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ISSN: 2365-9793

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ABSTRACT

Effects of Mandatory Residencies on Female Physicians' Specialty Choices: Evidence from Japan's New Medical Residency Program*

Female physicians remain underrepresented in surgical specialties in Japan. The 2004 New Postgraduate Medical Education Program mandated a two-year rotating residency that allowed residents to choose their specialty after training in multiple fields, including surgery. Following this reform, there was a 2.7 percentage points increase in female physicians choosing general surgery and a 1.5 percentage points increase in urology being chosen, compared to male physicians, as well as a 3.4 percentage points decrease in internal medicine being chosen. This shift of female physicians toward male-dominated surgical specialties is primarily seen in breast surgery, catering to female patients, and in urology, known for its shorter workweeks.

JEL Classification: J16, J24, J44

Keywords: specialty choice, policy reform, gender

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* We gratefully acknowledge the permission received from the Ministry of Health, Labour and Welfare (MHLW) to use the data collected through the Survey of Physicians, Dentists and Pharmacists. For helpful comments and suggestions, we would like to thank Yoko Ibuka, Ryo Kambayashi, Mizuki Kawabata, Sachiyo Nishida, Shintaro Yamaguchi, and participants in meetings held at the International Conference on Science and Technology for Sustainability at the Science Council of Japan, the Japanese Economic Association, the Annual Congress of the Japanese College of Surgeons, the Asian & Australasian Society of Labour Economics, Hitotsubashi University, Hokkaido Medical Association, Keio University, Nihon University, Otaru School of Commerce, and the University of Tokyo. This research is supported by JSPS grant 19H01497.

1. Introduction

The proportion of female physicians under the age of 45 in Japan significantly increased from 13.8 percent in 1994 to 30.8 percent in 2016. Female physicians often choose different specialties than their male counterparts do. Concerns among public health experts have arisen regarding the potential consequences of the gender differences in initial specialty choices, especially considering that 77.6 percent of physicians continue to work at age 40 in the specialty they choose initially. These gender differences, coupled with the rise in female physicians, could lead to shortages or surpluses in certain specialties (Fukuda and Harada, 2010).

This paper examines the impact of the New Postgraduate Medical Education Program (PGME) implemented in 2004, which mandated that medical residents must train across seven specialties, including general surgery—a typically male-dominated specialty—rather than focusing solely on one specialty of their own choosing. We find that the reform led to a 2.7 percentage points increase in the likelihood of female physicians specializing in general surgery, compared to their male counterparts. Before the reform, 4.8 percent of female physicians from the 1976–1978 birth cohorts chose general surgery, which increased to 7.2 percent post-reform. In contrast, the numbers for male interns decreased slightly from 13.8 percent to 13.6 percent. Additionally, the proportion of women choosing urology—another male-dominated surgical specialty with one of the shortest workweeks—rose by 1.5 percentage points.[1] The proportion of women who choose urology was 0.8 percent pre-reform, increasing to 1.5 percent post-reform; the corresponding numbers for men decreased from 3.8 percent to 3.3 percent. After the reform, female interns were 3.4 percent less likely to enter internal medicine, a specialty already chosen by over 30 percent of male and female physicians.

Since the existing medical literature finds that (i) surgical experiences during medical training are associated with an increased interest in surgical careers (Marshall et al., 2015), and (ii) male medical students are more inclined than their female counterparts to express an intention to pursue surgery upon entering medical school,[2] we conclude that the post-reform surgical training experiences have prompted Japanese female interns to modify their

[1] Urology is the medical and surgical specialty involving disorders of the genitourinary tract and the adrenal glands (American College of Surgeons, https://www.facs.org/education/resources/residency-search/specialties/urology).

[2] Nishida and Usui (2023) conducted an alumni survey at Sapporo Medical University in Japan in 2023. It revealed that 37.2 percent of male physicians reported an intention to pursue surgery upon entering medical school, while only 10.6 percent of female physicians reported a similar preference at that point in time.

expectations, particularly regarding their career potential as surgeons.[3] More female interns choosing surgery after receiving actual surgical training aligns with findings from other studies indicating that although female or minority students are initially less likely to choose male-dominated fields or institutions (e.g., STEM fields, selective universities), they are more likely to choose these paths when provided with more relevant information (e.g., Cohodes et al, 2022; González-Pérez et al., 2020).[4]

While the new residency program in Japan has led some young female physicians to pursue surgical specialties, those were predominantly limited to general surgery and urology without significant involvement in orthopedics—a surgical specialty known for its demanding physical requirements.[5] General surgery encompasses various subfields, including breast surgery, which predominantly serves female patients. The proportion of female breast surgeons in Japan increased from 15.0 percent in 2008 to 28.6 percent in 2016, with other surgical subfields experiencing comparatively modest growth in female representation. The female physicians who are increasingly choosing surgery are drawn to breast surgery, not only because almost all patients are female, but also because the patients tend to prefer physicians of their own gender (Reid, 1998).

Furthermore, among hospital doctors in surgical specialties who work more than 60 hours per week, urologists are underrepresented (with 38.5 percent in urology versus 50.9 percent in surgery, 53.0 percent in neurosurgery, and 46.2 percent in orthopedics, according to Ministry of

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[3] Our result is in accordance with a 2006 survey by the Ministry of Health, Labour and Welfare (MHLW) involving medical interns who began their residency in 2004—this group being the first affected by the reform. The survey found that one-third of these interns changed their specialty choice from what they had initially expected before starting their two-year residency. However, the survey did not ask which specialties the residents initially expected to pursue or the specialties they eventually chose. Similarly, Tomiki et al. (2011) surveyed medical residents who started their residency at Juntendo Hospital and its affiliated hospitals in 2007, 2008, and 2009. Their findings indicate that most residents decided their specialty in the latter half of their second year of training, with over 90 percent citing clinical training experience as influential in their decision-making, and 40 percent changing their specialty choice. These findings underscore the significance of the initial two years of clinical training as a critical period for Japanese medical residents in deciding their future specialties.

[4] Cohodes et al. (2022) found that a STEM summer program in the US aimed at underrepresented high-school students increases the likelihood of these students graduating with a STEM degree. Their research highlights the fact that the largest effect on STEM degree attainment comes from the six-week, in-person program, while the effect of one-week and online programs had a smaller and insignificant impact, indicating the importance of lengthy, hands-on, in-person experiences. González-Pérez et al. (2020) evaluated a role-model intervention in Spain, where female volunteers from STEM fields engaged with girls aged twelve to sixteen at school to discuss their careers. This intervention improved girls' beliefs in their potential success in STEM fields and increased the likelihood of their choosing a STEM career.

[5] See, for example, Rohde et al. (2016) and https://careertrend.com/physical-demands-being-orthopedic-surgeon-40350.html.

Health, Labour and Welfare, MHLW, 2019). This is consistent with findings by Goldin and Katz (2011), who observed that surgical specialties with lower weekly workloads in the United States tend to have higher proportions of female physicians. They also noted an increase in female representation in colon and rectal surgery and gastroenterology; this coincided with the expansion of routine, scheduled colonoscopies, which made the workload more predictable and thus reduced overtime hours.

While mandatory surgical training in Japan has increased interest among female physicians in surgical fields, the work characteristics inherent in the surgical profession act as career barriers to female physicians, especially when they have greater domestic responsibilities. These barriers include a longer workweek and a longer training period for board certifications. Therefore, solely mandating surgical training may not suffice to bridge the gender gap in every surgical field.

The paper is structured as follows. Section 2 provides background information on the Japanese medical profession and the 2004 medical reform. Section 3 describes the data used for our analyses. Section 4 discusses the empirical framework for examining the effect of the 2004 training reform on the specialty choice of medical residents. Section 5 presents the main results on specialty choice, conducts several robustness checks, and discusses their implications. Section 6 examines the reform effects on the long-term career advancement of female physicians. Finally, Section 7 provides the conclusion.

