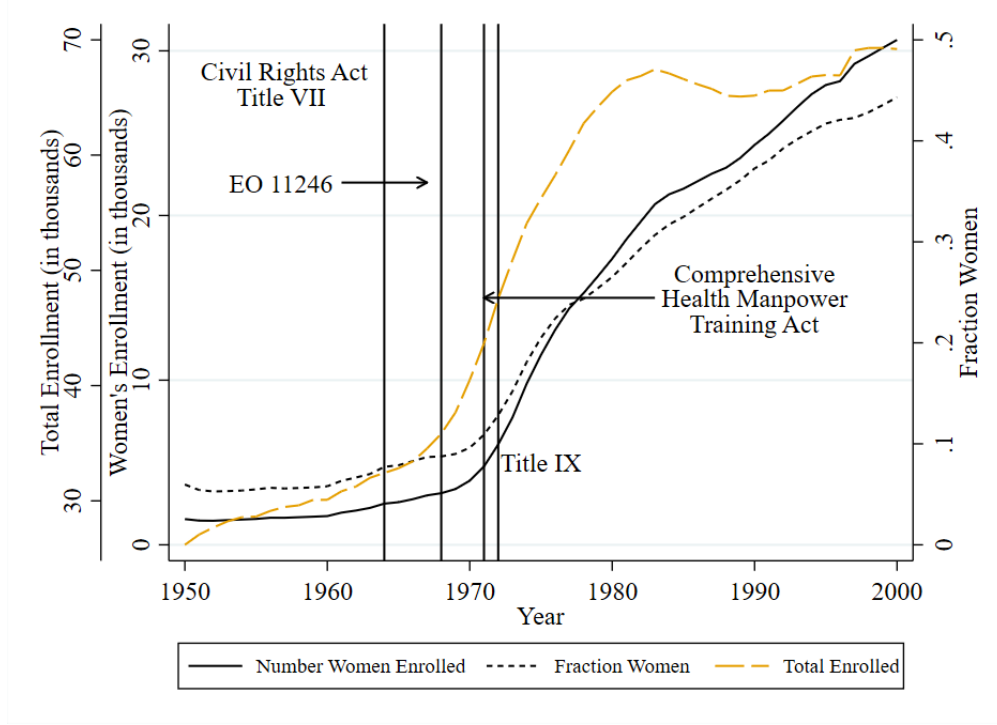
1 Introduction

The most prominent federal action pursuing gender equity in higher education is Title IX of the Education Amendments Act of 1972, which broadly prohibited discrimination on the basis of sex for any institution receiving federal funding. However, this was the culmination, rather than beginning, of activist efforts to pressure the government to take action. Title VI of the Civil Rights Act of 1964 had provided a similar prohibition on discrimination that was not limited to educational institutions, but sex was not included as a protected category;¹ further, educational institutions were explicitly exempt from the employment nondiscrimination provisions in Title VII, even though sex was included here. This would change with Executive Order 11375 in 1967, which amended Executive Order 11246 to prohibit federal contractors from discrimination in hiring on the basis of sex. Recognizing that many institutions of higher education were recipients of federal contracts, EO 11246 was utilized by the Women's Equity Action League (WEAL), led by Bernice Sandler, to file around 250 complaints of noncompliance against colleges and universities, several of which led to investigations resulting in the withholding of federal funding. This paper will argue that it was this push that sparked women's entry into medical schools in the early 1970s, combined with a successful effort to codify sex nondiscrimination through the legislature and amplified by a massive federal push to expand medical school enrollment in the 1970s.

Beginning in the early 1970s, women began to enter medical schools at historic rates. Figure 1 plots women's enrollment in both levels and as a percentage of total enrollment at all allopathic medical schools from 1950 through 2000. There is a slight uptick in women's enrollment starting in the 1960, but the growth rate changes abruptly around 1970, and there is a drastic increase in both the number of women in medical schools as well as the fraction of all medical students who are women. Figure 1 also plots total enrollment throughout this time period - starting in the mid-1960s, enrollment at allopathic medical schools undergoes a massive expansion, essentially doubling between 1965 and 1980. Many of these seats are filled by women: in an accounting sense, women's gains by 1980 comprised 49% of all seats created between 1965 and 1980, representing a 680% increase in women's enrollment. This expansion was the result of several pieces of legislation under the umbrella of Health Manpower Policy that incentivized expansion through construction grants for teaching facilities in conjunction with direct payments to medical schools proportional to enrollment.

¹This similarity was not accidental - when drafting what would become Title IX, Rep. Edith Green initially wanted to amend Title VI to include sex, but was dissuaded over fears that this would inspire other regressive changes to the law (Suggs, 2006).

Figure 1: Trends in Medical School Enrollment, 1950-2000



This figure plots the total number of women enrolled, the total number of students enrolled, and their ratio at U.S. allopathic medical schools from 1950 through 2000. Data are collected from the *Journal of the American Medical Association's* Education Number in various years between 1950 and 1989. Data from 1990 onwards are collected from the *Association of American Medical Colleges*. In addition, I date several important anti-discrimination policies - note that EO 11246 is dated in 1968, when sex was officially added to the list of protected classes.

It is well known that anti-discrimination mandates likely played a role in women's progress during this time period, but it has been difficult to identify their impact (Goldin, 2005). The time series evidence points to a sudden, episodic change in the early 1970s. Yet it seems to come too early for Title IX, which was not effective until 1973, to be the principal cause. Data restrictions have also played a role: aggregate statistics have revealed changes in women's attendance at professional schools (Goldin and Katz, 2002), but more detailed institutional enrollment data in the Higher Education General Information Survey (HEGIS)² is not available at the degree level until the mid 1970s. Finally, while it is well known that there were large institutional changes occurring concurrently at medical schools as women began to enter (Boulis and Jacobs, 2008; More, 1999), the relaxing of capacity constraints has remained unnoticed by the economics literature.

²This was the predecessor to the Integrated Postsecondary Education Data System (IPEDS).

This paper resolves these issues and provides new evidence that antidiscrimination policy played an important role in women’s entry into medicine. To do this, I construct a novel school-by-year dataset from 1960 through 1980 with institution-level enrollment and admissions data split by sex. This allows me to characterize changes in the distribution of women across medical schools during their rapid entry in the 1970s. As this is not possible with aggregate data, I contribute to a nascent literature looking more deeply at women’s access to professional schools (Katz et al., 2022). Further, this data allows me to utilize causal inference methods to understand the influence of institution-level changes on women’s enrollment, adding to Moheling et al. (2019)’s study of women’s access to the medical profession during a period of medical school closings from 1900-1960.

I provide causal estimates of the impact of anti-discrimination policy on women’s enrollment in medical school. Reviewing action by the women’s movement to leverage government policy to end sex discrimination in higher education, I identify a complaint filed by the Women’s Equity Action League (WEAL) in October 1970 as the most likely point in time in which anti-discrimination policy would bite for medical schools. I collect data on the amount of funding provided by HEW that would be at stake if a school were to violate this policy. Then, using a continuous difference-in-differences strategy, I show that schools with more funding at stake increase their enrollment of women at higher rates starting in the Fall of 1971. Specifically, I find that a medical school receiving the mean level of funding increases women’s first-year enrollment by 4 seats, accounting for 25% of women’s gains between 1971 and 1973. This contributes to a growing literature on the effectiveness of anti-discrimination policy in improving labor market outcomes (Bailey et al., 2022; Beller, 1979, 1983; Leonard, 1989; Manning, 1996) and educational outcomes (Rim, 2021) for women.

Finally, I provide OLS evidence that women were able to capture around 20% of newly created seats in the 1970s, accounting for 40% of their progress during this time period. This estimation strategy relies on the restriction that year-to-year changes to enrollment can only affect contemporaneous changes in women’s enrollment, ruling out any dynamic effects in which women fill newly created seats over a period of years. I relax this restriction in a case study exploring the construction of a new basic sciences building at the University of Cincinnati. Using a synthetic control design, I find that women are able to capture around 1/3 of the new seats, but it takes around 3 years following the completion of construction for these effects to materialize. This contributes to our understanding of how changes in the supply of college enrollment affects equilibrium outcomes, which has received little attention in the higher education literature (Blair and Smetters, 2021).

2 Medical Schools in the 1960s

In the 1960s, it was impossible to deny that women were underrepresented in the nation's medical schools - in each year between 1960 and 1969, women did not account for more than 9% of all medical students enrolled. Table 1, reproduced from [U.S. Congress 1970](#), pg. 528, gives a snapshot of enrollment at medical schools in 1966. There are a handful of progressive schools in this time period enrolling proportionally more women than the average by a substantial margin, such as Howard University, Boston University and SUNY Downstate. However, the modal medical school is not very different from the average - as this table makes clear, by and large, women constitute a very small fraction of enrollees that does not differ terribly by institution. In other words, there was not an issue of access to a particular set of medical schools, but rather access to any medical school, with the exception of Women's Medical, which exclusively enrolled women.

At the time, analysts tended to point to gender differences in the demand for medical education, rather than discrimination by the admissions committee, as the central reason why women did not take up medicine in greater numbers ([Epstein, 1970](#); [Lopate, 1968](#)). Defenders of the *status quo* were quick to point out that acceptance rates for men and women were consistently similar, arguing that this was evidence that admissions committees did not consider sex when evaluating applications. This argument was formalized by [Cole \(1986\)](#), who found that men were not admitted at higher rates from the entire period between 1924 and 1984.³

Despite these arguments, it was not at all difficult to establish that some medical schools were discriminating against women. Beginning in 1958, the Association of American Medical Colleges (AAMC) began publishing *Medical School Admission Requirements*, a yearly periodical intended to help prospective students in the application process. Included in each year starting in 1959 is a table containing preferences for each school over applicant characteristics, including sex, race, residency and age in earlier years. In 1960, 21 medical schools (excluding Women's Medical) reported that they considered applicant sex in the admissions process; by 1970, this had dropped to 4 schools, but was still being reported by the AAMC.

What was more unclear was the extent of the problem. In 1969, Women's Medical first began to consider male applicants, a decision that met resistance from alumni worried that

³Interestingly, women's advocates utilized this exact same statistic to conclude that there must be discrimination; in their letter to Congress, WEAL argues that this could not be the case unless admissions committees were utilizing information on sex to ensure admissions rates were identical ([U.S. Congress 1971](#), pg. 874)

Table 1: Medical School Enrollment by Sex in 1966

Rank	Medical School	Men			Women			Rank	Medical School	Men			Women		
		30,652	2,771	8.3	2,771	100	8.3			371	451	30	371	451	30
0	Total	30,652	2,771	8.3	2,771	100	8.3	45	University of Texas, Southwestern	371	451	30	371	451	30
1	Woman's Medical College	0	204	100	204	100	100	46	University of Iowa	451	36	36	451	36	36
2	University of Puerto Rico	166	49	22.8	49	22.8	22.8	47	University of Florida	219	17	17	219	17	17
3	Howard University	322	79	19.7	79	19.7	19.7	48	University of Texas, medical branch	549	42	42	549	42	42
4	Rutgers State University	13	3	18.8	3	18.8	18.8	49	University of Maryland	452	34	34	452	34	34
5	Boston University	244	42	14.7	42	14.7	14.7	50	New Jersey College of Medicine, Seton Hall University	282	21	21	282	21	21
6	State University of New York, Downstate	652	102	13.5	102	13.5	13.5	51	Hahnemann Medical College	398	29	29	398	29	29
7	University of California, San Francisco	428	61	12.5	61	12.5	12.5	52	University of North Dakota	85	6	6	85	6	6
8	University of New Mexico	58	8	12.1	8	12.1	12.1	53	University of Oregon	314	22	22	314	22	22
9	Case Western Reserve University	310	41	11.7	41	11.7	11.7	54	Ohio State University	543	38	38	543	38	38
10	New York University	423	55	11.5	55	11.5	11.5	55	University of Minnesota	601	42	42	601	42	42
11	University of Chicago	250	30	10.7	30	10.7	10.7	56	Tufts University School of Medicine	416	29	29	416	29	29
12	Loma Linda University	303	36	10.6	36	10.6	10.6	57	University of Missouri	305	21	21	305	21	21
13	University of Wisconsin	353	42	10.6	42	10.6	10.6	58	University of Tennessee	629	43	43	629	43	43
14	Columbia University	422	50	10.6	50	10.6	10.6	59	University of California, Los Angeles	280	19	19	280	19	19
15	Temple University	493	58	10.5	58	10.5	10.5	60	Jefferson Medical College	621	42	42	621	42	42
16	Stanford University	275	32	10.5	32	10.5	10.5	61	Vanderbilt University	193	13	13	193	13	13
17	University of Kentucky	248	28	10.1	28	10.1	10.1	62	University of Vermont	183	12	12	183	12	12
18	Albert Einstein College of Medicine	349	39	10.1	39	10.1	10.1	63	Cornell University	317	21	21	317	21	21
19	Albany Medical College	225	24	9.6	24	9.6	9.6	64	University of Oklahoma	375	24	24	375	24	24
20	New York Medical College	447	47	9.5	47	9.5	9.5	65	University of North Carolina	267	17	17	267	17	17
21	Meharry Medical College	212	22	9.4	22	9.4	9.4	66	State University of South Dakota	83	5	5	83	5	5
22	Yale University	290	30	9.4	30	9.4	9.4	67	Medical College of Virginia	354	21	21	354	21	21
23	University of Illinois	695	70	9.2	70	9.2	9.2	68	Bowman-Gray School of Medicine	202	12	12	202	12	12
24	California College of Medicine	289	29	9.1	29	9.1	9.1	69	University of Louisville	343	20	20	343	20	20
25	Wayne State University	469	47	9.1	47	9.1	9.1	70	University of Kansas	422	24	24	422	24	24
26	West Virginia University	210	21	9.1	21	9.1	9.1	71	University of Arkansas	351	19	19	351	19	19
27	Harvard Medical School	488	48	9	48	9	9	72	University of Washington	299	16	16	299	16	16
28	University of Colorado	310	30	8.8	30	8.8	8.8	73	Georgetown University	427	22	22	427	22	22
29	State University of New York at Buffalo	353	34	8.8	34	8.8	8.8	74	Loyola University Stritch School of Medicine	322	16	16	322	16	16
30	Louisiana State University	471	45	8.7	45	8.7	8.7	75	Emory University	267	13	13	267	13	13
31	State University of New York, Upstate	357	34	8.7	34	8.7	8.7	76	Marquette University	376	18	18	376	18	18
32	University of Pittsburgh	348	33	8.7	33	8.7	8.7	77	University of Nebraska	324	15	15	324	15	15
33	University of Michigan	713	67	8.6	67	8.6	8.6	78	University of Pennsylvania	480	22	22	480	22	22
34	Northwestern University	490	46	8.6	46	8.6	8.6	79	University of Rochester	263	12	12	263	12	12
35	Dartmouth Medical School 2	86	8	8.5	8	8.5	8.5	80	Tulane University	489	21	21	489	21	21
36	Indiana University	750	68	8.3	68	8.3	8.3	81	Baylor University	330	14	14	330	14	14
37	University of Southern California	256	23	8.2	23	8.2	8.2	82	Medical College of Georgia	369	14	14	369	14	14
38	Johns Hopkins University	336	30	8.2	30	8.2	8.2	83	University of Virginia	286	9	9	286	9	9
39	University of Miami	287	25	8	25	8	8	84	Medical College of South Carolina	299	9	9	299	9	9
40	St. Louis University	404	35	8	35	8	8	85	University of Cincinnati	377	11	11	377	11	11
41	Washington University	303	26	7.9	26	7.9	7.9	86	University of Utah	231	6	6	231	6	6
42	George Washington University	373	32	7.9	32	7.9	7.9	87	Medical College of Alabama	305	7	7	305	7	7
43	Duke University	298	25	7.7	25	7.7	7.7	88	Chicago Medical School	279	3	3	279	3	3
44	University of Mississippi	275	23	7.7	23	7.7	7.7	89	Creighton University	280	3	3	280	3	3

it would compromise opportunities for women to study medicine provided by a women-only institution ([U.S. Congress 1971](#), pg. 563). To investigate the severity of the problem, the dean of Women’s Medical interviewed admissions officers at 25 Northeastern medical schools, finding that 19 “admitted they accepted men in preference to women unless the women were demonstrably superior” ([U.S. Congress 1971](#), pg. 872), suggesting that many schools acted in a discriminatory manner without admitting formally to preferences over sex.

