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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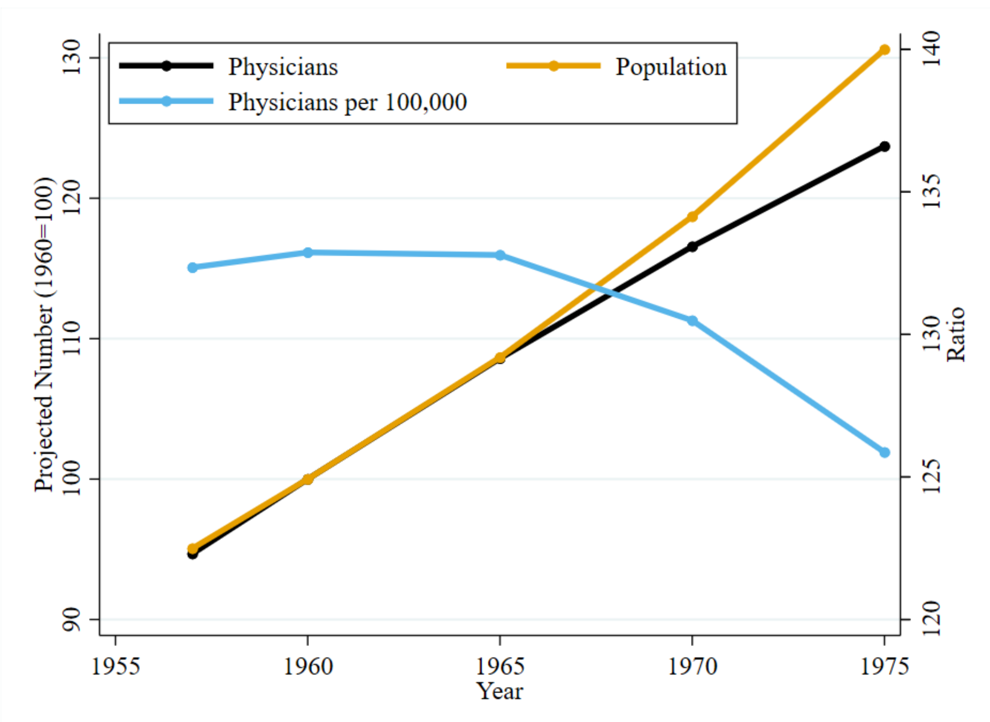
1 Introduction

As President Kennedy took office in the beginning of the 1960s, the U.S. was increasingly concerned with an expected shortage of health professionals by the end of the decade. Figure 1 plots projections of the U.S. population and the size of the health workforce from the Department of Health, Education and Welfare (HEW) from 1959 for the next 15 years. Taken together, the country was expecting a drop in the number of physicians per 100,000 people from 133 in 1960 to 126 in 1975. The reason for this was straightforward: a dramatic rise in fertility rates during the late 1940s and 1950s was driving up the U.S. population at a much faster rate than it was producing (and importing) newly minted physicians. Moreover, the earlier decline in fertility during the 1920s implied important shifts in the age distribution: In his 1961 congressional testimony, Abraham Ribicoff, then HEW sectretary, notes that the number of people aged under 15 and over 64 were projected to increase by 35% and 40% respectively, both demographics with high demand for healthcare (U.S. Congress 1962), suggesting a large increase in the physician-to-population ratio was warranted.

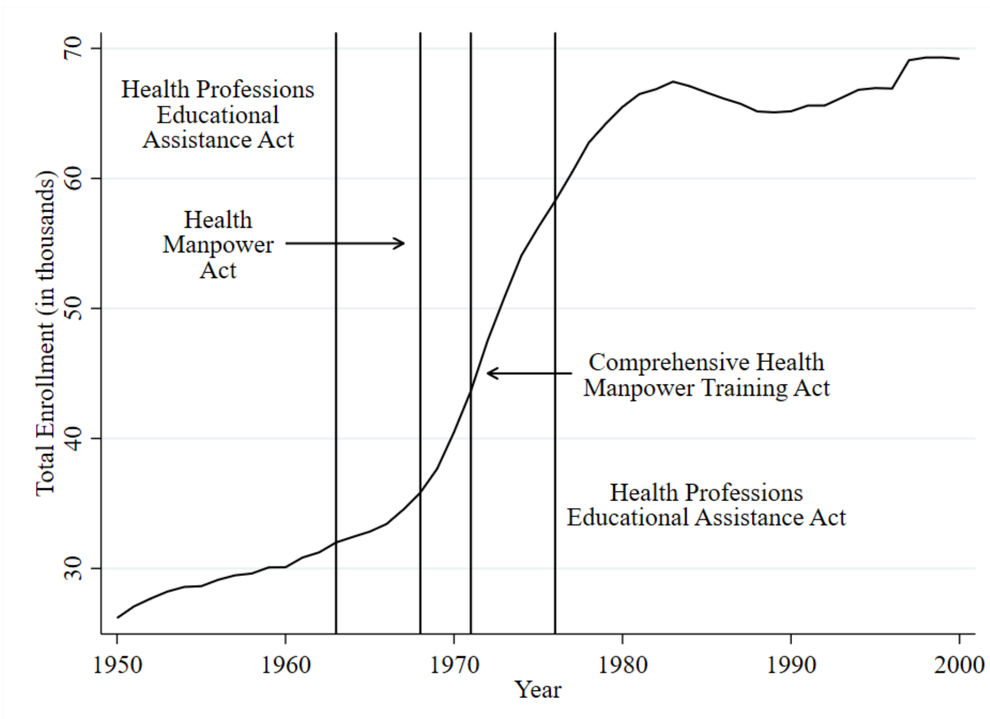
Figure 1: Population and Health Workforce Projections, 1957



Projections are taken from Section 9 of the *Health Manpower Source Book* (DHEW 1959, pg. 31). Estimates are provided for 1957, while data fo 1960, 1965, 1970 and 1975 are projections. Data on physicians and population are normalized by their 1960 value.

In response to this looming crisis, the federal government passed a collection of legislation providing large incentives for medical schools to increase enrollment. Figure 2 plots the passage dates of the four main pieces of this policy against total enrollment at allopathic (M.D.) medical schools from 1950 - 2000. Between 1965, when funding from the Health Professions Educational Assistance (HPEA) Act was first doled out, and 1980, when Health Manpower funding was substantially cut, medical schools responded to these incentives by undertaking a historic expansion in total enrollment. This was accomplished through substantial subsidies for the construction of new teaching facilities, including renovations tied to enrollment maintenance or increases at 79% of all existing institutions, and the construction of 26 new medical schools. In addition, the federal government made direct payments to schools for each enrolled student and graduate conditional on a small sustained increase in enrollment, which both directly incentivized increased enrollment and lowered marginal costs. All in all, over \$3.2b was given to health professional schools, with approximately \$2b given to medical schools specifically, under the umbrella of Health Manpower policy.

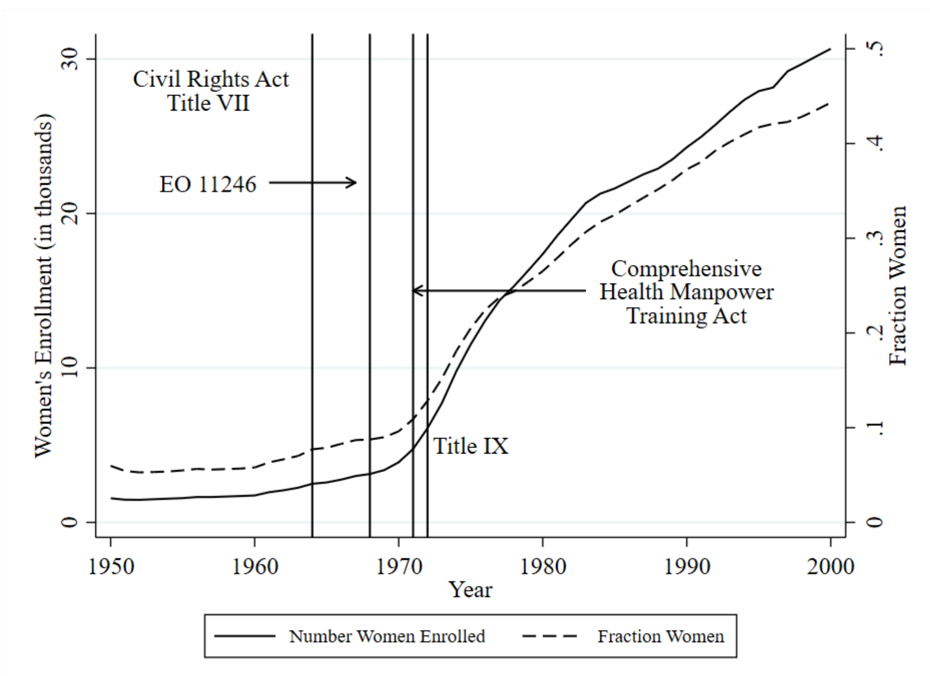
Figure 2: Health Manpower Policy & Enrollment Change, 1950-2000



Data on total enrollment 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*.