2. Medical Education and Residency Training Reform in Japan

In Japan, students typically graduate high school at the age of eighteen, due to the educational system's uniform progression.[6] Those aspiring to become physicians apply to six-year undergraduate medical programs at universities.[7] Admission to these programs requires passing a high-stakes examination. There were 32,124 applicants to public university medical schools in 2005, with only 4,340 accepted, resulting in an acceptance rate of 13.5 percent. Those who fail to pass the medical-school entrance exam on their first attempt often spend one or more additional years preparing for the entrance exam in the following year(s). Consequently,

[6] Students can skip grades only after their first two years of high school, and even this is uncommon. Additionally, before they reach high school, it is rare for students to advance or be held back a grade, regardless of their abilities or challenges. As a result, students almost always move through their education with their age cohort (OECD, 2010).

[7] This section draws extensively from Koike et al. (2010) and Takahashi et al. (2017) for the explanation of medical education and the residency training program in Japan.

among those who entered medical school in 2005, 34.9 percent had graduated from high school that same year, 32.4 percent the previous year, 16.2 percent two years prior, and 6.2 percent three years prior, while 10.4 percent had graduated earlier than 2002 (see Appendix Table 1). Once enrolled, however, almost all students complete the six-year program on time. In 2005, only 3.57 percent of students required more than the minimum six-year enrollment period (Appendix Table 2; Ministry of Education, Culture, Sports, Science and Technology, MEXT, 2010). Upon completion of their studies, students take the National Medical Practitioners Qualifying Examination, with a passing rate of 89.1 percent in 2005. Passing this exam grants them a National License for Physicians from the Ministry of Health, Labour and Welfare, making them newly registered physicians.

Prior to 2004, the majority of newly registered physicians enrolled in a noncompulsory two-year postgraduate clinical training program at the university hospital affiliated with their medical school, where they typically trained in only one specialty. In 2004, the Japanese government implemented a reform in medical education, the first in thirty-six years, introducing the New Postgraduate Medical Education Program (PGME). This program was designed to provide *all* medical residents with essential training as primary-care doctors during their two-year postgraduate residency. Before the NPMEP, residents would choose their specialty immediately upon receiving their medical license and train exclusively in that specialty at their universities or related facilities. However, under the 2004 reform, residents choose their specialty only *after* receiving two years of mandatory residency training divided among *seven* specialties: (1) internal medicine, (2) general surgery, (3) emergency medicine (including anesthesiology), (4) pediatrics, (5) psychiatry, (6) community medicine, and (7) OBGYN.[8] Training under the new system has been mandatory for any physician licensed on or after April 1, 2004. Between 2004 and 2009, medical interns rotated through seven specialties over the course of their two years of residency. The first year of training focused on internal medicine (for at least six months), as well as surgery and emergency medicine (the model course shown for each of these being three months long); in the second year, training included at least one month each in pediatrics, OBGYN, psychiatry, and community medicine. As a result of the 2004 reform, medical residents gained the opportunity to train in multiple specialties, which

[8] See Teo (2007) and Iizuka and Watanabe (2016) for details on the 2004 reform. In addition to establishing a mandatory rotating residency training program, the PGME introduced a matching mechanism similar to the one used in the US to allocate physicians to a two-year mandatory residency training program.

was not possible before the reform. After this two-year program, Japanese residents choose their initial specialty and move into training in their chosen specialty.

Another aspect of the reform involves the residents' workweek: the statutory workweek of the medical residents is set at forty hours for their first two years, and residents are prohibited from engaging in medical practice outside the training program. The workweek of medical residents is also the subject of Wasserman (2023), which studies the impact of a US policy, instituted in 2003, that capped the average workweek for a medical resident at eighty hours in their chosen specialty. Since the hours had differed across specialties before the policy change, she was able to use the variation among specialties in the reduction of working hours to discover that the reduction in work hours led more women to change their specialties to those with reduced work hours. In Japan, however, because this forty-hour workweek applies only for the initial two years of a residency, it has led to even more overwork among more senior physicians. Consequently, residents can foresee that they too will face overtime work in the future; therefore, any possible workweek shortening in surgical specialties may have a lesser impact on Japanese residents' initial specialty choice.

In 2010 the government instituted a further change in the training program, which allowed for more flexibility in the training program so that resident-training clinical hospitals could offer more varied programs. Among the seven specialties cited earlier, internal medicine, emergency medicine (without anesthesiology), and community medicine remained mandatory, whereas surgery, anesthesiology, pediatrics, OBGYN, and psychiatry became elective.[9] Therefore, this paper will focus solely on the impact of the 2004 reform, which made training in seven specialties mandatory, on the choice of initial specialty by medical residents. Additionally, before 2018 there was no formal quota system limiting the number of physicians who could specialize in a particular specialty; thus, during our study period, medical residents were allowed to choose both the specialty and the prefecture where they preferred to work.[10]

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[9] Based on surveys conducted by the Ministry of Health, Labour and Welfare in 2011 and 2013, the average time for training in internal medicine increased from 8.0 months to 9.5 months, while the average times for specialties that had become electives all decreased. In particular, the training time in surgery decreased from 3.2 months to 2.3 months; in anesthesiology from 2.1 months to 1.9 months; in pediatrics from 1.8 months to 1.3 months; and in OBGYN from 1.5 months to 1 month (https://www.mhlw.go.jp/file/06-Seisakujouhou-10800000-Iseikyoku/0000049070.pdf). Unfortunately, the survey does not provide data on the proportion of interns who received no training in any of the elective specialties after 2010.

[10] It was only after 2018 that a ceiling number was set on the number of physicians to be recruited in each prefecture and each specialty. That ceiling number is set by the Japanese Medical Specialty Board, which judges what number of physicians is sufficient for each prefecture and in each specialty.

3. Data

We use data from the National Survey of Physicians, conducted biennially by the Ministry of Health, Labour and Welfare, which covers the universe of physicians in Japan. We use the data between 1994 and 2016. The data include physicians' gender, birthdate, physician registration number, registration date, primary specialty, type of practice (i.e., hospital or clinic, practitioner, duty doctor, other job, or not employed), and workplace (i.e., the municipality).

After obtaining their medical license from the Ministry of Health, Labour and Welfare upon passing the National Medical Practitioners Qualifying Examination, physicians do not need to renew this license because it remains valid indefinitely. Therefore, the medical registration number is unique for each physician. We track the physicians by utilizing information on gender, birthdate, medical registration number, and date of medical registration.[11] We can track physicians every two years after they receive their license.[12] In our analysis, we restrict the physicians to those who (i) were born in the period extending from the 1968 through the 1981 Japanese academic years (i.e., between April 2, 1968, and April 1, 1982), and (ii) were registered as physicians by the age of 27 (i.e., physicians who spent no more than four years beyond the norm to obtain their medical license, which is 89.2 percent of all medical residents). Our sample comprises 61,249 male physicians and 27,934 female physicians.

We define the *initial specialty choice of a physician* as the primary specialty a physician chooses two years after receiving their medical license. We observe marked gender differences in their initial specialty choice (Table 1). Only 5.2 percent of female physicians chose surgery as their initial specialty, compared to 14.7 percent of male physicians. Female physicians were also less likely to choose urology (0.8 percent of female physicians versus 3.5 percent of male

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[11] Across 1994 and 2016, 2.5 percent of physicians reported different genders, 1.8 percent of physicians reported different birth years, and 0.9 percent reported different registration years; these physicians have been removed from the sample.

