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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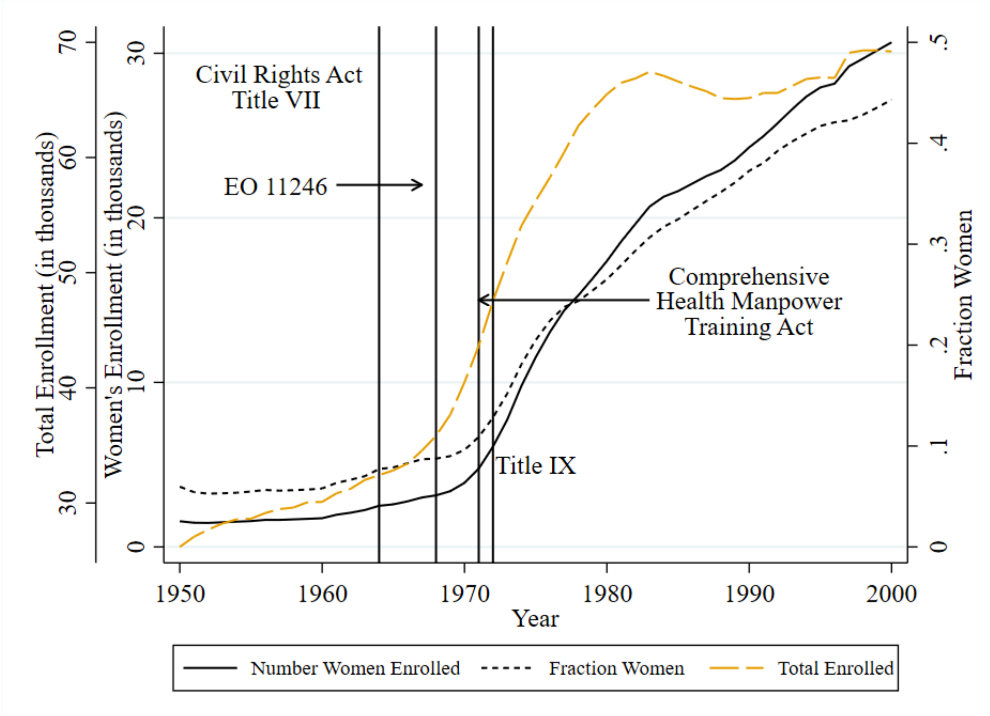
1 Introduction

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 fuding. 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 prohibited discrimination by any institution receiving federal funding, but sex was not included as a protected category,[1] and educational institutions were explicitly exempt from the employment nondiscrimination provisions in Title VII. 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 enroll in 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. The expansion in total enrollment was the result of several pieces of legislation under the umbrella of Health Manpower Policy that incentivized growth through construction grants for teaching facilities in conjunction with direct payments to medical schools in exchange for increases in enrollment.

[1]This 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 an 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 total enrollment increased substantially at medical schools as women begain to enter (Boulis and Jacobs, 2008; More, 1999), the relaxing of capacity constraints has remained unnoticed by the economics literature.

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

This paper resolves these issues and provides new evidence that anti-discrimination 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 first-year 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 Moehling 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 leveraging 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 the Department of Health, Education, and Welfare (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 exposure 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 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 analysis is motivated by a simple decomposition of the year-to-year change in women's first-year enrollment, allowing me to estimate the contribution of expansions in the number of seats as well as gains conditional on enrollment remaining constant. 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. I then augment my initial decomposition to allow for dynamic effects and find a small but significant role of enrollment expansions for women's enrollment in the year after the expansion has occurred. This also 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).

My findings provide a clear picture of the role of federal policy in women's entry to medicine in the 1970s. In the first half of the decade, anti-discrimination policy begins to bind, allowing women to fill seats that men had previously held. I show this explicitly by providing causal estimates of the effect of anti-discrimination policy on women's and men's enrollment and verify this finding in my decomposition estimates. However, in later years, federal policy benefits women through incentivizing expansions in first-year enrollment. Women fill many of these new seats due to more effective anti-discrimination legislation in conjunction with a surge in demand for medical education. Even though this push for expanded medical school enrollment was called Health "Manpower" Policy at the time, it proved important for giving women access to health professional training.

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

Table 1: Medical School Enrollment by Sex in 1966

Rank	Medical School	Men	Women		Rank	Medical School	Men	Women	
			Number	Percent				Number	Percent
0	Total	30,652	2,771	8.3	45	University of Texas, Southwestern	371	30	7.5
1	Woman's Medical College	0	204	100	46	University of Iowa	451	36	7.4
2	University of Puerto Rico	166	49	22.8	47	University of Florida	219	17	7.2
3	Howard University	322	79	19.7	48	University of Texas, medical branch	549	42	7.1
4	Rutgers State University	13	3	18.8	49	University of Maryland	452	34	7
5	Boston University	244	42	14.7	50	New Jersey College of Medicine, Seton Hall University	282	21	6.9
6	State University of New York, Downstate	652	102	13.5	51	Hahnemann Medical College	398	29	6.8
7	University of California, San Francisco	428	61	12.5	52	University of North Dakota	85	6	6.6
8	University of New Mexico	58	8	12.1	53	University of Oregon	314	22	6.5
9	Case Western Reserve University	310	41	11.7	54	Ohio State University	543	38	6.5
10	New York University	423	55	11.5	55	University of Minnesota	601	42	6.5
11	University of Chicago	250	30	10.7	56	Tufts University School of Medicine	416	29	6.5
12	Loma Linda University	303	36	10.6	57	University of Missouri	305	21	6.4
13	University of Wisconsin	353	42	10.6	58	University of Tennessee	629	43	6.4
14	Columbia University	422	50	10.6	59	University of California, Los Angeles	280	19	6.4
15	Temple University	493	58	10.5	60	Jefferson Medical College	621	42	6.3
16	Stanford University	275	32	10.5	61	Vanderbilt University	193	13	6.3
17	University of Kentucky	248	28	10.1	62	University of Vermont	183	12	6.2
18	Albert Einstein College of Medicine	349	39	10.1	63	Cornell University	317	21	6
19	Albany Medical College	225	24	9.6	64	University of Oklahoma	375	24	6
20	New York Medical College	447	47	9.5	65	University of North Carolina	267	17	6
21	Meharry Medical College	212	22	9.4	66	State University of South Dakota	83	5	5.7
22	Yale University	290	30	9.4	67	Medical College of Virginia	354	21	5.6
23	University of Illinois	695	70	9.2	68	Bowman-Gray School of Medicine	202	12	5.6
24	California College of Medicine	289	29	9.1	69	University of Louisville	343	20	5.5
25	Wayne State University	469	47	9.1	70	University of Kansas	422	24	5.4
26	West Virginia University	210	21	9.1	71	University of Arkansas	351	19	5.1
27	Harvard Medical School	488	48	9	72	University of Washington	299	16	5.1
28	University of Colorado	310	30	8.8	73	Georgetown University	427	22	4.9
29	State University of New York at Buffalo	353	34	8.8	74	Loyola University Stritch School of Medicine	322	16	4.7
30	Louisiana State University	471	45	8.7	75	Emory University	267	13	4.6
31	State University of New York, Upstate	357	34	8.7	76	Marquette University	376	18	4.6
32	University of Pittsburgh	348	33	8.7	77	University of Nebraska	324	15	4.4
33	University of Michigan	713	67	8.6	78	University of Pennsylvania	480	22	4.4
34	Northwestern University	490	46	8.6	79	University of Rochester	263	12	4.4
35	Dartmouth Medical School 2	86	8	8.5	80	Tulane University	489	21	4.1
36	Indiana University	750	68	8.3	81	Baylor University	330	14	4.1
37	University of Southern California	256	23	8.2	82	Medical College of Georgia	369	14	3.7
38	Johns Hopkins University	336	30	8.2	83	University of Virginia	286	9	3.1
39	University of Miami	287	25	8	84	Medical College of South Carolina	299	9	2.9
40	St. Louis University	404	35	8	85	University of Cincinnati	377	11	2.8
41	Washington University	303	26	7.9	86	University of Utah	231	6	2.5
42	George Washington University	373	32	7.9	87	Medical College of Alabama	305	7	2.2
43	Duke University	298	25	7.7	88	Chicago Medical School	279	3	1.1
44	University of Mississippi	275	23	7.7	89	Creighton University	280	3	1.1

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 less clear 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 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 demostrably 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.

[3] Interestingly, 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)

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

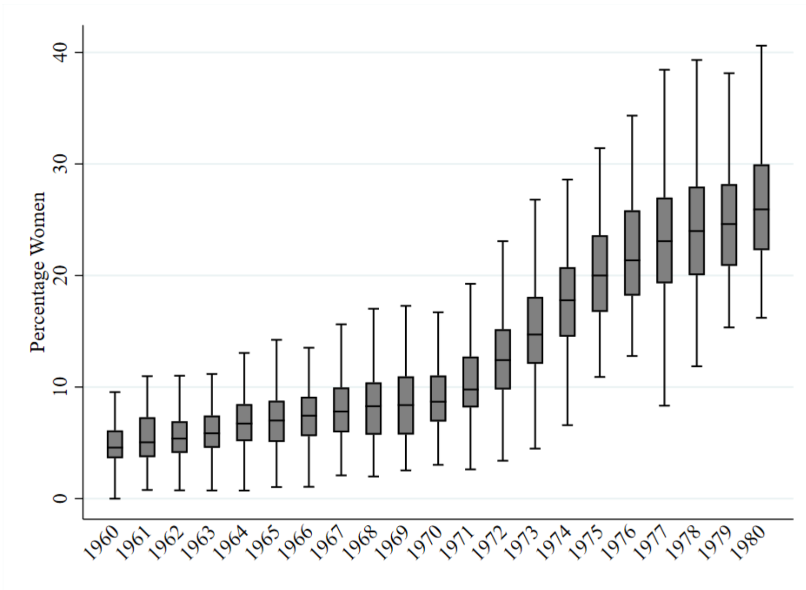
As Figure 1 demonstrates, the *status quo* begins to dissolve in the 1970s as women entered medical schools in far greater numbers than before. To characterize the nature of this transition, I begin by establishing several stylized facts. I collect institution-level data on enrollment by sex at every 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.