The irony of the policy namesake is that the story of the 1970s was the entry of women into medical schools; 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. Figure 3 plots women's enrollment in both levels and as a percentage of total enrollment. Women's entry begins in earnest shortly after medical schools begin expanding in 1965 and includes both increases in the number of students as well the fraction of all medical students who are women. Further, the dramatic change in women's rate of entry around 1970 occurs concurrently with large changes in federal anti-discrimination policy. This push begain in 1964 with the Civil Rights Act, though neither Title VI, pertaining to recipients of federal funds, nor Title VII, governing employers, pertained to institutions of higher education. This would change rapidly in the early 1970s; in addition to promoting enrollment increases, the Comprehensive Health Manpower Training Act of 1971 prohibited meical schools receiving funding from discriminating in admissions on the basis of sex. This model was generalized with Title IX of the Educational Amendments of 1972, prohibiting sex-based discrimination in graduate admissions by any institution receiving federal funds.

Figure 3: Women's Enrollment, 1950-2000



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*.

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

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

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

2 Data

I collect a novel institution-by-year dataset from 1960 through 1980. 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[1] 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.[2] Figure 4 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.

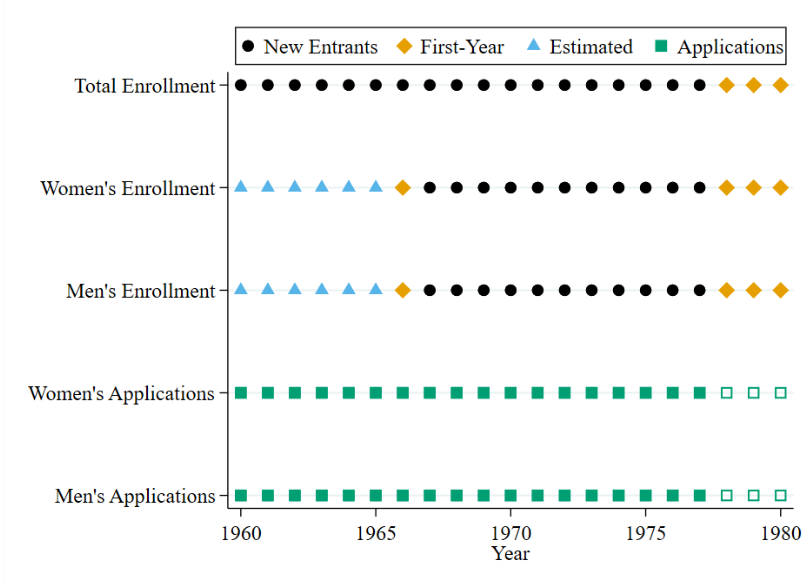
I summarize some key features of the data in Figure 5. I classify observed medical schools as either "existing" or "new", in line with HEW designations when awarding grants. The 87 existing medical schools include all institutions with positive enrollment in 1960 as well as the California College of Medicine (now the UC Irvine School of Medicine), which I observe enrollment for starting in 1962.[3] 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 existing schools. While there is a large push to establish new medical schools, the bulk of seats still remain at existing institutions - by 1980, 80% of first-year seats were at institutions that existing at the beginning of my sample period.

[1]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.

[2]These estimates, while published in the Education Number, were first compiled for the *MSAR* in each year.

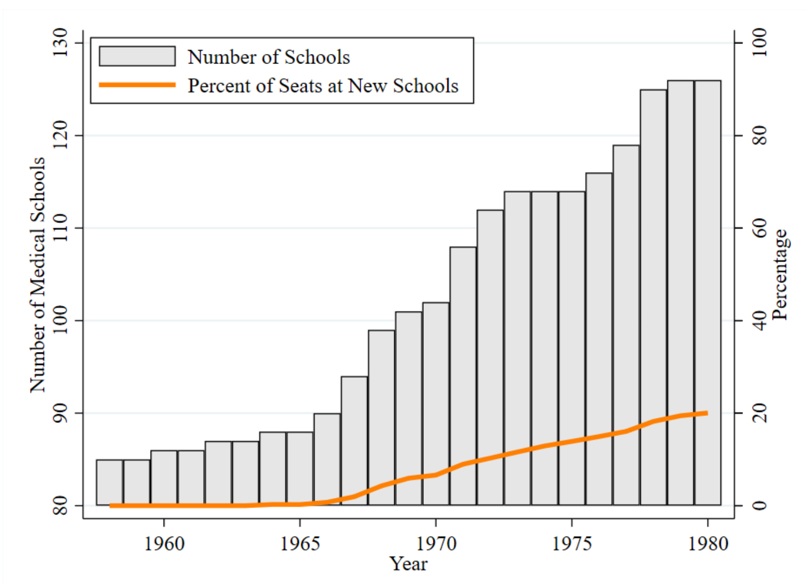
[3]This medical school was established in 1896, but did not become accredited until 1962.

Figure 4: 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 5: 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.

2.1 Unpacking Women's Entry

Using this dataset, I begin by establishing several stylized facts about the nature of women's entry into medicine. 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 6 plots the distribution across medical schools of the fraction of their first-year students who are women. We see that women's representation increases across the board at all medical schools between 1970 and 1980, as evidenced by a shift upwards in this distribution. In particular, we see the most rapid changes between 1970 and 1975, with growth slowing in the second half of the 1970s. Simultaneously, we see a large increase in the variance of this distribution - by 1980, some medical schools have almost reached parity, but at others only 15% of students are women.

Table 1: Transition Probabilities Between 1970 and 1980

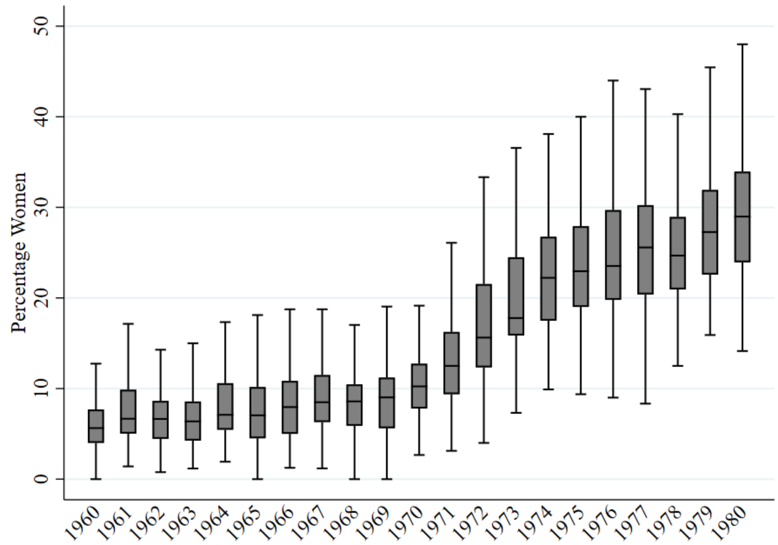
		1980			
	Quartile	1	2	3	4
1970	1	43%	29%	19%	10%
	2	23%	32%	32%	14%
	3	29%	19%	19%	33%
	4	5%	23%	23%	50%

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

It is unclear from looking only at distributional changes how individual medical schools are evolving over time. To understand this, Table 1 plots transition probabilities for quartiles of this distribution from 1970 to 1980. For schools with relatively high (low) representation of women in 1970 [Quartile 1 (4)], this status is usual maintained in 1980 - 72% of schools in quartile 1 in 1970 end up above the median in 1980, while 73% of schools in quartile 4 end up below the median in 1980. However, schools in quartiles 2 & 3 in 1970 display a large variance in representation in 1980, suggesting that this status is not entirely permanent.