[12] Licensed doctors living in Japan are obliged to submit the form; those who do not incur a penalty of 500,000 yen (4,000 USD) and their names are removed from the Medical Practitioner Eligibility Verification Search System maintained by the Ministry of Health, Labour and Welfare. Despite these penalties, not all physicians fulfill this obligation. A physician may fail to submit this form because of (1) death, (2) residing in a foreign country, or (3) residing in Japan but without practicing as a medical doctor that particular year. We assume that the physician is "not active as a physician in that particular year" if he/she did not submit the survey in that particular year, but submitted the survey in any of the succeeding years. Under this assumption, 3.2 percent of women in their twenties, 13.1 percent of women in their thirties, and 9.6 percent of women in their forties did not submit the form; for men, these numbers are 1.9 percent, 6.2 percent, and 3.9 percent, respectively. We speculate that women in their childbearing years are less likely to submit the form because they are not working due to child-rearing.

physicians), neurosurgery (0.8 percent versus 3.6 percent), or orthopedics (2.1 percent versus 9.5 percent). In contrast, 8.3 percent of female physicians chose OBGYN, while only 2.7 percent of male physicians chose that specialty; female physicians were also more likely to choose ophthalmology (8.1 percent of female physicians versus 4.0 percent of male physicians), pediatrics (9.6 percent versus 4.9 percent), anesthesiology (7.6 percent versus 3.7 percent), and dermatology (7.0 percent versus 1.9 percent). A large fraction of both men and women chose internal medicine (31.2 percent of female physicians versus 32.9 percent of male physicians).

In the following analysis, we consider the predominantly male specialties to be surgery, urology, neurosurgery, and orthopedics, and the predominantly female specialties to be OBGYN, ophthalmology, pediatrics, anesthesiology, and dermatology. We also examine internal medicine because such a large proportion of both male and female physicians works in this specialty.

In Table 2, we display how the proportion of women choosing a particular initial specialty changed from the 1968 to the 1981 birth cohorts. Specifically, the proportion of female physicians choosing surgery as their initial specialty increased from 7.2 percent for the 1968–1969 birth cohort to 15.9 percent for the 1974–1975 birth cohort and to 18.8 percent for the 1980–1981 birth cohort. The trend is even stronger in urology, increasing from 3.7 percent for the 1968–1969 birth cohort to 9.4 percent for the 1974–1975 birth cohort and to 19.5 percent for the 1980–1981 birth cohort. The proportion of women choosing female-dominated specialties also increased, and to a greater extent, rising from 44.3 percent to 62.0 percent to 66.5 percent in OBGYN, and from 34.3 percent to 51.5 percent to 56.4 percent in anesthesiology. This trend reflects a broader increase in female representation across all specialties, with more pronounced growth in female-dominated specialties.

4. Empirical Strategy

4.1 Initial Specialty Choice Before and After the Reform

We begin by examining whether there is a noticeable difference between residents who chose their initial specialty before the 2004 reform, and those who made their choice after the reform was implemented. To investigate this, we use separate quadratic polynomials for before and after the 2004 reform to analyze the proportion of physicians' initial specialty choices. Any gap observed in 2004 serves as an estimate of the reform effect. Figure 1 displays a plot of the proportion of residents who chose a specific specialty against the year they registered as physicians (with female physicians in the upper panel and male physicians in the lower panel).

The specialties represented in Figure 1 are surgery, urology, neurosurgery, ophthalmology, anesthesiology, and internal medicine, each of which exhibited notable variations around the year of the reform.

As already noted, the proportion of female physicians who choose surgery has been increasing since 1994, but there is a discontinuous increase at the threshold reform year of 2004. In contrast, the proportion of male physicians who choose surgery has been gradually declining since 1994, with no break at the reform year of 2004. For urology, there is a discontinuous increase at the threshold year of 2004 for female physicians, but a discontinuous drop in that year for male physicians. However, there is a notable decrease in the choice of neurosurgery for both female and male physicians in 2004, with a larger decline for male physicians.

Regarding internal medicine, the probability of female physicians' choosing this specialty drops discontinuously in 2004, while there is a discontinuous increase for male physicians. The choice of ophthalmology declines gradually for both male and female physicians, and there is no break in the reform year of 2004. Also in that year, for both male and female physicians there is a discontinuous increase in the choice of anesthesiology.

4.2 Econometric Model

Among women who registered as physicians in 1994, 3.8 percent chose surgery as their initial specialty, which increased to 7.2 percent for those registering in 2009. This rise in female physicians choosing surgery suggests not only an increasing interest in pursuing surgery among later cohorts of female physicians, but also an apparent decrease in barriers to entry into predominantly male specialties, barriers that previously might have included discrimination against earlier female cohorts.[13] Therefore, the circumstances relevant to specialty choice for female residents born in the 1960s (who registered as physicians around 1995 and received medical training before the reform) may differ from the circumstances for those born in the late 1970s (who registered around 2005 and trained post-reform) for reasons *independent of* whether or not they participated in the reform. In our subsequent analysis, we therefore control for medical residents' birth cohorts and their interaction with a female dummy.

To examine whether the difference in the training program (pre-reform vs. post-reform)

[13] When the authors presented this paper at a public lecture at the University of Tokyo, a woman physician left a written note for the presenters. She recounted that, in the late 1980s, women were not admitted at all to the surgical departments in the University of Tokyo's Medical School, which provides at least anecdotal evidence of informal or unofficial barriers to women entering medical specialties that had historically been exclusively male.

affected the *initial* specialty choice of medical residents, we estimated the equation as follows:

$$1(\text{initial specialty} = \text{k}) = \beta_1 Post + \beta_2 FEM \times Post + X\Gamma + \varepsilon, \qquad (1)$$

where k is specialty, FEM is an indicator for female medical resident, and $Post$ is an indicator for whether the resident underwent post-reform training. The vector X contains (i) indicators for whether the medical resident was born in the academic year j, (ii) the interaction of these birth cohort indicators and a female dummy, (iii) indicators for age at medical licensure (calculated here as 18 plus any additional years of preparation), which could be linked to the resident's academic skill level, (iv) prefecture dummies, and (v) the log of the population size of the municipality where the medical resident works.

The coefficient of interest, β_2, captures the reform effect, which is the likelihood of female physicians' choosing specialty k after the reform relative to the likelihood before the reform (compared to male medical residents). The identifying assumption is that, absent the 2004 reform, the change in initial specialty choice would have been the same for the two groups (i.e., those who received pre-reform training, versus those with post-reform training) after controlling for background characteristics, including the resident's birth cohort and additional preparation years. Under this assumption, the coefficient β_2 represents the average causal effect of the reform on the initial specialty choice.

In our analysis, we are concerned about the possibility that some physicians in the 1976–78 birth cohorts may have self-selected the timing of obtaining their medical license to nudge themselves over the 2004 threshold and thus receive the rotating training.[14] To prevent this kind of self-sorting from occurring, it would be necessary for the medical reform not to have been announced too far in advance of its implementation to ensure that, after the announcement of the reform, medical students did not manipulate the year in which they received their medical license. In fact, the description of the 2004 reform was announced in December 2000, but the exact date for its implementation was not announced until December 2002. It is unlikely that

[14] Specifically, the timing of medical training relative to the 2004 reform varied by birth year and the age at which individuals obtained their medical licenses. For those born in the 1976 academic year, individuals who received their medical license by the ages of 24, 25, and 26 received their training before the 2004 reform, but those who were licensed at the age of 27 underwent training after the reform. Next, for the 1977 cohort, those licensed by the ages of 24 or 25 were trained before the reform, while those who became licensed at the ages of 26 or 27 received post-reform training. Finally, in the 1978 cohort, those who obtained their license by the age of 24 were trained before the reform, but those licensed at the ages of 25, 26, or 27 underwent their training after the reform was implemented.

fifth- or sixth-year medical students at the time would have repeated the coursework just in order to participate in the New Postgraduate Medical Education Program (PGME) in 2004. This can be confirmed by observing that (i) the number of years' delay in entering medical school did not change for the residents receiving their training *before* the reform (i.e., those who entered medical school before 1997) compared to those trained *after* the reform (i.e., those who entered medical school after 1998, and so definitely received the post-reform training), as shown in Appendix Table 1; (ii) the grade repetition rate is always in the range of 3 to 4 percent both before and after the reform, as shown in Appendix Table 2; and (iii) the passing rate on the National Examination for Medical Practitioners has remained stable at around 90 percent, with specific rates of 90.4 percent in 2002, 90.3 percent in 2003, 88.4 percent in 2004, and 89.1 percent in 2005. These findings indicate that the reform did not significantly alter the educational timelines for medical students, but rather inspired a negligible amount of strategic behavior regarding licensing year adjustments.

