Reporting versus Reputation: Physician Quality and the Flexner Report of 1910

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Abstract: If patients can be persuaded to switch between licensed providers on the basis of authoritative opinions, policy-makers can harness such reporting as a tool to implement incentives for high-quality care. I employ the landmark Flexner Report (1910) medical school evaluations to show that existing consumer beliefs and market-specific capital such as established reputations are primary threats to effective reporting. This historic report did not target specific physicians, but ruthlessly disparaged the quality of American medical schools and recommended the vast majority be closed. Using linked individual-level data from medical directories, I show that doctors who recently entered a local geographic market and who attended poorly-reviewed schools – not just the recent graduates thereof – were about three times more likely to relocate or retire after the report's release. Expert recommendations have considerably less impact when providers have established themselves in a local area, and no impact on market exit can be detected. These heterogeneous effects imply that policy-makers are unlikely to dramatically alter consumer demand with expert quality information when trust and reputation are important market features.

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1 Introduction

According to Adam Smith in his *Lectures on Jurisprudence (1766)*, "A physician's character is injured when we endeavour to perswade [sic] the world he kills his patients instead of curing them, for by such a report he loses his business" (Smith 1978, p. 399).[1] The perspective that provider demand can be shifted by novel consumer information has generated many reporting initiatives. For example, a consumer searching for hospital care in California now has access to the online resources *CMS Hospital Compare* and *Cal Hospital Compare*. When seeking primary care, they could consult California's *Office of the Patient Advocate* report cards for medical groups.[2] Before seeing a new doctor, a patient can also access an array of evaluations available through *Yelp*, *Healthgrades*, *ZocDoc*, *RateMDs*, and other online platforms. Despite the widespread availability of information, physicians designated as low-quality remain in business.[3]

Consumers now have broad and near-instant access to the above and other sources of provider quality data. This may cause a problem of information saturation: discordant provider ratings are frequently highlighted by researchers (e.g., Halasyamani & Davis (2007), Austin et al. (2015)), and information overload may cause consumer confusion (Rothberg et al. 2008, Gebele et al. 2014). In this paper, I use one of the first systematic public quality evaluations in American medical history – those contained in the *Flexner Report* (Flexner 1910) – to investigate the impact of expert recommendations on physician practice viability in a controlled information environment. My primary finding is that negative authoritative information increases practice relocation and retirement by a factor of about three, but only for physicians who entered a local geographic market within the previous two years. These heterogeneous effects imply that quality information can have a large impact on market outcomes, but that interventions may fail to shift demand for providers due to prior consumer learning, trust, and established provider reputations.

Written by Abraham Flexner and published by the Carnegie Foundation for the Advancement of Teaching on 5 June 1910, the now-eponymous report entitled *Medical Education in the United States and Canada* advocated major reform and assessed each medical school in these countries. Some institutions received glowing appraisals while others were ruthlessly disparaged, and Flexner stated that the vast majority of the region's programs should be shuttered for quality concerns. He did not introduce new ideas: his 'muckraking' pronouncements instead alerted the public to

[1] Adam Smith's contributions to early health economics were pointed out by Gaynor (1994).

[2] Accessed 21 August 2021: `https://www.opa.ca.gov/reportcards/Pages/default.aspx`

[3] Evidence that quality information affects provider demand is mixed. Some studies find no impact of reporting on the quality of Coronary Artery Bypass Graft [CABG] surgeries on hospital volume or market share (Jha & Epstein 2006, Wang et al. 2011). Yoon (2020) find that even though high-risk patients shift demand to low-mortality hospitals after CABG reporting, they are matched to low-quality surgeons at the selected hospital. Within hospitals, there is sometimes considerable patient sorting across physicians by quality. Among rated surgeons in PA, Wang et al. (2011) find that quarterly CABG operations decrease by about 31.5% [an estimated decrease of 7.9 operations from a mean of 25.1] for high-mortality surgeons. Cutler et al. (2004) find that hospitals reported as high CABG mortality lose about 10% of their related volume in the subsequent 12 month period, but this effect dissipates over time. Pope (2009) finds that hospitals improving their *US News and World Report* ranking by one spot are rewarded with 0.88% and 1.06% increases in patient volume and associated revenue, respectively. The effect of quality reporting on consumer demand ranges from null to dramatic.

information previously restricted to a medical audience (Ludmerer 2010) and helped shape public opinion (Hudson 1992, p. 18).[4] While the report evaluated institutions, graduates of poorly-reviewed schools were routinely implicated in front-page news around the country. For example, the Arkansas Gazette declared to its readers "Too Many Ill-Trained Doctors" (Arkansas Gazette 6 June 1910, p. 1) and the San Francisco Examiner exclaimed "Three-Quarters of Doctors 'Quacks'" (San Francisco Examiner 6 June 1910, p. 1).[5] Consumers were suddenly warned about the quality of their local physicians' medical training. These easily understandable but indirectly targeted evaluations constitute imprecise signals of provider quality.