[Lopate \(1968\)](#) reports that discrimination against women at medical schools manifested in a very particular way: “Prejudice against accepting women continues to exist, except that it is directed toward some future point when the ‘minority group’ might begin to apply in greater numbers.” This was driven by a legitimate concern over an expected shortage of physicians in conjunction with an expectation that women were less likely to practice after graduation. In the words of an admissions officer,

With the predicted shortage of the 1970’s we have to produce as many physicians as we can who will guarantee sufficient practice. If we accept a woman, we’d better make sure she will practice after she gets out. This year I had to insist that we only accept better-than-average women. ([qtd. in Lopate, 1968](#))

The expectation that women are less likely to practice was directly tied to family decisions. This line of reasoning is demonstrated succinctly by Bernice Sandler, here discussing all graduate admissions:

If a woman is not married, she’ll get married. If she is married, she’ll probably have children. If she has children, she can’t possibly be committed to a profession. If she has older children, she is too old to being training. ([U.S. Congress 1970](#))

This concern was compounded by higher attrition rates for women, though this was perversely at least partially the result of a male-dominated academic climate that was hostile towards women ([Lopate, 1968](#)). Interestingly, though, while attrition for female medical students was higher than their male counterparts, overall attrition in medical schools was far lower than other advanced degrees. Between 1948 and 1958, 8.69% of admitted students did not receive an M.D., with gender-specific attrition rates of 8.28% for men and 15.51% for women; for comparison, similar figures at law and engineering schools for overall attrition during this time period were 40% and 51%, respectively ([Johnson and Hutchins, 1966](#)).

2.1 Changes in the 1970s

As Figure 1 demonstrates, the *status quo* begins to dissolve in the 1970s as women entered medical schools in far greater numbers than before. To characterize the nature of this transition, I begin by establishing several stylized facts. I collect institution-level data on enrollment by sex at every medical school between 1960 and 1980 in the *Journal of the American Medical Association's* Education Number.⁴ Similar to Katz et al. (2022), I characterize entry with respect to two margins: representation among all medical students and overall access to medical education. Figure 2 plots the distribution across medical schools of the fraction of their students who are women. We see that women's representation increases across the board at all medical schools between 1970 and 1980, as evidenced by a shift upwards in this distribution. In particular, we see the most rapid changes between 1970 and 1975, with growth slowing in the second half of the 1970s. Simultaneously, we see a large increase in the variance of this distribution - by 1980, some medical schools have almost reached parity, but at others only 15% of students are women.

Table 2: Transition Probabilities Between 1966 and 1980

		1980			
1966	Quartile	1	2	3	4
	1	29%	29%	33%	10%
	2	32%	32%	18%	18%
	3	33%	19%	19%	29%
	4	5%	23%	27%	45%

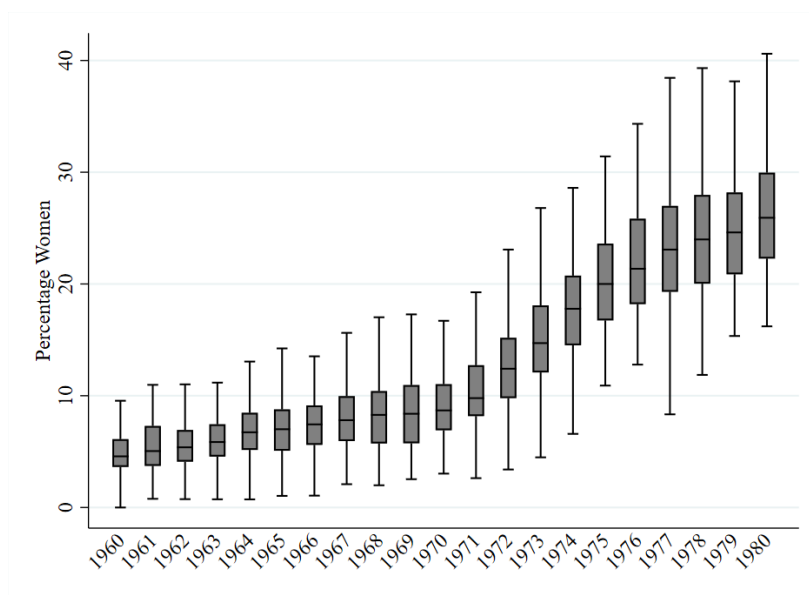
I divide up medical schools into 4 quartiles in 1966 and 1980, ordered by the percentage of their students who are women. Each cell gives the percentage of schools in the row quartile in 1970 that were in the column quartile in 1980.

It is unclear from looking only at distributional changes how individual medical schools are evolving over time. To understand this, I split schools in Table 1 into 4 groups, given by which quartile they fall into measured by the proportion of their students that are women.⁵ I then calculate the fraction of schools in each group that end up in each quartile, defined similarly, at the end of my sample period in 1980. Table 2 plots these transition probabilities for quartiles of this distribution from 1966 to 1980. For schools with relatively high representation of women in 1970 (Quartile 4), this status is usually maintained in 1980 - 72% of schools in quartile 4 in 1966 end up above the median in 1980. However, this pattern is

⁴In Appendix B.1 I discuss construction of this dataset in more detail.

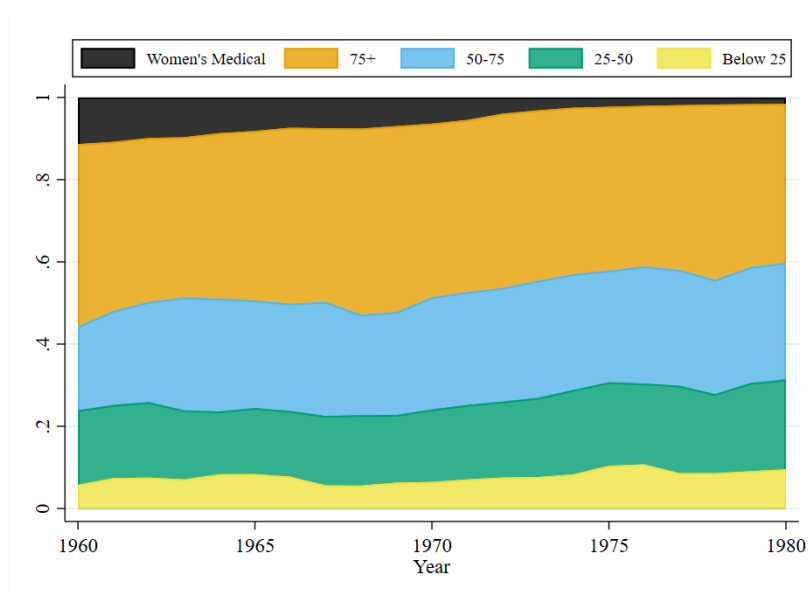
⁵For this exercise, I include only schools that are in my dataset from 1960 through 1980.

Figure 2: Evolution of Women's Representation



This figure plots a box and whisker plot summarizing the distribution of women's representation in medical schools in each year, excluding Women's Medical. I calculate the fraction of total enrollees who are women at each medical school in every year. For each year, the box plots the 25th, 50th, and 75th percentile of this distribution. The whiskers plot the upper and lower adjacent values.

Figure 3: Evolution of Women's Access



For each year, I calculate the 25th, 50th, and 75th percentile of the distribution of the number of women in each school. This figure plots the percentage of women enrolled in schools in each quartile of this distribution. Women's Medical is plotted separately as well.

not maintained in lower quartiles; we see a relatively even spread of schools throughout the distribution in 1980 conditional on residing in each quartile in 1966. This is an important pattern to note. As women enter medical schools, we do not see schools with low enrollment of women catch up to their peers; conversely, more women-friendly schools remain this way at the end of the 1970s, with a substantial increase in the variance of women’s representation in the remaining institutions.

Figure 3 plots the percentage of women enrolled at institutions in each quartile, with Women’s Medical plotted in its own category. In 1960, women’s access to medical schools was largely determined by a handful of institutions. Women’s Medical enrolled around 10% of all women, and 60% of all female medical students were concentrated at 25% of all institutions. However, substantial progress was made throughout my sample period to increase women’s enrollments at other institutions. By 1980, the top 25% institutions account for only 40% of women’s enrollment driven by increases in women’s enrollment across the distribution below the 75th percentile.

Both of these figures paint a distinct picture: women’s enrollment increases in the aggregate because of changes across the distribution in women’s admission to medical schools, rather than schools with low enrollment “catching up” to schools that had enrolled more women. As a result, women had access to a larger swathe of medical schools, with concentration at more female-friendly institutions decreasing between 1960 and 1980. Now, I turn to the task of determining what drove these changes. I start by describing the progression of federal antidiscrimination policy that occurred throughout the 1960s and early 1970s.

2.2 Development of Policy

The fight against sex discrimination in higher education, which would ultimately lead to the passage of Title IX, was led early on by Bernice Sandler and the Women’s Equity Action League (WEAL). As the 1960s came to a close, Sandler realized that there was already federal policy in place that prohibited sex discrimination in the hiring practices of colleges and universities (Suggs, 2006). In 1965, President Johnson issued Executive Order 11246, which prohibited government contractors from discriminating in hiring on the basis of race, color, religion or national origin. However, this was amended in 1967 by Executive Order 11375 to include sex as a protected category, which went into effect in October 1968. Since most universities receive federal contracts, Sandler reasoned that they would be subject to this regulation. A newcomer to political action, Sandler placed a call to the Office of Federal Contract Compliance (OFCC), where she happened to be put in touch

with Vincent Macaluso, who not only confirmed that she was correct but also helped Sandler draft complaints to ensure they would be effective ([Fitzgerald, 2020](#)). On January 31, 1970, together with the Women’s Equity Action League (WEAL), Sandler filed her first complaint under EO 11246, which called for a compliance review of all universities and colleges, with a specific complaint filed against the University of Maryland.

This complaint was passed along to the Department of Health, Education and Welfare (DHEW), which was responsible for enforcement. By this point, DHEW had been involved in enforcement of the racial nondiscrimination provision of EO 11246; compliance guidelines were issued by the OFCC in 1968, and DHEW was in the midst of several compliance investigations by the end of the decade ([Fitzgerald, 2020](#)). Over the next two years, Sandler and WEAL continued to file EO 11246 complaints against around 250 institutions ([Suggs, 2006](#)). DHEW took these complaints seriously and began investigations at several universities - by the end of 1970, investigations were ongoing at the University of Maryland, recipient of the initial complaint, as well as Harvard, Loyola (Chicago), George Washington, the University of Pittsburgh, the University of Southern Illinois, and the University of Michigan ([The New York Times, 1970](#)).

While initially attention was focused on hiring, action was broadened to include allegations of admissions discrimination at both the undergraduate and graduate level ([Fitzgerald, 2020](#)). These investigations were often lengthy battles between HEW and administration officials, involving the disclosure of relevant data by the university as well as negotiations over remediative action if a university was found in noncompliance, and DHEW proved willing to withhold funding at any stage of this process. Institutions often did not want to provide data on hiring and admissions, but when Harvard refused to do so at the onset of a review, DHEW held up several millions in funding until the data were released ([Harvard Crimson, 1971](#)). Further, the conclusion of these investigations resulted in the suspension of contracts for several institutions in the late 1970s/early 1971 until they complied with HEW demands ([Bazell, 1970](#)).

2.2.1 Medical Schools

As WEAL continued to file complaints of EO 11246 violations, Sandler shifted her attention to the legislature, working as a consultant for Rep. Edith Green’s Subcommittee on Higher Education ([Suggs, 2006](#)). In June 1970, Green led a series of federal hearings on discrimination against women, in which medical schools featured prominently. Admissions data and several studies of admissions committees were presented, and testimony went as far as naming

an explicit list of schools where “female enrollment figures are consistently, patently, discriminatory” (U.S. Congress 1970, pg. 512). Accordingly, it was no surprise when in October 1970, WEAL filed EO 11246 complaints against all medical schools in the country citing sex discrimination (More, 1999).

Eventually, Sandler and Green would succeed with the passage of Title IX in 1972, but a similar ban on admissions discrimination was passed a year earlier for health professional schools. The Comprehensive Health Manpower Training Act (CHMTA), passed in November 1971, was the linchpin of a federal push to increase enrollments at medical schools. It involved a host of programs including direct payments to medical schools in exchange for enrollment increases, matching funds for construction projects, and grants to alleviate financial distress at troubled institutions. All of this funding could now be withheld if a medical school utilized discriminatory practices in its admissions process. The stipulation prohibiting sex discrimination in admissions was not in the original bill on the Senate floor, S. 934, but added later as an amendment which was maintained in the final version of the legislation (U.S. Congress 1970). This addition was likely the result of a successful lobbying effort on the part of the Women’s Equity Action League (WEAL), which called for such an amendment during the hearings on S. 934.