5. Estimation Results

5.1 Baseline Results

We examine the effect of the reform on the probability of female physicians entering each specialty relative to male physicians. A positive coefficient on $\text{Post} \times FEM$ indicates that post-reform female physicians are more likely than their male colleagues to choose specialty j as their initial specialty choice, relative to their pre-reform counterparts. Table 3 reports the estimation results.

We first look at the four specialties with a higher proportion of male physicians. In the case of surgery, reported in column 1 of Table 3, the coefficient on $\text{Post} \times FEM$ is 0.027, which is significant at the 5 percent level. In the pre-reform 1976–1978 cohort, 13.8 percent of male physicians and 4.8 percent of female physicians selected surgery as their initial specialty. Women in the pre-reform group were 9.0 percentage points less likely than men to choose surgery as their initial specialty, but the gender gap narrowed by 2.7 percentage points for those who received residency training after 2004. This decrease in the gender gap can be considered large because it corresponds to almost one third of the prior gap.

Regarding the likelihood of entering urology, as shown in column 2 of Table 3, the gender gap narrowed by 1.5 percentage points for those who received their training after 2004. Since the women's probability of choosing urology in the pre-reform 1976–78 cohorts is only 0.8 percent and that of men is 3.8 percent, women in the pre-reform group were 3.0 percentage points less likely than men to choose urology as their initial specialty; the decreased gender gap due to the reform is therefore half of the prior gap. The corresponding gender gap in neurosurgery is 0.9 percentage points, which is small but significant at the 10 percent level (column 3, Table 3). However, the gender gap in orthopedics is –0.2 percentage points, which is close to zero and takes a negative value (column 4, Table 3).

Next, we look at the five specialties with a historically higher proportion of female physicians. In the case of ophthalmology, one of the traditionally female-dominated specialties, the corresponding difference takes a negative value of –1.2 percentage points, although this is insignificant. Since the women's probability of choosing ophthalmology in the pre-reform 1976–78 cohorts is 7.4 percent and that of men is 3.9 percent, women in the pre-reform group were 3.5 percentage points more likely than men to choose ophthalmology as their initial specialty. Thus, the reform reduced the gender gap by one third. The gender gaps in the other female-dominated specialties (i.e., OBGYN, pediatrics, anesthesiology, and dermatology) are estimated to be small and not statistically significant.

When we look at internal medicine, the specialty with the largest number of physicians of either gender, the corresponding difference takes the negative value of –3.4 percentage points. Since the women's probability of choosing internal medicine in the pre-reform 1976–78 cohort is 30.8 percent and that of men is 33.1 percent, women in the pre-reform group were 2.3 percentage points less likely than men to choose internal medicine as their initial specialty. Owing to the reform, the gender gap widened.

Overall, the reform led some female physicians to shift from internal medicine (the largest specialty for both genders) to surgery and urology (the two male-dominated surgical specialties).

5.2 Robustness Checks

We explore the robustness of our results to the changes in our sample specifications. First, we conduct a placebo test, hypothetically assuming that the medical reform occurred in 1996 instead of 2004.[15] We estimate the model as described in Section 4.2. The results, shown in

[15] In such a situation, individuals born after the 1971 birth cohort would be the treated group, while those born before the 1967 birth cohort would be the untreated group. For the 1968 birth cohort, individuals who received their medical license at ages 24, 25, or 26 constitute the untreated group and those who obtained their license at age 27 constitute the treated group. In the 1969 cohort, those who obtained their license at ages 24 or 25 constitute the untreated group, whereas those who obtained it at ages 26 or 27 constitute the treated group. For the 1970 cohort, those who obtained their license at ages 24, 25, or 26 constitute the untreated group, and those who obtained it at age 27 constitute the treated group.

Table 4, indicate that for all specialty choices, the coefficients on $Post \times FEM$ are small and insignificant. In particular, we observe no significant shift in the initial specialty choices of surgery or urology, nor any significant reduction in the choice of internal medicine, suggesting no impact from this hypothetical reform scenario.

Second, we expand our analysis to include individuals who obtained their medical license at age 28—those who underwent four additional years of preparation (representing six percent of medical residents). The findings, detailed in Table 5, show coefficients on $Post \times FEM$ of 0.026 for surgery, 0.020 for urology, and 0.008 for neurosurgery. Conversely, the coefficients are –0.033 for internal medicine and –0.015 for ophthalmology. Compared to earlier estimates from Section 5.1 (Table 3), the result for ophthalmology is now significant. These outcomes affirm that our findings are stable across different sample adjustments, reinforcing the conclusion that the reform has influenced female physicians to transition from internal medicine towards surgery and urology.

5.3 Discussion

5.3.1 Heterogeneity in Specialty Characteristics: Workweek and Minimum Years Required to Obtain Basic Board Certification

Sivey et al. (2012) showed that a range of work-life and intrinsic job attributes (e.g., working hours, time spent on call) influences the choice of specialty among junior doctors in Australia. Similarly, Goldin and Katz (2011) discussed how workplace flexibility contributes to the variation in the fraction of female doctors across different specialties in the United States.[16] Goldin and Katz (2011) find a negative relationship between the number of hours worked per week and the fraction of female physicians in a specialty. Furthermore, they highlight the fact that the nature of the workload—including additional demands such as being on call for emergencies, working regular night shifts, or dealing with unpredictable hours—is closely tied to the overall time demands placed on physicians, and that women generally prefer having fewer of these extra demands.[17]

[16] Goldin and Katz (2011) also consider other factors, including the length of residency (e.g., the longer residency required for surgery). Esteves-Sorenson and Snyder (2012) and Chen and Chevalier (2012) show that female physicians in the US work fewer hours than male physicians. Amer-Mestre and Charpin (2022) find that French female physicians prefer to self-select into occupations which have lower expected earnings, allow for more time flexibility, are less competitive, and are more socially important than those into which male physicians self-select.

[17] McKinstry (2008) points out that women physicians in the UK are concentrated in a few specialties regarded as family-friendly (in the sense of being more compatible with *the physician's* family). He

In this subsection, we review the working hours of physicians by specialty in Japan. Since the National Survey of Physicians does not collect data on working hours, we used the Survey on Work Conditions of Physicians conducted by the MHLW in 2019. This survey provides the average working hours for hospital doctors (including time spent on duty during nights and holidays) who work for more than four days per week, categorized by specialty. The average workweek for all hospital doctors is 56 hours 22 minutes. Surgery has the longest workweek at 61 hours 54 minutes, closely followed by neurosurgery with 61 hours 52 minutes; orthopedics ranks third at 58 hours and 50 minutes. These three are typically male-dominated surgical specialties. Interestingly, urology—another male-dominated surgical specialty in which we find a positive reform effect—shows a shorter average of 56 hours 59 minutes; this is roughly two hours less than the female-dominated specialty of OBGYN (which averages 58 hours 47 minutes), and is close to the overall average workweek for all hospital doctors.[18] Internal medicine's average workweek is 56 hours 13 minutes, similar to that of urology. In contrast, ophthalmology, a female-dominated specialty, has the second-shortest workweek among the fourteen specialties at 50 hours 28 minutes. Other female-dominated specialties also tend to have shorter working hours; for example, the average for anesthesiology is 54 hours 6 minutes.