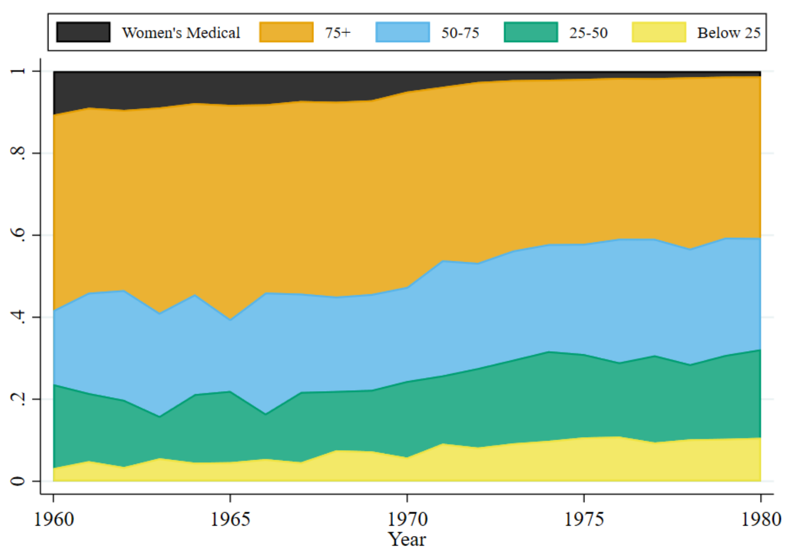
Figure 7 plots the percentage of women enrolled at institutions in each quartile, with Women's Medical plotted in its own category. In 1960, women's access to medical schools was largely determined by a handful of institutions. Women's Medical enrolled around 10% of all women, and 60% of all female medical 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

Figure 6: 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 women in each school's first year class. 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 7: Evolution of Women's Access



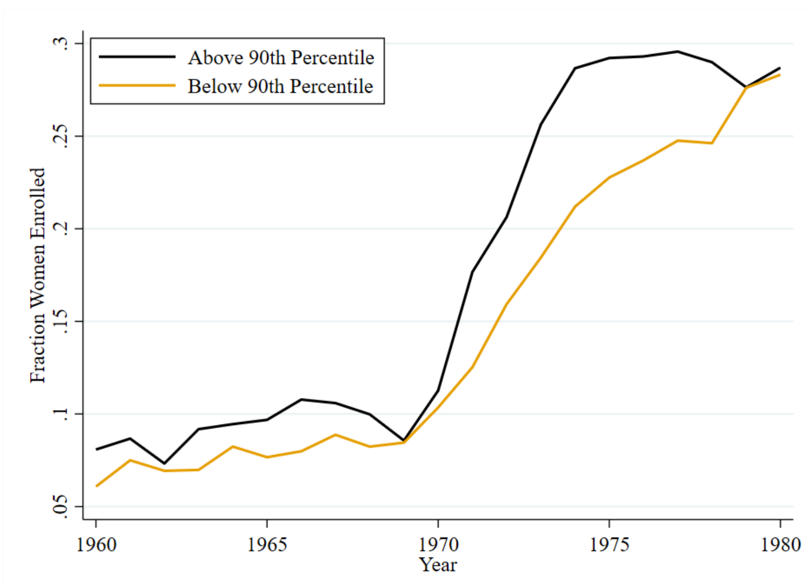
For each year, I calculate the 25th, 50th, and 75th percentile of the distribution of the number of women in each school. This figure plots the percentage of women enrolled in schools in each quartile of this distribution. Women's Medical is plotted separately as well.

women's enrollment driven by increases in women's enrollment across the distribution below the 75th percentile.

In addition to access to medical education, we might also care about women's access to higher quality medical schools. 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. I take this as a reasonable metric of medical school quality and divide institutions into two groups - "elite" schools, those scoring above the 90th percentile of perceived quality, and "standard" schools, which includes all other institutions.

The results are plotted in Figure 8. There is a distinctly different pattern observed in elite schools relative to all other medical schools. Institutions at the top make very large adjustments in a very short amount of time - the percentage of women enrolled jumps from little over 10% in 1970 to almost 30% in 1974. However, women make no progress in terms of representation here over the second half of the 1970s; on the other hand, progress is slower but more consistent at non-elite medical schools, rising from a similar baseline to identical representation by 1979.

Figure 8: Limited Entry to Top Medical Schools



I split medical schools into two groups - those with a perceived quality score from Cole and Lipton (1977) above and below the 90th percentile. For both groups, I calculate the fraction of first-year students who are women in every year, which is plotted here,

3 Anti-Discrimination Policy

For anti-discrimination policy to be effective, it must of course be the case that there is existing discrimination that needs to be rectified. In the 1960s, analysts tended to point to gender differences in the demand for medical education, rather than discrimination by the admissions committee, as the central reason why women did not take up medicine in greater numbers (Epstein, 1970; Lopate, 1968). Defenders of the *status quo* were quick to point out that acceptance rates for men and women were consistently similar, arguing that this was evidence that admissions committees did not consider sex when evaluating applications. This argument was formalized by Cole (1986), who found that men were not admitted at higher rates from the entire period between 1924 and 1984.[4]

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

What was more unclear was the extent of the problem. By the end of the 1960s, while all medical schools admitted women, there was one institution, Women's Medical College, which did not admit any men. This school would, in 1970, decide to start admitting men, a decision that met resistance from alumni worried that it would compromise opportunities for women to study medicine provided by a women-only institution. In 1969, 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

[4]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)

greater numbers." This was driven by a legitimate concern over an expected shortage of physicians in conjunction with an expectation that women were less likely to practice after graduation. In the words of an admissions officer,

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

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

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

This concern was compounded by higher attrition rates for women, though this was perversely at least partially the result of a male-dominated academic climate that was hostile towards women (Lopate, 1968).

3.1 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. Since most universities receive federal contracts, Sandler reasoned that they would be subject to this regulation.

Starting with the University of Maryland, Sandler, together with WEAL and various allies, submitted complaints against 250 institutions under EO 11246 (Suggs, 2006). 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). Enforcement fell to the Department of Health, Education and Welfare (DHEW), which propmtly began investigations of several institutions that had received complaints (Harvard Crimson, 1971). These investigations were often lengthy battles between the HEW and adminstration officials, which resulted in the suspension of contracts for several instiutions in the late 1970s/early 1971 until they complied with HEW demands (Bazell, 1970).

In October 1971, attention turned to medical schools as WEAL filed EO 11246 complaints against all medical schools in the country (More, 1999). Shortly afterwards, this was codified into the Comprehensive Health Manpower Training Act, which required non-discrimination on the basis of sex from any medical school receiving funding through the health manpower program. This 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, which it reports that it does.

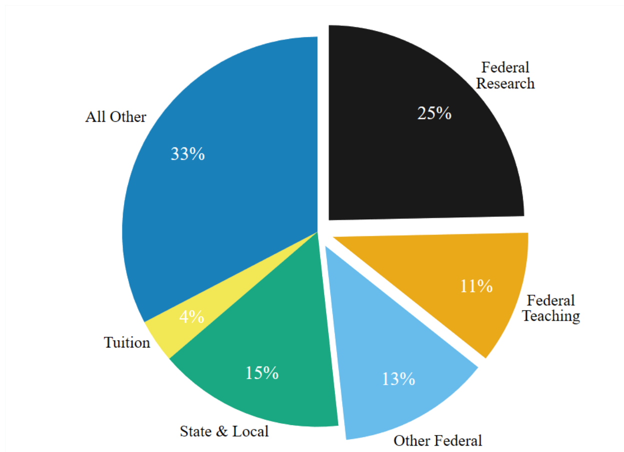
3.2 Empirical Design

To estimate the impact of this policy on women's enrollment, I assume that there is a differential response across medical schools depending on their financial exposure. Similar to Rim (2021), schools with more at stake to lose from non-compliance should be more likely to admit higher levels of women. First, I collect data on the amount of HEW funding each medical school is receiving, which I argue is an excellent proxy for financial exposure. Then, I utilize variation in this funding in a continuous difference-in-differences design to identify the impact of anti-discrimination policy on women's enrollment.

3.2.1 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.

Figure 9: Medical School Revenues, 1969



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.

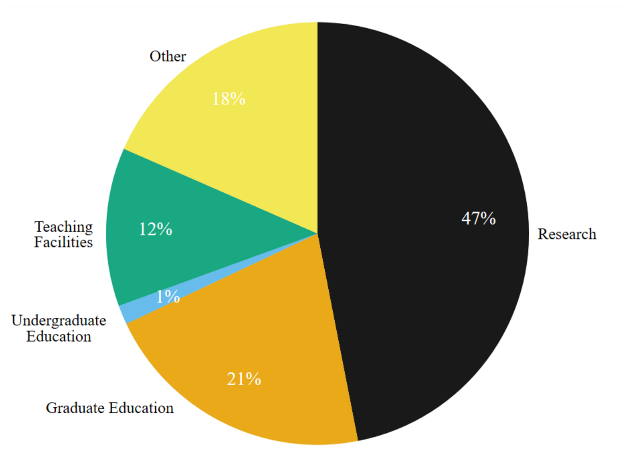
Institution-level data on revenue is scarce, but aggregate statistics on sources of funding for medical schools are available. In Figure 9, I plot the share of all medical school revenue in 1969 by funding source, taken from Fruen (1983). Funding from the federal government comprises around half of all 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.

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).[5] This will comprise the bulk, if not all, of federal support to medical schools. Figure 10 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

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

support, as evidenced by the funding here for teaching facilities.

Figure 10: Source of DHEW Support, 1969



I plot the percentage of total medical school DHEW support by program. The data were collected from (DHEW 1971).