Once enacted, enforcement fell to the Bureau of Health Manpower (BHM) of the Department of Health, Education and Welfare. From their report to congress, it appears that the BHM took this seriously, stating the requirement of non-discrimination as one of the “assurances” that must be provided by institutions before receiving a capitation grant (DHEW BHM 1976). The BHM has access to admissions data through the grant application process, and it is given the power to visit medical schools to check on their progress on special projects.

2.2.2 Anti-Discrimination Literature

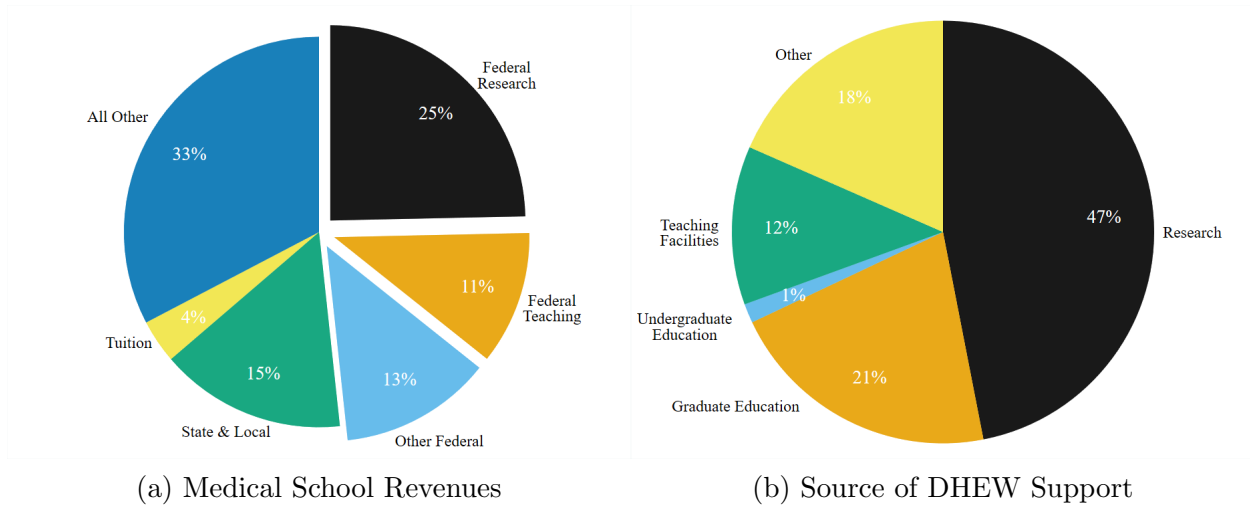
There has been much work trying to understand if EO 11246, along with Title VII of the Civil Rights Act, had improved labor market outcomes for women and Black employees. Early work utilized a difference-in-differences design comparing the progression of employment at firms with and without federal contracts, finding higher employment growth for Black workers at covered firms (Leonard, 1984, 1990), with similar but small effects for white women (Leonard, 1990). However, there was evidence that Title VII (rather than EO 11246) improved women’s earnings (Beller, 1979) and helped their entry into male-dominated professions (Beller, 1983).

Recent work has extended this basic design to leverage variation over time in firm exposure to antidiscrimination policy. Kurtulus (2016) utilizes changes in contractor status over time for a panel dataset of firms, finding effects for Black and Native American men and women concentrated in the 1970s and early 1980s. Miller (2017) builds on this strategy, restricting the comparison group to firms that have never been contractors to avoid bias stemming from dynamic treatment effects (Goodman-Bacon, 2021), finding that there are persistent effects of coverage even after a federal contract is completed. Neumark and Stock (2006) leverage changes in state anti-discrimination laws that predate federal action, finding mixed evidence, including earnings gains for Black workers but reduced employment for women.

In this setting, there is no variation over time in medical school coverage, as EO 11246 complaints are filed against every institution simultaneously, and subsequently policy is passed at the national level. Consequently, I leverage differential exposure to affirmative action given by the amount of funding at stake from violating anti-discrimination provisions. This design builds on an important contribution from Rim (2021), who leverages differences across institutions in the amount of federal funding received to measure the impact of Title IX on changes in women’s graduate enrollment. I build on this paper by showing that earlier affirmative action policies, in particular EO 11246 and the Comprehensive Health Manpower Training Act, mattered for institutions of higher education, which has been largely unexplored in the economics literature.

3 Empirical Strategy

The “stick” wielded by the federal government in this context is its ability to rescind funding to medical schools. The identifying assumption of my design is that medical schools receiving more of this funding should increase their enrollment of women by a greater amount in order to remain compliant with this law. I begin by providing some brief background on how medical schools are financed. I show that federal funding provides around half of total operations support, suggesting that the hold-up of this funding would pose a serious threat to the viability of an institution. After describing my preferred measure of federal dependence, I describe the data I utilize to test the hypothesis that anti-discrimination policy improved women’s enrollment at medical schools. Following this, I introduce my main specification and provide results and discussion.



I plot the percentage of total medical school support by source. All funding from the federal government is “popped out” on the right hand side. The data were collected from [Fruen \(1983\)](#) Table 1, and were collected by this author from the *JAMA* Education Number in various years. I plot the percentage of total medical school DHEW support by program. The data were collected from ([DHEW 1971](#)).

3.1 Medical School Finances

The medical school is a complex entity that has many functions besides classroom education, namely clinical training of both prospective M.D.’s and residents and medical research. These functions are financed through a host of revenue sources, including the federal and state government, tuition payments, as well as recompense for patient care in affiliated hospitals. Consequently, it is extremely difficult to tie a source of revenue to a particular function of the medical school ([Townsend, 1983](#)), and I consider all funding as potentially at stake.

Institution-level data on revenue is scarce, but aggregate statistics on sources of funding for medical schools are available. In Figure 4a, I plot the share of all medical school revenue in 1969 by funding source, taken from [Fruen \(1983\)](#). Funding from the federal government comprises around half of all medical school revenue, with the bulk of this funding provided for research or teaching. This is the most important source of revenue for medical schools, significantly greater than the contribution from the state and local government and tuition revenue combined.

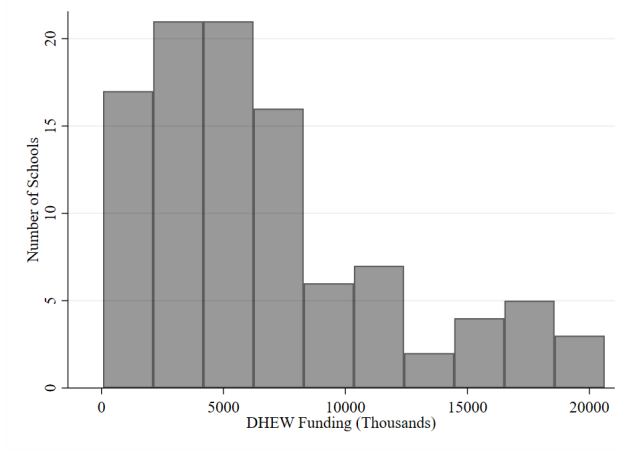
Further, by the end of the 1960s, this support had become even more important as an increasing number of medical schools experienced financial distress. To alleviate this, beginning in 1968, the government had been providing financial distress grants for institutions under the health manpower program; by 1970, 61 of the existing 103 medical schools were

receiving funding through this program. The problem had begun to reach crisis levels at particular programs, threatening their ability to stay afloat ([The New York Times, 1971](#)).

To measure institutional reliance on government funding, I collect medical school-level data on the total HEW obligations to medical schools in 1969 ([DHEW 1971](#)).⁶ This will comprise the bulk, if not all, of federal support to medical schools. Figure 4b breaks down this funding by program. The largest funding stream comes through research contracts & grants, which had been the primary way the federal government had supported medical schools for the past several decades ([Townsend, 1983](#)). However, as the government pursued its health manpower program in the 1960s, this focus had begun to shift to construction support, as evidenced by the funding here for teaching facilities.

My preferred measure of medical school dependence on federal funding is the total amount of HEW support received in 1969, less any construction grants that are given to a school in 1969, which are temporary payment that do not reflect continued government support of a school. I plot a histogram of this variable in Figure 5. There is substantial variation

Figure 5: Distribution of DHEW Dose Variable



I plot a histogram of the distribution of my dose variable, which is the amount of total DHEW funding provided to a school in 1969.

among institutions in the amount of funding received; in particular, this distribution has a right skew, where several institutions receive outsized funding from DHEW relative to the mean medical school. Denote this variable $d_{i,1969}$, where i denotes the institutions. To understand if anti-discrimination policy has benefited women's enrollment, I need to measure how the relationship between enrollment and $d_{i,1969}$ has changed over time. However, even

⁶Data is collected in 1969 instead of 1970 because of data availability restrictions.

if admissions policies adjust rapidly, total enrollment will change slowly, as it is a lagged function of women’s admissions. To account for this, I construct a institution-by-year panel of first-year enrollment to obtain a much better metric of changes in medical school enrollment decisions.

3.2 Data

I collect a novel institution-by-year dataset from 1960 through 1980. Fortunately, medical schools are unique among health professional schools in that there is consistent historic reporting of institution-level enrollment data. My main source of data is the Study of Applicants published yearly in the *Journal of Medical Education*. From 1967 - 1977, the Study of Applicants reports the number of new entrants, as well as applicants, for each medical school, split by sex. Unfortunately, data reporting from this source stops in 1977, and before 1967, enrollment figures are not split by sex.

Accordingly, to fill a complete panel, I bring in several other sources of data. I am able to collect first-year enrollment⁷ in years 1966 and 1978-1980. In 1966, this information is reported in the 1967 *Medical School Admission Requirements*; and in 1978-1980, this is reported in the Education Number, published yearly in the *Journal of the American Medical Association*. To extend the number of pre-periods I can study, I also collect information on estimated new entrants, split by sex, from 1960 - 1965 in the Education Number.⁸ Figure 6 gives a graphical representation of the dataset I’ve constructed, showing the type of information used for each series in every year. The appendix includes a more detailed discussion of all data sources used.

I summarize some key features of the data in Figure 7. I classify observed medical schools as either “established” or “new”, in line with HEW designations when awarding grants. The 87 established medical schools include all institutions with positive enrollment in 1960 as well as the California College of Medicine (now the UC Irvine School of Medicine), which I observe enrollment for starting in 1962.⁹ The 39 new medical schools report positive enrollment for the first time between 1964 and 1979, leaving me with an unbalanced panel

⁷This is not equivalent to new entrants as it includes students repeating the first year, though these students represent a miniscule portion of the first year class in medical schools.

⁸These estimates, while published in the Education Number, were first compiled for the *MSAR* in each year. These estimates are made in the spring after a large portion of the application cycle has completed, but there can be differences between these estimates and actual enrollment if, for example, an incoming student drops out. In Appendix B.2.1, I utilize years where estimated and actual enrollment are observed to verify that these estimates are accurate.

⁹This medical school was established in 1896, but did not become accredited until 1962.

of medical schools. I also plot the percentage of seats in every year that are at established schools. While there is a large push to establish new medical schools, the bulk of seats still remain at established institutions - by 1980, 80% of first-year seats were at institutions that established at the beginning of my sample period.

3.3 Methodology & Specification

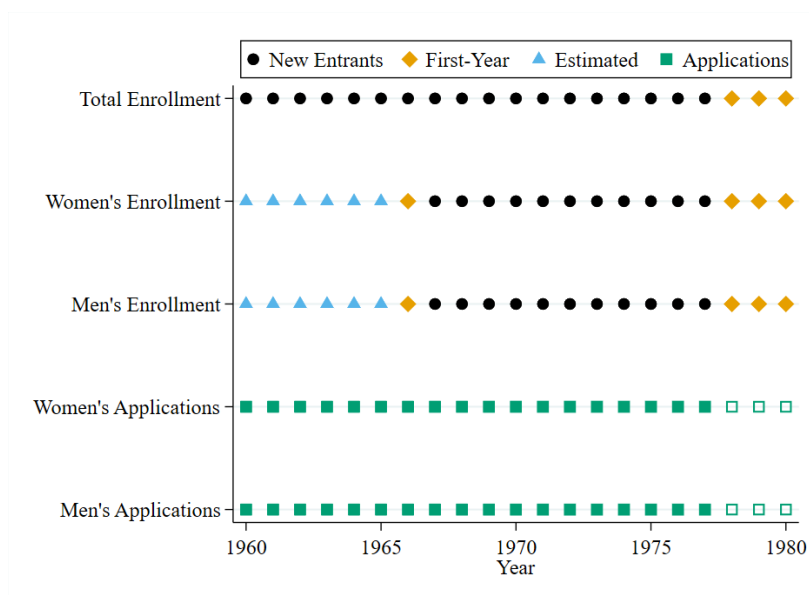
Using this panel dataset, I estimate a continuous difference-in-differences design with an event study specification:

$$Y_{it} = \sum_{\tau=1960, \tau \neq 1970}^{\tau=1977} \alpha_{\tau} d_{i,1969} \mathbb{1}(t = \tau) + \beta' \mathbf{X}_{it} + \gamma_i + \delta_{st} + \varepsilon_{it} \quad (1)$$

The outcome, Y_{it} , gives the number of women enrolled at institution i in year t . $d_{i,1969}$ is my preferred measure of exposure to the policy, which is interacted with a set of year dummies, omitting 1970. My parameter of interest, α_{τ} , captures changes in the relationship between DHEW funding and women's enrollment. If it was the case that this policy raised women's enrollment, we would expect that this relationship would change abruptly in 1971 and that $\alpha_{1971} > 0$. I include a long pre-period extending back to 1960 in order to check for pre-existing trends in this relationship.