I show that doctors who entered a local geographic market in the preceding two years and who attended poorly-reviewed schools – and not just the recent graduates thereof – were about three times more likely to relocate or retire after the report's release. These effects were strongest in areas with sufficient differentiated competition on physician degree held, and especially in areas with a competing well-rated physician, which supports the postulated consumer information mechanism.[6] An elevated rate of practice removals (local failures) implies that perceived quality and expected demand fell by enough to compel market exit. I therefore capture monumental shifts in the viability of recent entrants' physician practices immediately after the release of imprecise negative signals. Expert opinion has considerably less impact when providers have established themselves in a market, and no impact on failure can be detected.

Previously available data are insufficient to establish these facts. I therefore collected a novel dataset of annual physician practice locations and educational details preserved in the *Medical Directory of New York, New Jersey and Connecticut* (1903-1914). These directories are almost unique in the time period for their granularity; competing national directories were published every 2-3 years.[7] Consequently, the dataset permits the analysis of physician practice failure by date of entry to a local market, which was previously untenable for this era, and provides annual market duration data with specific years of exit. I digitized 120,989 physician-year records for 1903-1914 and manually linked these doctors across time and geography, obtaining 14,261 distinct individuals.[8] The construction of this dataset involved years of effort, removing a significant barrier to the investigation of physician decision-making in American economic history.

Focusing attention on the state of New York, I estimate duration models of time to practice failure.[9] Duration models estimate the effect of covariates x on a hazard function $\lambda(z, x)$ which gives

[4] See Section 2.1 for details on previously circulating quality information in the medical community.

[5] See Section 2.2 for more examples.

[6] Access to information shocks through a nearby weekly general-content newspaper is important, but less important than market structure. This may be due to the quality of the proxy available to capture historical information dispersal in a fixed time period and a fixed region.

[7] *Polk's Medical Register and Directory of North America* (1898-1917) was published in even years over the sample period and the first four editions of the *American Medical Directory* (AMA 1907-1922) were published in 1906, 1909, 1912, and 1914. California also produced statewide annual directories for 1903-1914 which are currently being digitized for an extension to this project.

[8] Data for Brooklyn and New York City were not digitized as the hypothesized 'treated' area for this project includes only areas without a local medical school. See Section 3 for a detailed explanation of this important exclusion.

[9] Data for Connecticut and New Jersey appear to be imprecisely entered in the original documents. Market entry dates and survival times are therefore likely unreliable. See Section 3.

the failure rate in period z for individuals with characteristics x, conditional on having survived to the previous period. As a baseline, I employ the Cox (1972) proportional hazards model with an underlying difference-in-differences specification built into the heterogeneous component of $\lambda(z, x)$. Naive models which exclude time-in-market differences fail to capture any impact of the *Flexner Report* on practice survival.

On the other hand, differences in the hazard of local practice failure emerge when recent entrants are compared against more established physicians of the same quality rating. Specifically, poorly-rated physicians who entered a local market in the previous two years were about three times more likely to experience practice failure in a subsequent period, conditional on surviving to the preceding period, compared to other poorly-rated doctors after the release of Flexner's recommendations. Adding competing differences for recent graduation from these poorly-reviewed schools, I find that reporting affects all poorly-rated recent entrants and not only the recently trained for whom this information should be more temporally relevant. By contrast, well-rated recent entrants face a slightly reduced hazard of practice failure in the post-period compared to other well-rated doctors.