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]

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

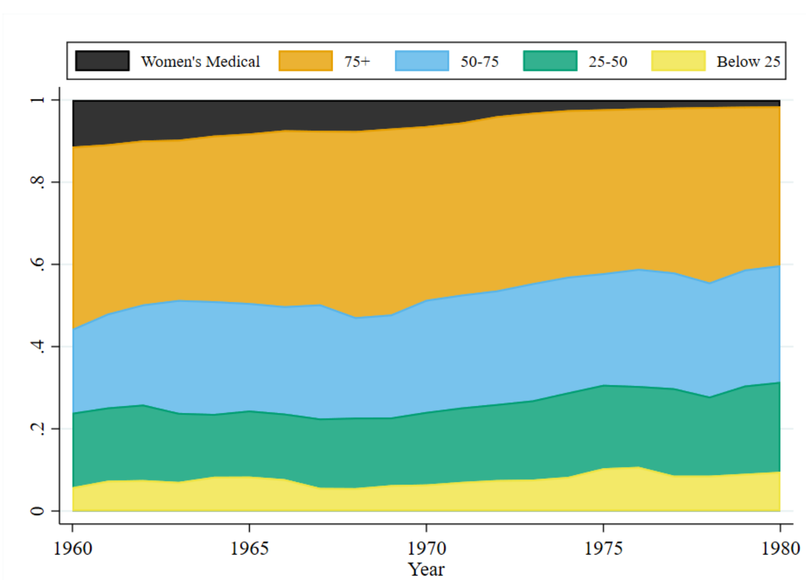
[5] For this exercise, I include only schools that are in my dataset from 1960 through 1980.

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.

Table 2: Transition Probabilities Between 1966 and 1980

		1980			
	Quartile	1	2	3	4
1966	Below 25^{th}	29%	29%	33%	10%
	25^{th} - 50^{th}	32%	32%	18%	18%
	50^{th} - 75^{th}	33%	19%	19%	29%
	Above 75^{th}	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.

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 reports these transition probabilities for quartiles of this distribution from 1966 to 1980. For schools with relatively high representation of women in 1970, this status is usually maintained in 1980 - 72% of schools in the top quartile in 1966 end up above the median in 1980. However, this pattern is 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 invlolved 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). WEAL argued that graduate and professional admissions policies were subject to the executive order as they are analagous to training and apprenticeship programs, which are explicitly covered (Walsh, 1971). These investigations were often lengthy battles between HEW and adminstration 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 withold 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 help 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 instiutions 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 consutant 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 comittees 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 concetrated 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 Contract Pressure

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.

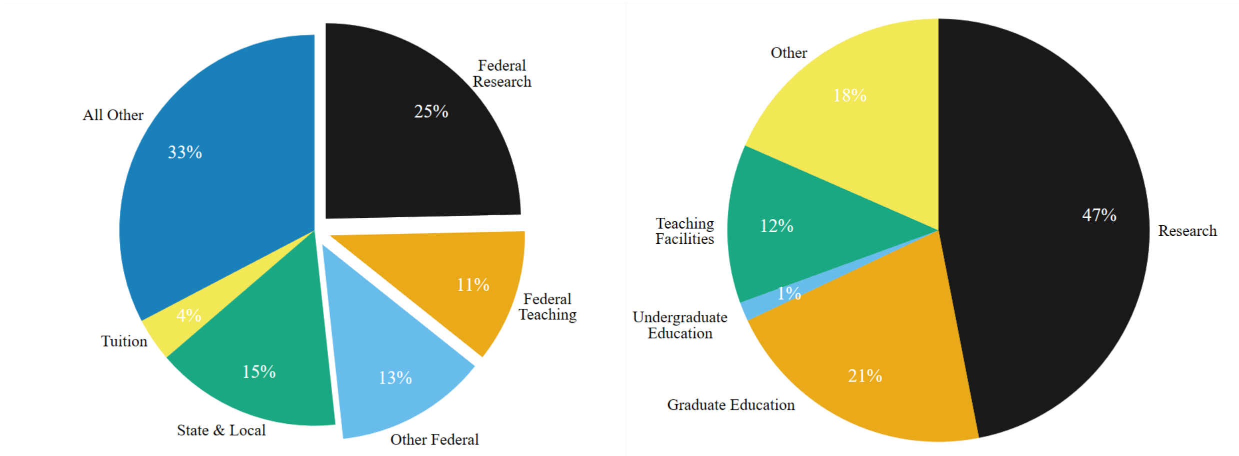
3.1 Medical School Finances

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. The problem had begun to reach crisis levels at particular programs, threatening their ability to stay afloat (The New York Times, 1971). To alleviate this, beginning in 1968, the government had been providing

Figure 4: Medical School Finances



(a) Medical School Revenues

(b) Source of DHEW Support

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).

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.

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 - in 1969, total HEW obligations of $770m represent 103% of total federal support to medical schools in 1969 (Fruen, 1983; DHEW 1971).[7] 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 began to shift to construction support, as evidenced by the funding here for teaching facilities.

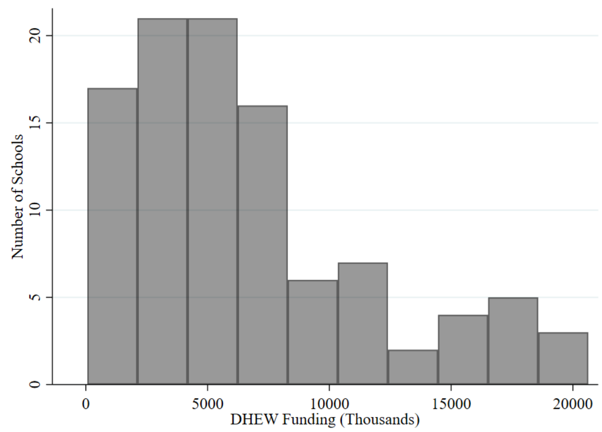
My preferred measure of medical school dependence on federal funding is the total amount of HEW support received in 1969, less any construction grants that are given to a school in 1969, which are temporary payment that do not reflect continued government support

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

[7]This proportion is over 100% as obligations are not always paid in the same fiscal year as they are appropriated.

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 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 enrollment[8] 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.[9] Figure 6 gives a graphical representation of the dataset I've construction, 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.[10] The 39 new medical schools report positive enrollment for the first time between 1964 and 1979, leaving me with an unbalanced panel 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:

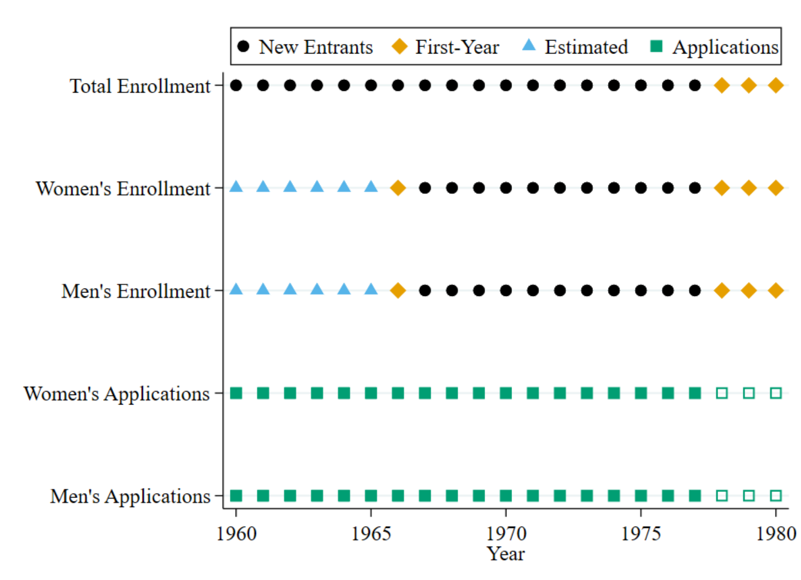
$$Y_{it} = \sum_{\tau=1960,\tau\neq 1970}^{\tau=1977} \alpha_\tau d_{i,1969} \mathbb{1}(t=\tau) + \boldsymbol{\beta}'\mathbf{X}_{it} + \gamma_i + \delta_{st} + \varepsilon_{it} \tag{1}$$

[8]This 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.

[9]These 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.