We use these data to explore whether female physicians are more likely than male physicians to choose initial specialties that would permit a shorter workweek. We assign the average workweek data from the MHLW survey to each specialty initially chosen by medical residents, and then regress that workweek on a dummy for female physician, and on dummies for birth cohorts and the age at which physicians obtained their medical license. The regression results show a coefficient of –1.488 (0.027) for the female dummy, indicating that the initial specialties chosen by women permit a workweek that is 1.488 hours shorter than those chosen by men.[19]

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makes the point that women are underrepresented within specialties requiring more acute and on-call responsibilities and more technical skills. Using results of a 2013 UK survey, Santana and Chalkley (2017) find the greatest gender gap among GPs and surgeons. They argue that there could be many potential causes for specialty imbalances among demographic and socioeconomic groups, including the complex process of specialty allocation, potential earnings, and statistical discrimination.

[18] In a study at a public university hospital in Brazil, Costa (2017) finds significant differences in the operating times across various surgical specialties. Urology had one of the shortest average operating times at 94 minutes. In contrast, orthopedic surgeries averaged 152.0 minutes, and neurosurgical operations averaged 135.1 minutes, both exceeding the average duration for all surgical specialties.

[19] Physicians in specialties with longer workweeks tend to earn the highest salaries. When we look at the annual salary of hospital doctors by specialty, the highest average salaries are paid to physicians in neurosurgery and OBGYN (14,803,000 yen and 14,663,000 yen, respectively), which are specialties whose workweeks are among the longest, while the lowest average salary is in radiology (11,033,000

Goldin and Katz (2011) discuss the variability in the duration of training required by specialty as one factor influencing the distribution of female physicians across specialties in the US. Similarly, in Japan, specialties differ in the minimum number of years needed to obtain basic board certification following residency training. Specifically, a minimum of three years is required for surgery, internal medicine, OBGYN, pediatrics, radiology, and psychiatry, while at least four years are required for urology, neurosurgery, orthopedics, anesthesiology, ophthalmology, otorhinolaryngology, and plastic surgery. This raises the question of whether female physicians in Japan are like their US counterparts in being more likely to choose specialties that require a shorter training period to obtain basic board certification. To address this, we estimate the effect of women on the likelihood of choosing specialties that require four years of training, controlling for the same covariates as above. The results indicate that the initial specialties chosen by women are 5.3 percentage points less likely to require four years of training compared to those chosen by men.

From these analyses, we find evidence that female physicians in both the US and Japan tend to choose initial specialties with both shorter workweeks and shorter training periods, probably due to greater domestic responsibilities. They may therefore prefer a specialty that requires fewer hours, so that they can achieve a better work-life balance, and/or a specialty with a shorter training period so that they can start family formation sooner. Unfortunately, the National Survey of Physicians did not collect data on physicians' marital status or parental status until the 2016 survey (the latest survey available to researchers). As a result, we were not able to explore whether anticipating marriage and family influences the choice of initial specialty among female physicians. Future research should investigate these aspects further.[20]

5.3.2 Patients' Gender Composition

The impact of the 2004 reform is notably more pronounced in general surgery, compared to neurosurgery and orthopedics. General surgery encompasses a wide range of subfields, including breast surgery, which primarily serves female patients. The National Survey of Physicians only began listing breast surgery as a selectable option in 2008, making it impossible

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yen), a specialty with one of the shorter workweeks (JILPT, 2012). Nevertheless, the salary disparity among different medical specialties in Japan is considerably smaller than in the United States; for example, US surgeons in 1995 earned over $269,000 annually while family practice doctors in the US earned $131,200, approximately half the amount that surgeons made (Bhattacharya, 2005).

[20] Using data on Australian doctors, Cao and Rammonhan (2020) find that female physicians work fewer hours compared to male physicians, and Schurer et al. (2016) and Song and Cheng (2020) find that female physicians with children have significantly reduced working hours.

to directly evaluate the 2004 reform's impact on this specialty. Nevertheless, we can examine the changes in the proportion of female breast surgeons from 2008 to 2016. In 2008, 15.0 percent of breast surgeons were female, which contrasts sharply with the lower percentages in other surgical areas: 4.2 percent in gastrointestinal surgery, 4.4 percent in cardiovascular surgery, 6.7 percent in thoracic surgery, 5.2 percent in respiratory surgery, and 3.4 percent in colorectal surgery. By 2016, the proportion of female breast surgeons had increased to 28.6 percent (a 13.6 percentage point increase from 2008). In comparison, the increases in other surgical specialties were much smaller, with gastrointestinal surgery rising to 6.2 percent, cardiovascular to 5.9 percent, thoracic to 7.2 percent, respiratory to 7.6 percent, and colorectal to 5.3 percent. These statistics demonstrate that a significant number of female physicians who initially chose general surgery eventually specialized in breast surgery. Mandatory surgery rotations during clinical training likely enhanced their interest in surgical fields, particularly breast surgery. This subfield offers a distinct advantage, since the majority of its patients are female, and many show a preference for female surgeons, as noted by Ried (1998). This patient preference highlights the unique role that female surgeons can play within this specialty.

6. Long-Term Effects of the 2004 Reform

We now turn to examining whether post-reform female physicians who chose surgery initially were more likely than their pre-reform counterparts to (i) continue practicing in the same specialty, and (ii) obtain board certification.

In Japan, physicians can receive certification from academic medical societies—organized primarily by specialty, such as the Japan Surgical Society.[21] There are two types of certificates: (i) a board certificate in a basic field, obtained after completing three to four years of training following a two-year medical residency; and (ii) a board certificate in a subspecialty field. A single basic-area board certification exists for each broad medical specialty, such as surgery or OBGYN. However, subspecialty board certifications are more specialized and are available for each specific disease, organ, diagnostic method, and treatment approach. Typically, prerequisites for subspecialty certification include having a basic-specialty medical certification, completing an additional three to four years of training, and serving as the primary physician

[21] In Japan, medical societies are organized according to specialty fields. Each society is dedicated to advancing academic activities and enhancing the care provided within its specialty. These societies independently handle the training of physicians and manage the certification systems for specialists in their respective specialties.

in a specified number of medical cases (Sakai, 2004).[22]

We estimate whether the reform had different impacts on men and women regarding (i) their continuing to practice in the same specialty as their initial choice, and (ii) their acquisition of board certifications (both basic and subspecialty). The National Survey of Physicians has collected data on physicians' board certification statuses only since 2010; thus our analysis of board certifications is restricted to the waves from 2010 to 2016. We focus on physicians whose initial specialty choice was either surgery, OBGYN, or internal medicine. We chose those specialties because they have a high proportion of physicians with subspecialty certificates. Specifically, in 2016, 46.3 percent of those who began their career in surgery, 60.9 percent of those in internal medicine, and 19.6 percent of those in OBGYN had obtained subspecialty certificates; these rates are significantly higher compared to those in other specialties.

The results are reported in Table 6. First, we look at the results for those who started their careers in surgery. The 2004 reform had a positive but insignificant effect of 1.8 percentage points on the likelihood of female physicians continuing in surgery compared to male physicians. Regarding board certification, the 2004 reform's impact on the likelihood of female physicians obtaining a basic board certification compared to male physicians was an increase of 3.5 percentage points, which was also not statistically significant. In contrast, the impact on the probability of female physicians obtaining subspecialty board certification compared to male physicians was an increase of 9.7 percentage points, which is statistically significant at the 5-percent level. The latter effect is large given that the gender gap in acquiring subspecialty board certification was 19.2 percent in the 1974 birth cohort; this increase thus reflects a substantial reform effect on enhancing subspecialty qualifications among female physicians.

We find similar patterns for physicians who began their careers in OBGYN, a female-dominated specialty. The reform effect on the probability of female physicians obtaining subspecialty board certification compared to male physicians is significant at 11.0 percentage points. This large impact effectively closes two-thirds of the gender gap, as female physicians in the 1974 birth cohort were 15.1 percentage points less likely than their male counterparts to obtain subspecialty board certificates.