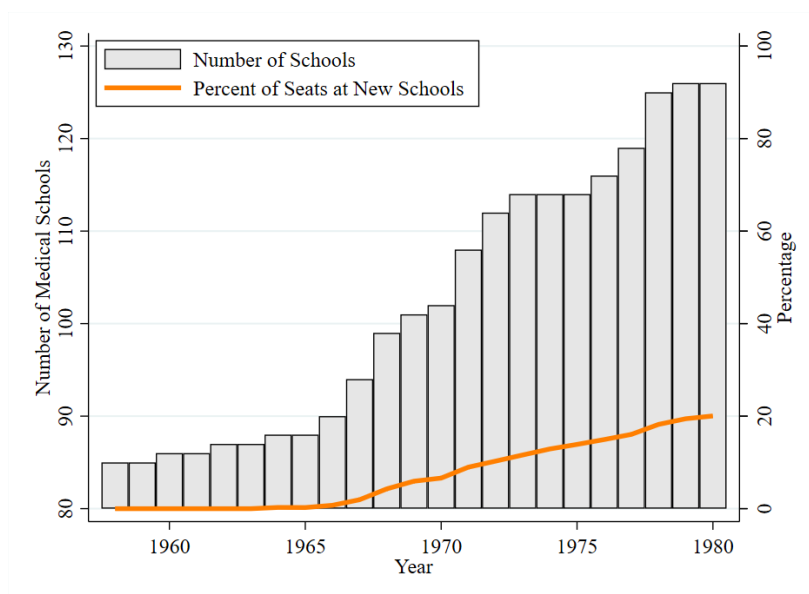
My baseline specification includes institution fixed-effects γ_i to control for time-invariant differences in school preferences over women's enrollment and year fixed effects δ_t to account for year-to-year changes in women's demand for medical education. My baseline control \mathbf{X}_{it} is the school's total enrollment, which adjusts for changes in women's enrollment attributable to total enrollment growth across institutions. I include two additional specifications to contend with potential confounders to my design. First, we might be concerned that women's enrollment is affected by changes in men's demand for medical education. Previous work has shown that the announcement of the Vietnam Wartime Draft by President Nixon in 1969 led to increased educational attainment by men ([Card and Lemieux, 2001](#)), and the end of the draft in 1973 has been suggested as a cause of the increase in women's enrollment in medical school in particular ([Boulis and Jacobs, 2008](#)). Accordingly, I include the number of applications filed by men to control for institution-specific changes in the male demand for medical education. Second, the introduction of oral contraception in 1960 had wide-reaching implications for U.S. women, leading to changes in fertility decisions ([Bailey, 2006](#)) and age at first marriage ([Goldin and Katz, 2002](#)). My third specification includes state-by-year

Figure 6: Graphical Description of Dataset



This figure gives a visual description of how my panel dataset is constructed. For each main variable of interest, the marker in a given year indicates if the data from that year pertains to new entrants, all first-year students (new entrants and repeat students), or is estimated in the spring of the previous year. Application information is included as well, where a hollow marker indicates that data is missing.

Figure 7: Number of Medical Schools



The bars give the number of medical schools that I observe in every year, where a school is counted if it reports non-missing total enrollment for its first year class. I also include a line indicating the percentage of first-year seats that are at schools I classify as new, which is defined in the text.

fixed effects to control for differential access to the pill as states liberalized access at different times. For all designs, standard errors are clustered at the medical school level to correct for serial correlation (Bertrand et al., 2004).

To summarize my event study results, I estimate a three-part linear spline of the form:

$$Y_{it} = \alpha_1^s d_{i,1969}(t - 1970) + \alpha_2^s d_{i,1969}(t - 1970)\mathbb{1}(t > 1970) + \alpha_3^s d_{i,1969}(t - 1970)\mathbb{1}(t > 1974) + \beta' \mathbf{X}_{it} + \gamma_i + \delta_{st} + \varepsilon_{it} \quad (2)$$

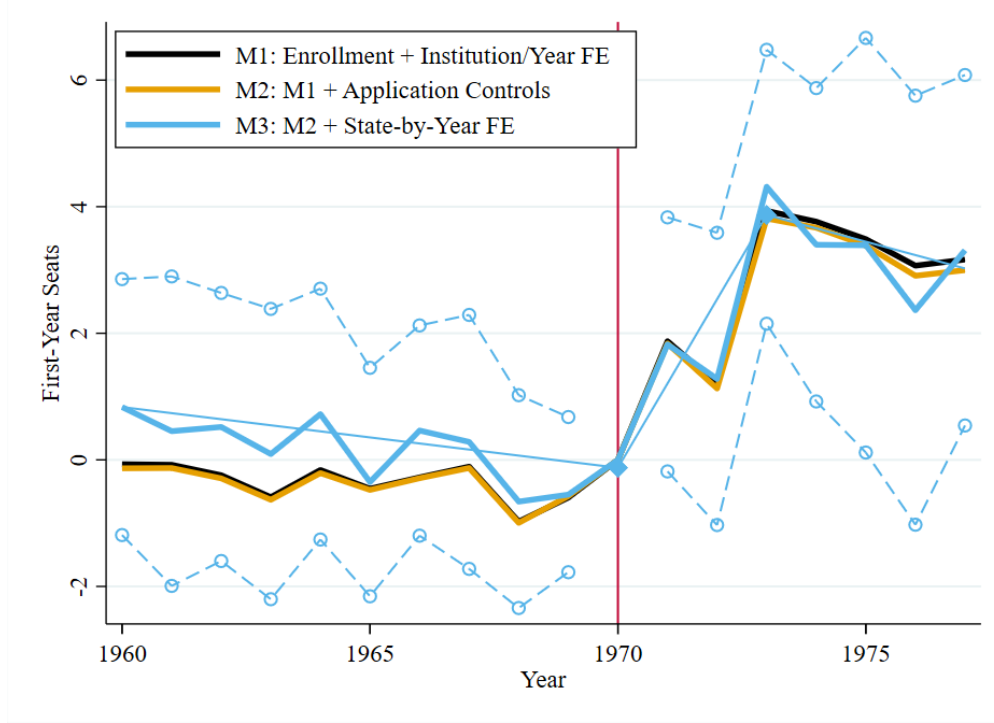
Here, I interact the dose $d_{i,1969}$ with event time $t - 1970$ and estimate the slope of my event coefficients before 1970 ($\hat{\alpha}_1^s$), between 1971 and 1973 ($\hat{\alpha}_2^s$) and after 1973 ($\hat{\alpha}_3^s$). My main coefficient of interest, $\hat{\alpha}_2^s$, measures the break in slope after the EO 11246 filing, adjusting for an estimated pre-trend $\hat{\alpha}_1^s$. To summarize short-run effects, I report $3 * \hat{\alpha}_2^s * \hat{d}_{i,1969}$, which estimated the cumulative number of seats given to women by 1973, relative to any pre-trend, at the mean of the dose distribution $\hat{d}_{i,1969}$.

3.4 Results & Discussion

These results are presented in Figure 8, and transformed spline estimates are reported in Table 3. Event coefficient estimates are scaled by the mean of the dose distribution so that they can be interpreted as the number of first-year seats added. For the 10 years prior to 1971, we see almost no change in the relationship between DHEW funding and women’s enrollment. This changes abruptly in 1971, and gains for women peak in 1973, likely buoyed by the anti-discrimination provisions in the Comprehensive Health Manpower Training Act and Title IX, which are passed in 1971 and 1972, respectively. At the mean, women gain 4 first-year seats as the result of this policy, which is a small but significant increase in enrollment. Across the 101 medical schools, this would create 404 first-years seats, which constitutes roughly an increase in enrollment of 1600 women. Model 2 accounts for changes in men’s enrollment, which changes the coefficient estimates very little, suggesting that increased demand from men between 1969 and 1973 did not affect women’s entry in the early 1970s. Including state-by-year fixed effects in Model 3 highlights a slight trend downwards in women’s enrollment in the pre-period, which was abruptly reversed at the beginning of the 1970s.

The primary threat to identification in this design is that other institutional characteristics, which correlate with DHEW funding, might drive differential responses to an unrelated policy. Specifically, with the passage of the Comprehensive Health Manpower Training Act

Figure 8: Difference-in-Differences: Results for Women



I plot the event study coefficients from equation (1) scaled by the mean of the dose distribution, where the outcome is women's enrollment. Model 1 includes a control for total enrollment as well as institution and year fixed effects. Model 2 adds a control for men's applications. Model 3 adds state-by-year fixed effects. I plot a 95% confidence interval for model 3, where standard errors are clustered at the institution level. Additionally, I report spline estimates from equation (2) for model 3.

in 1971, we worry that better funded schools might have expanded enrollment more rapidly, causing an increase in women's enrollment. This hypothesis would also predict increases in men's enrollment in the early 1970s; accordingly, to rule out this explanation, I run an identical design with men's enrollment on the left-hand side.¹⁰

The results from this design are in Figure 9, and spline estimates are reported in columns 4-6 of Table 3. Not only does this design rule out enrollment expansion as an alternative explanation, but it also gives insight into the nature of the institutional response. The coefficient for men's enrollment in 1973 is around -4, suggesting that the seats allotted to women as a result of this policy would have been given to men if not for government intervention.

If there is a change in the willingness of medical schools to admit women, does this

¹⁰To preserve symmetry, M2 includes the number of applications submitted by women, but since women were not subject to the Vietnam draft, this control does not have the same significance.

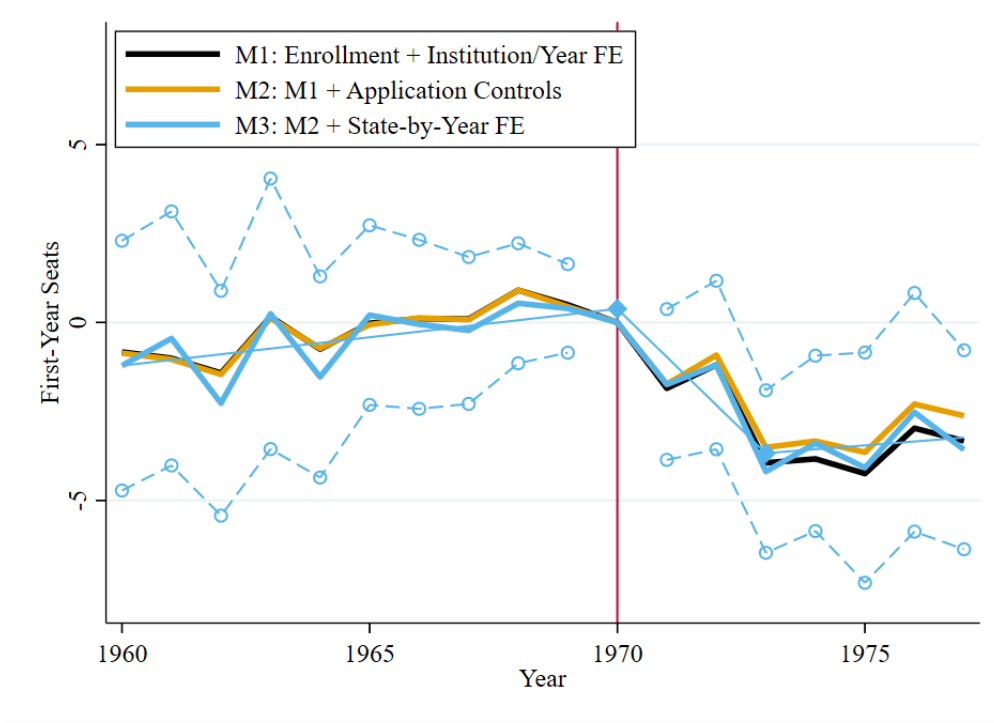
Table 3: Changes in Enrollment in Response to Anti-Discrimination Policy: Spline Estimates

	Women			Men			Applications	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pre-Trend Change, 1960-1970	-0.025 (0.071)	-0.018 (0.072)	-0.084 (0.090)	0.154 (0.116)	0.156 (0.117)	0.148 (0.156)	0.489 (1.459)	-0.039 (1.937)
Spline Estimate in 1973 at Mean Dose	3.996*** (0.865)	3.945*** (0.867)	4.195*** (1.072)	-4.648*** (0.881)	-4.355*** (0.898)	-4.397*** (1.195)	61.142 (37.636)	51.447* (27.517)
Observations	1598	1598	1242	1598	1598	1242	1599	1242
Total Enrollment	X	X	X	X	X	X	X	X
Men's Applications		X	X		X	X		
State-by-Year Fixed Effects			X			X		X

This table reports transformed estimates from equation (2). The outcome for columns 1-3 columns 4-6 are women's first-year enrollment and men's first-year enrollment, respectively, and the outcome for columns 7 & are women's applications. All coefficients are scaled by the mean of the dose distribution so that they give an estimate of the change in seats over a time period attributable to the dose variable. Row 1 reports estimates of the pre-trend slope and Row 2 reports estimates of the cumulative change in seats by 1973 adjusted for the pre-trend slope. All standard errors are clustered at the institution level.

*** $p < .01$, ** $p < .05$, * $p < .10$

Figure 9: Difference-in-Differences: Results for Men



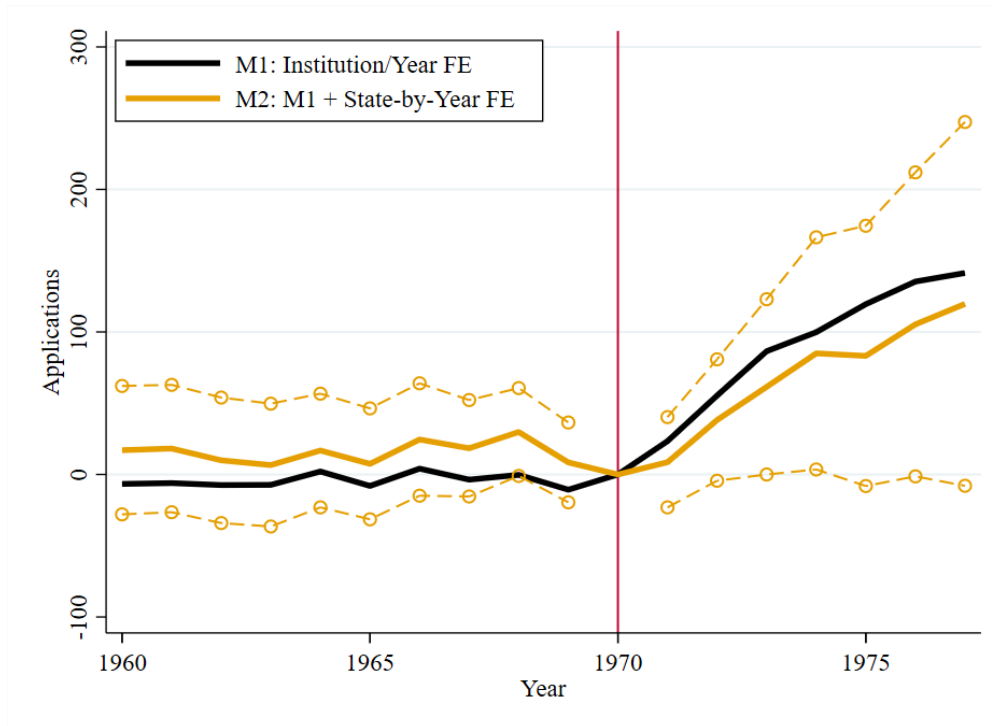
I plot the event study coefficients from equation (1) scaled by the mean of the dose distribution, where the outcome is men's enrollment. Model 1 includes a control for total enrollment as well as institution and year fixed effects. Model 2 adds a control for men's applications. Model 3 adds state-by-year fixed effects. I plot a 95% confidence interval for model 3, where standard errors are clustered at the institution level. Additionally, I report spline estimates from equation (2) for model 3.

translate into changes in women's application behavior? There is reason to believe that this information would find its way to prospective applicants. In addition to the formal channels mentioned earlier, matriculant data at each school split by sex is generally available in *Medical School Admission Requirements*, which was published for use by prospective students. Further, the introduction of a computerized application system (American Medical College Application Service) in 1971 would have substantially lowered the marginal cost of an additional application, allowing students to respond to institutional changes by filing more applications.