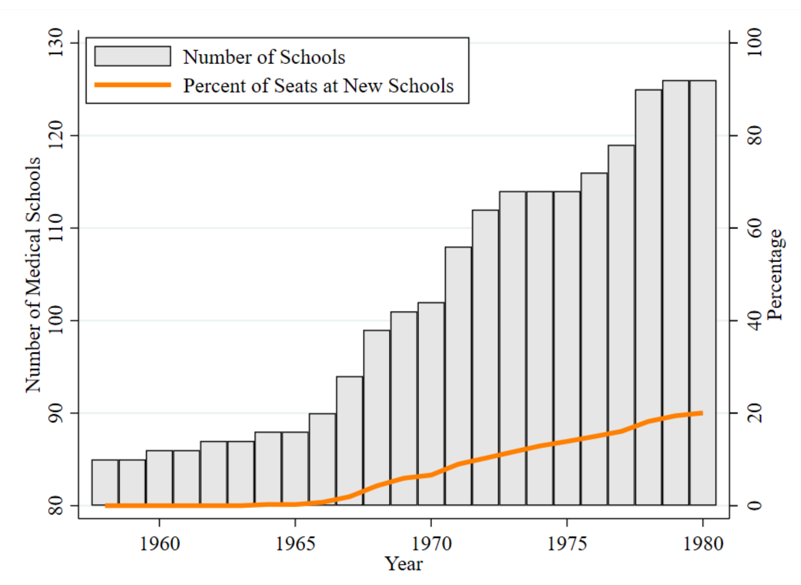
[10]This medical school was established in 1896, but did not become accredited until 1962.

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.

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, and I estimate dynamic effects through 1977, as this is the latest year in which all covariates are available.

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 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:

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

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 between 1971 and 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 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.[11]

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.

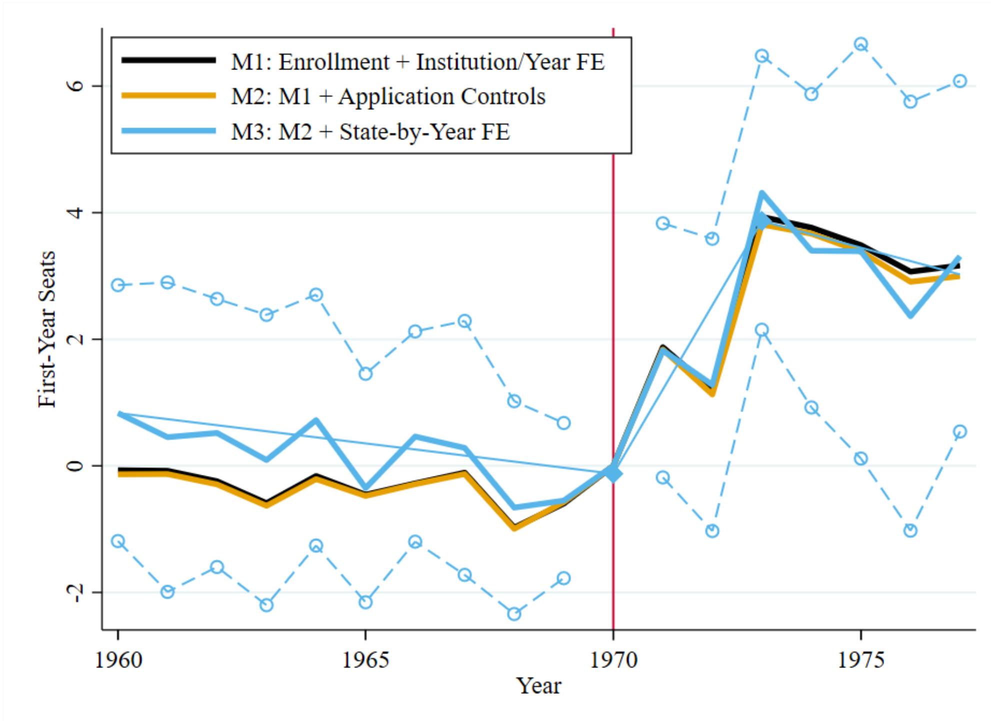
[11] To preserve symmetry, M2 includes the number of applications submitted by women, but since women were not subject to the Vietnam draft, this control does not have the same significance.

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	-0.015	-0.008	-0.096	0.148	0.149	0.158	0.303	-0.987
	(0.070)	(0.070)	(0.094)	(0.108)	(0.108)	(0.152)	(1.565)	(2.171)
Spline Estimate in 1973 at Mean Dose	4.087***	3.959***	4.282***	-4.761***	-4.359***	-4.585***	88.390**	54.373**
	(0.814)	(0.816)	(1.045)	(0.815)	(0.812)	(1.114)	(35.685)	(26.963)
Observations	1701	1701	1299	1701	1701	1299	1702	1299
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 between 1971 and 1973 adjusted for the pre-trend slope. All standard errors are clustered at the institution level.
*** $p < .01$, ** $p < .05$, * $p < .10$

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

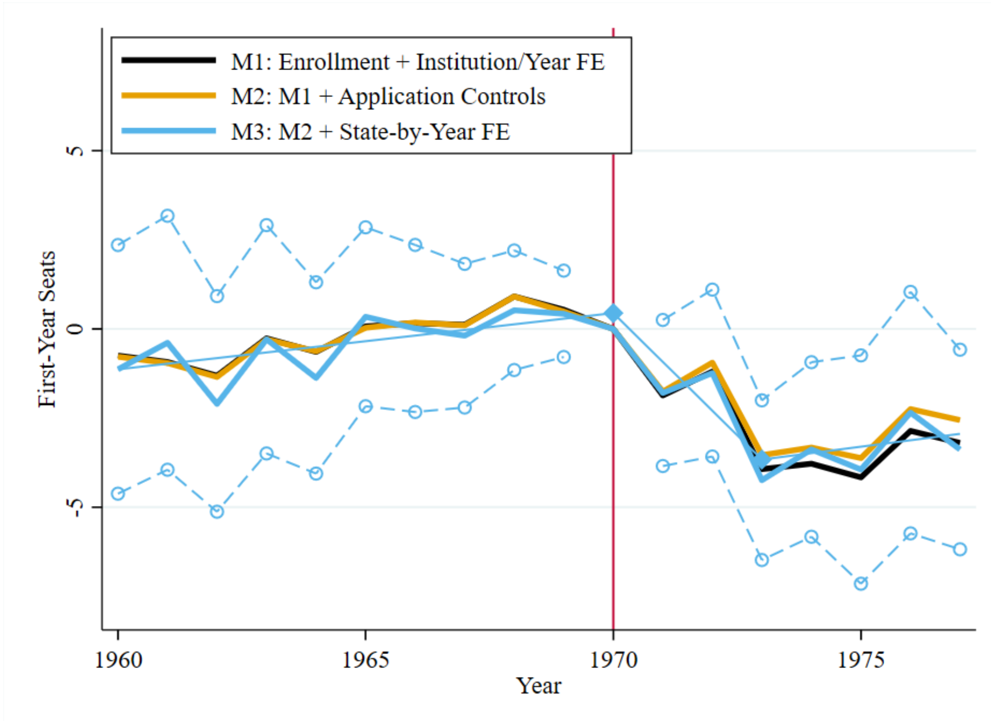


I plot the event study coefficients from equation (1) scaled by the mean of the dose distribution, where the outcome is women's enrollment. Model 1 includes a control for total enrollment as well as institution and year fixed effects. Model 2 adds a control for men's applications. Model 3 adds state-by-year 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. Estimates end in 1977 as application data are not available after this year.

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

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



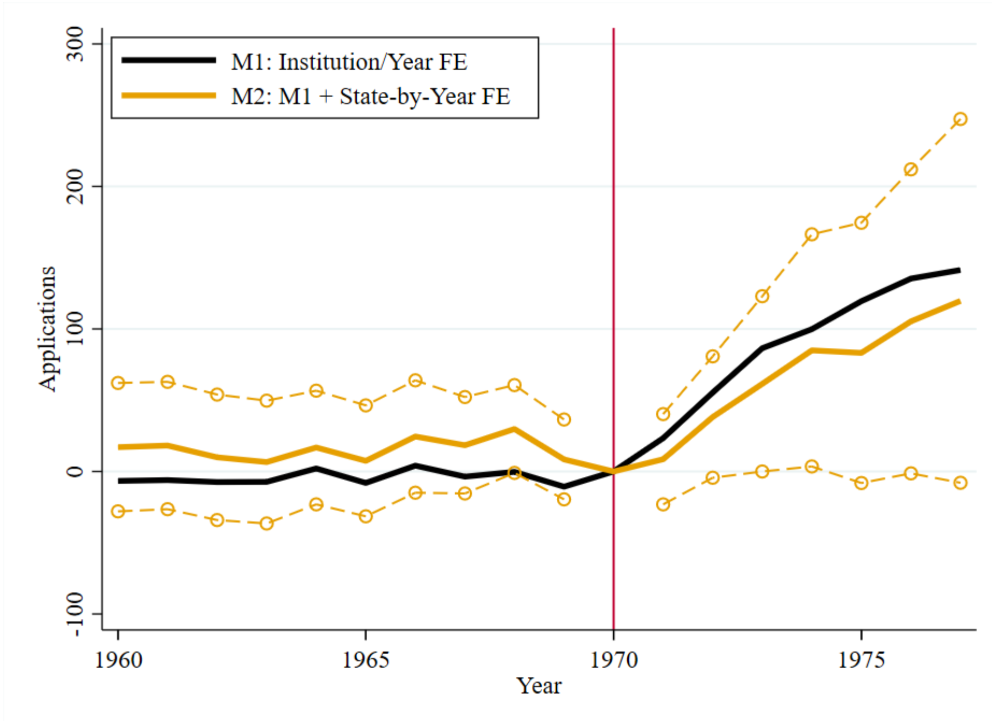
I plot the event study coefficients from equation (1) scaled by the mean of the dose distribution, where the outcome is men's enrollment. Model 1 includes a control for total enrollment as well as institution and year fixed effects. Model 2 adds a control for men's applications. Model 3 adds state-by-year 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. Estimates end in 1977 as application data are not available after this year.

ple 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 specification to control for changes in women's educational decisions stemming from differential access to the pill as noted before.[12]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.