[22] Internal medicine is unique among medical specialties because obtaining a basic board certification is not a prerequisite for subspecialty board certification. As a result, in 2016, only 23.5 percent of physicians who began their careers in internal medicine had basic board certification, whereas 52.6 percent held a subspecialty certification. This makes internal medicine the only specialty where the proportion of physicians with subspecialty certifications exceeds the proportion of those with basic certifications.

The 2004 reform also had a positive impact on female physicians in internal medicine. The reform increased the probability of female physicians (i) continuing to practice in internal medicine compared to male physicians by 3.2 percentage points, (ii) obtaining basic board certification by 3.7 percentage points, and (iii) achieving subspecialty board certification by 4.3 percentage points—all statistically significant. Interestingly, although the reform led fewer female physicians to choose internal medicine as their initial specialty, those who did were more likely to remain in that specialty and to succeed in obtaining certifications in it. This suggests a better alignment between female physicians and their chosen specialty in internal medicine, with an increased likelihood of their obtaining both basic and subspecialty certifications.

Overall, these findings demonstrate that the 2004 reform substantially narrowed the gender gap in obtaining subspecialty board certifications in surgery, OBGYN, and internal medicine, thereby enhancing long-term career advancement for female physicians. Additionally, the evidence indicates that the reform enabled a better match of female physicians with the specialty of internal medicine, as those who chose that specialty were more likely to continue in it and to secure board certificates.

7. Conclusion

Japan's experience with the New Postgraduate Medical Education Program in 2004 has led more female physicians to select general surgery and urology (two surgical fields) as their initial specialty.

We estimated the gender differences in the effect of the 2004 reform on the *initial* specialty choice. Specifically, the reform, which mandated exposure to multiple specialties including surgery during residency training, resulted in female physicians being 2.6 percentage points more likely to choose surgery and 1.6 percentage points more likely to choose urology, but 3.5 percentage points less likely to choose internal medicine compared to their male counterparts. Notably, the increase in female physicians in surgical specialties was limited to general surgery and urology and did not manifest in the surgical specialty of orthopedics (which entails more physical demands on physicians than other surgical specialties).

General surgery is a broad discipline encompassing multiple subfields, such as breast surgery, which primarily serves female patients. Since the reform, there has been an increase in the proportion of female breast surgeons relative to other general surgery subfields. Similarly, urology, which features the shortest workweek among the surgical specialties, has also seen a post-reform increase in female representation among its physicians. These changes demonstrate that mandatory residency training in surgery has helped female physicians develop an interest in surgical fields, particularly those with a predominantly female patient base or less demanding working hours.

In light of the fact that male residents are more interested than female residents in pursuing surgery at the start of their careers, having surgery as a mandatory requirement during residency is one way to reduce the gender gap in initial specialty choice. However, the shifts observed in surgery (breast surgery in particular) and urology are not dramatically large enough to achieve an equal distribution of women and men in these specialties. It is therefore clear that the gender gaps in surgical specialties will not be fully closed through mandatory training alone.

As indicated in the 2019 special issue of *The Lancet* on Women in Medicine (Jagsi et al., 2019; Liang et al., 2019), various factors contribute to the professional disadvantages faced by women in surgery. Therefore, efforts to enhance the retention and advancement of women in surgery must address multiple issues. As long as factors such as long working hours, a male-dominated culture within the surgical fields, and the gendered division of domestic responsibilities continue, the gender gap in specialty choice will persist.

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Figure 1: Initial Specialty Choice by the Year Physicians Registered as Medical Doctors:

Regression Discontinuity Design Plots

Surgery | Urology | Neurosurgery

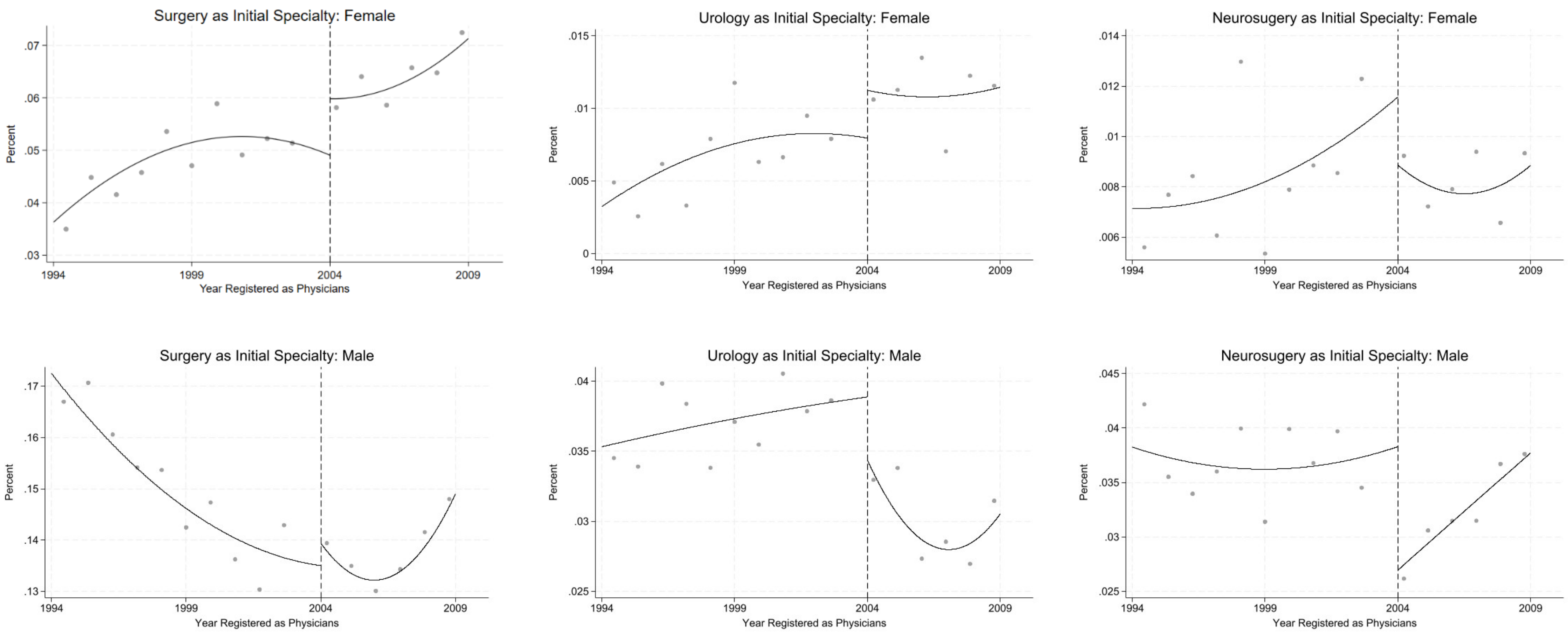
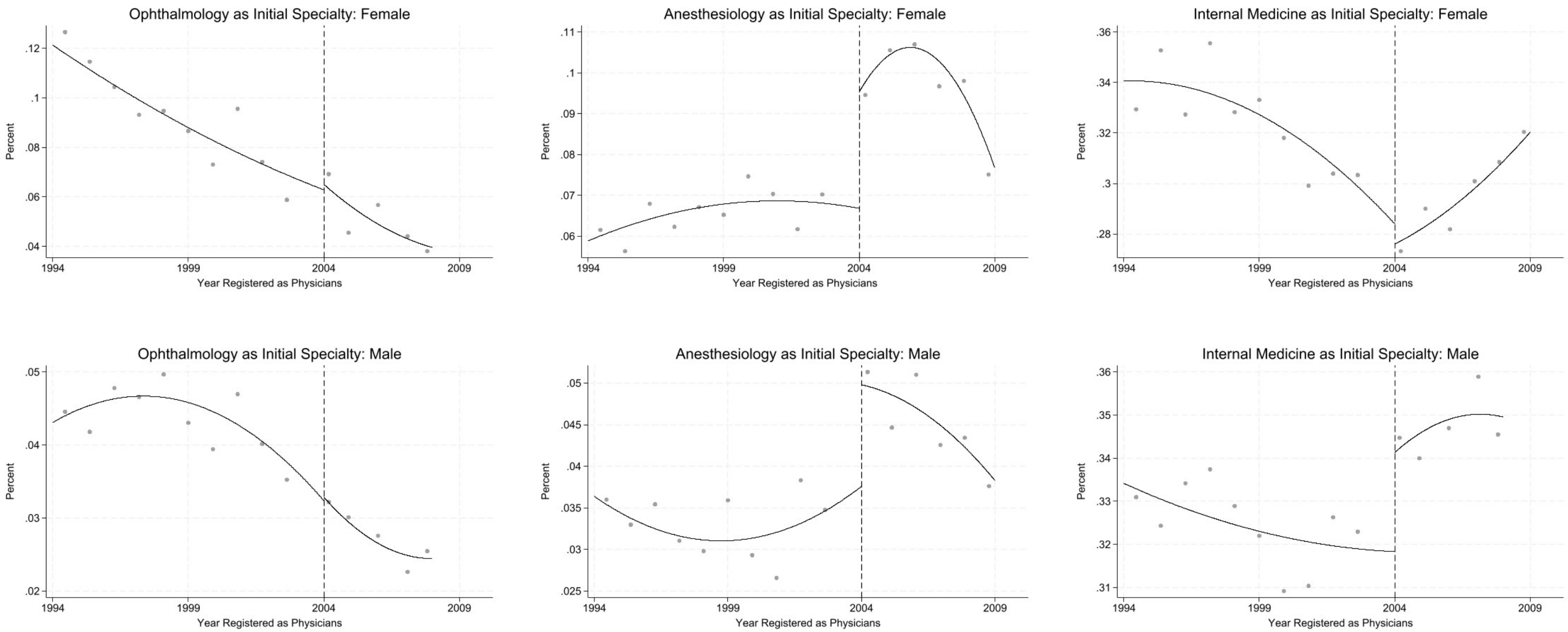