I differ from the literature in significant ways. Economic studies focused on modern healthcare quality reporting initiatives directly estimate their impact on consumer choice of providers (Dranove & Sfekas 2008, Pope 2009, Wang et al. 2011, Yoon 2020). This approach is precluded because comprehensive data on physician-patient interactions from this time period do not broadly exist. While I therefore do not identify small variations in consumer demand caused by the *Flexner Report*, a major contribution of this paper is to demonstrate that well-designed quality reporting can affect the viability of healthcare providers by enough to compel market exit. I provide the first detailed results on the impact of medical quality reporting on physician practice failures (relocation and retirement decisions) of which I am presently aware.[10]

By tracking physicians across time and geography, I also provide novel evidence on the geographic sorting of doctors before and after the release of quality information. Previous work has focused on high-risk surgery refusal (Schneider & Epstein 1996, Burack et al. 1999) and physician-patient sorting after the release of state-by-state surgical outcomes information (Dranove et al. 2003, Cutler et al. 2004, Mukamel et al. 2004, Yoon 2020). My historical approach leverages a national reporting initiative focused on medical training. Physicians therefore could not avoid negative quality information by relocating to another state, and faced no novel incentive to cream-skim the lowest risk patients. In this context, I show in supplemental logistic regressions that relocating poorly-rated physicians always avoided high-quality competitors – and were doing so at an elevated rate over time – while relocating well-rated physicians increased their avoidance of other

[10]Heightened practice failure has been documented for Coronary Artery Bypass Graft [CABG] surgeons revealed as high-mortality options, but these results were not a primary objective of these studies, and are tenuous due to the small number of practicing specialists. Jha & Epstein (2006) investigate the New York CABG reporting system using 168 surgeons rated between 1989 and 2002. They find that surgeons in the bottom quartile of reported risk-adjusted mortality quit their New York CABG practice within 2 years at a rate of 20% as compared to 5% for the other practitioners (p. 849-850). Yoon (2020) produces statistics from a total of 87 surgeons in New Jersey, of whom only 45 were rated. The present data structure and sample size permit both a more in-depth analysis of rated physicians' practice failure, as well as greater statistical precision.

high-quality doctors in the post-period. Quality information can therefore increase the desirability of low-competition areas among relocating physicians.[11]

These results imply that imprecise signals of physician quality can be very influential on the viability and decision-making of some doctors; however, the estimated impact on practice failure disappears when consumers were already familiar with a physician. This highlights the importance of market learning & news (Dafny & Dranove 2008, Dranove & Sfekas 2008) as well as established reputations (Xiao 2010) in tempering the effect of quality information. Trust is a primary feature of healthcare markets (Arrow 1963), and so interpersonal relationships may be particularly relevant for regulators designing quality reports for individual practitioners. This evidence undercuts the longstanding and widely subscribed notion that releasing quality information can effectively move consumers from low-quality to high-quality providers. If policymakers are confident in their quality assessments, alternative policies which incorporate prior consumer knowledge and market relationships may be more successful at shifting demand, but which policy maximizes consumer welfare is left an open question.[12]

The remainder of this paper is organized as follows. First, I discuss additional related literature. Next, I provide the historical setting for the *Flexner Report* in Section 2, providing context for its reception. I also provide details on the report and related information available to the contemporary consumer. The medical directory data is described in detail in Section 3, and restrictions are made to the analysis sample based on preliminary findings. In Section 4, I use an event study framework to show that physician practice failure was unaffected by Flexner's ratings on aggregate, and provide preliminary evidence for the interactive effect with recent entry to a local geographic market. In the next section, I relate physician practice failure to hazards in duration models, and lay out an approach to estimation which captures the rating & time-in-market interaction. Section 6 provides my main results, assesses the impact of differentiated competition and access to information, and shows that market readjustment was rapid. In my discussion, I search for evidence of gaming behavior, discuss equilibrium national trends, and link my results to models of reputation and consumer demand. I conclude with policy lessons for regulators & questions for health economists.

1.1 Related Literature

Reporting initiatives are one of many institutions which may develop to offer consumers quality assurance in markets with quality uncertainty.[13] In the absence of supplementary information, low-quality providers can drive out high-quality providers, decreasing the overall size of the market and degrading average quality (Akerlof 1970). When quality guarantees are non-formal, consumer trust becomes central. This is especially true for the decision to seek medical care, as potentially

[11] I show in other supplemental logistic regressions that the release of the *Flexner Report* was associated with an increase of entry to desirable urban areas for all physicians except the poorly-rated physicians. It is only conditional on relocation – which is itself a quality signal – that well-rated competitors select less competitive areas.

[12] Policymakers may lack information available to consumers, leading to regulatory errors.

[13] For hospitals, Dranove & Jin (2010) list brand-names, experience & word of mouth, industry-sponsored voluntary disclosure, third-party disclosure, government-mandated disclosure, and licensing (p. 938).

life-threatening illnesses and errors from untalented physicians make healthcare unique in its consequential nature combined with its heightened uncertainty (Arrow 1963). It is not possible to sample medical care, and so consumers must search for information on physician quality primarily through direct experience (Nelson 1970) or through reputation channels such as recommendations from friends or family (Satterthwaite 1979).