My preferred measure of medical school dependence on DHEW funding is the total amount of support received in 1969, less any construction grants that are given to a school in 1969, which are temporary payment that do not reflect continued government support of a school. I plot a histogram of the dose distribution in Figure 11.

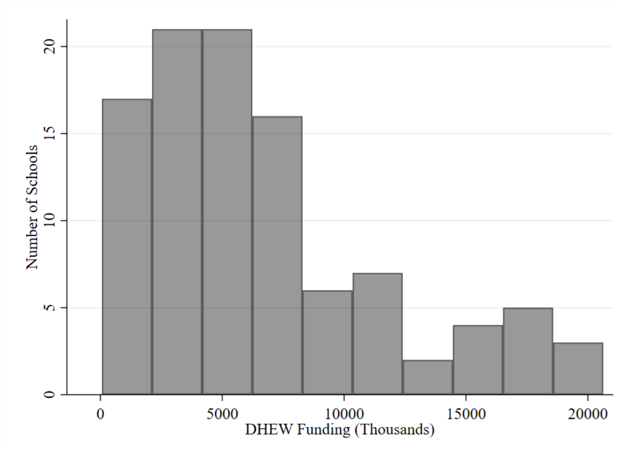
3.2.2 Methodology & Specification

I test this hypothesis using a continuous difference-in-differences approach with an event study specification:

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

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.

Figure 11: 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.

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 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:

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

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 $\hat{\alpha}_1^s$. This specification is designed to design a summary of the event study coefficients..

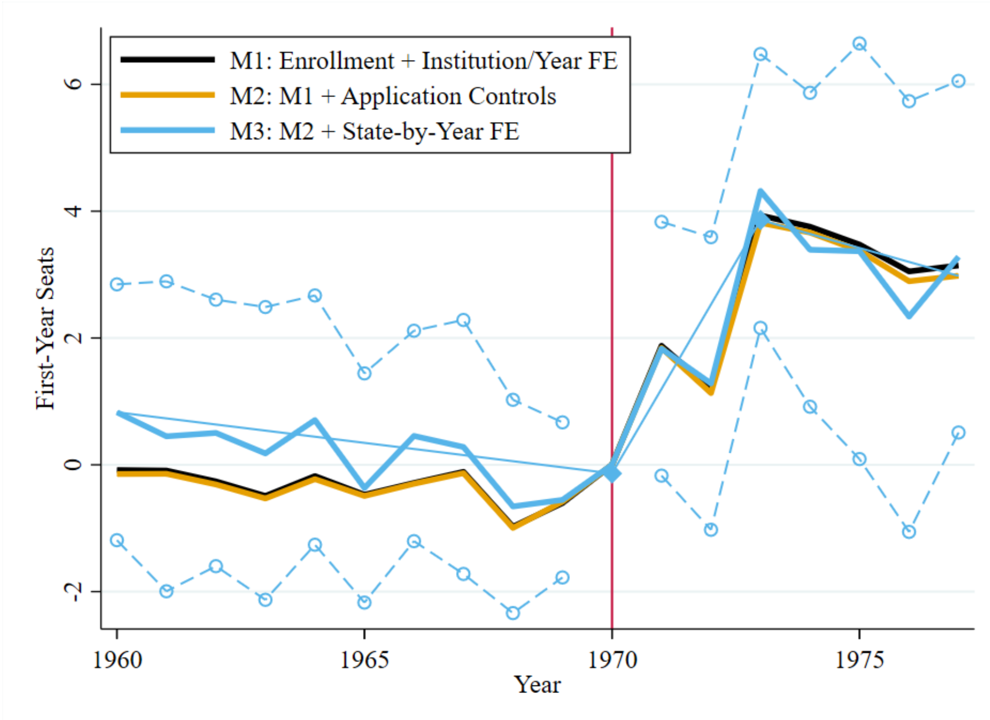
3.2.3 Results

These results are presented in Figure 12. 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 at 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.[6]

[6] 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.

Figure 12: Difference-in-Differences: Results for Women

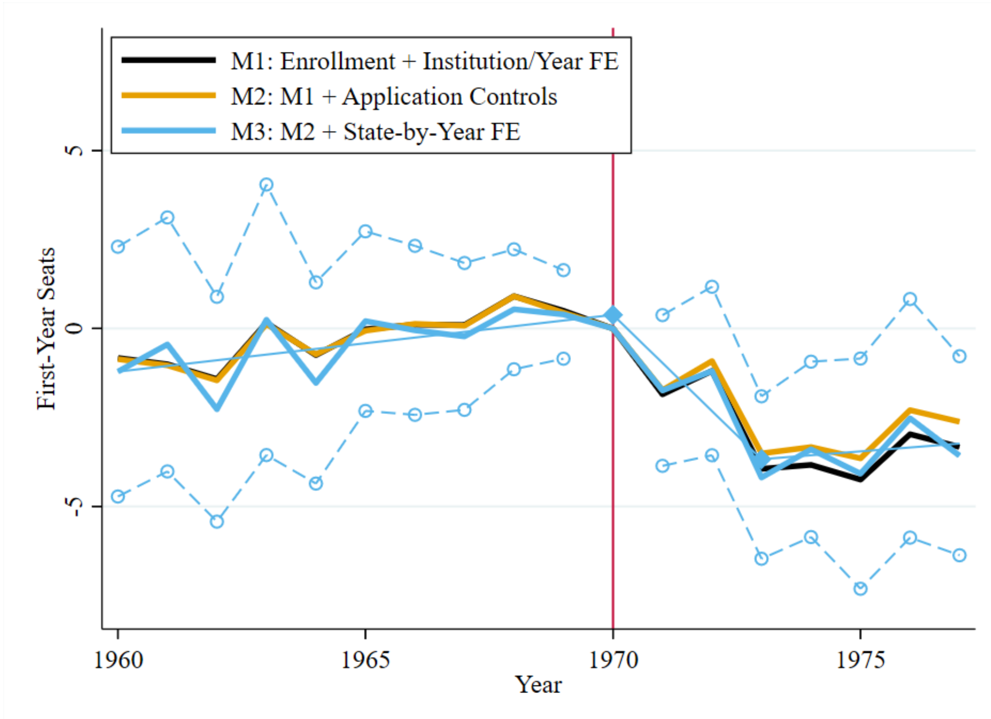


I plot the event study coefficients from equation (1) scaled by the mean of the dose distribution, where the outcome is women's enrollment. Model 1 includes a control for total enrollment as well as institution and year fixed effects. Model 2 adds a control for men's applications. Model 3 adds state-by-year 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.

The results from this design are in Figure 13. 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 -4, suggesting that the seats allotted to women as a result of this policy would have been given to men if not for government intervention.

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

Figure 13: 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.

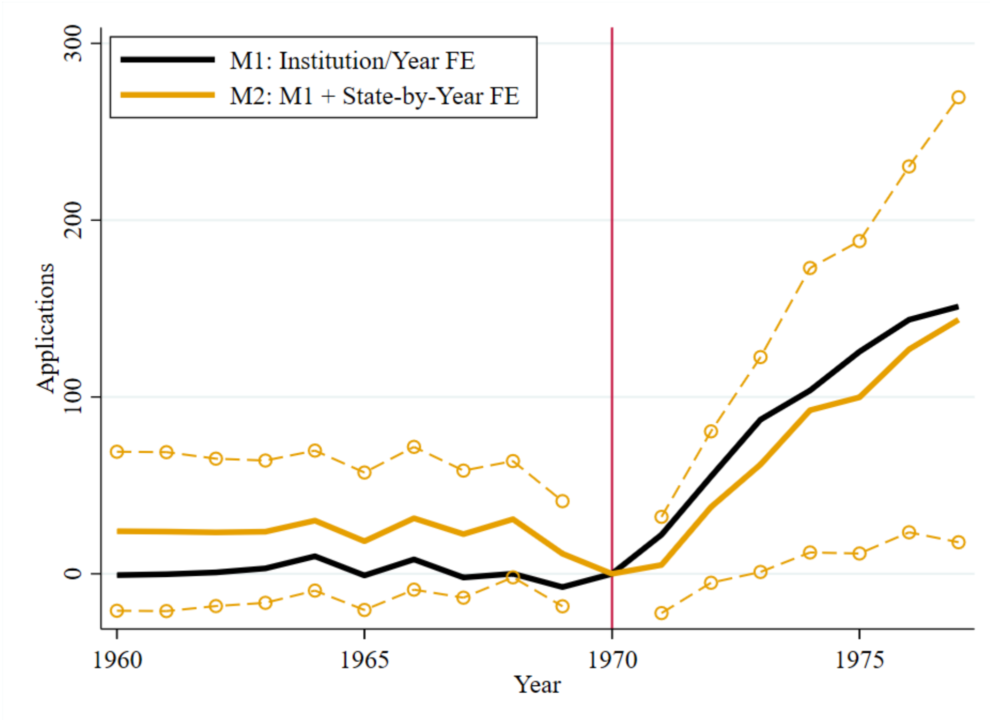
applications.