Figure 1: Initial Specialty Choice by the Year Physicians Registered as Medical Doctors: Regression Discontinuity Design Plots (*continued*)

Ophthalmology | **Anesthesiology** | **Internal Medicine**



Note: These figures show the proportion of females (upper panel) and males (lower panel) who choose a specific specialty, plotted against their year of registration as physicians. The horizontal axis represents the registration year, with 2004 marked as the reform year. The vertical axis presents the proportion of females (upper panel) and males (lower panel) who choose a specific specialty. The dots represent the average values for each registration year, and the solid lines represent a quadratic fit estimated separately on each side of the 2004 cutoff.

Table 1: Proportion of Initial Specialty Choice by Medical Residents' Gender

Specialty	Men	Women	Difference
Surgery	0.147	0.052	0.095 ***
Urology	0.035	0.008	0.027 ***
Neurosurgery	0.036	0.008	0.027 ***
Orthopedics	0.095	0.021	0.074 ***
Internal medicine	0.329	0.312	0.017 ***
Obstetrics and gynecology	0.027	0.083	-0.056 ***
Pediatrics	0.049	0.096	-0.047 ***
Anesthesiology	0.037	0.076	-0.039 ***
Ophthalmology	0.040	0.081	-0.041 ***
Dermatology	0.019	0.070	-0.052 ***
Otorhinolaryngology	0.033	0.031	0.003 **
Radiology	0.045	0.053	-0.009 ***
Psychiatry	0.029	0.032	-0.002 **
Plastic surgery	0.016	0.020	-0.004 ***
Other specialties	0.042	0.040	0.002
N	61200	27900	

Note: The sample consists of medical residents born between April 2, 1968, and April 1, 1981.
*** p<0.01 ** p<0.05 * p<0.1

Table 2: Fraction of Females by Physicians' Initial Specialty Choice

Initial Specialty Choice	Born between 1968 and 1969	Born between 1974 and 1975	Born between 1980 and 1981
Surgery	0.072	0.159	0.188
Urology	0.037	0.094	0.195
Neurosurgery	0.067	0.090	0.089
Orthopedics	0.066	0.103	0.116
Internal medicine	0.263	0.319	0.308
Obstetrics and gynecology	0.443	0.620	0.665
Pediatrics	0.464	0.471	0.467
Anesthesiology	0.343	0.515	0.564
Ophthalmology	0.484	0.486	0.512
Dermatology	0.533	0.617	0.693
Otorhinolaryngology	0.253	0.311	0.319
Radiology	0.252	0.352	0.397
Psychiatry	0.305	0.337	0.407
Plastic surgery	0.200	0.412	0.414
Other specialties	0.250	0.286	0.305
All specialities	0.253	0.326	0.352

Note: The sample consists of medical residents born between April 2, 1968, and April 1, 1981.

Table 3: The Effect of the 2004 Reform on Initial Specialty Choice

Sample: Received Medical License between the Ages of 24 and 27

	Dependent Variable: Initial Specialty Choice									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Independent Variables	Surgery	Urology	Neuro-surgery	Ortho-pedics	Internal medicine	OBGYN	Pediatrics	Anesthe-siology	Ophthal-mology	Derma-tology
Post	-0.003	-0.006	-0.012***	-0.007	0.019*	-0.001	-0.003	0.022***	-0.001	0.003
	(0.008)	(0.004)	(0.004)	(0.007)	(0.011)	(0.004)	(0.006)	(0.005)	(0.005)	(0.003)
Post× Female	0.027**	0.015**	0.009*	-0.002	-0.034*	-0.000	-0.011	0.002	-0.012	-0.009
	(0.011)	(0.006)	(0.005)	(0.008)	(0.019)	(0.010)	(0.012)	(0.011)	(0.009)	(0.009)
R^2	0.021	0.007	0.006	0.019	0.002	0.018	0.010	0.010	0.012	0.017
N	77314	77314	77314	77314	77314	77314	77314	77314	77314	77314
Male mean	0.149	0.036	0.036	0.096	0.326	0.027	0.049	0.037	0.039	0.018

Note: Each column in the table represents estimates from separate regressions. The dependent variable in each regression is an indicator that corresponds to the specialty indicated at the top of the column. "Post" is an indicator for whether the resident received the post-reform training. All regressions control for birth cohort, interaction of birth cohort and a female indicator, age of receiving the medical license, prefecture, and log of the population size of the medical resident's workplace municipality. "Male mean" is the mean of the dependent variable among male physicians. *** p<0.01 ** p<0.05 * p<0.1

Table 4: Placebo Test

	Dependent Variable: Initial Specialty Choice									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Independent Variables	**Surgery**	**Urology**	**Neuro-surger**	**Ortho-pedics**	**Internal medicine**	**OBGYN**	**Pediatrics**	**Anesthe -siology**	**Ophthal-mology**	**Derma-tology**
Post	-0.005	0.004	-0.003	-0.002	0.022**	-0.001	-0.005	0.005	0.008	0.001
	(0.009)	(0.004)	(0.004)	(0.007)	(0.011)	(0.004)	(0.005)	(0.004)	(0.005)	(0.003)
Post× Female	0.019	-0.002	0.006	-0.012	-0.018	0.007	0.008	0.003	-0.018	-0.002
	(0.012)	(0.005)	(0.005)	(0.008)	(0.022)	(0.012)	(0.013)	(0.011)	(0.013)	(0.011)
R^2	0.023	0.007	0.006	0.017	0.001	0.012	0.012	0.006	0.012	0.013
N	45099	45099	45099	45099	45099	45099	45099	45099	45099	45099
Male mean	0.156	0.038	0.039	0.099	0.321	0.029	0.044	0.033	0.044	0.019