[12]As changes in men's demand do not crowd out women's applications, I do not include men's applications as a control.

Figure 10: Women's Applications

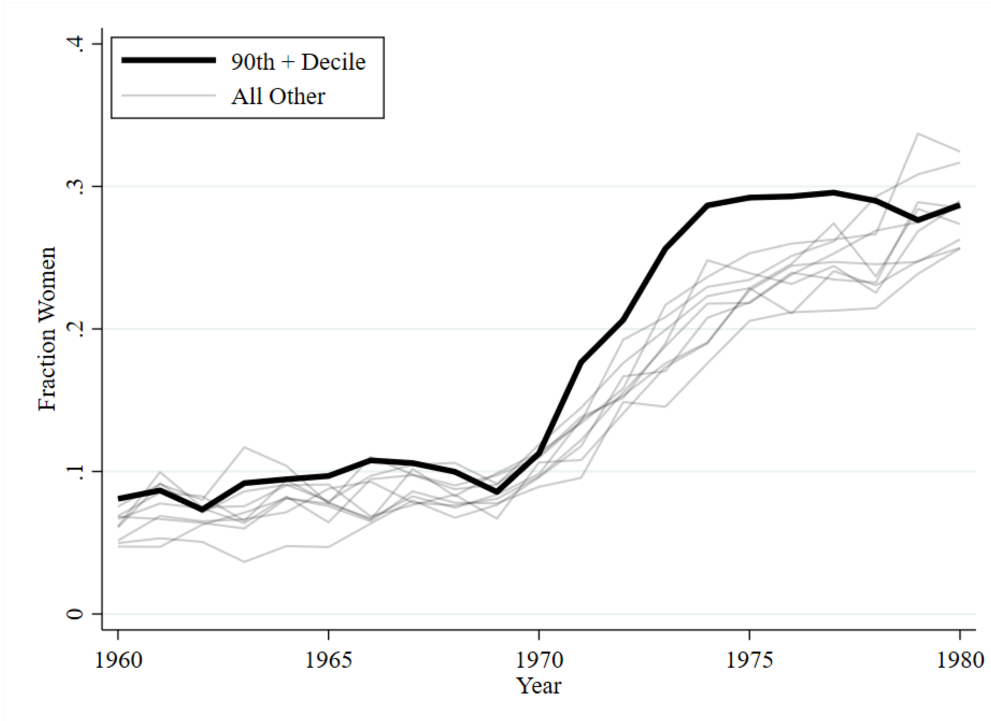


I plot the event study coefficients from equation (1) scaled by the mean of the dose distribution, where the outcome is men's enrollment. Model 1 includes institution and year fixed effects. Model 2 adds state-by-year fixed effects. I plot a 95% confidence interval for model 2, where standard errors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

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 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.

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

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.

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.

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,

Table 4: Differences Across the Quality Distribution: Spline Estimates

	(1)	(2)	(3)
Non-Elite: Pre-Trend Change, 1960-1970	-0.081	-0.071	-0.133
	(0.099)	(0.100)	(0.128)
Non-Elite: Spline Estimate in 1973 at Mean Dose	2.762***	2.653***	2.605*
	(0.899)	(0.907)	(1.463)
Elite: Pre-Trend Change, 1960-1970	-0.001	0.003	-0.064
	(0.066)	(0.066)	(0.081)
Elite: Spline Estimate in 1973 at Mean Dose	4.957***	4.941***	4.996***
	(1.141)	(1.131)	(1.042)
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). Rows 1 & 2 give results for institutions below the 90th percentile (non-elite), and Rows 3 & 4 give results for institutions above the 90th percentile (elite). The outcome for all columns is women's first-year enrollment. All coefficients are scaled by the overall mean of the dose distribution so that they give a comparable 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 between 1971 and 1973 adjusted for the pre-trend slope. All standard errors are clustered at the institution level.
*** $p < .01$, ** $p < .05$, * $p < .10$

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, though 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 to 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 finacial 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,[13] 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 disriminate 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 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).

[13] Bonuses were given for students enrolled in 3-Year programs.

4.1.1 Impact on Medical School Enrollment

The totality of Health Manpower policy is summarized in Figures 12 and 13. Figure 12 plots total enrollment across all medical schools between 1950 and 2000. While Health Manpower Policy is actively supporting medical schools from 1965 - 1980, there is a historic rise in enrollment, with the total number of students approximately doubling during this time period. This stands in stark contrast to period from 1980 - 2000 where total enrollment remains constant after federal support for enrollment increases abates. Figure 13 plots the major components of federal funding provided specifically to medical schools. 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 in 1971, this switched to Capitation Grants, and special project grants grew in importance as well.

It is difficult to tie observed enrollment increases directly to federal programs, but the time series strongly suggests that medical schools responded strongly to federal incentives to increase enrollment. Construction grants provided by the Bureau of Health Manpower (BHM) were tied to a specific number of first-year seats that a medical school would maintain and increase as a result of the new building: in total, these grants implied an increase of 4873, accounting for 56% of the observed increase of 8650 seats between 1965 and 1970. Almost every medical school increased enrollment to obtain capitation grant funding in response to the CHMTA: the average school would have to have increased first-year enrollment by at least 10 students, leading to the creation of 1,020 seats through this program alone. Given the difficulties of estimating the direct association between federal programs and enrollment increases, I focus on identifying the reduced form relationship between enrollment changes and women's enrollment.

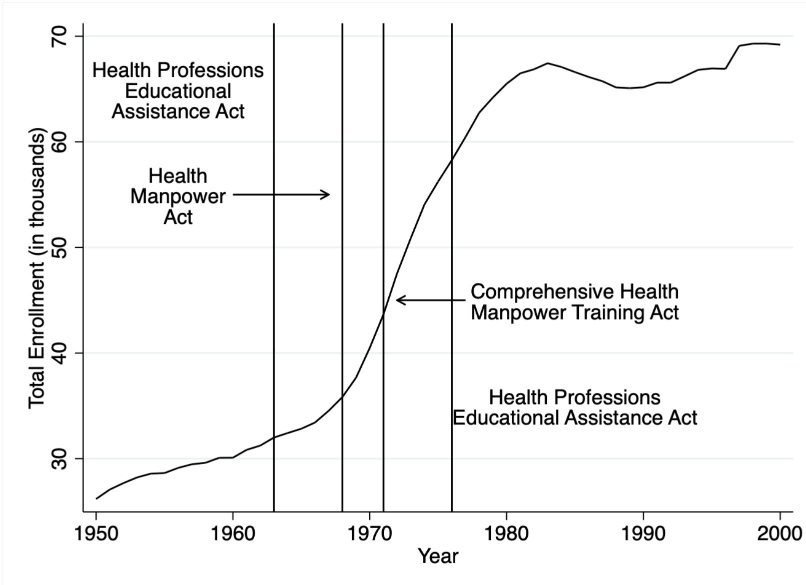
4.2 Empirical Specification and Results

To do this, I begin by showing that we can decompose changes in women's enrollment into a portion attributable to enrollment expansion and another attributable in gains in the share of seats keeping enrollment constant. We can write women's enrollment as a function of total enrollment:

$$F_{i,t} = \gamma_t E_{i,t} + \varepsilon_{i,t} \tag{3}$$

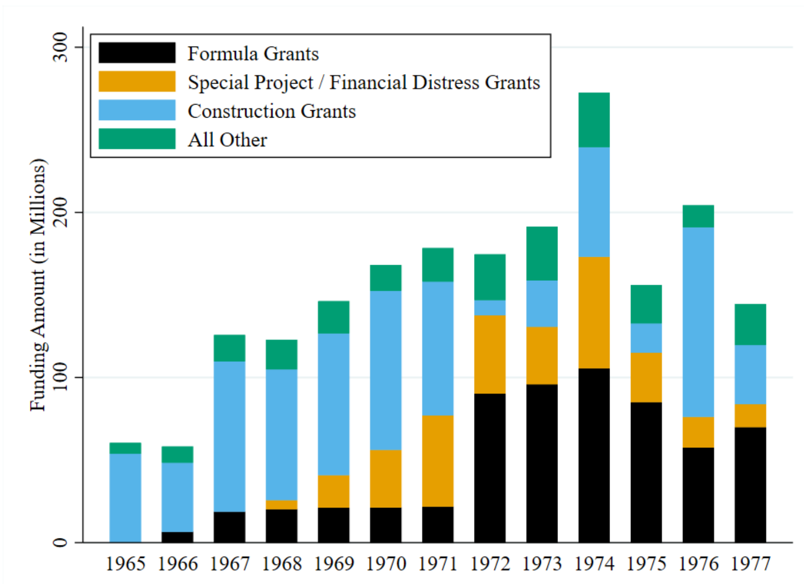
We observe $F_{i,t}$, women's enrollment at institution i in year t, and $E_{i,t}$, total enrollment at institution i in year t. γ_t gives the fraction of total seats in every year that are filled by women at the mean, where $\varepsilon_{i,t}$ is an error term that is mean zero within each year by