An influx of novel quality information can be modeled as a negative shock to a provider's reputation. In his basic model, Holmström (1999) shows that learning about managerial ability depends on the amount of information available: early output observations are weighted heavily, but eventually talent is fully revealed and new observations do not impact beliefs. Intuitively, heightened availability of information makes new signals less valuable, which reduces the value of reporting for established physicians. Board & Meyer-ter-Vehn (2013) model reputational learning as perfect good news or bad news signals, and find the latter is characterized by shirk-work equilibria – when reputation falls below some threshold, firms will shirk. Cabral & Hortaçsu (2010) find that eBay sellers who receive a negative review are more likely to receive additional negative reviews and are subsequently more likely to exit. My results are consistent with a negative quality signal causing recent entrants to shirk within a local market and subsequently exit.

As I do not observe physician-patient relationships, I cannot fully differentiate between reputation, trust, established relationships, and other forms of market-based learning which entrench patient demand for a physician's services over time. Trust is a key feature of healthcare markets (Arrow 1963, Frank 2007) and may be particularly relevant for consumers with established physician-patient relationships, who may use direct experience to evaluate uncertain product quality (Nelson 1970). A consumer with previous positive experiences may have developed trust in their physician's competence, and external reputations may have no impact on their decisions. To the extent that established providers have more loyal customers, my results may actually reflect the protective effect of direct relationships, not established reputations.

I contribute most directly to the literature concerned with quality reporting for medical providers. A strong plurality of these studies focus on risk-adjusted mortality reporting for Coronary Artery Bypass Graft [CABG] surgeries (Schneider & Epstein 1996, 1998, Burack et al. 1999, Cutler et al. 2004, Mukamel et al. 2004, Jha & Epstein 2006, Dranove & Sfekas 2008, Wang et al. 2011, Yoon 2020).[14] Relationships between these specialists and patients are mediated by referring physicians, complicating the link between physician-patient trust and practice failure, but high-mortality surgeons have been shown to be more likely to quit practice after the release of CABG surgery report cards (Jha & Epstein 2006, Yoon 2020). My main results advance this narrative: effective quality reports can actually be powerful enough to compel low-quality providers to exit markets.[15]

[14]There are also papers which investigate the effect of reporting across differing specialties in other states such as California (Romano & Zhou 2004, Pope 2009) and Wisconsin (Hibbard et al. 2005).

[15]Other narratives are slowly emerging. Reporting has been documented to cause an increase in provider-patient sorting for both hospitals (Dranove et al. 2003, Cutler et al. 2004) and surgeons (Mukamel et al. 2004, Yoon 2020). This may be explained by provider gaming (Schneider & Epstein 1996, Burack et al. 1999) or capacity constraints (Yoon 2020). Reporting can also spur quality improvements (Cutler et al. 2004, Hibbard et al. 2005, Smith et al. 2012, Vallance et al. 2018, Eyring 2020).

This paper is also related to the literature on the relationship between consumer learning and the impact of reporting. Dafny & Dranove (2008) demonstrated that health plan consumers learn from reporting, but market learning dominates. Dranove & Sfekas (2008) find that only hospitals receiving negative *news* in New York's CABG program were impacted – a naive model which treats all low-quality information the same finds no impact. My results are aligned with the observation that reporting is effective when it facilitates learning. First, the *Flexner Report* had no impact on the viability of physicians for whom local consumers had more than two years of market-based learning opportunities. Second, I show that increases in practice failure are loaded on physicians who attended institutions rated highly in lenient less-publicized reports, but disparaged by Flexner.

I also provide novel empirical evidence on the specificity of quality information. Previous research has shown that even after controlling for available detailed information, coarse measures of quality are consequential for consumer decision-making in markets ranging from health plans (Spranca et al. 2000) to energy efficiency in refrigerators (Houde 2018) to sugar/calories in breakfast cereals (Barahona et al. 2021). Simple measures may help summarize complex information for inattentive consumers. Flexner's degree-based ratings are coarse at the institutional level. They are even less precise for specific physicians and yet consumers sometimes respond to these signals. This finding suggests that group-targeted ratings may be effective for some consumers.[16]

Specifically, Flexner's recommendations are analogous to *warning labels* for licensed professional services, a potential policy option for regulators in lieu of more aggressive licensing. Friedman (1962) writes passionately against both certification and licensing, but finds "it difficult to see any case for which licensure rather than certification can be justified" (p. 149). The results of the present study provide unique empirical evidence concerning how consumers respond specifically to warnings substituted for more aggressive licensing in an era where gross variations in quality persisted. I find that information alone sometimes fails to shift demand for providers.