Note: This analysis uses a hypothetical scenario in which the medical reform took place in 1996, rather than 2004. Each column in the table represents estimates from separate regressions. The dependent variable in each regression is an indicator that corresponds to the specialty indicated at the top of the column. “Post” is an indicator for whether the resident received the post-reform training. All regressions control for birth cohort, interaction of birth cohort and a female indicator, age of receiving the medical license, prefecture, and log of the population size of the medical resident’s workplace municipality. “Male mean” is the mean of the dependent variable among male physicians.
*** p<0.01 ** p<0.05 * p<0.1

Table 5: The Effect of the 2004 Reform on Initial Specialty Choice

Sample: Received Medical License between the Ages of 24 and 28

	Dependent Variable: Initial Specialty Choice									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Independent Variables	Surgery	Urology	Neuro-surger	Ortho-pedics	Internal medicine	OBGYN	Pediatrics	Anesthe-siology	Ophthal-mology	Derma-tology
Post	0.001	-0.009**	-0.009**	-0.005	0.021**	-0.001	-0.003	0.020***	-0.003	-0.001
	(0.007)	(0.004)	(0.004)	(0.006)	(0.010)	(0.003)	(0.005)	(0.005)	(0.004)	(0.003)
Post× Female	0.026**	0.020***	0.008	-0.002	-0.033*	-0.001	-0.012	0.006	-0.015**	-0.005
	(0.010)	(0.006)	(0.005)	(0.007)	(0.017)	(0.009)	(0.011)	(0.010)	(0.008)	(0.009)
R^2	0.022	0.006	0.006	0.017	0.002	0.014	0.011	0.009	0.012	0.016
N	87590	87590	87590	87590	87590	87590	87590	87590	87590	87590
Male mean	0.151	0.036	0.037	0.097	0.324	0.029	0.047	0.037	0.040	0.018

Note: Each column in the table represents estimates from separate regressions. The dependent variable in each regression is an indicator that corresponds to the specialty indicated at the top of the column. "Post" is an indicator for whether the resident received the post-reform training. All regressions control for birth cohort, interaction of birth cohort and a female indicator, age of receiving the medical license, prefecture, and log of the population size of the medical resident's workplace municipality. "Male mean" is the mean of the dependent variable among male physicians. *** p<0.01 ** p<0.05 * p<0.1

Table 6: Long-Term Effects of the 2004 Reform

	Initial Specialty: Surgery			Initial Specialty: OBGYN			Initial Specialty: Internal Medicine		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Independent Variables	Work in Initial Specialty	Basic Board Cert.	Sub-Specialty Board Cert.	Work in Initial Specialty	Basic Board Cert.	Sub-Specialty Board Cert.	Work in Initial Specialty	Basic Board Cert.	Sub-Specialty Board Cert.
Post	0.023*	0.016	-0.011	0.033	-0.050*	-0.034	-0.012*	0.025**	-0.089***
	(0.013)	(0.020)	(0.022)	(0.022)	(0.027)	(0.039)	(0.007)	(0.012)	(0.016)
Post× Female	0.018	0.035	0.097**	-0.028	0.023	0.110***	0.030**	0.039**	0.082***
	(0.032)	(0.046)	(0.043)	(0.029)	(0.033)	(0.042)	(0.012)	(0.017)	(0.025)
R^2	0.025	0.088	0.149	0.020	0.084	0.101	0.032	0.098	0.103
N	69389	31894	31894	24446	11118	11118	184524	83333	83333
Male mean	0.817	0.837	0.522	0.886	0.923	0.293	0.880	0.273	0.681

Note: Each column in the table represents estimates from separate regressions. The sample used in Columns (1) to (3) consists of physicians who initially chose surgery as their specialty; Columns (4) to (6) consists of physicians who initially chose OBGYN; and Columns (7) to (9) consists of those who initially chose internal medicine. The dependent variable in each regression (whether they still work in their initial specialty, whether they have basic board certification, and whether they have any subspecialty board certification) is indicated at the top of the column. "Post" is an indicator for whether the resident received the post-reform training. All regressions control for birth cohort, interaction of birth cohort and a female indicator, age of receiving the medical license, years since physician received medical license, and survey year. Robust standard errors clustered at the individual level are shown in parentheses. "Male mean" is the mean of the dependent variable among male physicians. *** p<0.01 ** p<0.05 * p<0.1

Appendix Table 1: Number of Years' Delay in Entering Medical School

Year Enter Medical School	No Delays	1-Year Delay in Entering Medical School	2-Year Delay in Entering Medical School	3-Year Delay in Entering Medical School	4-Year+ Delay in Entering Medical School	Total
1995	2,744	2,563	1,106	381	627	7,421
	37.0%	34.5%	14.9%	5.1%	8.4%	100.0%
1996	2,810	2,578	1,066	390	716	7,560
	37.2%	34.1%	14.1%	5.2%	9.5%	100.0%
1997	3,061	2,424	967	357	635	7,444
	41.1%	32.6%	13.0%	4.8%	8.5%	100.0%
1998	2,899	2,362	1,192	432	829	7,714
	37.6%	30.6%	15.5%	5.6%	10.7%	100.0%
1999	2,711	2,362	1,120	380	699	7,272
	37.3%	32.5%	15.4%	5.2%	9.6%	100.0%
2000	2,665	2,288	1,034	439	801	7,227
	36.9%	31.7%	14.3%	6.1%	11.1%	100.0%
2001	2,753	2,393	940	398	705	7,189
	38.3%	33.3%	13.1%	5.5%	9.8%	100.0%
2002	2,638	2,426	1,012	386	720	7,182
	36.7%	33.8%	14.1%	5.4%	10.0%	100.0%
2003	2,570	2,422	1,167	369	689	7,217
	35.6%	33.6%	16.2%	5.1%	9.5%	100.0%
2004	2,540	2,362	1,098	417	784	7,201
	35.3%	32.8%	15.2%	5.8%	10.9%	100.0%
2005	2,524	2,340	1,172	445	749	7,230
	34.9%	32.4%	16.2%	6.2%	10.4%	100.0%
2006	2,626	2,337	1,102	430	741	7,236
	36.3%	32.3%	15.2%	5.9%	10.2%	100.0%
2007	2,800	2,306	1,058	448	711	7,323
	38.2%	31.5%	14.4%	6.1%	9.7%	100.0%
2008	2,696	2,419	1,106	416	769	7,406
	36.4%	32.7%	14.9%	5.6%	10.4%	100.0%
2009	3,056	2,547	1,149	433	878	8,063
	37.9%	31.6%	14.3%	5.4%	10.9%	100.0%
2010	3,265	2,557	1,103	463	970	8,358
	39.1%	30.6%	13.2%	5.5%	11.6%	100.0%

Source: Ministry of Education, Culture, Sports, Science and Technology, Japan.

Appendix Table 2: Number of Medical Students, and Number of Students who Repeat Grades in Medical School by Year

Year	Number of Medical Students	Number of Students who Repeat Grades	Proportion of Students who Repeat Grades
1995	47,729	2468	5.17%
1996	47,646	2275	4.77%
1997	47,185	1980	4.20%
1998	47,442	2003	4.22%
1999	46,807	1707	3.65%
2000	46,697	1751	3.75%
2001	46,655	1,879	4.03%
2002	46,410	1,715	3.70%
2003	46,258	1,645	3.56%
2004	46,207	1,571	3.40%
2005	46,256	1,652	3.57%
2006	46,190	1,530	3.31%
2007	46,248	1,413	3.06%
2008	46,610	1,503	3.22%
2009	47,496	1,455	3.06%
2010	48,615	1,377	2.83%

Source: Ministry of Education, Culture, Sports, Science and Technology, Japan.