I study changes in the demand for medical education utilizing specification (1). Y_{it} gives the number of applications filed by women at institution i in year t . I include institutional fixed effects γ_i to account for pre-existing differences in women's applications across my sample period. I include year fixed effects δ_t to account for national-level changes in women's application behavior. These are augmented to state-by-year fixed effects in a second speci-

fication to control for changes in women’s educational decisions stemming from differential access to the pill as noted before.¹¹Standard errors are clustered at the institution level.

Figure 10: Women’s Applications



I plot the event study coefficients from equation (1) scaled by the mean of the dose distribution, where the outcome is men’s enrollment. Model 1 includes institution and year fixed effects. Model 2 adds state-by-year fixed effects. I plot a 95% confidence interval for model 2, where standard errors are clustered at the institution level.

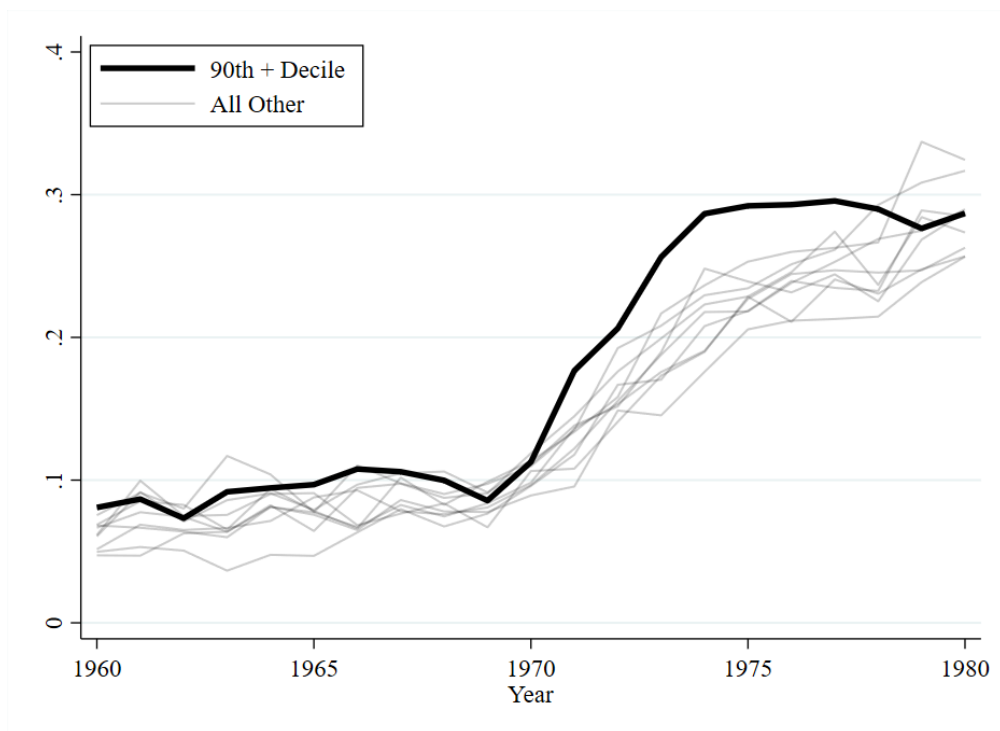
The results from this exercise are given in figure 10, and spline estimates are reported in columns 7-8 of Table 3. Both specifications suggest that women increased application effort at medical schools where women’s enrollment jumped by a larger amount in response to the policy. In sum, then, what I’ve found is that anti-discrimination policy both increased women’s enrollment at and directed women’s applications towards medical schools that were more dependent on federal funding. However, in addition to increases in the number of women enrolled in medical schools, we might also care about access to high quality schooling.

To look at this, I bring in data from Cole and Lipton (1977), who conduct a survey of medical school faculty in 87 out of the 94 AMA-approved medical schools in 1971. For each

¹¹As changes in men’s demand do not crowd out women’s applications, I do not include men’s applications as a control.

medical school, they produce a “perceived quality score,” which utilizes this survey data to order schools based on their quality as reported by medical faculty across the country, which I take as a reasonable metric of medical school quality. If there are differential effects across the quality distribution, it is unclear *ex ante* where these would obtain. So, I look first at the time series and divide schools into 10 groups, based on which decile they fall into in the quality score distribution. For each group, in each year, I calculate the fraction of students across all institutions who are women - Figure 11 plots this time series for each decile group across my sample period.

Figure 11: Change’s Women’s Representation Across the Quality Distribution



I divide schools into 10 groups, based on which decile they fall into in the quality score distribution, where the score is taken from [Cole and Lipton \(1977\)](#). Each line plots the fraction of students in each decile who are women between 1960 and 1980. The top decile (90% and above) is in bold.

One decile appears to display a different pattern than other schools and is highlighted in Figure 11: medical schools scoring in the top decile of the quality distribution, which includes the University of California at San Francisco, Columbia, Cornell, Duke, Harvard, Johns Hopkins, the University of Michigan, Stanford, Washington University in St. Louis, and Yale. Women very quickly make advances in representation between 1970 and 1975, but convergence seems to stall during the second half of the 1970s. On the other hand, for

all other deciles, progress is more limited before 1975 but sustained through the end of the decade.

I return to my causal specification to explore heterogeneity in effects for schools at differing points in the quality distribution. To do so, I estimate different event coefficients for “elite” medical schools scoring above the 90th percentile and “non-elite” medical schools below the 90th percentile by interacting my linear spline specification in (2) with a dummy for elite status. The results are given in Table 4.

Table 4: Differences Across the Quality Distribution: Spline Estimates

	(1)	(2)	(3)
Pre-Trend Change, 1960-1970	-0.080 (0.098)	-0.070 (0.099)	-0.133 (0.126)
Pre-Trend Change, 1960-1970	-0.003 (0.066)	0.002 (0.066)	-0.065 (0.081)
Spline Estimate in 1973 at Mean Dose	2.785*** (0.901)	2.684*** (0.908)	2.654* (1.456)
Spline Estimate in 1973 at Mean Dose	4.944*** (1.141)	4.927*** (1.132)	4.984*** (1.039)
Observations	1598	1598	1242
Total Enrollment	X	X	X
Men’s Applications		X	X
State-by-Year Fixed Effects			X

This table reports transformed estimates from equation (2), where each spline coefficient is interacted with a dummy for a school scoring above the 90th percentile on the quality score from [Cole and Lipton \(1977\)](#). The outcome for all columns is women’s first-year enrollment. All coefficients are scaled by the mean of the dose distribution so that they give an estimate of the change in seats over a time period attributable to the dose variable. Row 1 reports estimates of the pre-trend slope and Row 2 reports estimates of the cumulative change in seats by 1973 adjusted for the pre-trend slope. All standard errors are clustered at the institution level.

*** $p < .01$, ** $p < .05$, * $p < .10$

These estimates support the time series evidence - anti-discrimination policy had a larger impact at elite medical schools, allocating around 5 seats for women, as opposed to 3 seats at all other institutions. It is important to note that these results are, in some sense, mechanical - as research quality is an input into the perceived quality of a medical school, if institutions that produce better research receive more federal funding, high quality medical schools should receive relatively more federal funding. However, this should not dilute the

importance of these results; rather, due to the way in which federal anti-discrimination policy leverages research contracts, we can be assured that women are not kept out of the nation's best institutions.

4 Expansionary Policy

In the previous section, I found that anti-discrimination policy increased women's enrollment by around 1600 seats, which explains around 25% of women's gains between 1971 and 1973. While an important driver of growth during this time period, women's entry continues through the second half of the 1970s, which leaves plenty of room for complementary explanations. I now turn to exploring the role of policy aimed at expanding the capacity of existing medical schools and constructing new medical schools and the interaction between these policies and anti-discrimination legislation.

4.1 Development of Policy

Recognizing that in order to increase the supply of health professionals in the 1970s the nation would have to act far earlier, Congress passed the Health Professions Educational Assistance (HPEA) Act in 1963. This legislation created what would become two pillars of health manpower policy: assistance for medical schools, through the provision of construction grants, and aid for medical students by providing student loans. The federal government had, by this point, become involved in the funding of medical schools, but this represented a fundamental shift away from research grants, which comprised the lion's share of federal support by the start of the 1960s ([Townsend, 1983](#)). Under the construction grant program, the Department of Health, Education, and Welfare (DHEW) would provide funding for 2/3 of the costs for building a new school or expanding an existing one in exchange for several promises from the institution, including that the building would be used for teaching purposes for at least 10 years and a small increase in first-year enrollment ([MacBride, 1973b](#)). In addition, the HPEA provided student loans, jointly with medical schools, to defray the increasing costs of medical education.

The HPEA was amended in 1965 to both extend the existing programs and add three more: the government would provide additional assistance to medical schools through basic and special improvement grants, as well as further aid to students through a new scholarship program. Basic improvement grants, which would later be more aptly called "Capitation Grants," provided institutions with a grant consisting of a baseline payment in addition to

further funding for each enrolled student. In exchange, the institution would be required to implement a small increase in first-year enrollment. Any appropriated funds left over after these payments were made would be put towards Special Improvement Grants, which were provided to fund specific types of projects that schools would pitch in their application (Kline, 1971). Finally, student assistance was broadened with the introduction of a scholarship program in addition to loan provision.

These programs were extended and modified by the Health Manpower Act of 1968, but remained reasonably constant through the end of the decade. In 1961, during hearings on what would become the HPEA, then HEW secretary Abraham Ribicoff stated that the U.S. would have increase medical school admissions to 12,000 per year in order to stabilize the physician-to-population ratio (U.S. Congress 1962). Taking stock in 1970, a report to the President on the effectiveness of these policies noted that first-year places had risen from 9,213 in 1963 to a projected 11,500 in 1970 (DHEW BHM 1976), very close to Ribicoff's stated threshold. Despite this progress, however, concerns about a shortage of health professionals persisted. An October 1970 report from *The Carnegie Commission on Higher Education* reiterated the severity of the problem, citing an estimate from then DHEW secretary Roger Egeberg that the U.S. needed approximately 50,000 more physicians at the beginning of the 1970s (Carnegie Commission on Higher Education, 1970).

At the same time, the financial position of medical schools had become markedly worse, with many schools receiving financial distress grants through the Health Manpower Act. Consequently, congress looked for a "comprehensive" solution that would stabilize the financial situation of medical schools while incentivizing an increase in enrollment (MacBride, 1973a). This policy took the form of the Comprehensive Health Manpower Training Act (CHMTA) of 1971, where the focus of federal support shifted to Capitation Grants, which provide schools with a set amount of funding dependent on their enrollment, type of enrollment,¹² and number of graduates. As before, to receive this funding, an institution was also required to increase its first-year enrollment by a given amount. In addition, all forms of funding in the CHMTA are tied to a requirement that a school "will not discriminate on the basis of sex in the admission of individuals to its training programs."

The last important piece of Health Manpower legislation was passed in 1976, also named the Health Professions Educational Assistance Act. By this point in time, emphasis had shifted from producing more M.D.'s to directing newly minted doctors to primary care specialties and areas with a shortage of health professionals (Korper, 1980). Accordingly, the

¹²Bonuses were given for students enrolled in 3-Year programs.

conditions for receiving capitation grants were changed to align better with these new priorities and new types of special project grants were introduced. Nevertheless, previous sources of funding were largely maintained, and first year enrollment continued to rise through 1980. However, as the new decade began, support for health manpower policy began to fade quickly as newer projections showed a physician surplus in place of a shortage ([Congressional Quarterly, 1981](#)). Eventually, a new piece of legislation was passed in 1981, but focus had shifted again almost entirely towards student support and away from institutional aid ([Congressional Quarterly, 1982](#)).

4.1.1 Impact on Medical School Enrollment

The totality of Health Manpower policy is summarized in Figures 12 and 13. First-year enrollment rose consistently and continuously between 1965 and 1980, approximately doubling over this time period. For the first 7 years, the focus was on building new facilities, as most funding was directed towards construction grants. With the passage of the CHMTA, this switched to Formula Grants, and special project grants grew in importance as well. To study the effects of enrollment expansion on women's entry, I first construct a simple model of admissions decisions. The solution to this model implies a simple specification to estimate this impact, which I then take to the data. A final section extends this analysis by exploring more complicated dynamics of women's enrollment.