This paper also makes significant inroads in economic and medical history. While previous work has shown that the *Flexner Report* impacted medical school survival (Hiatt & Stockton 2003, Miller & Weiss 2008, 2012, Weiss & Miller 2010), this paper contributes both by modeling the *Flexner Report* as a shock to consumer information and analyzing its impact on practicing physicians. My results further advance our understanding of how early medical education reforms restructured the availability and composition of American physicians.[17] Moehling et al. (2020) found that as medical education reform increased the quality of medical graduates, preferences for urban location

[16] This may be a fruitful area for future research. For example, in 2009 the United States Congress passed the 'Family Smoking Prevention and Tobacco Control and Federal Retirement Reform Act' (H.R. 1256, 111th U. S. Congress 2009), which required the Food and Drug Administration [FDA] to publicize a "list of harmful and potentially harmful constituents, including smoke constituents, to health in each tobacco product by brand and by quantity in each brand and subbrand" (section 904(e)). Consumers may respond to quality information published at the brand level even when sub-brand level data are available, and how consumers use brand versus sub-brand quality information may have important welfare implications.

[17] Moehling et al. (2019) find that medical education reform led to a large decrease in female physicians from a peak around 1900. This occurred due to both the closure of women-only schools and substitution from female to male students as the entry requirements increased and overall enrollment decreased. Owing to the small proportion of physicians educated in female-only medical schools in any given year, I cannot separately estimate the effect of quality reporting in the *Flexner Report* on practicing female physicians.

increased, widening the urban-rural gap in equilibrium physician supply.[18] By tracking individual physicians across time, I complement their approach by showing that relocating physicians typically also selected larger urban locations. While differential ratings in the *Flexner Report* cannot explain shifts in physician density, these results suggest that location preferences were shifting globally, and not just among high-quality entrants.[19] In addition, physicians relocating for at least a second time move to less populated locations, a result which mirrors the pattern for failing physicians some decades later in 1971-83 (Marder 1990). Life cycle patterns in physician practice locations are therefore similar under very different institutional regimes, heightening our confidence that physician behaviors may be fundamentally comparable over diverse settings.

2 Historical Setting

The path to obtaining medical credentials in the United States today is a long and arduous journey involving extensive training. To enter a medical school in the United States, students are required to demonstrate extensive premedical training with specific requirements.[20] The four-year medical degree (MD) is now standard, with approximately 10% of matriculates now graduating after five years (AAMC 2020*b*). Three regulated examinations are required during training to obtain a medical license in the United States, with the final examination taking place after students have matched with a medical residency – post-graduate training in which they'll be engaged for 3-7 years depending on specialty, including general practitioners of family medicine.[21]

The modern American physician seeing patients has thus typically engaged in at least 10 years of post-secondary education involving three distinct components.[22] The human capital investment is convoluted and difficult to disentangle – the most promising students attend the best medical schools and are matched with the most renowned residency programs. MD program quality may not even provide pertinent information concerning the overall quality of a physician's training: their residency was more recent, tailored to their specialization, and these programs assessed applicants conditional on their relative performance in the MD program.

The *Flexner Report* made an appreciable impact on public consciousness (Hudson 1992, Ludmerer 2010) in a very different America. In the section which follows, I demonstrate that (i) physicians in 1910 were primarily engaged in general practice; (ii) the MD represented the lion's share of a practitioner's training; (iii) gross variation persisted among licensed physicians; (iv)

[18] Their primary measure of quality was whether a school required entrants to have 1-2 years of college education.

[19] It is possible that the influx of young high-quality entrants were the factor that made urban areas more attractive to relocating physicians. I leave such questions to future research.

[20] For example, Harvard Medical School requires a baccalaureate degree of at least three years with requirements in biology, chemistry/biochemistry, physics, and writing. Premedical laboratory work is required and coursework in mathematics and behavioral sciences are encouraged. See 'Prerequisite Courses' on Harvard Medical School's website: `https://meded.hms.harvard.edu/admissions-prerequisite-courses`. Accessed 2 August 2021.