I study changes in the demand for medical education by women with a simple specification:

$$Y_{it} = \sum_{\tau=1960,\tau\neq 1970}^{\tau=1977} \alpha_\tau d_{i,1969} \mathbb{1}(t=\tau) + \gamma_i + \delta_t + \varepsilon_{it} \tag{3}$$

This is a standard two-way fixed effects design. Y_{it} gives the number of applications filed by women at institution i in year t. I include institutional fixed effects γ_i to account for pre-existing differences in women's applications across my sample period. I include year fixed effects δ_t to account for national-level changes in women's application behavior. These are augmented to state-by-year fixed effects in a second specification to control for changes in women's educational decisions stemming from differential access to the pill as noted before. Standard errors are clustered at the institution level.

Figure 14: Women's Applications



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

The results from this exercise are given in figure 14. Both specification suggest that women increased application effort at medical schools where women's enrollment jumped by a larger amount in response to the policy.

4 Expansionary Policy

In the previous section, I found that anti-discrimination policy 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 around a quarter of all revenue in 1960 (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 doled out 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, institutions were provided with funding to provide scholarships to a fraction of their students.

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

4.1.1 Comprehensive Health Manpower Training Act of 1971

However, even as progress was made on this crisis, another had propped up - medical schools were experiencing increased funding issues at the beginning of the 1970s. To alleviate this, beginning in 1968, the government had been providing financial distress grants for institutions under the health manpower program; by 1970, 61 of the existing 103 medical schools were receiving funding through this program. The problem had begun to reach crisis levels at particular programs, threatening their ability to stay afloat (The New York Times, 1971).

Recognizing the need to rectify this situation in order to obtain its goal of increased enrollment, 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 Basic Improvement Grants (now called Capitation Grants), which provide schools with a set amount of funding dependent on their enrollment, type of enrollment,[7] 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."

4.1.2 HPEA (Again)

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

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

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).

The totality of Health Manpower policy is summarized in Figures 15 and 16. First-year enrollment rose consistently and continuously between 1965 and 1980, approximately doubling over this time period. For the first 7 years, the focus was on building new facilities, as most funding was directed towards construction grants. With the passage of the CHMTA, this switched to Formula Grants, and special project grants grew in importance as well. To study the effects of enrollment expansion on women's entry, I first construct a simple model of admissions decisions. The solution to this model implies a simple specification to estimate this impact, which I then take to the data. A final section extends this analysis by exploring more complicated dynamics of women's enrollment.

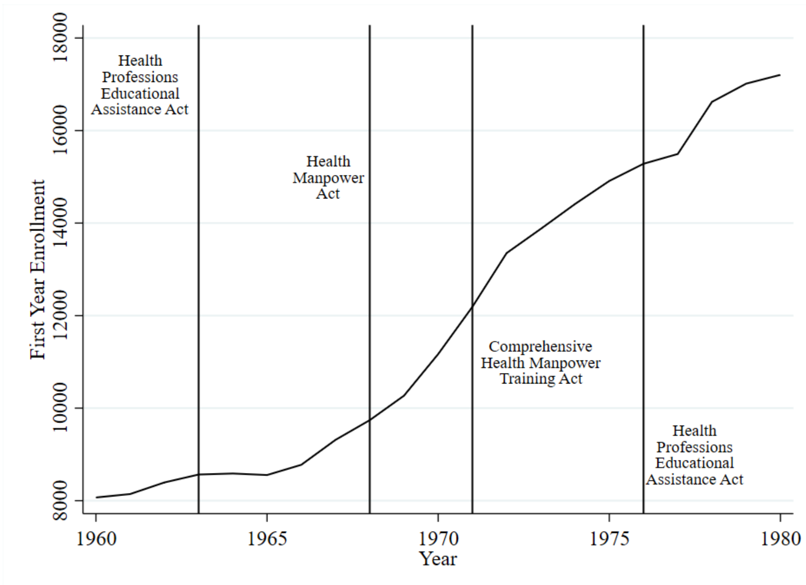
4.2 Conceptual Framework

There is little theoretical work on changes in the supply of seats in higher education; most of the literature assumes that supply is inelastic (Blair and Smetters, 2021). Accordingly, I write down a simple model to understand how women's enrollment should respond to changes in capacity. My framework captures two key features of admissions decisions: medical schools care about tuition revenue as well as the quality of students that it admits (Fu, 2014). To fit my setting, I add a friction whereby women are treated differently than observationally equivalent men, which results in a lower application threshold for men than for women. Then, I derive the equilibrium relationship between changes in capacity and women's enrollment, which depends both on the density of male and female applications around their respective admissions threshold as well as the extent of the penalty on women's applications.

4.2.1 Setup

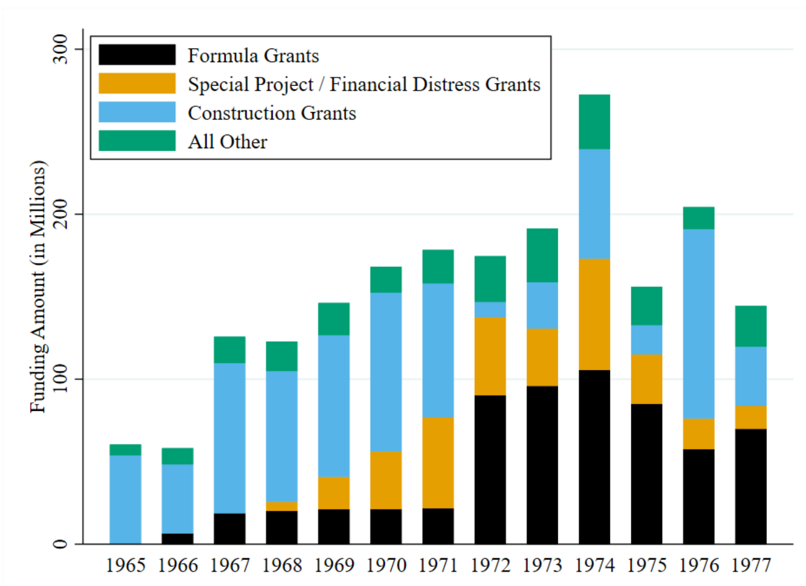
I utilize a simple two period structure. In the first period, the medical school chooses its desired enrollment after observing market demand for medical education. Then, in the second period, applications are observed, and the admissions committee chooses which students to admit in order to fill its enrollment total determined in the first period.

Figure 15: Health Manpower Policy Timeline: First-Year Enrollment



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

Figure 16: Health Manpower Policy Funding



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

Period 1

For tractability, I assume that student willingness to pay depends only on the number of students admitted, not the quality or gender mix of applicants. The medical school has revenue given by

$$R(E) = E \cdot T(E) + R_o(\bar{K}, \bar{L}) \tag{4}$$

Here, E is the number of enrolled students, and $T(E)$ is the implied tuition level to enroll E students, given by demand faced by the institution. $R_o(\bar{K}, \bar{L})$ is the revenue from all other operations of the medical school, which is a function of buildings constructed $\bar{K}$ and faculty hired $\bar{L}$. These are variable inputs, but I add a bar to reflect that they are fixed from the perspective of the admissions committee. The inclusion of this term might seem superfluous, but I add it here to make explicit that the only way in which admitted students benefit the university is through tuition revenue. In addition, the medical school has costs given by

$$C(E) = c(\bar{K}, \bar{L})E + C_o(\bar{K}, \bar{L}) \tag{5}$$

I assume there is a constant marginal cost $c(\bar{K}, \bar{L})$ of enrollment in every period, which can vary over time given capital and labor present. There is also another term $C_o(\bar{K}, \bar{L})$ representing all other costs the university faces. Putting this together, we can write profits as

$$\Pi(E) = R(E) - C(E) + G(E) \tag{6}$$

Where $G(E)$ is the (so far unspecified) federal government incentive program.

Period 2

In period 2, the admissions committee takes the enrollment decision in period 1 (E^*) as given. After observing applicants, they decide which students to admit to fulfill their desired enrollment. I assume that there is a univariate, observable measure of student quality, x, and that each university receives applications from women with distribution $f(x)$ and men with distribution $m(x)$. When making admissions decisions, the school sets a separate admissions threshold for women a_f and men a_m so that all students with $x \geq a_g$ are admitted.