Figure 12: Health Manpower Policy Timeline: Total Enrollment



I plot total enrollment at allopathic medical schools from 1950-2000. 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, collected from DHEW BHM 1977. 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.

definition. Adding and subtracting $\gamma_t E_{i,t-1}$ we obtain that

$$F_{i,t} = \gamma_t \triangle E_{i,t} + \gamma_t E_{i,t-1} + \varepsilon_{i,t} \tag{4}$$

The first term, $\gamma_t \triangle E_{i,t}$, identifies the contribution of recent enrollment expansions $\triangle E_{i,t}$ 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:

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

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 $\triangle F_{i,t}$ can be decomposed into gains due to enrollment expansions $\gamma_t \triangle E_{i,t}$ 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:

$$\triangle F_{it} = \alpha + \beta_t \triangle E_{it} + \theta_t E_{it-1} + \nu_{it} \tag{6}$$

Here, β_t estimates the role of enrollment expansions in every period, θ_t estimates changes in the share of total enrollment that women capture in the absences of expansions, and ν_{it} is an error term. Ideally, I would estimate each coefficient in every period, but these estimates are too noisy, so I utilize two year bins to improve precision. In addition, I estimate the average value of β_t and θ_t before and after anti-discrimination legislation begins with the following summary specification:

$$\begin{aligned} \triangle F_{it} = \alpha &+ \beta_t^{pre} \mathbb{1}(t < 1971) \triangle E_{it} + \theta_t^{pre} \mathbb{1}(t < 1971) E_{it-1} \\ &+ \beta_t^{post} \mathbb{1}(t \geq 1971) \triangle E_{it} + \theta_t^{post} \mathbb{1}(t \geq 1971) E_{it-1} + \nu_{it} \end{aligned} \tag{7}$$

I begin by plotting estimates of β_t in Figure 14a, averaged over two year periods, and summary estimates from (7) are given in Table 5. There is a drastic change in the role of enrollment expansions throughout my sample period. In the 1960s, women capture around 10% of seats created, but this increases to almost 30% in the late 1970s. Interestingly, there is not a sharp uptick in women's gains in the early 1970s. This can be explained by changes in θ_t, which are plotted in Figure 14b. From 1971-1974, there is a sharp increase in the change in the proportion of seats filled by women absent any change in enrollment; this explains why we still see a rise in women's enrollment in the time series in this time period and is fully consistent with my earlier finding that women capture seats that would have been filled by men as the result of anti-discrimination policy.

Table 5: Summary Estimates of the Impact of Enrollment Changes on Women's Enrollment

	(1)	(2)	(3)
Enrollment Change, 1960s	0.092***	0.063**	0.072***
	(0.022)	(0.024)	(0.027)
Lagged Enrollment, 1960s	0.001	0.003**	0.022***
	(0.001)	(0.002)	(0.007)
Enrollment Change, 1970s	0.226***	0.222***	0.226***
	(0.024)	(0.025)	(0.029)
Lagged Enrollment, 1970s	0.013***	0.013***	0.029***
	(0.001)	(0.001)	(0.006)
Observations	2035	2035	2034
Year Fixed Effects		X	X
Institution Fixed Effects			X

This table plots estimates from equation (7). Enrollment change refers to estimates of β_t, and Lagged enrollment refers to estimates of θ_t. These coefficients are binned separately for 1961-1970 (1960s) and 1971-1980 (1970s). 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 year fixed effects, and Model 3 adds institution fixed effects.
*** $p < .01$, ** $p < .05$, * $p < .10$

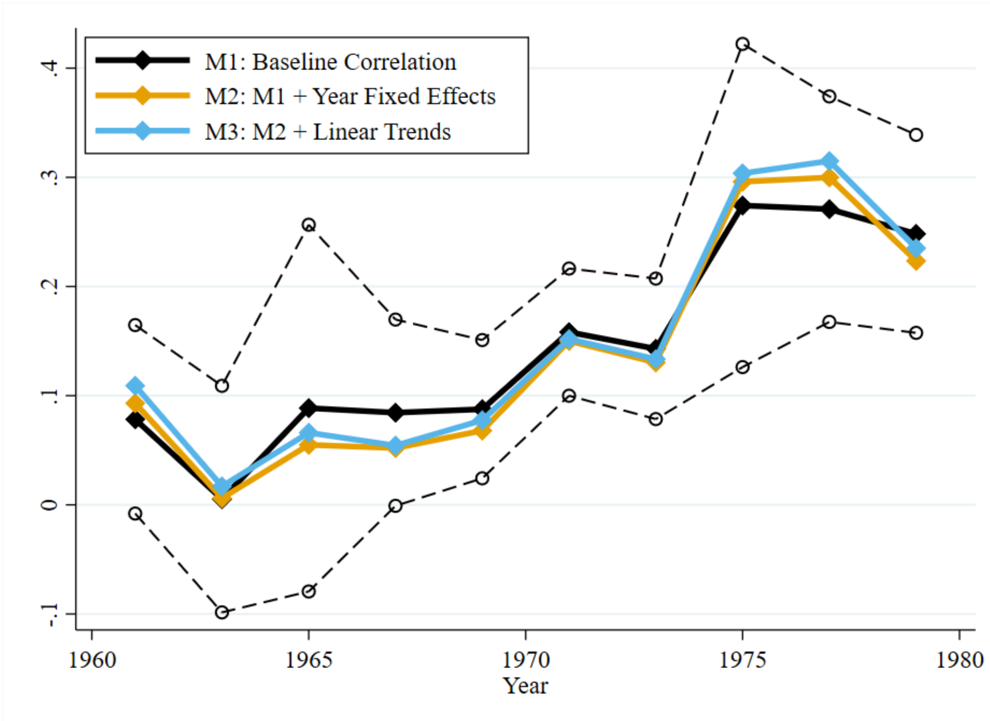
To explore robustness of this specification, I consider two other designs. My second specification includes year fixed effects, which capture national changes in women's enrollment that are not driven by enrollment expansions and uncorrelated with the size of the institution:

$$\triangle F_{it} = \alpha + \beta_t \triangle E_{it} + \theta_t E_{it-1} + \delta_t + \nu_{it} \tag{8}$$

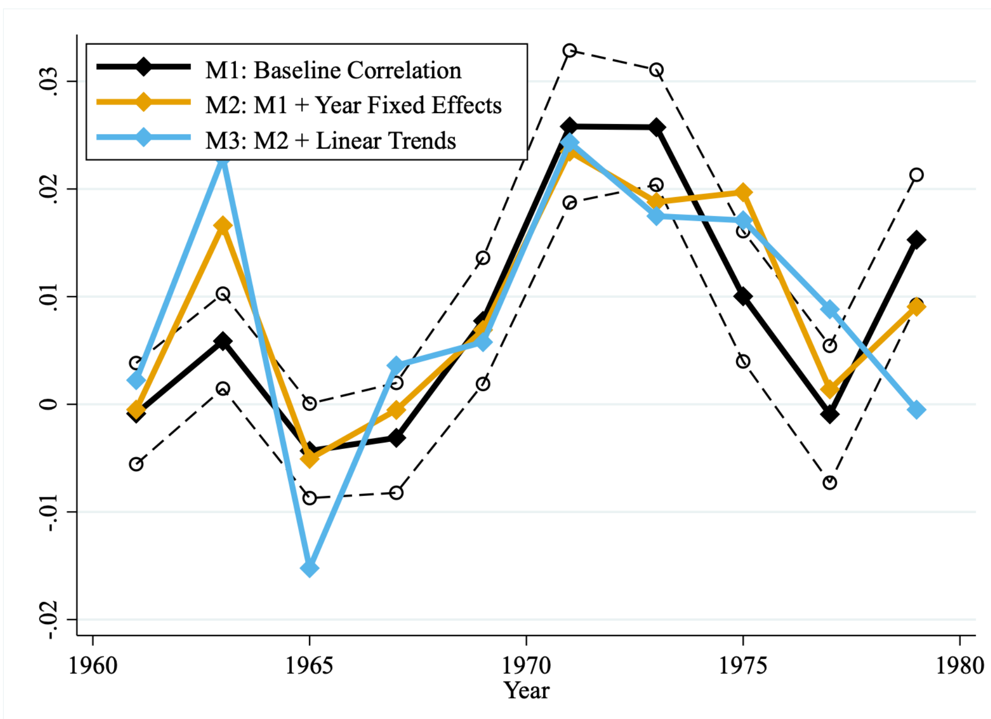
The results of this specification are plotted in Figures 14a and 14b. My results are generally robust to the inclusion of year effects, with estimates of β_t and θ_t not changing much. My last specification adds institution fixed effects, which are equivalent to institution-specific linear trends in the level of women's enrollment:

$$\triangle F_{it} = \alpha + \beta_t \triangle E_{it} + \theta_t E_{it-1} + \gamma_i + \delta_t + \nu_{it} \tag{9}$$

Figure 14: Role of Enrollment Expansions in Women's Enrollment



(a) Enrollment Expansions



(b) Gains Conditional on Enrollment

This figure plots results from Equation (5), where I estimate β_t (Figure 14a) and θ_t (Figure 6) 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 year fixed effects, estimating equation (8). Model 3 adds institution fixed effects, estimating equation (9).