[21] See 'Board Certification Requirements' on the American Board of Medical Specialties website: `https://www.abms.org/board-certification/board-certification-requirements/`. Accessed 2 August 2021.

[22] Extensive clinical training, clerkships, and internships are also commonly completed, including by premedical students.

physicians signaled quality using gameable aesthetic considerations; and (v) Flexner's evaluations of laboratory and clinical competence were particularly salient for healthcare consumers in this era. In this context, the information in the report was a relatively clear heuristic for prospective patients concerned about the expected quality of a potential physician. Section 2.2 describes the report, the informational setting in which it was released, and its widespread dissemination.

2.1 Medical Training in 1910

When President William McKinley was shot in Buffalo in September 1901, the surgeon who operated on his wounds specialized in *gynecology*. His performance has led to suggestions of possible malpractice or guilt in the President's untimely death (Markel 2019), but this type of medical arrangement was not uncommon.[23] The dominance of specialists among physicians in the United States had not yet been established, and those who did specialize also engaged in general practice. By 1923, only about 9.2% of physicians in the AMD could be classified as full-time specialists.[24] Even by 1931, about 82.9% of practicing physicians – excluding interns, residents and fellows – were general practitioners or engaged in part-time specialism (Stevens 1971, Table 2, p. 181). The typical American physician was engaged in at least some general practice throughout the first three decades of the twentieth century. Stevens showed this had already changed by 1969, when full-time specialists accounted for 77.1% of physicians in the United States. In 2019, at most 12.6% of American doctors list family medicine & general practice as their specialty (AAMC 2020*a*).[25]

As specialists were not yet omnipresent, medical residencies – the cornerstone of modern medical education – were also less prevalent. In fact, the AMA did not publish a list of hospitals approved for residencies until 1927. In this number, the AMA listed 1,699 educational residencies at 270 hospitals (AMA 1927, p. 829).[26] These educational residences were distinct from salaried 'resident' physicians and were also referred to as 'advanced' or 'special' internships. An editorial to the *Journal of the American Medical Association* [JAMA] in 1940 notes only 428 special internships in 1914 (JAMA 1940) – residencies as we know them today were a complete non-factor in 1910.

Special internships were a natural evolution of the existing hospital intern position occupied by many recent medical graduates in the early twentieth century. This internship system arose naturally in the United States, without the direction of medical schools, and so early statistics on this training are sparse. John Rose Bradford, a professor of medicine at University College London contrasted the role of hospital staff in relation to medical schools in the United States and Britain

[23] As it happens, the gynecological surgeon was Matthew D. Mann, who appears in the dataset used in this paper.

[24] There were 145,969 physicians in the 1923 edition of the AMD. There were 15,408 full-time specialists – excluding interns and residents – of which 1,958 practiced internal medicine in 1923 (Stevens 1971, Table 1, p. 162). If we choose to include internal medicine as general practitioners instead, the percentage becomes 10.6%. Stevens reports that internal medicine was the third largest specialty in 1923, while the largest segment was a glut of 4,703 ophthalmologists and otorhinolaryngologists. The second largest group the 3,336 surgeons & practitioners of occupational medicine.

[25] At most another 12.8% of the nation's 938,980 practitioners specialize in internal medicine. Put together, these two fields account for just barely over a quarter of American physicians belonging to a 'specialty' of at least doctors. Additional specialists may engage in part-time general practice.

[26] Council on Medical Education and Hospitals (1960) states that there were 278 hospitals with 1,776 such positions in 1927 (p. 28). JAMA (1940) also refers to 1,776 residencies in 1927.

in his report to the *Mosely Education Commission* in 1904. The disconnection of hospital training from the standard medical training in the United States – with the exception of Johns Hopkins[27] – was highlighted, but he noted that the American "interne" system had the benefit of using more advanced graduates in hospitals, and these recruits could apply acquired knowledge and skill. He was disheartened that only "about half the students in the leading medical schools" made use of a hospital internship before practice (Mosely Education Commission 1904, p. 66). By 1913, some 66-70% of American medical graduates were partaking in a hospital internship[28] but no American medical school required it for graduation and neither did any state licensing board require it for certification (Council on Medical Education and Hospitals 1960, p. 21).