4.2 Empirical Specification and Results

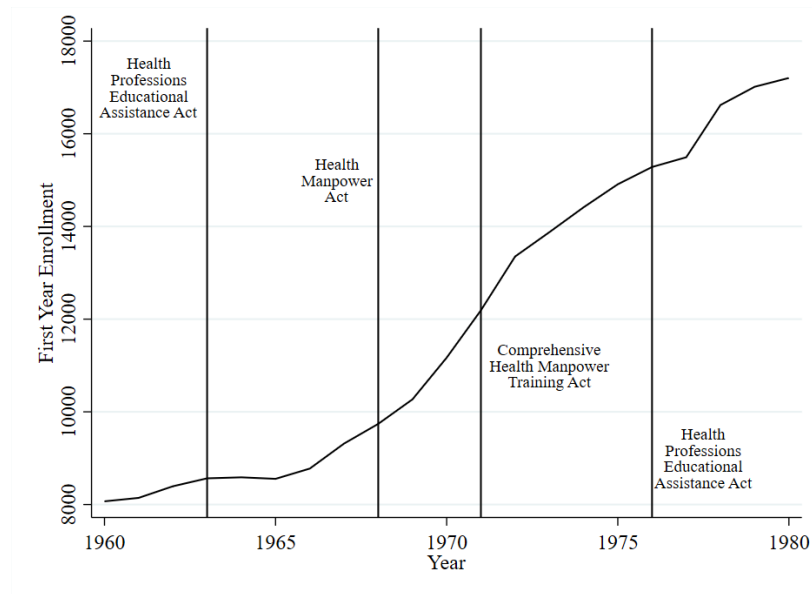
A bit of algebra allows us to decompose changes to women's enrollment and estimate how each contribution has changed over time. Without loss of generality, we can write women's enrollment as a function of total enrollment:

$$F_{i,t} = \gamma_t E_{i,t} + \varepsilon_{i,t} \quad (3)$$

We observe $F_{i,t}$, women's enrollment at institution i in year t , and $E_{i,t}$, total enrollment at institution i in year t . γ_t gives the fraction of total seats in every year that are filled by women at the mean, where $\varepsilon_{i,t}$ is an error term that is mean zero within each year by definition. Adding and subtracting $\gamma_t E_{i,t-1}$ we obtain that

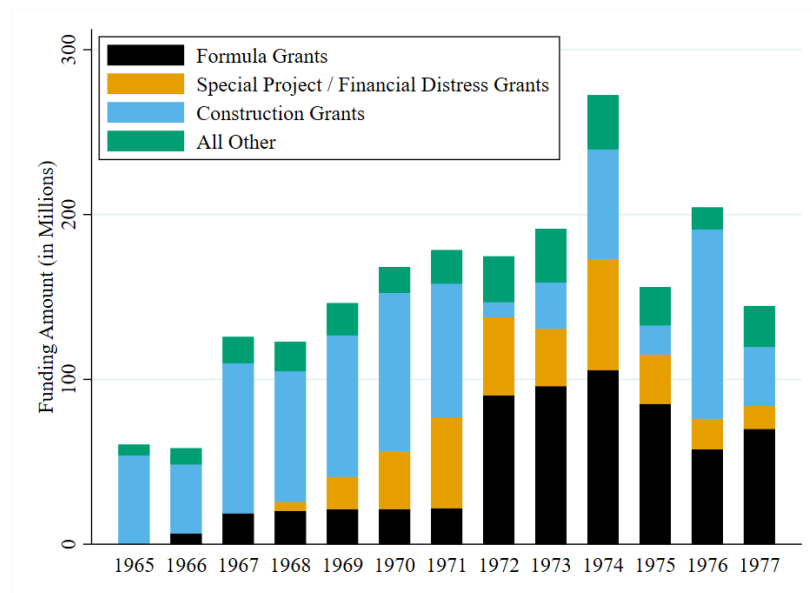
$$F_{i,t} = \gamma_t \Delta E_{i,t} + \gamma_t E_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

Figure 12: Health Manpower Policy Timeline: First-Year Enrollment



I plot total first-year enrollment in my dataset from 1960-1980. The main pieces of Health Manpower Legislation are denoted with vertical lines.

Figure 13: Health Manpower Policy Funding



In each year, I plot the amount of funding for formula grants, special project grants (including financial distress grants in years when these are counted separately), construction grants, and all other sources of funding. From 1965-1968, this funding comes from the HPEA; from 1969-1971, from the Health Manpower Act; from 1972-1976, from the CHMTA & continued resolutions; and from 1977-1980, from the 1976 HPEA & continued resolutions.

The first term, $\gamma_t \Delta E_{i,t}$, identifies the contribution of recent enrollment expansions $\Delta E_{i,t}$ to women's enrollment. We could attempt to estimate (4) directly, but $\varepsilon_{i,t}$ is almost certainly serially correlated; as we saw in Table 2, medical schools enrolling more women than their peers are likely to still be doing so in the future. To deal with this, we can subtract $F_{i,t-1}$ from both sides to obtain our estimating equation:

$$\Delta F_{i,t} = \gamma_t \Delta E_{i,t} + (\gamma_t - \gamma_{t-1}) E_{i,t-1} + \Delta \varepsilon_{i,t} \quad (5)$$

Specification (5) also provides a decomposition of women's enrollment gains in each period that is simple to interpret: The year-over-year change in women's enrollment $\Delta F_{i,t}$ can be decomposed into gains due to enrollment expansions $\gamma_t \Delta E_{i,t}$ and gains due to capturing more seats conditional on enrollment $(\gamma_t - \gamma_{t-1}) E_{i,t-1}$.

I estimate the decomposition given in (5) with the following specification:

$$\Delta F_{it} = \alpha + \beta_t \Delta E_{it} + \nu_t E_{it-1} + \varepsilon_{it} \quad (6)$$

Here, β_t estimates the role of enrollment expansions in every period, and ν_t estimates changes in the share of total enrollment that women capture in the absences of expansions. I begin by plotting estimate of β_t in Figure 14, where I average over two year periods to reduce noise. I find a sharp difference in this relationship between the 1960s, where women capture around 10% of all seats created, and the 1970s, where women capture almost 30% of new seats.

To better understand these changes, I consider two other specifications, which control for different types of changes. I consider a second specification with institution fixed-effects, which are equivalent to unit-specific linear trends in a first-differences model:

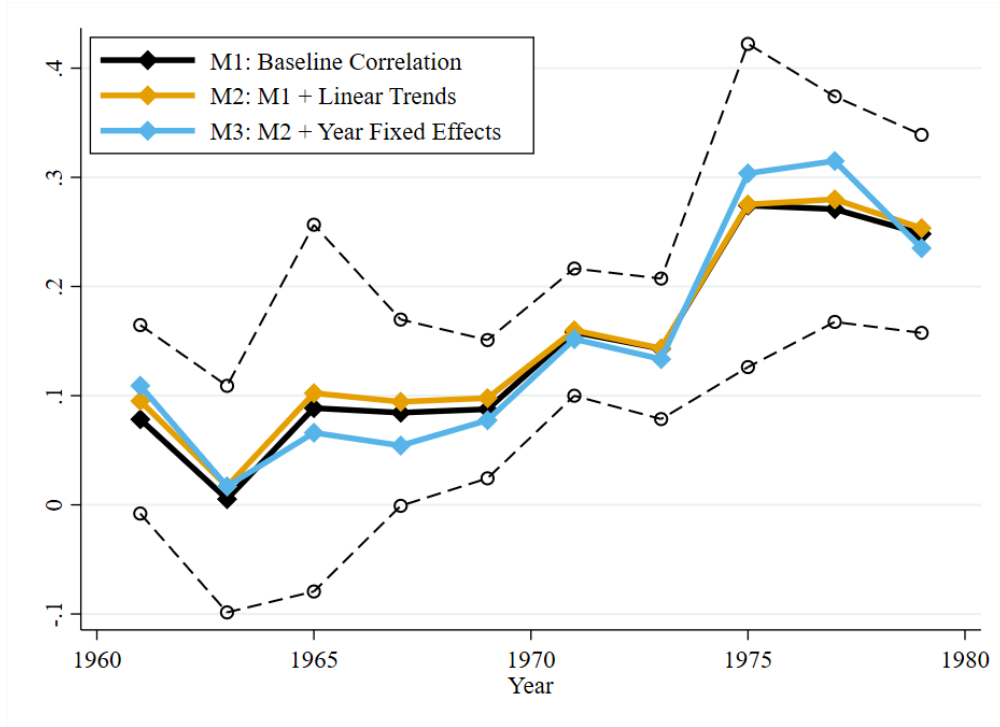
$$\Delta F_{it} = \alpha + \beta_t \Delta E_{it} + \nu_t E_{it-1} + \gamma_i + \varepsilon_{it} \quad (7)$$

This specification fits a linear trend in women's enrollment for each institution, measuring responses to enrollment growth apart from this trend. The results of this specification are plotted in Figure 14. This produces no almost no difference in my point estimates, suggesting that differential trends are not a substantial explanatory factor in women's entry.

My last specification adds year fixed effects, which captures differences between years in any national trend in women's enrollment:

$$\Delta F_{it} = \alpha + \beta_t \Delta E_{it} + \nu_t E_{it-1} + \gamma_i + \delta_t + \varepsilon_{it} \quad (8)$$

Figure 14: Seats Captured by Women



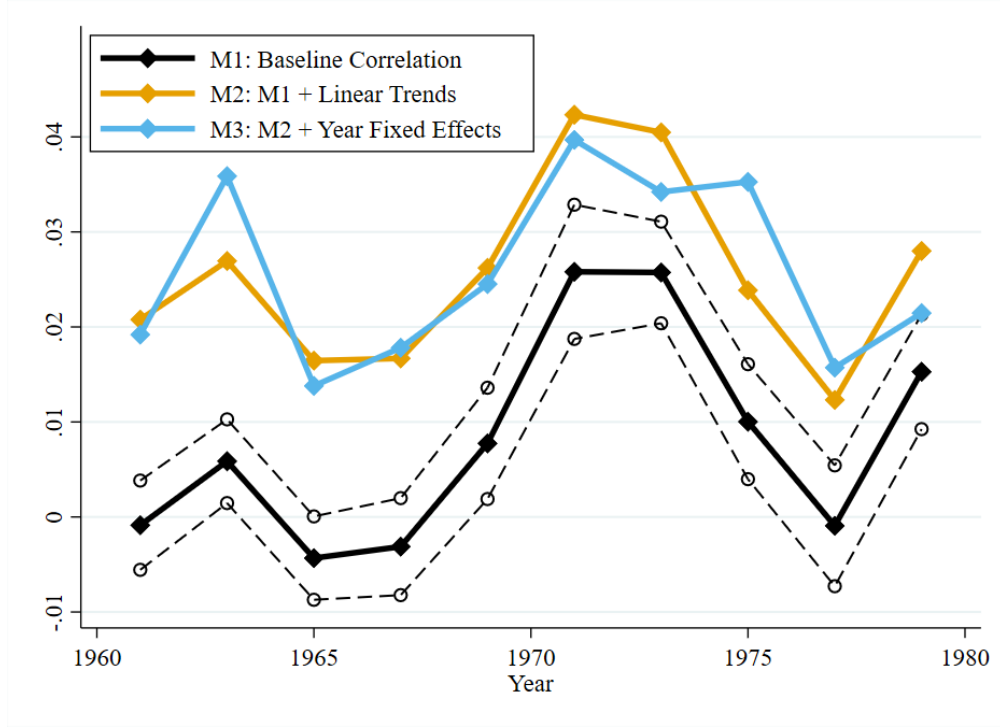
This figure plots results from Equation (5), where I estimate β_t within two-year bins to reduce noise in the estimates. Model 1 does not include any other right hand side variables, and 95% confidence intervals are plotted using standard errors clustered at the institution level to correct for serial correlation. Model 2 adds linear trends, estimating equation (7). Model 3 adds year fixed effects, estimating equation (8).

I find that this also does not affect my coefficient estimates. However, while these changes do not impact $\hat{\beta}_t$, they do lead to a substantial change in $\hat{\nu}_t$, my measure of seat gains conditional on enrollment remaining fixed. Estimates for these coefficients across all specifications, again binned in two year intervals, are provided in Figure 15. Without accounting for differential trends in enrollment across institutions, I underestimate year-to-year changes in the fraction of seats captured by women at the mean.

Nevertheless, the pattern across all specifications remains consistent. I confirm my finding earlier that women make outsized gains in the early 1970s. However, by the end of the decade, gains conditional on enrollment appear to have fallen back to their trend 1960s. Additional gains in the late 1970s seem to be much better explained by enrollment increases rather than capturing an increased fraction of existing seats.

A quick back of the envelope calculate suggests that enrollment expansions are an important part of women's entry during the 1970s. Between 1970 and 1980, 6,035 new first-year

Figure 15: Seats Captured by Women



This figure plots results from Equation (5), where I estimate β_t within two-year bins to reduce noise in the estimates. Model 1 does not include any other right hand side variables, and 95% confidence intervals are plotted using standard errors clustered at the institution level to correct for serial correlation. Model 2 adds linear trends, estimating equation (7). Model 3 adds year fixed effects, estimating equation (8).

seats were created; the OLS results from above suggest that women captured 1,388 of these, representing roughly 40% of their gain of 3,742 seats during this time period.

4.3 Treatment Effect Dynamics

The specification utilized above implicitly imposes a constraint that increases in women's enrollment must occur in the period in which enrollment changes. This follows simply from the fact that the model motivating this design treats the admissions decision as static within each period. We might expect, however, that it takes several years for enrollment expansions to translate into gains for women. To illustrate this, I utilize a large expansion in enrollment capacity at the University of Cincinnati as a case study to show that the gains can take several years to materialize. Following this, I augment my previous specification to estimate dynamic effects over my entire sample.

4.3.1 Case Study: University of Cincinnati

In addition to capitation grants, the main way the government funded enrollment expansions was through providing grants for the construction of new teaching facilities (and the renovation of existing capital). These grants were attached to a specific number of first-year places that a medical school would add as a condition of receiving this funding. I collect data on all grants given to medical schools between 1965, when the HPEA began doling out funds, and 1979. Summary statistics on grant awards are presented in the appendix.

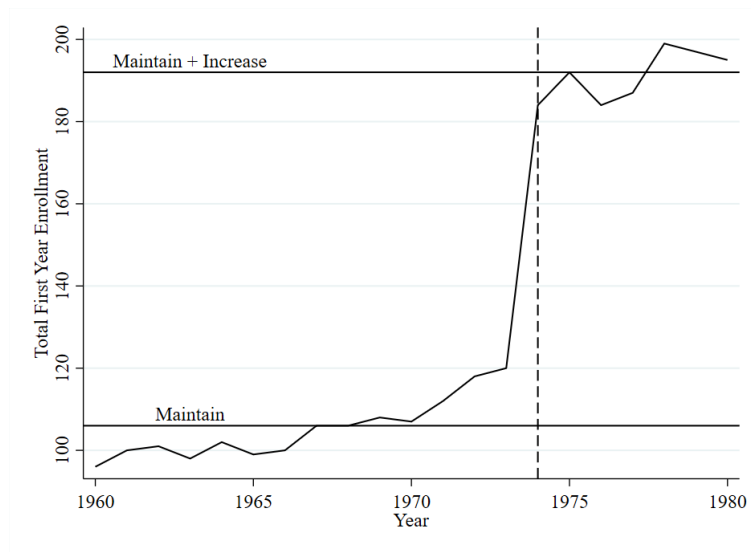
To understand the potential dynamics of women’s entry, I consider a case study of a grant given to the University of Cincinnati. This medical school received a grant in Fiscal Year 1970 for \$32m to construct a Basic Science Building. In exchange, the university would maintain 106 existing seats and add 86 new seats. The university’s website reports that this building was completed in 1974, and the time series for enrollment verifies this. Figure 16 plots first-year enrollment for the University of Cincinnati during my sample period, and there is a clear discrete jump in enrollment when the new Medical Sciences Building opens in 1974 of around 60 students.

It is less clear that women benefit from this enrollment expansion; women’s enrollment at the University of Cincinnati is plotted in Figure 17. Women’s enrollment is increasing over this entire time period, but it is unclear to what extent this increase is due to a specific increase in teaching capital or part of a previous rise in women’s enrollment. To disentangle the impact of this expansion on women’s enrollment, I construct a synthetic University of Cincinnati in the years leading up to this expansion in order to directly estimate the counterfactual where the university does not expand (Abadie et al., 2010)..