This specification fits a linear trend in women's enrollment for each institution, measuring responses to enrollment growth apart from this trend. While these changes do not impact $\hat{\beta}_t$, they do lead to a substantial change in $\hat{\theta}_t$, 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 14b. 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 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.

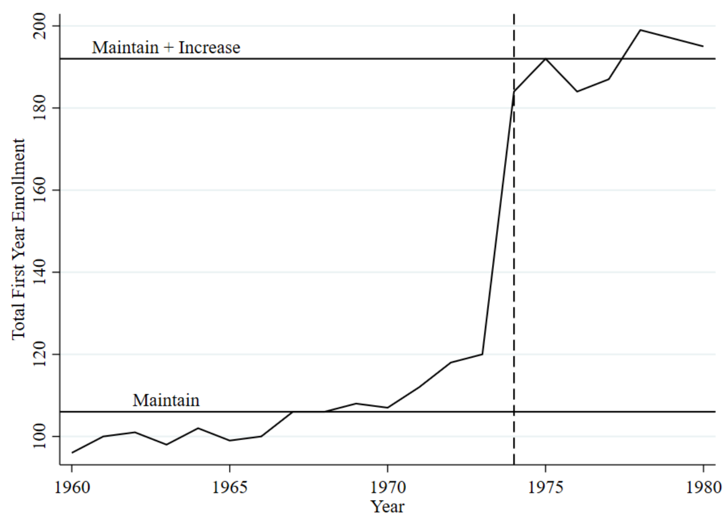
4.3 Treatment Effect Dynamics

The specification utilized above implicitly imposes a constraint that increases in women's enrollment must occur in the period in which enrollment changes. 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.

Figure 15: 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 16: 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.

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 15 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 16. 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.[14] 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 not matching on these years, I allow for a simple graphical placebo test along these lines. Table 6 summarizes the results of my estimation procedure, which constructions a synthetic University of Cincinnati from four medical schools.

Figure 17 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 determiing women's enrollment. Startin in 1974, I find a distinct break

[14] Women'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.

Table 6: 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	Pittsbugh	0	Yale	0

This table 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.

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.

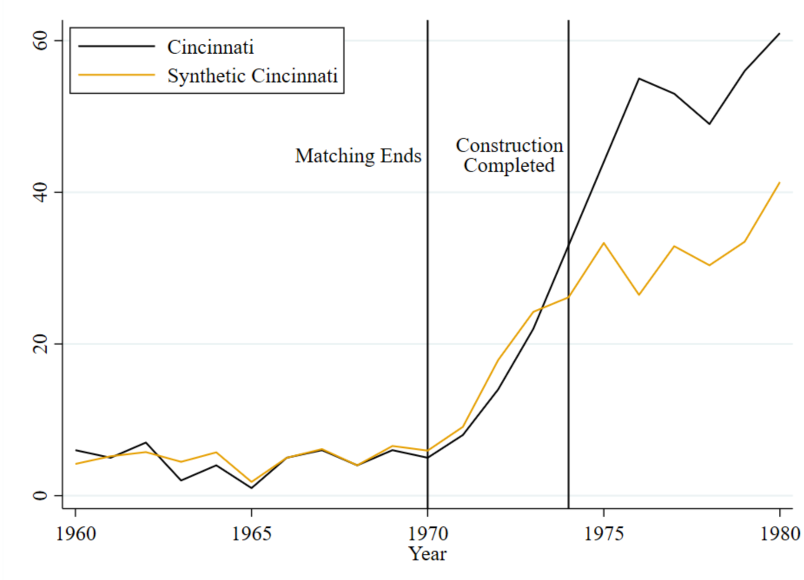
I perform the standard placebo test recommended in Abadie et al. (2010). I add the University of Cincinnati back into my donor pool, and run an identical procedure for all 46 medical schools. Figure 18 plots the treatment effect estimate for every medical school, with results for the University of Cincinnati 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.

4.3.2 Extending The Differences Specification

To account for these dynamics, I return to the general specification from earlier. Recognizing that $E_{i,t-1} = \triangle E_{i,t-1} + E_{i,t-2}$, we can augment equation (5) to account for lagged effects of enrollment expansion on women's entry:

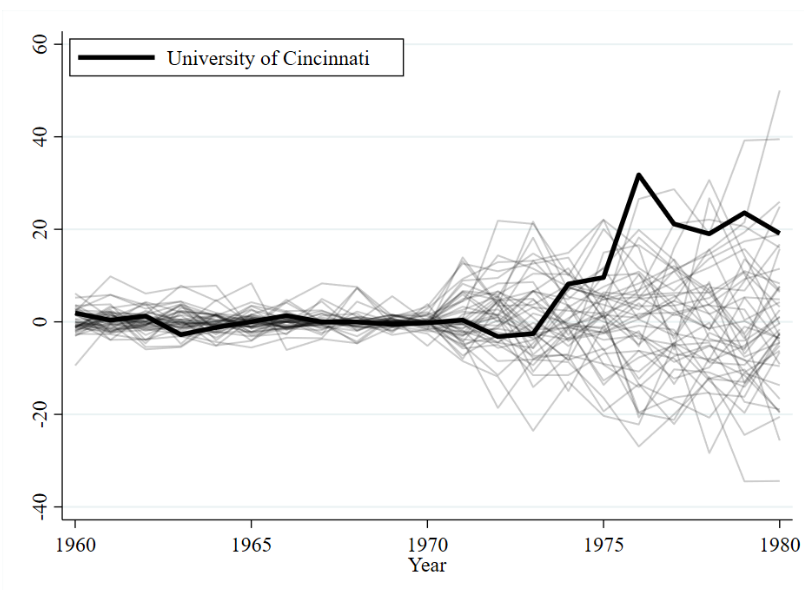
$$\triangle F_{i,t} = \gamma_t \triangle E_{i,t} + (\gamma_t - \gamma_{t-1}) \triangle E_{i,t-2} + (\gamma_t - \gamma_{t-1}) E_{i,t-2} + \triangle \varepsilon_{i,t} \tag{10}$$

Figure 17: 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 6

Figure 18: 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.

I estimate this equation using the following specification:

$$
\begin{aligned}
\triangle F_{i,t} = \alpha &+ \beta_t^{pre}\mathbb{1}(t < 1971)\triangle E_{i,t} + \eta_t^{pre}\mathbb{1}(t < 1971)\triangle E_{i,t-1} + \theta_t^{pre}\mathbb{1}(t < 1971)E_{i,t-1} \\
&+ \beta_t^{post}\mathbb{1}(t \geq 1971)\triangle E_{it} + \eta_t^{post}\mathbb{1}(t \geq 1971)\triangle E_{i,t-1} + \theta_t^{post}\mathbb{1}(t \geq 1971)E_{it-1} \quad (11) \\
&+ \nu_{it}
\end{aligned}
$$

Here, I've binned estimates into pre and post anti-discrimination bins to summarize effects. In principle, we would expect that $\eta = \theta$ if all seats created in the past are treated similarly by medical schools. However, if as we saw with the University of Cincinnati, it takes institution several years to reach their desired gender mix at new levels of enrollment, we would expect that $\eta > \theta$.

Table 7 plots results. We verify the case study and find that dynamics do matter in the 1970s. While our coefficient from before on contemporaneous enrollment changes remains the same, I find that women do not capture around 6% - 8% of newly created seats until the year after they are added to the first year. This is around double the rate at which women are filling existing seats, which remains at around 1% - 2% per year. Interestingly, while they are noisy, point estimates on the lagged enrollment change in the 1960s are negative. This suggests that women actually lost seats that had filled in previous years, consistent with a story where women are admitted to fill new slots but replaced with men if the medical school can located a sufficiently qualified male candidate in future years.

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 policy 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

Table 7: Dynamics of Enrollment Expansions

	(1)	(2)	(3)
Enrollment Change, 1960s	0.085***	0.044	0.048
	(0.025)	(0.028)	(0.030)
Lagged Enrollment Change, 1960s	-0.006	-0.020	-0.012
	(0.024)	(0.022)	(0.023)
2nd Enrollment Lag, 1960s	0.002	0.006***	0.019**
	(0.001)	(0.002)	(0.007)
Enrollment Change, 1970s	0.218***	0.217***	0.222***
	(0.029)	(0.029)	(0.031)
Lagged Enrollment Change, 1970s	0.080***	0.052*	0.059**
	(0.026)	(0.028)	(0.029)
2nd Enrollment Lag, 1970s	0.012***	0.012***	0.023***
	(0.001)	(0.001)	(0.006)
Observations	1911	1911	1905
Year Fixed Effects		X	X
Institution Fixed Effects			X

This table plots estimates from equation (7). Enrollment change refers to estimates of β_t, and Lagged enrollment refers to estimates of θ_t. These coefficients are binned separately for 1961-1970 (1960s) and 1971-1980 (1970s). 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 year fixed effects, and Model 3 adds institution fixed effects.
*** $p < .01$, ** $p < .05$, * $p < .10$

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.

References

Abadie, A. (2021). Using synthetic controls: Feasibility, data requirements, and methodological aspects. *Journal of Economic Literature 59*(2), 391–425.