Accordingly, we can write total enrollment, women's enrollment, and men's enrollment as

$$
\begin{aligned}
E &= \int_{a_m}^{\infty} m(x)\mathrm{d}x + \int_{a_f}^{\infty} f(x)\mathrm{d}x \\
F &= \int_{a_f}^{\infty} f(x)\mathrm{d}x \\
M &= \int_{a_m}^{\infty} m(x)\mathrm{d}x
\end{aligned}
$$

The admissions committee seeks to maximize the weighted sum of student quality so that an additional student increases school utility but marginal utility is decreasing in enrollment. The committee solves the following problem:

$$
\begin{aligned}
\underset{a_f,\, a_m}{\text{maximize}} \quad & \left\{ \int_{a_m}^{\infty} x m(x)\mathrm{d}x + \int_{a_f}^{\infty} \tau(x) f(x)\mathrm{d}x \right\} \\
\text{subject to} \quad & E^* = \int_{a_m}^{\infty} m(x)\mathrm{d}x + \int_{a_f}^{\infty} f(x)\mathrm{d}x
\end{aligned} \tag{7}
$$

$\tau(\cdot)$ is a generalized penalty to women's applications. $\tau(\cdot)$ implicitly defines an equivalence relation between men and women: if observationally equivalent men and women considered identical, we would have that $\tau(x) = x$, but in general I assume that $\tau(x) < x$ and that this function is differentiable.

4.2.2 Solving the Model

The period 1 solution is simple: the medical school chooses enrollment so that:

$$
R'(E) = C'(E) - G'(E) \tag{8}
$$

That is, marginal revenue should equal marginal cost, less government subsidies for enrollment on the margin. This expression, while very straightforward, highlights an important point: the government influences medical school enrollment though changes to marginal cost. Consequently, even though the language of the policy is in fixed costs, i.e. a one-off grant for the construction of a facility should lead to a one-off increase in enrollment, by lowering the marginal cost of enrollment, facilities construction can also have a further indirect influence on total enrollment.

In period 2, the admissions committee divides up desired enrollment between men and women. This problem has the following first order conditions for a_f and a_m:

$$\lambda = \tau(a_f) \tag{9}$$

$$\lambda = a_m \tag{10}$$

Where λ is a multiplier on the equality constraint. This system immediately gives us that $\tau(a_f) = a_m$ so that men and women on the margin provide the same utility to the medical school. Since $\tau(x) < x$, this implies directly that $a_m < a_f$ so that admissions standards are more stringent for women.

4.2.3 Policy Counterfactuals

We can utilize this model to understand the response of women's enrollment when there is a change in total enrollment. Totally differentiating the system giving enrollment totals yields:

$$\begin{aligned}
\mathrm{d}E &= -m(a_m)\mathrm{d}a_m - f(a_f)\mathrm{d}a_f \\
\mathrm{d}F &= -f(a_f)\mathrm{d}a_f \\
\mathrm{d}M &= -m(a_m)\mathrm{d}a_m
\end{aligned}$$

The equilibrium condition from above implies that $\mathrm{d}a_m = \tau'(a_f)\mathrm{d}a_f$; substituting this into the system above and rearranging gives us that

$$\mathrm{d}F = \frac{f(a_f)}{m(a_m)\tau'(a_f) + f(a_f)}\mathrm{d}E \tag{11}$$

This conclusion has a simple interpretation. Following a shock to enrollment, women capture a fraction of the new seats created, given by $f(a_f)/m(a_m)\tau'(a_f) + f(a_f)$. In the absence of any friction ($\tau(x) = x$), this would be determined by the fraction of marginal students that are women. Further, the affect of $\tau(\cdot)$ on women's enrollment is driven by the change in this penalty on the margin. In this way, a more concave admissions penalty will inflate the denominator, leading to women capturing fewer seats during enrollment changes.[8]

[8]The limiting case here is a quota on women's admissions at $\bar{a}$; in this case, $\tau'(\bar{a}) = \infty$ and women capture no seats during enrollment expansions.

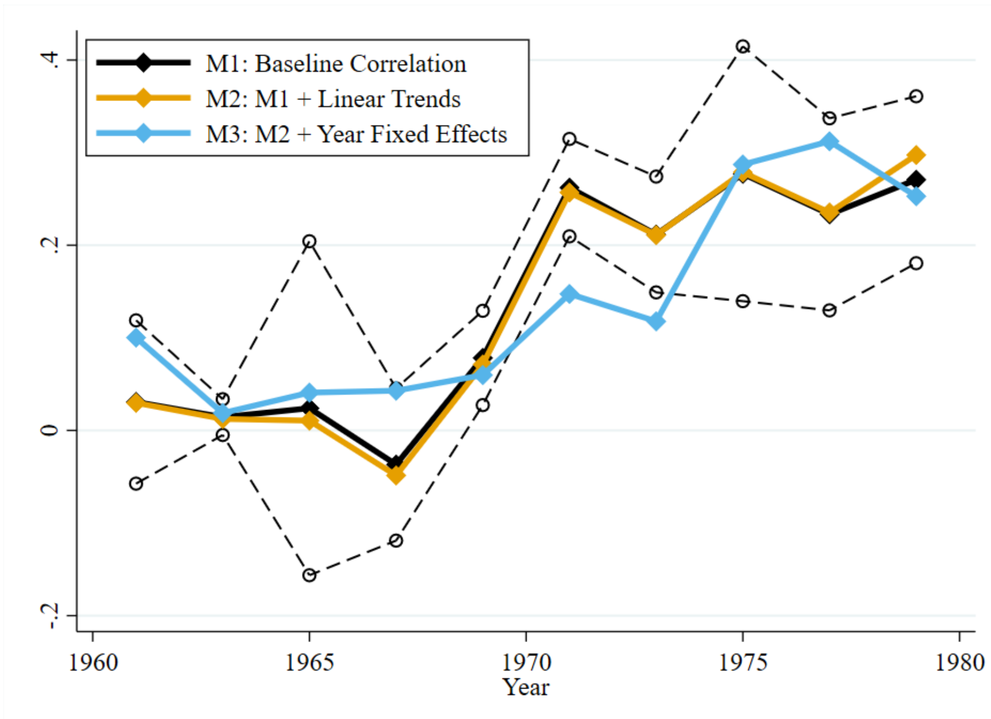
4.3 Empirical Specification and Results

To estimate the role of enrollment expansions in women's entry, I utilize a discrete time formulation of (11):

$$\triangle F_{it} = \beta_t \triangle E_{it} + \varepsilon_{it} \tag{12}$$

The outcome of interest is the change in women's enrollment between year t and $t-1$, $\triangle F_{it}$, and the independent variable is $\triangle E_{it}$, which gives the change in total enrollment at institution i between year t and $t-1$. I am interested in capturing their reduced form relationship, β_t, which I allow to change over time to explore changes in this relationship.

Figure 17: Seats Captured by Women



This figure plots results from Equation (12), where I estimate β_t within two-year bins to reduce noise in the estimates. Model 1 does not include any other right hand side variables, and 95% confidence intervals are plotted using standard errors clustered at the institution level to correct for serial correlation. Model 2 adds linear trends, estimating equation (13). Model 3 adds year fixed effects, estimating equation (14).

These results are contained in Figure 17. My baseline specification M1 estimates (12) where β_t is averaged over two year bins. I find a sharp difference in this relationship between the 1960s, where women capture essentially none of the new seats created, and the 1970s, where women capture slightly above 20% of new seats.

To better understand these changes, I consider two other specifications, which control for different types of changes. I consider a second specification M2 with institution fixed-effects, which are equivalent to unit-specific linear trends in a first-differences model:

$$\triangle F_{it} = \beta_t \triangle E_{it} + \gamma_i + \varepsilon_{it} \tag{13}$$

This specification fits a linear trend in women's enrollment for each institution, measuring responses to enrollment growth apart from this trend. The results of this specification are plotted in Figure 17. This produces no almost no difference in my point estimates, suggesting that differential trends are not a substantial explanatory factor in women's entry.

My last specification adds year fixed effects:

$$\triangle F_{it} = \beta_t \triangle E_{it} + \gamma_i + \delta_t + \varepsilon_{it} \tag{14}$$

This significantly lowers the estimated coefficients in the early 1970s. This is consistent with evidence presented earlier that women gained seats previously filled by men during this time period as a result of anti-discrimination policy. However, from 1975-1980, my estimates are robust to both of these changes, suggesting that enrollment changes in the later 1970s are driven primarily by the expansion of enrollment.

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.