I utilize a donor pool of all medical schools that did not receive a construction grant after 1969, which includes 45 institutions after dropping Women’s Medical.¹³ To construct a synthetic control, we search for a weighted average of schools in the donor pool that minimize the distance to the treated unit for a collection of pre-intervention covariates, which are left to researcher discretion. I utilize women’s enrollment and total enrollment from 1966 through 1970; this prevents over-fitting by matching on the entire pre-intervention period and ensures that my estimates are not sensitive to measurement error in estimated enrollment data before 1966. Further, since construction is not completed until 1974, the treatment effect estimate in 1971 through 1973 should be close to zero if it is the case that my synthetic control accurately estimates the latent factors driving women’s enrollment. By

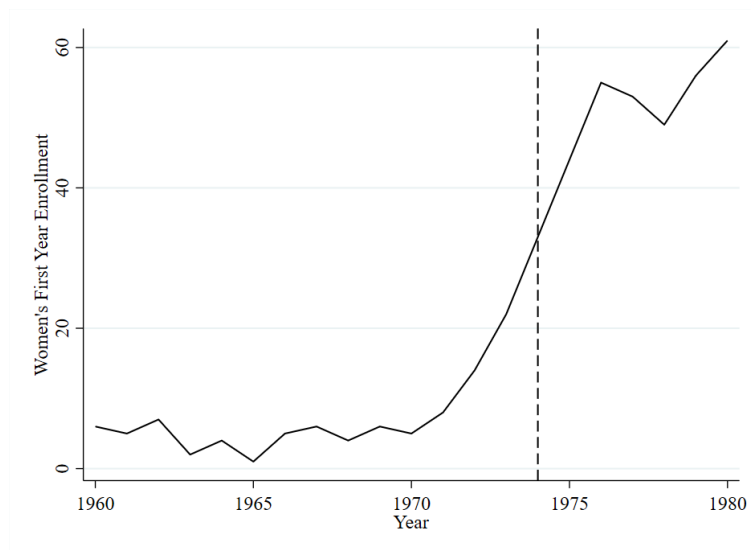
¹³Women’s Medical is an all-women’s school until 1970, so I drop the school from my donor pool to prevent this from confounding my results.

Figure 16: University of Cincinnati First-Year Enrollment, 1960-1980



This figure plots the time series of total first-year enrollment at the University of Cincinnati medical school from 1960 through 1980. The vertical dashed line at 1974 indicates completion of construction of a new basic science building. This building was funded by a federal grant, in exchange for which Cincinnati promised to maintain 106 seats (lower solid line) and increase enrollment by 86 seats to a total of 192 seats (upper solid line).

Figure 17: University of Cincinnati Women's First-Year Enrollment, 1960-1980



This figure plots the time series of women's first-year enrollment at the University of Cincinnati medical school from 1960 through 1980. The vertical dashed line at 1974 indicates completion of construction of a new basic science building.

not matching on these years, I allow for a simple graphical placebo test along these lines. Table 5 summarizes the results of my estimation procedure, which constructions a synthetic University of Cincinnati from four medical schools.

Table 5: Synthetic University of Cincinnati

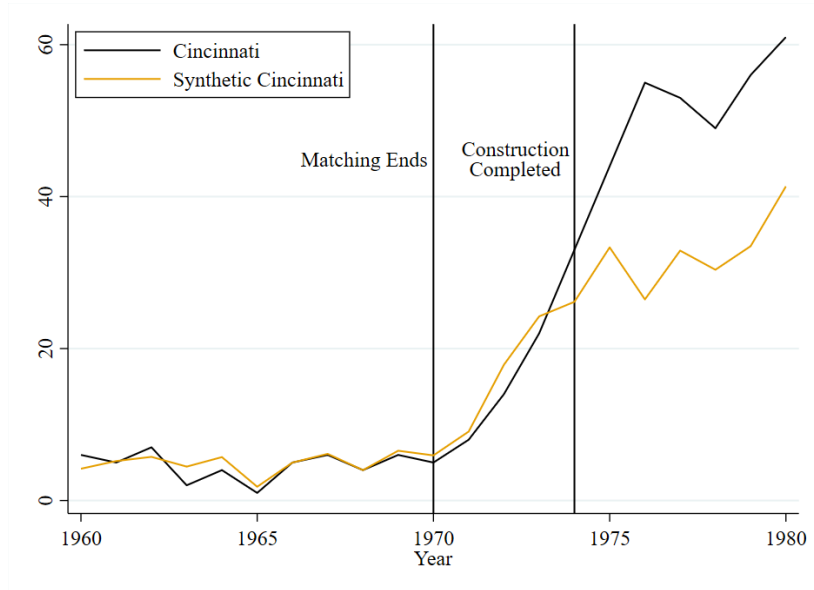
School	Weight	School	Weight	School	Weight
Albany	0.166	Indiana	0	Puerto Rico	0
Albert Einstein	0	Jefferson	0	Rochester	0
Boston	0	Johns Hopkins	0	SUNY-Buffalo	0
Bowman Gray	0	Kentucky	0	SUNY-Downstate	0
California-San Francisco	0	Loma Linda	0	SUNY-Upstate	0
Case Western Reserve	0	Loyola (Stritch)	0	South Dakota	0
Chicago Medical	0	Maryland	0	Southern California	0
Chicago-Pritzker	0	Medical College of GA	0.562	Stanford	0
Colorado	0	Michigan	0	Temple	0
Columbia	0	Missouri-Columbia	0	Tennessee	0
Cornell	0.121	New Jersey Medical	0	Utah	0.151
Duke	0	North Dakota	0	Vermont	0
Georgetown	0	Northwestern	0	Washington-St. Louis	0
Hahnemann	0	Oregon	0	West Virginia	0
Harvard	0	Pittsburgh	0	Yale	0

This Table 2 includes entries for all medical schools in my donor pool. I include the weight on each medical school which comprises my synthetic control. The only institutions with positive weights are Albany, Cornell, the Medical College of Georgia, and Utah.

Figure 18 plots the synthetic control against observed enrollment. Even though I do not match on 1971 through 1973, I am able to match the rise in women’s enrollment well with an estimated treatment effect around 0, suggesting that my synthetic control has matched well on latent factors determining women’s enrollment. Starting in 1974, I find a distinct break between these series - by 1977, three years after construction is completed, I estimate that the University of Cincinnati enrolls around 20 more women than it would have if it had not construction a new teaching facility. This point estimate of 20 students is stable through the end of my sample period.

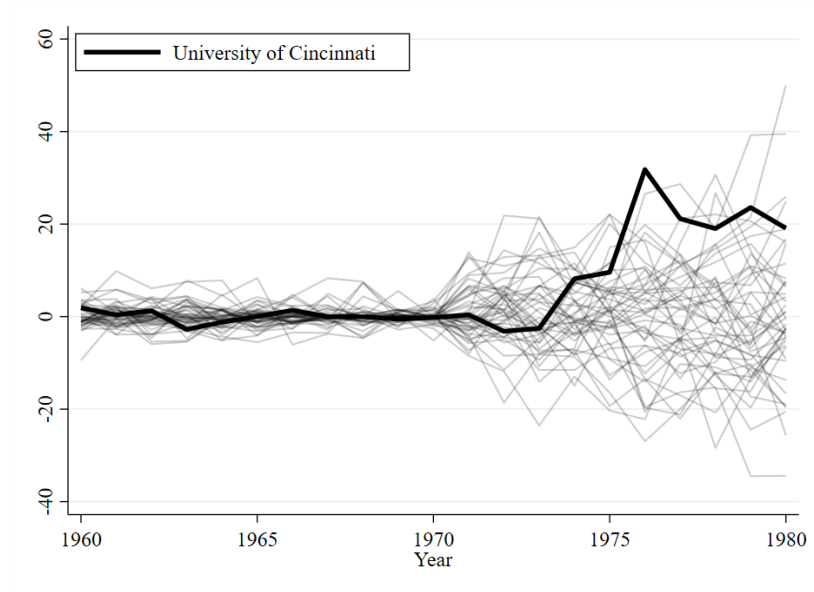
I perform the standard placebo test recommended in Abadie et al. (2010). I add the University of Cincinnati back into my donor pool, and run an identical procedure for all 46 medical schools. Figure 19 plots the treatment effect estimate for every medical school, with results for the University of Cincinnati highlighted; a graphical analysis confirms that my findings are extreme relative to the distribution plotted here. I confirm this by running the standard statistical test recommended by Abadie (2021) - I calculate a p-value of 0.022.

Figure 18: Synthetic Control And Observed Enrollment



This figure plots women's first year enrollment for the University of Cincinnati against the same time series for my synthetic control. This is constructed by taking a weighted average of women's enrollment at other medical schools, where weights are given in Table 5

Figure 19: Placebo Test



This figure plots the results of the placebo test outline in [Abadie et al. \(2010\)](#). Each series here plots the estimated treatment effect for each unit in my donor pool, as well as Cincinnati, which is bolded. This is calculated by constructing a synthetic control for each unit and taking the difference between actual and synthetic enrollment.

4.3.2 Extending The Differences Specification

To account for these dynamics, I return to the general specification from earlier. It is simple to augment the baseline model to account for lagged effects of enrollment expansion on women's entry:

$$\Delta F_{it} = \beta_{t,1}\Delta E_{i,t} + \beta_{t,2}\Delta E_{i,t-1} + \varepsilon_{it} \quad (9)$$

I include only one additional lag to test the hypothesis that there are dynamic effects. Further, I bin estimates into two groups - before 1971 and after 1970, to test if there are differential effects across decades. My results are in Table 6.

Table 6: Dynamics of Enrollment Expansions

	(1)	(2)
	Contemporaneous	One Lag
$\beta_{1960,1}$	0.040 (0.02)	0.041 (0.02)
$\beta_{1970,1}$	0.248*** (0.02)	0.235*** (0.02)
$\beta_{1960,2}$		0.015 (0.02)
$\beta_{1970,2}$		0.094*** (0.02)
Constant	1.373*** (0.14)	1.162*** (0.15)
N	2035	1911
* p < 0.05, ** p < 0.01, *** p < 0.001		

I plot estimates from specification (6) in Column 1 and ?? in Column 2, where coefficients are binned for years 1960-1970 and 1971-1980. Standard errors are clustered at the institution level to correct for serial correlation.

The first two rows give estimates of the contemporaneous coefficient both before and after 1971. These values are unaffected by the inclusion of a lag term. After 1971, I find that women capture around 1/4 of total seats created in the year that they are created. However, there is a precisely estimated lag effect whereby women capture another 9% of these seats in the following year, suggesting that around 1/3 of all seats created are filled by women. This confirms the findings from my synthetic control estimator in the previous section.

5 Conclusion

In her 2006 Ely lecture, Claudia Goldin opens by stating that “women’s increased involvement in the economy was the most significant change in labor markets during the past century” (Goldin, 2006). Women’s entry into professional schools was a core part of the last phase of this transition, beginning in the early 1970s and continuing through the new millennium. This paper contributes to our understanding of this era of history by quantifying the role of federal in women’s entry into medicine, a small part of a much broader story. I find that federal policy began to matter in 1971, when anti-discrimination policy was first directed effectively at medical schools. Aspiring women were helped further by large increases in enrollment spurred by Health Manpower policy in the second half of the 1970s and filled many of these new seats. This was just the first chapter in a long process of change: in 2017, women comprised the majority of first-year medical students for the first time, becoming the majority of all enrollees shortly afterwards in 2019 (AAMC 2019).

These changes have had a massive impact on U.S. economic progress. Hsieh et al. (2019) find that changes in the occupational distribution explain anywhere from 20% to 40% of the growth in U.S. output per person between 1960 and 2010. One of the key frictions in their model that was relaxed during this time period was barriers to human capital formation; I provide microeconomic evidence that federal policy played an important role in breaking these barriers. Since medicine and many other professional occupations are licensed, there is direct link between access to schooling and work, suggesting that educational frictions play an outsized role in women’s access to these jobs. Future work should be directed at understanding changes in non-health professional occupations, such as the legal profession, which were unaffected by health manpower policy. Medicine (and other health professions) are unique in that education is capital-intensive, requiring not only lecture halls and classroom labs, but also hospitals for clinical training and research laboratories to fund the medical school. For this reason, the supply of legal education seems to be much more elastic than medical education, suggesting a bigger role for changes in women’s (and men’s) demand for seats.

Finally, there is likely much more to be gleaned about women’s contributions to medicine as the 1970s came to a close. There is still a long road between graduation and practice - where did these newly minted M.D.’s go? And did the differential preferences of women over specialties and locations help fill gaps in healthcare provision and improve outcome for patients? These interesting and important questions are left for future work.