Abadie, A., A. Diamond, and J. Hainmueller (2010). Synthetic control methods for comparative case studies: Estimating the effect of california's tobacco control program. *Journal of the American Statistical Association 105*(490), 493–505.

Association of American Medical Colleges (2019, December 9). The majority of u.s. medical students are women, new data show.

Bailey, M. J. (2006). More power to the pill: The impact of contraceptive freedom on women's life cycle labor supply. *Quarterly Journal of Economics 121*(1), 289–320.

Bailey, M. J., T. Helgerman, and B. A. Stuart (2022). How the 1963 equal pay act and 1964 civil rights act shaped the gender gap in pay. Working Paper.

Bazell, R. J. (1970). Sex discrimination: Campuses face contract loss over hew demands. *Science 170*(3960), 834–835.

Beller, A. H. (1979). The impact of equal em- ployment opportunity laws on the male/female earnings differential. In C. B. Lloyd, E. S. Andrews, and C. L. Gilroy (Eds.), *Women in the Labor Market*, pp. 304–330. New York: Columbia University Press.

Beller, A. H. (1983). The effects of title vii of the civil rights act of 1964 on women's entry into nontraditional occupations: An economic analysis. *Minnesota Journal of Law & Inequality 1*(1), 73–88.

Bertrand, M., E. Duflo, and S. Mullainathan (2004). How much should we trust differences-in-differences estimates? *Quarterly Journal of Economics 119*(1), 249–275.

Blair, P. Q. and K. Smetters (2021). Why don't elite colleges expand supply? NBER Working Paper 29309.

Boulis, A. K. and J. A. Jacobs (2008). *The Changing Face of Medicine: Women Doctors and the Evolution of Health Care in America*. Ithaca, NY: Cornell University Press.

Card, D. and T. Lemieux (2001). Going to college to avoid the draft: The unintended legacy of the vietnam war. *American Economic Review 91*(2), 97–102.

Carnegie Commission on Higher Education (1970). *Higher Education and the Nation's Health: Policies for Medical and Dental Education. A Special Report and Recommendations.* New York: McGraw-Hill.

Cole, J. R. and J. A. Lipton (1977). The reputations of american medical schools. *Social Forces 55*(3), 662–684.

Cole, S. (1986). Sex discrimination and admission to medical school, 1929-1984. *American Journal of Sociology 92*(3), 549–567.

Congressional Quarterly (1981). *Health Manpower Bill Dies*, pp. 445–449. CQ Almanac 1980. Washington, DC: CQ Role Call.

Congressional Quarterly (1982). *Health Manpower Programs*, pp. 475–476. CQ Almanac 1981. Washington, DC: CQ Role Call.

Epstein, C. F. (1970). *Woman's Place: Options and Limits in Professional Careers*. Berkeley, CA: University of California Press.

Fitzgerald, S. (2020). *Conquering Heroines: How Women Fought Sex Bias at Michigan and Paved the Way for Title IX.* Cambridge, MA: University of Michigan Press.

Fruen, M. A. (1983). How the Medical Student Finances Educational Expenses. In *Medical Education and Societal Needs: A Planning Report for the Health Professions*.

Goldin, C. (2005). From the valley to the summit: The quiet revolution that transformed women's work. *Regional Review Q1*, 5–12.

Goldin, C. (2006). The quiet revolution that transformed women's employment, education, and family. *AEA Papers and Proceedings 96*(2), 1–21.

Goldin, C. and L. F. Katz (2002). The power of the pill: Oral contraceptives and women's career and marriage decisions. *Journal of Political Economy 110*(4), 730–770.

Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics 225*(2), 254–277.

Harvard Crimson (1971, Jan. 8,). Hew acts to check sex discrimination.

Hsieh, C.-T., E. Hurst, C. I. Jones, and P. J. Klenow (2019). The allocation of talent and u.s. economic growth. *Econometrica 87*(5), 1439–1474.

Johnson, D. G. and E. B. Hutchins (1966). Doctor or dropout? a study of medical school attrition. *Journal of Medical Education 41*(12), 1099–1274.

Katz, E., K. Rozema, and S. Sanga (2022). Women in u.s. law schools, 1948-2021. Working Paper.

Kline, J. (1971). The comprehensive health manpower training act of 1971: Legislative history and analysis of major provisions. Technical report, Congressional Research Service.

Korper, S. P. (1980). Federal health manpower legislation: History and prologue. In J. Hadley (Ed.), *Medical Education Financing*, pp. 278–292. New York, NY: Prodist.

Kurtulus, F. A. (2016). The impact of affirmative action on the employment of minorities and women: A longitudinal analysis using three decades of eeo-1 filings. *Journal of Policy Analysis and Management 35*(1), 34–66.

Leonard, J. S. (1984). The impact of affirmative action on employment. *Journal of Labor Economics 2*(4), 439–463.

Leonard, J. S. (1989). Women and affirmative action. *Journal of Economic Perspectives 3*(1), 61–75.

Leonard, J. S. (1990). The impact of affirmative action regulation and equal employment law on black employment. *Journal of Economic Perspectives 4*(4), 47–63.

Lopate, C. (1968). *Women in medicine.* Baltimore, MD: Johns Hopkins Press.

MacBride, O. (1973a). Legislative history of the federal formula-grant program under the health professions educational assistance act, 1965-1971. Technical report, Robert Wood Johnson Foundation.

MacBride, O. (1973b). An overview of the health professions educational assistance act, 1963-1971. Technical report, Robert Wood Johnson Foundation.

Manning, A. (1996). The equal pay act as an experiment to test theories of the labour market. *Economica 63*(250), 191–212.

Miller, C. (2017). The persistent effect of temporary affirmative action. *American Economic Journal: Applied Economics 9*(3), 152–190.

Moehling, C. M., G. T. Niemesh, and M. A. Thomasson (2019). Shut down and shut out: Women physicians in the era of medical education reform. Working Paper.

More, E. S. (1999). *Restoring the Balance: Women Physicians and the Profession of Medicine, 1850-1995.* Ann Arbor, MI: Harvard University Press.

Neumark, D. and W. A. Stock (2006). The labor market effects of sex and race discrimination laws. *Economic Inquiry 44*(3), 385–419.

Rim, N. (2021). The effect of title ix on gender disparity in graduate education. *Journal of Policy Analysis and Management 40*(2), 521–552.

Suggs, W. (2006). *A Place on the Team: The Triumph and Tragedy of Title IX.* Princeton, NJ: Princeton University Press.

The New York Times (1970, Nov. 8,). Women forcing colleges to give job data to u.s.

The New York Times (1971, Mar. 5,). Panel is told medical schools face money crises.

Townsend, J. (1983). Financing Medical Education. In *Medical Education and Societal Needs: A Planning Report for the Health Professions.*

U.S. Congress. House of Representatives. Committee on Education and Labor. Special Subcommittee on Education. (1970, June 17, 19, 26, 29, 30). *Hearings on Section 805 of H.R. 16098. Part 1.* 91st Congress, Second Session.

U.S. Congress. House of Representatives. Committee on Interstate and Foreign Commerce. (1970, January 23, 24, 25, 26, and 30). *Hearings on H.R. 4999, H.R. 8774, and H.R. 8833.* 87th Congress, Second Session.

U.S. Congress. Senate. Committee on Labor and Public Welfare. (1971, May 3, 7, 10). *Hearings on S. 934 and S. 1747.* 92nd Congress, First Session.

U.S. Department of Health, Education and Welfare. Public Health Service. Health Resources Administration. Bureau of Health Manpower (1976). *A Final Report to Congress on Health Professions School Project Plans Under the Capitation Grant Program.* Washington, DC: GPO.

U.S. Department of Health, Education and Welfare. Public Health Service. Health Resources Administration. Bureau of Health Manpower (1977). *Health Professions Schools. Selected BHM Support Data. FY 1965-77.* Washington, DC: GPO.

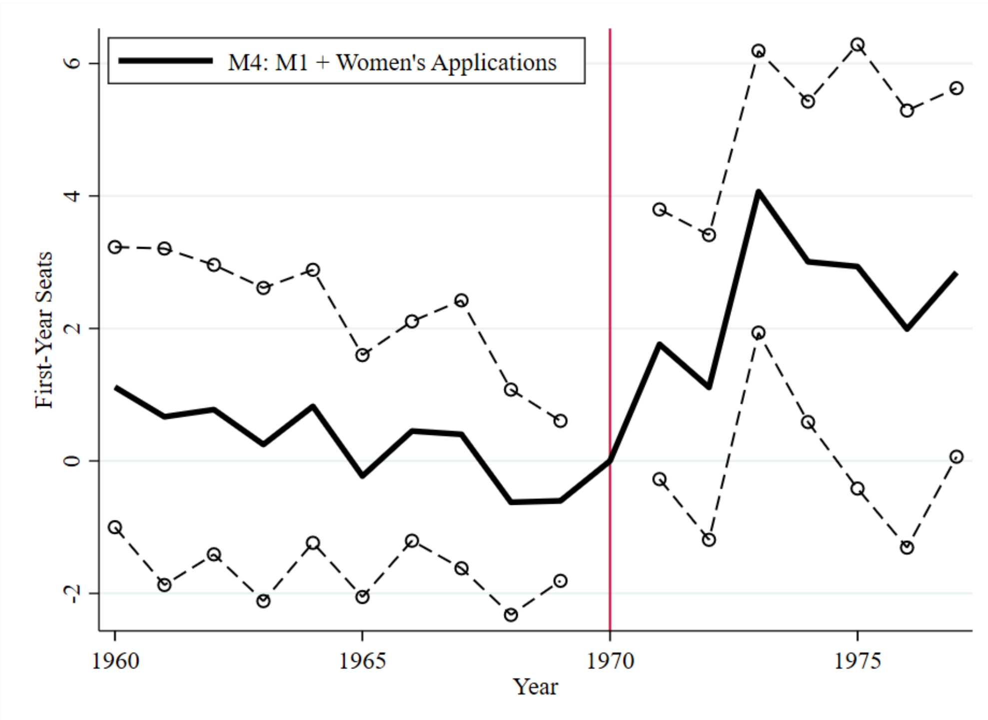
U.S. Department of Health, Education and Welfare. Public Health Service. National Institutes of Health. (1971). *DHEW Obligations to Medical Schools Fiscal Years 1967-1969*. Washington, DC: GPO.