4.4 Treatment Effect Dynamics

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

4.4.1 Case Study: University of Cincinnati

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

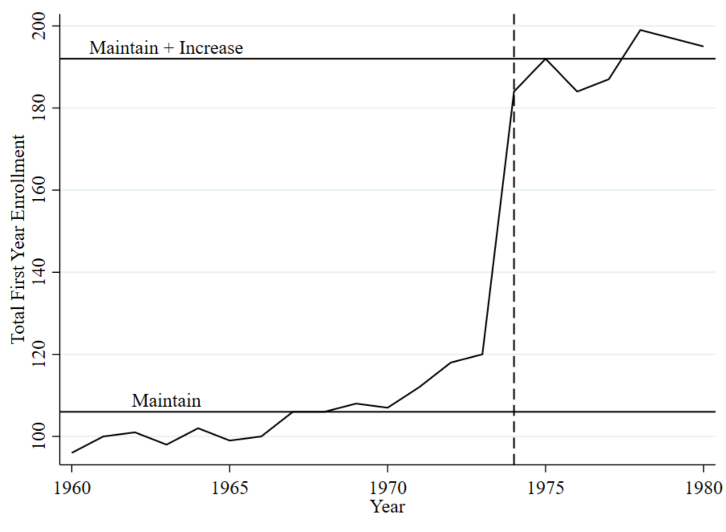
To understand the potential dynamics of women's entry, I consider a case study of a grant given to the University of Cincinnati. This medical school received a grant in Fiscal Year 1970 for $32m to construct a Basic Science Building. In exchange, the university would maintain 106 existing seats and add 86 new seats. The university's website reports that this building was completed in 1974, and the time series for enrollment verifies this. Figure 18 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 19. 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.[9] 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

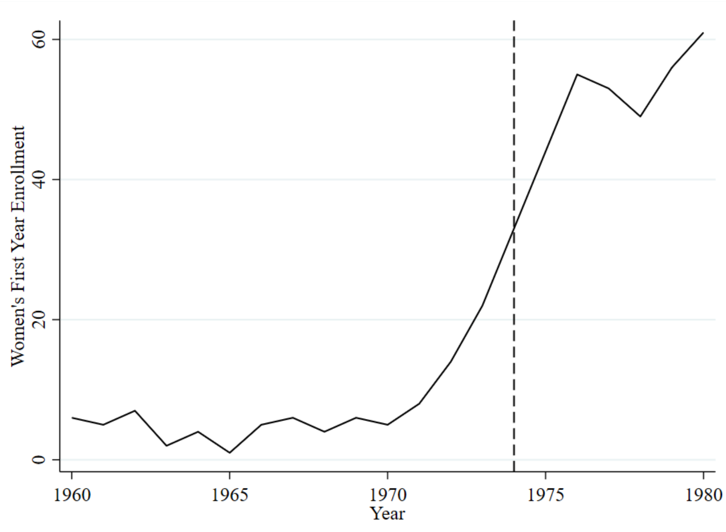
[9] Women's Medical is an all-women's school until 1970, so I drop the school from my donor pool to prevent this from confounding my results.

Figure 18: 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 19: University of Cincinnati Women's First-Year Enrollment, 1960-1980



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

not matching on these years, I allow for a simple graphical placebo test along these lines. Table 2 summarizes the results of my estimation procedure, which constructions a synthetic University of Cincinnati from four medical schools.

Table 2: Synthetic University of Cincinnati

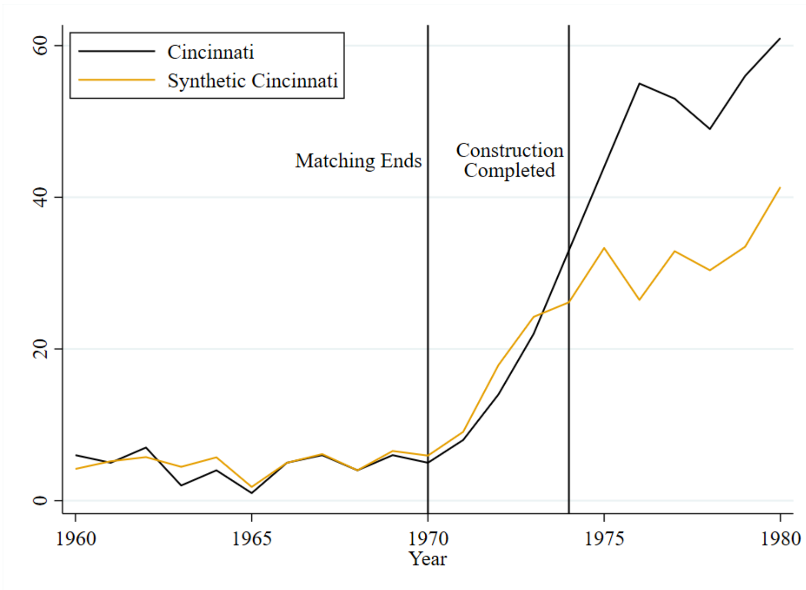
School	Weight	School	Weight	School	Weight
Albany	0.166	Indiana	0	Puerto Rico	0
Albert Einstein	0	Jefferson	0	Rochester	0
Boston	0	Johns Hopkins	0	SUNY-Buffalo	0
Bowman Gray	0	Kentucky	0	SUNY-Downstate	0
California-San Francisco	0	Loma Linda	0	SUNY-Upstate	0
Case Western Reserve	0	Loyola (Stritch)	0	South 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 2 includes entries for all medical schools in my donor pool. I include the weight on each medical school which comprises my synthetic control. The only institutions with positive weights are Albany, Cornell, the Medical College of Georgia, and Utah.

Figure 20 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 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.

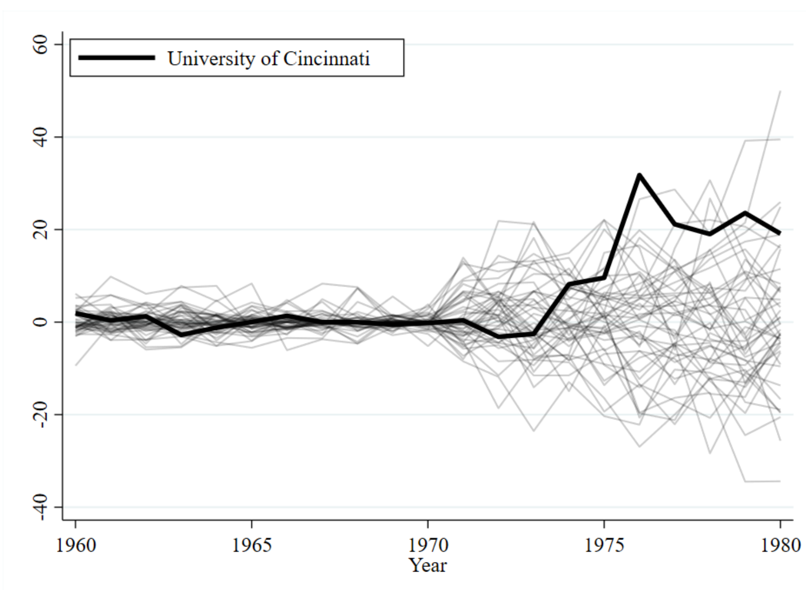
I perform the standard placebo test recommended in Abadie et al. (2010). I add the University of Cincinnati back into my donor pool, and run an identical procedure for all 46 medical schools. Figure 21 plots the treatment effect estimate for every medical school, with results for the University of Cincinnati highlighted; a graphical analysis confirms that my findings are extreme relative to the distribution plotted here. I confirm this by running the standard statistical test recommended by Abadie (2021) - I calculate a p-value of 0.022.

Figure 20: 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 2

Figure 21: Placebo Test



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

4.4.2 Extending The Differences Specification

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

$$\triangle F_{it} = \beta_{t,1} \triangle E_{i,t} + \beta_{t,2} \triangle E_{i,t-1} + \varepsilon_{it} \tag{15}$$

I include only one additional lag to test the hypothesis that there are dynamic effects Further, I bin estimates into two groups - before 1971 and after 1970, to test if there are differential effects across decades. My results are in Table 3.

Table 3: Dynamics of Enrollment Expansions

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

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

I plot estimates from specification (12) in Column 1 and **??** in Column 2, where coefficients are binned for years 1960-1970 and 1971-1980. Standard errors are clustered at the institution level to correct for serial correlation.