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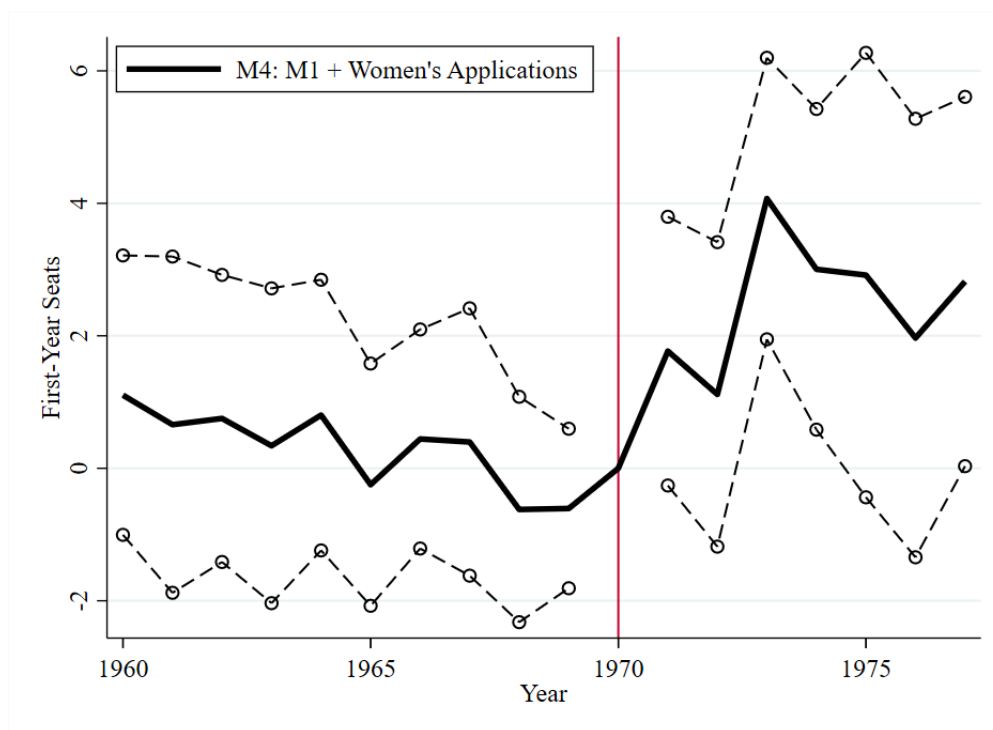
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A Additional Results

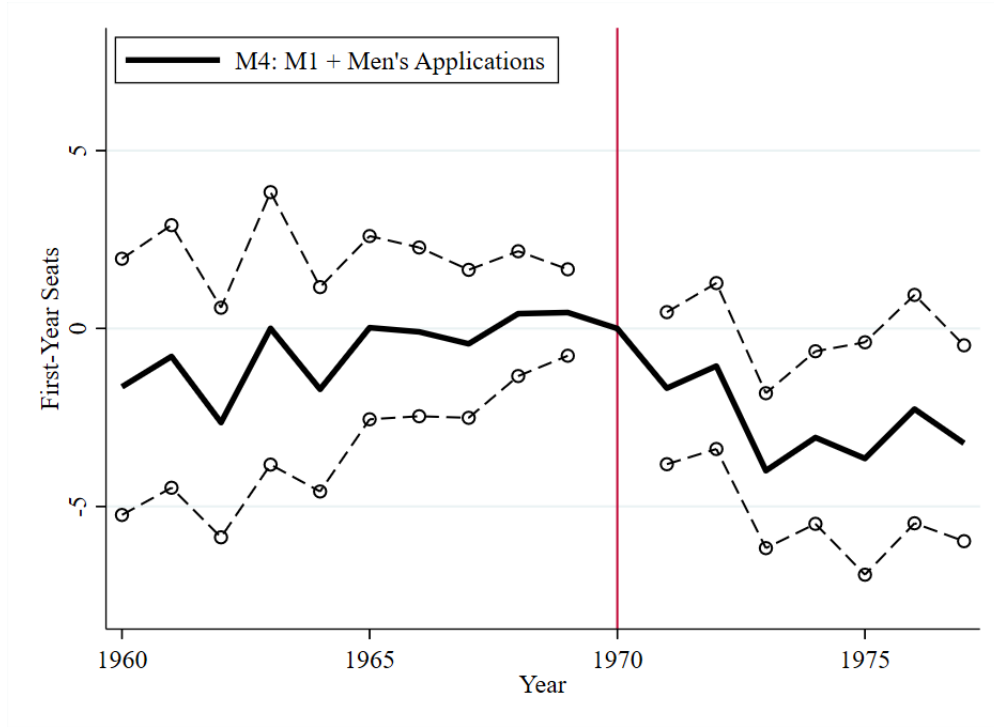
A.1 DiD: Application Controls

Figure 1: Difference-in-Differences: Including Women's Applications



I plot the event study coefficients from equation (1) scaled by the mean of the dose distribution, where the outcome is women's enrollment. Model 4 controls for total enrollment as well as men's and women's applications and includes institution and state-by-year fixed effects. I plot a 95% confidence interval, where standard errors are clustered at the institution level.

Figure 2: Difference-in-Differences: Including Men's Applications



I plot the event study coefficients from equation (1) scaled by the mean of the dose distribution, where the outcome is men's enrollment. Model 4 controls for total enrollment as well as men's and women's applications and includes institution and state-by-year fixed effects. I plot a 95% confidence interval, where standard errors are clustered at the institution level.

B Data

B.1 Total Enrollment Data

To construct time series evidence on changes in women's enrollment over time, I collect institution-level information on total enrollment, split by sex. In every year, the *Journal of the American Medical Association* publishes its Education Number, which includes reports and statistics on medical education. Between 1960 and 1972, the Education Number includes information on the number of current students and graduates from each medical school, reported separately by sex.. Starting in 1973, students are split into three categories: first-year students, intermediate students, and graduates. Intermediate students include students in years 2-3 at 4 year programs, students in year 2 at 3 year programs, as well as students in year 2 at 2 year basic science schools.

To construct a comparable time series throughout my sample period, I utilize data on the number of students in each year from 1960-1972. From comparing total enrollment figures to sums of the variables provided here, it appears each year's graduates are included in the count of total students. From 1973-1980, I construct information on total enrollment by sex by adding first-year, intermediate, and graduate enrollment.

There are two known issues with these data. First, enrollment of full-time students is reported from 1960-1962, while data on all students is reported from 1963 - 1980. Since most medical students are full-time, I am able to measure almost all enrollment in every year; further, since the data are consistent starting in 1973, I am able to capture important trend breaks around 1970 without worrying about this change in reporting. Second, I am missing information on one institution in 1973.

B.2 First-Year Enrollment Data

Table 1 summarizes the source of all variables that I collect to construct my dataset. I collect data from three sources:

JME *Journal of Medical Education*

MSAR *Medical School Admission Requirements (MSAR)*

JAMA EN *Journal of the American Medical Association (JAMA) Education Number*

The *Journal of Medical Education* published its “Study of Applicants” in every year from 1960 through 1977. In every year, I collect information on total new entrants, male applicants and female applicants for each institution. Unfortunately, information on new entrants split by sex is only available starting in 1967. To supplement this, I collect information on first-year enrollments in 1966 as well as 1978-1980. First-year enrollments differ slightly from new entrants, as this count includes students repeating the first year, but it generally very close to the number of new entrants. From 1978-1980, I collect this data from the *JAMA Education Number* in each year that it is reported. Information on the 1966-67 entering class, is published in the 1968-69 *MSAR*, but unfortunately earlier copies of the *MSAR* do not publish this data series.

Accordingly, to extend my panel back to 1960, I utilize estimated enrollment data. This is published in the *MSAR* and then reprinted in the *JAMA Education Number* during my years of interest, which is where I collect it. Medical Schools are surveyed in the spring before a class enters in the next fall for an estimate of the gender composition of their incoming students. Generally, this is a highly accurate estimate, as many applicants have committed to enroll in the following year by spring. Interestingly, starting with the 1971-72 *MSAR*, medical schools begin estimating the in-state/out-of-state composition of their incoming class instead of the sex composition.

Table 1: Data Sources and Availability

Year	First-Year Enrollment	New Entrants (Total)	New Entrants (By Sex)	Applications	Estimated Enrollment
1960		<i>JME</i>		<i>JME</i>	<i>JAMA EN</i>
1961		<i>JME</i>		<i>JME</i>	<i>JAMA EN</i>
1962		<i>JME</i>		<i>JME</i>	<i>JAMA EN</i>
1963		<i>JME</i>		<i>JME</i>	<i>JAMA EN</i>
1964		<i>JME</i>		<i>JME</i>	<i>JAMA EN</i>
1965		<i>JME</i>		<i>JME</i>	<i>JAMA EN</i>
1966	<i>MSAR</i>	<i>JME</i>		<i>JME</i>	<i>JAMA EN</i>
1967		<i>JME</i>	<i>JME</i>	<i>JME</i>	
1968		<i>JME</i>	<i>JME</i>	<i>JME</i>	
1969		<i>JME</i>	<i>JME</i>	<i>JME</i>	
1970		<i>JME</i>	<i>JME</i>	<i>JME</i>	
1971		<i>JME</i>	<i>JME</i>	<i>JME</i>	
1972		<i>JME</i>	<i>JME</i>	<i>JME</i>	
1973		<i>JME</i>	<i>JME</i>	<i>JME</i>	
1974		<i>JME</i>	<i>JME</i>	<i>JME</i>	
1975		<i>JME</i>	<i>JME</i>	<i>JME</i>	
1976		<i>JME</i>	<i>JME</i>	<i>JME</i>	
1977		<i>JME</i>	<i>JME</i>	<i>JME</i>	
1978	<i>JAMA EN</i>				
1979	<i>JAMA EN</i>				
1980	<i>JAMA EN</i>				

B.2.1 Accuracy of Estimated Enrollment

Fortunately, there are several years where I observe both estimated new entrants and actual new entrants, which allows me to evaluate the ability to which medical schools are able to accurately estimate the sex distribution of their incoming class. I utilize the following set of variables:

- F_{it} : New entrants for institution i in year t that are women
- M_{it} : New entrants for institution i in year t that are men
- F_{it}^{EST} : Estimated new entrants for institution i in year t that are women
- M_{it}^{EST} : Estimated new entrants for institution i in year t that are men

To evaluate the predictive value of F_{it}^{EST} and M_{it}^{EST} , I run the following bivariate regressions:

$$F_{it} = \beta F_{it}^{EST} + \varepsilon_{it} \quad (1)$$

$$M_{it} = \beta M_{it}^{EST} + \varepsilon_{it} \quad (2)$$

Notice that I do not include a constant, so $\beta = 1$ indicates a correct predictor. Standard errors are clustered at the institution level to correct for institution-specific errors in reporting.

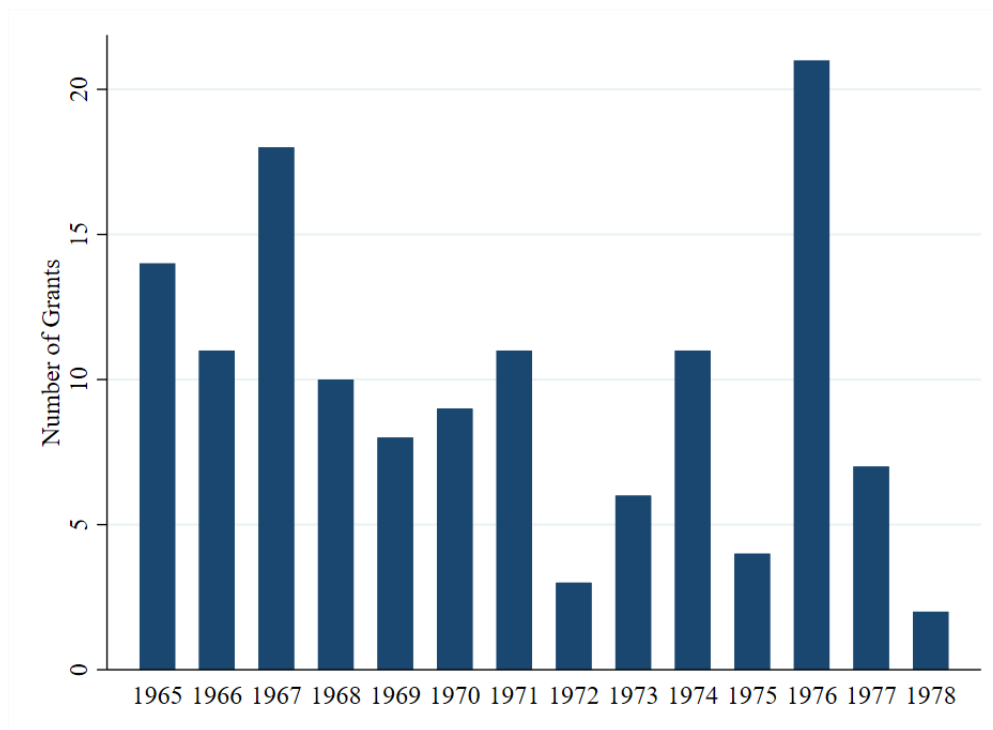
Table 2: Accuracy of Estimated Enrollment

	(1)	(2)
New Entrants (Men)	1.011*** (0.006)	
New Entrants (Women)		1.027*** (0.015)
Observations	485	485
R^2	0.991	0.944

Table 2 reports the results from (1) and (2). The primary statistic of interest is R^2 - I am able to explain 94% of variation in actual enrollment for women and 99% of variation in actual enrollment for men, suggesting that estimated enrollment functions as an excellent proxy for true enrollment.

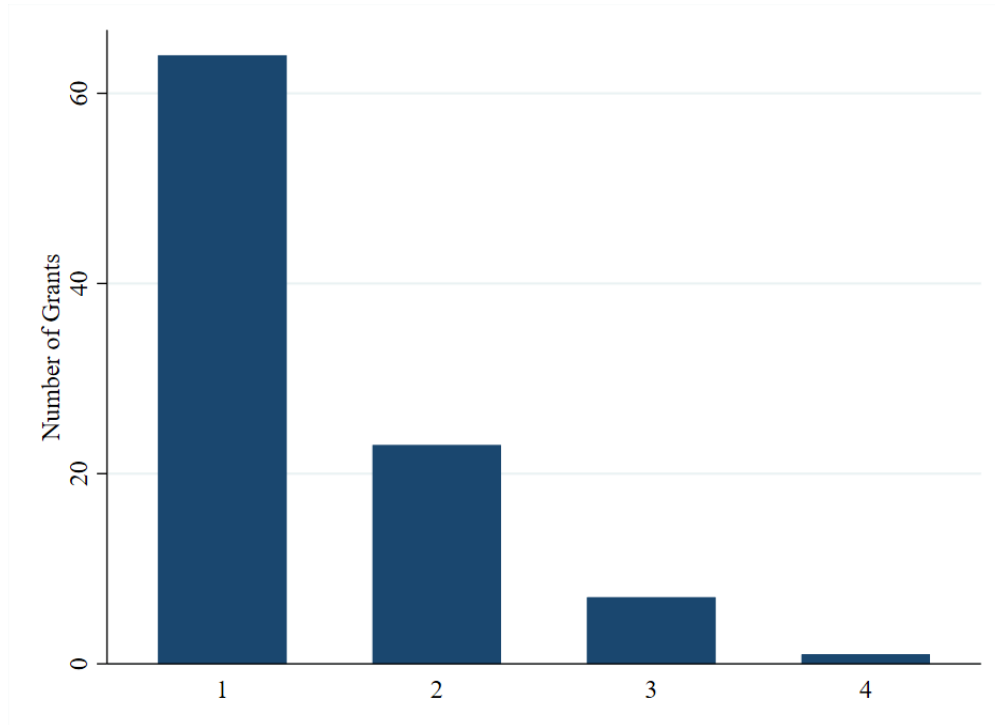
B.3 Construction Grants

Figure 3: Number of Grants Awarded by Year



In each year, I plot the number of construction grants awarded. While the Health Professions Educational Assistance Act was passed in 1963, the first grants were not awarded until 1965. Additionally, I located 0 grants awarded to medical schools in 1979, so this year is not plotted.

Figure 4: Number of Grants Awarded per Medical School



For each medical school that received at least one construction grant, I calculate the total number of grants they received between 1965 and 1979. The resulting distribution is plotted here.