The quality of the medical training of a contemporary physician was therefore determined primarily by their medical degree. In addition, having obtained a medical degree was not necessarily an indication that a doctor was well-qualified to practice medicine. Among medical schools from whom at least 50 graduates presented before state examining boards, failure rates in 1904 ranged from 0.6% for Harvard to 69.2% for Baltimore University (AMA 1905, p. 1455). State licensing boards only weeded out the bottom of the barrel; incompetent physicians managed to pass the examinations.[29] Examinations for the Marine Hospital Service and the medical corps of the Navy and Army were assessed to be more difficult and *more practical* than state board examinations, and had correspondingly higher failure rates (Flexner 1910, p. 170). As most examinations were written, purely didactic methods or "teaching to the test" could propel students into practice.

Keen followers of medicine might have been able to parse some information regarding the relative quality of medical schools through these and similar statistics in JAMA. This would not have represented the average patient. In 1910, about 62.6% of JAMA subscribers were members of the AMA in 1910.[30] Most of the remaining subscribers were probably physicians not yet converted to membership in the AMA.[31] As it stood, according to Abraham Flexner in the famed report, the layperson couldn't differentiate between graduates of Harvard and the Boston College of Physicians

[27]The Canadian schools were also noted as exceptions in the North American context.

[28]There were at least 3,006 interns in the United States and about 4,500 medical graduates annually (66.8%), and reports from a subset of the medical schools indicated the rate was approximately 70% (AMA 1913, p. 2017). The reason stated from the medical schools was that the remaining graduates did not wish to pursue an internship. The issue was with intern supply, not demand from clinical providers.

[29]There were many avenues, including successive reexamination, to achieve this end. As well, the typical passing rate was 75 percent overall, without a minimum standard by category. This meant that a physician could pass the test and be grossly incompetent. For example, in June 1906, one unnamed physician from the Baltimore Medical College [distinct from Baltimore University] passed the Maryland examinations with a score of 79 percent but only 56 percent in anatomy. Another physician from the same college passed (75 percent) with 57 percent in pathology and 49 percent in chemistry (AMA 1906).

[30]Circulation of the AMA in 1910 was 54,577 according to N. W. Ayer & Son's *American Newspaper Annual and Directory* (Ayer & Ayer 1910). Membership in the AMA reached 34,176 as of 1 May 1910 (AMA 1910*a*, p. 1963). Members of the AMA are assumed to be subscribers to JAMA because it was required for membership in the AMA By-Laws by 1909; see 'Chapter I. – Qualifications for Membership' in the 1909 edition of the *American Medical Directory* (p. 2).

[31]Based on 135,317 physicians listed in the in the United States in the 1909 edition of the AMD, it is likely that over 100,000 physicians were non-members of the AMA. The remaining 20,401 average annual recipients of JAMA could easily be physicians. Moreover, the AMA added 3,593 members between 1909 and 1910, of which 2,628 (73.1%) were previously non-member journal subscribers (AMA 1910*a*, p. 1963). Taken together, this is highly suggestive that non-medical audiences were likely not reading JAMA in large numbers.

and Surgeons, and usually didn't even know their medical alma mater (Flexner 1910, p. 172).

Prior to the release of his findings, the public wasn't very astute in evaluating the medical profession. So detached from professional training was medical reputation that self-help manuals were employed by the physician in improving their respectability among the local clientele. Among the highly popular of these manuals for the recent medical graduate was D. W. Cathell's *The Physician Himself and What He Should Add to the Strictly Scientific*, first published in 1882 and later renamed *Book on the Physician Himself and Things that Concern His Reputation and Success* (King 1984, p. 102). The state of medical practice around the time of the Flexner Report can be ascertained from a reading of the recommendations in the 1911 edition:[32]

> Public opinion is the supreme court. You will be more esteemed by patients who call at your office, for any purpose, if they find you engaged in your professional duties and studies, than if playing music, making toy steam-boats, entertaining loungers, or occupied in other non-professional or trivial pursuits; even reading the newspapers, smoking, etc., at times proper for study and business, have an ill effect on public opinion, which is the creator, the source of all reputation, whether good or bad, and should be respected; for a good reputation is a large, a very large, yea one of the chief parts of a physician's capital (Cathell & Cathell 1911, p. 11)

Specific recommendations also include to avoid making friends with 'aimless idlers', to grow a beard if possessed of a 'youthful-looking' face, and not to shake hands with the coarse or ignorant. Physicians should decorate their office with degrees, awards, society memberships, and photos of medical celebrities or heroes. This was a manual aimed at the former working class, attempting to cultivate an image in the professional world – the goal was to imply credibility.