Walsh, E. B. (1971). The role of government in the attainment of equal opportunity for women in universities. Technical report, American Association for the Advancement of Science.

A Additional Results

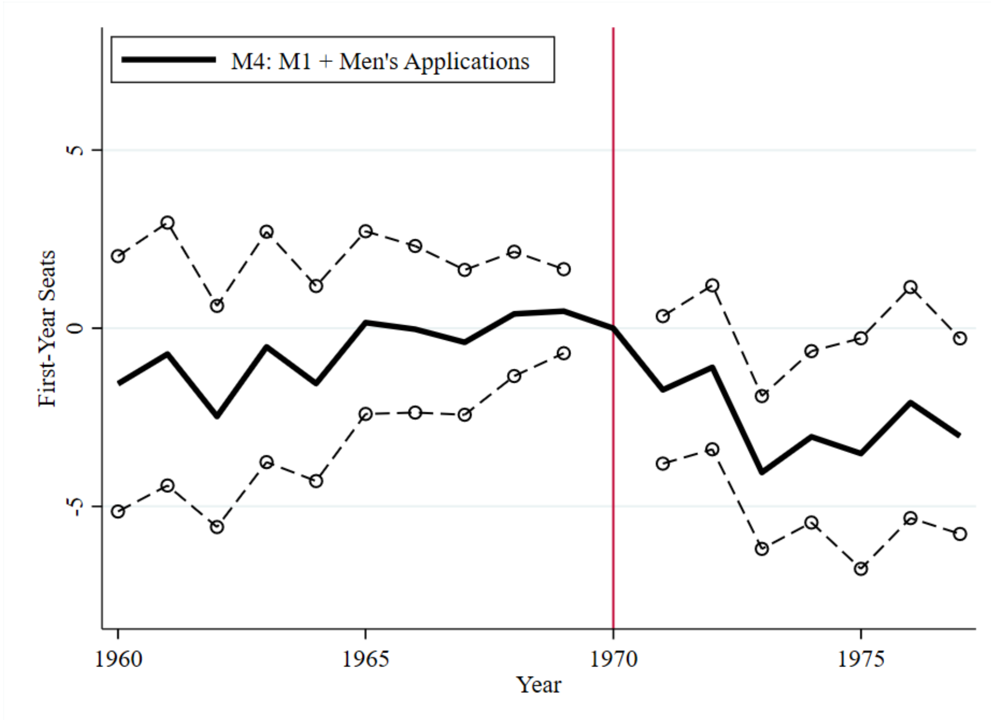
A.1 DiD: Application Controls

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		*JME*		*JME*	*JAMA* EN
1961		*JME*		*JME*	*JAMA* EN
1962		*JME*		*JME*	*JAMA* EN
1963		*JME*		*JME*	*JAMA* EN
1964		*JME*		*JME*	*JAMA* EN
1965		*JME*		*JME*	*JAMA* EN
1966	*MSAR*	*JME*		*JME*	
1967		*JME*	*JME*	*JME*	
1968		*JME*	*JME*	*JME*	
1969		*JME*	*JME*	*JME*	
1970		*JME*	*JME*	*JME*	
1971		*JME*	*JME*	*JME*	
1972		*JME*	*JME*	*JME*	
1973		*JME*	*JME*	*JME*	
1974		*JME*	*JME*	*JME*	
1975		*JME*	*JME*	*JME*	
1976		*JME*	*JME*	*JME*	
1977		*JME*	*JME*	*JME*	
1978	*JAMA* EN				
1979	*JAMA* EN				
1980	*JAMA* EN				

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

$$F_{it} = \beta F_{it}^{EST} + \varepsilon_{it} \tag{1}$$

$$M_{it} = \beta M_{it}^{EST} + \varepsilon_{it} \tag{2}$$

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

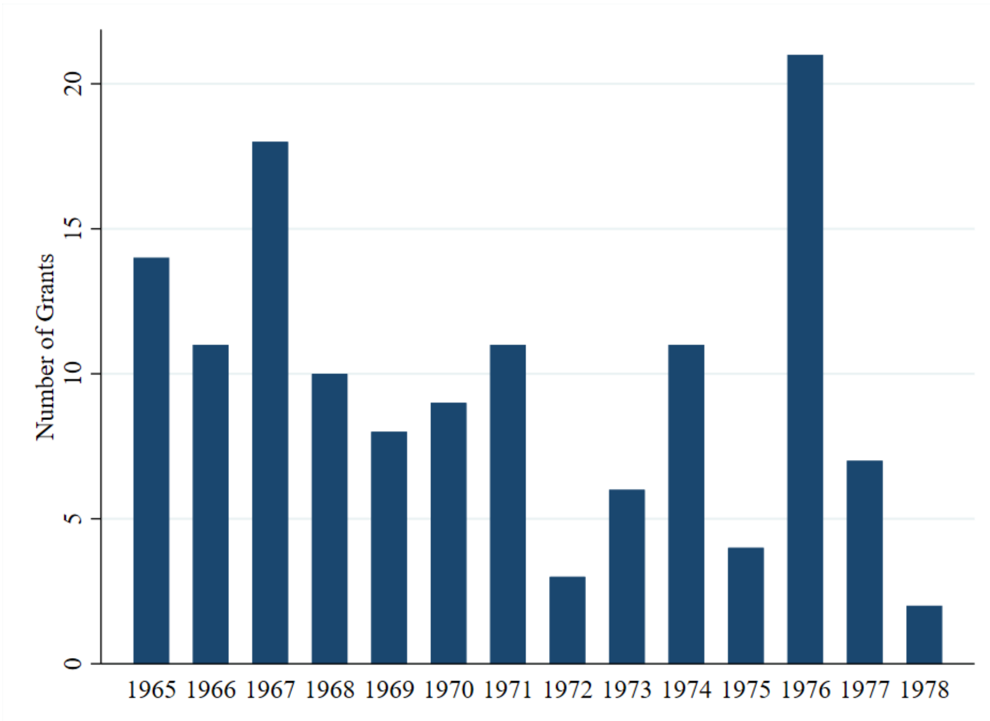
Table 2: Accuracy of Estimated Enrollment

	(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.

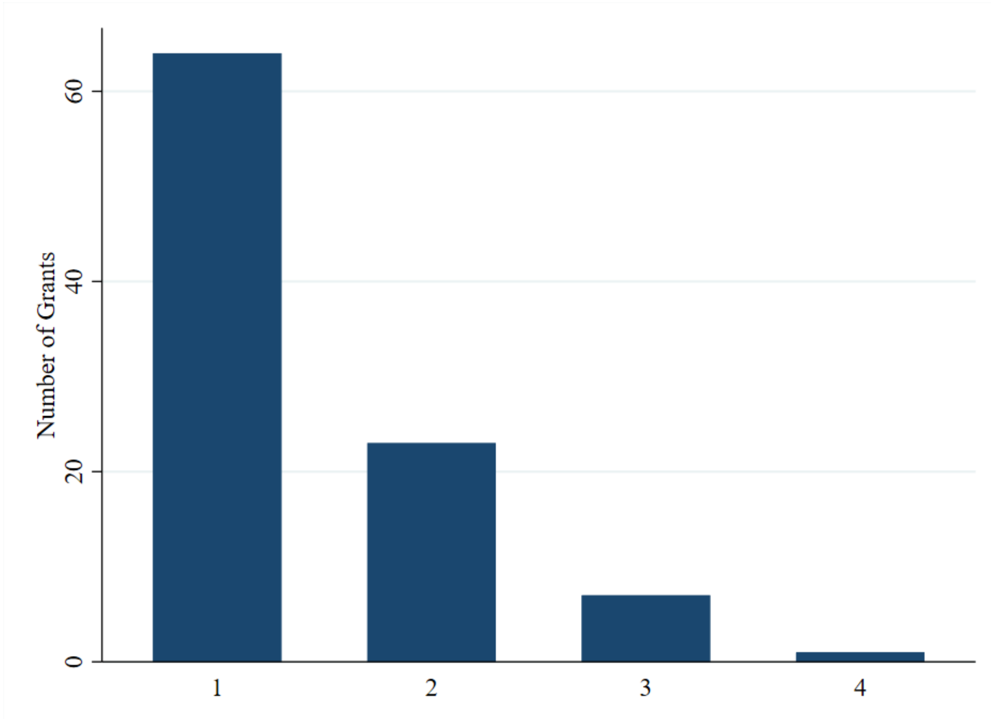
B.3 Construction Grants

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.