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

5 Conclusion

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

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

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

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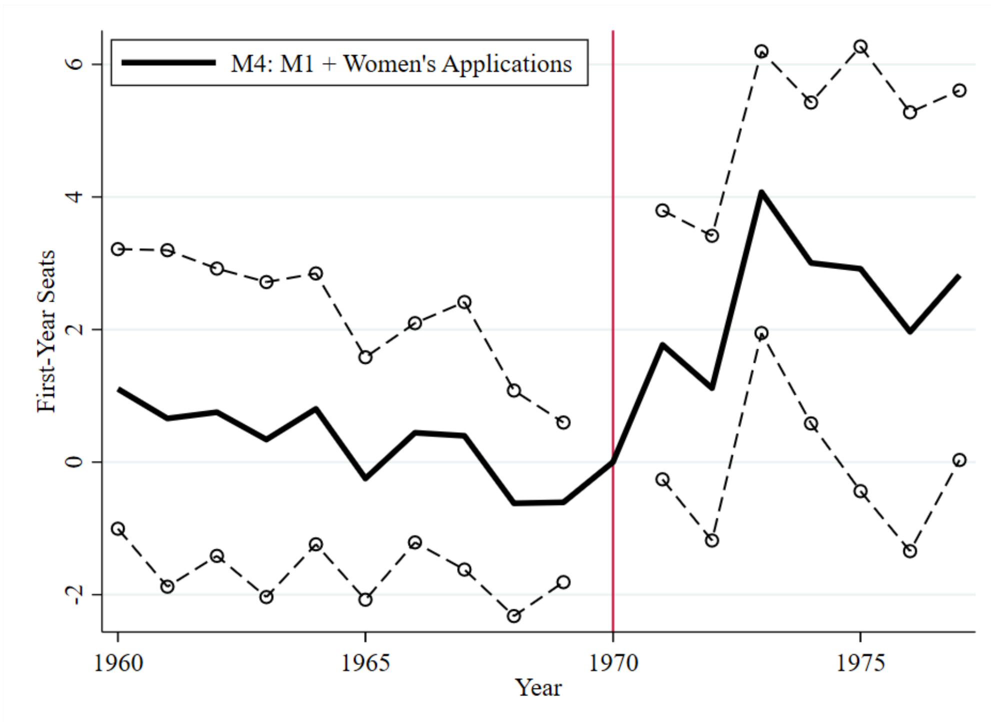
A Additional Results

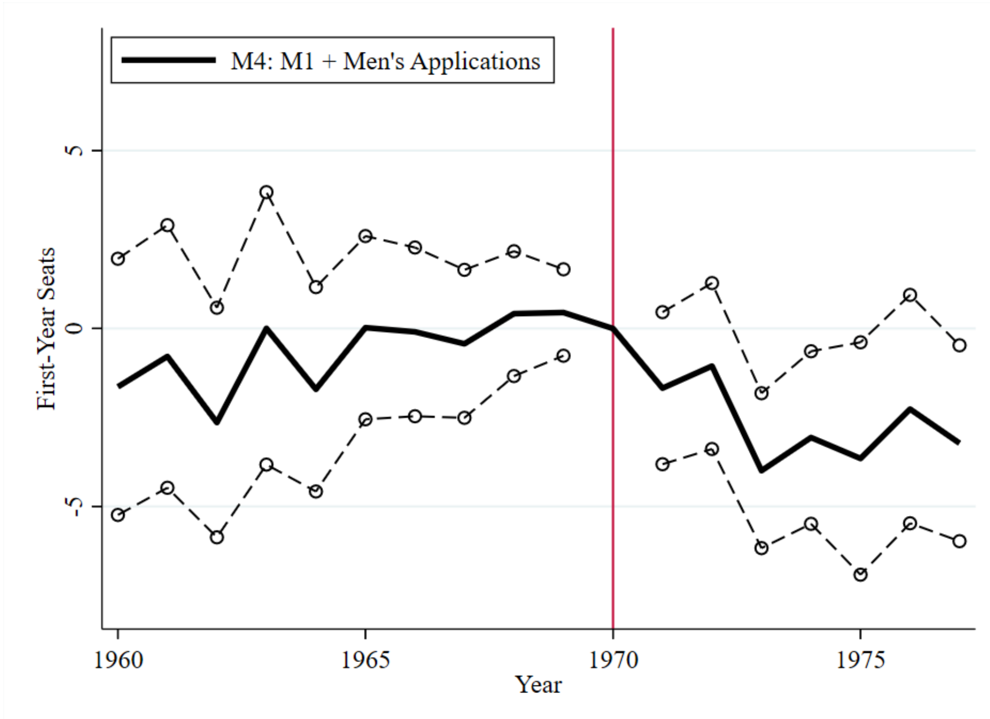
A.1 DiD: Application Controls

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 Data Sources

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.

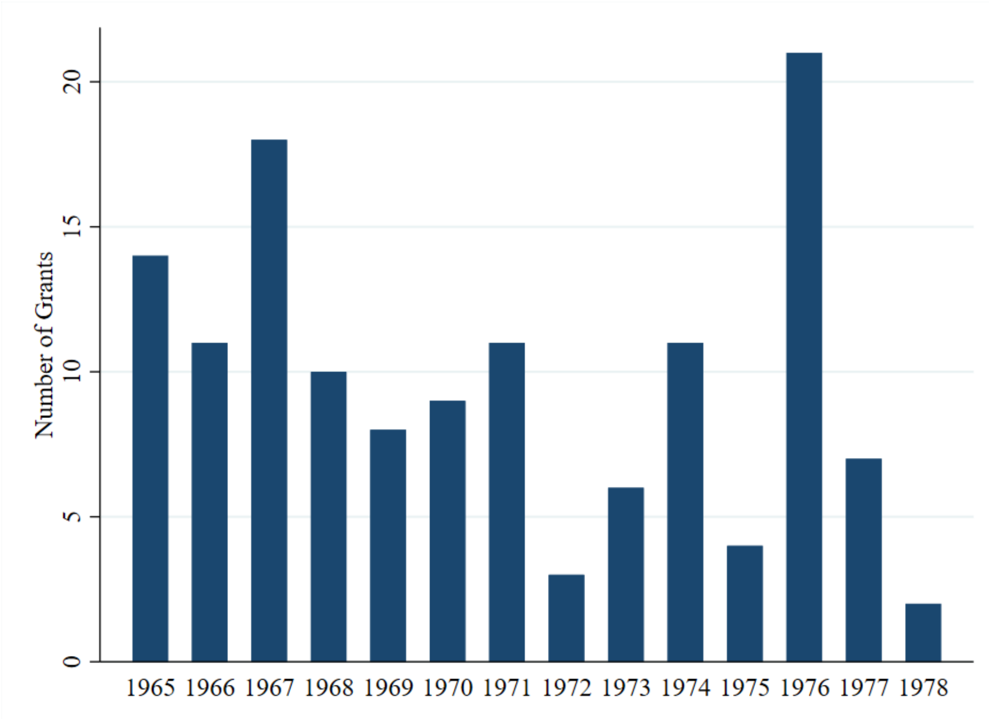
Accordingly, to extend my panel back to 1960, I utilize estimated enrollment data. This is published in the *MSAR* and then reprinted in the *JAMA* Education Number during my years of interest, which is where I collect it. Medical Schools are surveyed in the spring before a class enters in the next fall 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				

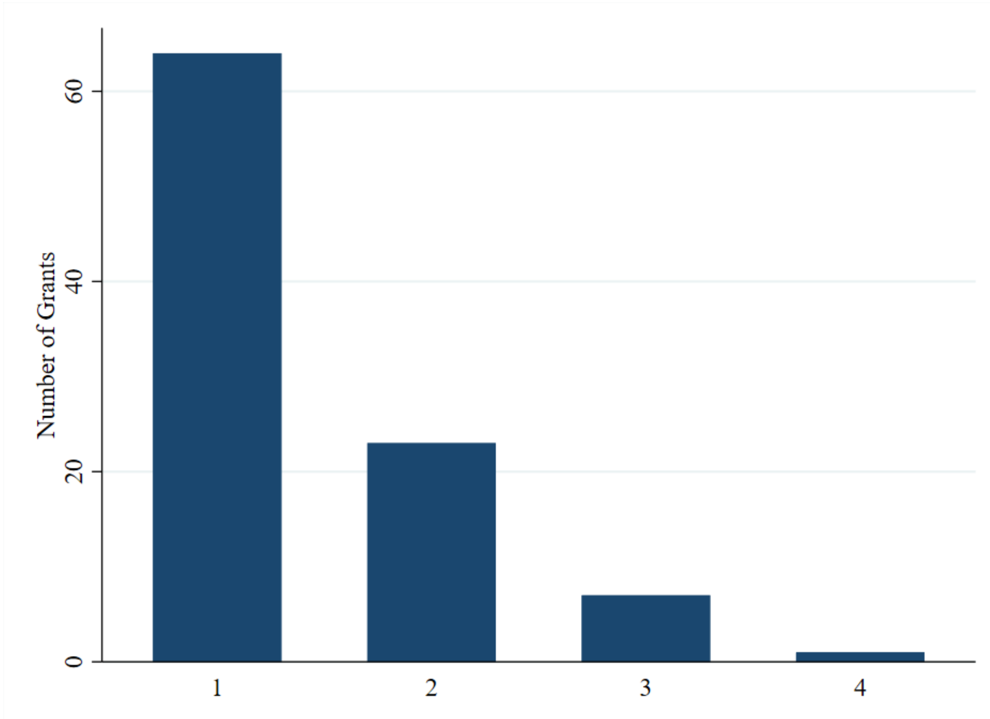
B.2 Construction Grants

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.