Medicine had undergone an overall quality explosion in the preceding decades. Robert Koch's discovery and description of the 'tubercle bacillus' in *The Etiology of Tuberculosis* in April 1882 (Koch 1882) is widely regarded as the paradigm-shifting moment in the rise of germ theory.[33] Understanding the causative agents of infection led to a revolution in healthcare. In the 1880s, 40% of abdominal and pelvic surgery patients died of complications; in 1900, the death rate was 5% (Stevens 1971, p. 49). Improvements in child mortality were so drastic that life expectancy at birth improved by about 7.1 years among white Americans between 1880 and 1900 (Preston & Haines 1991, p. 129).[34] By the turn of the century, laboratory work took on an enlarged role (King 1984), as a physician could harness scientific methods to accurately diagnose a lengthy list of conditions including cholera, leukemia, infection with the parasitic worm filaria, malaria, leprosy, amoebic dysentery, and diphtheria, among others (Musser 1898, p. 1490).

Progress meant that proper medical care was effective, aggravating the difference between 'good' and 'bad' medicine. The novel methods worked. It is therefore not shocking that Flexner (1910) devoted a lot of ink to the praise of the German model of medical education, and the benefits

[32] This edition had been revised by his son William T. Cathell.

[33] A contemporary review of Koch's work, published in July 1882 in the *American Journal of the Medical Sciences*, stated that Koch's new staining procedure determined the cause of tuberculosis 'beyond doubt' (AJMS 1882).

[34] This was estimated using questions about children and surviving children in the 1900 federal census. Preston & Haines (1991) find no evidence of improvement for black Americans over the same time period.

of strong clinical and laboratory training. The main criticisms of each school he disparaged are typically found under categories entitled 'laboratory facilities' and 'clinical facilities'. Prospective patients now faced a choice that *mattered* in context: hire a physician with proper knowledge of the literally life-saving state of the art, or risk life and limb by contracting the services of a physician with lesser training. Given the gross variation in quality among physicians available, the methods by which contemporary consumers assessed physician quality, and the narrow dimensions of medical training, the public was seemingly susceptible to have their perceptions of physician quality shocked by a well-designed report on the efficacy of medical training.

2.2 Flexner's Shocking Report

The abysmal and highly variable training of physicians in the nineteenth century was noticed by expert contemporaries. Since its inception in 1847, the American Medical Association [AMA] has avowed improvements in medical education and public health as two of its primary goals (AMA 2021). Not much was done.[35]

Eventually, a new era of standardization in medical education was initiated in 1904, when the AMA created its Council on Medical Education [CME]. The CME was entrusted with the review of medical degree-granting institutions in the United States and Canada, with the set aim of enforcing minimum standards for the education of physicians. To accomplish this goal, the CME began inspecting institutions in 1906. The CME presented the results of its 1906 inspections at its Third Annual Conference in Chicago on 29 April 1907 (AMA 1907). For each medical school, 0-10 points were assigned to each of ten categories.[36] A grade of A was assigned to medical schools scoring 90 or higher, B was assigned to 80-90, and C was assigned to scores of 70-80. All three categories were considered acceptable. Grades of D and E were given to 60-70 and 50-60, respectively; these schools needed some improvements. Scores below 50 were considered unacceptable and given a score of F. Of the 160 American medical schools evaluated, 81 were assigned grades A-C, 47 needed improvements, and 32 were assigned a failing grade of F. The list of schools receiving each grade was not publicized, and only summary statistics were available in the *Journal of the American Medical Association.*

The public and the profession have largely forgotten this and earlier initiatives, and remember instead Flexner's quality reporting in June 1910. His obituary in the *New York Times* was front-page news, and its first sentence claimed his report "revolutionized medical studies in the United States" (New York Times 22 Sept 1959, p. 1). This legacy has endured. When the *New England*

[35] This may have been due to the relatively dismal state of the profession previously. As the capabilities of medicine improved, so too did the power of the AMA. Membership in the AMA more than doubled between 1904 and 1910. Listed at 15,039 as of 1 May 1904 (AMA 1904, p. 1575), it reached 34,176 as of 1 May 1910 (AMA 1910*a*, p. 1963).

[36] These categories were: (i) "showing of graduates before state board examinations;" (ii) "requirements and enforcement of satisfactory preliminary education;" (iii) "character and extent of college curriculum;" (iv) "medical school buildings;" (v) "laboratory facilities and instructions;" (vi) "dispensary facilities and instruction;" (vii) "hospital facilities and instruction;" (viii) "extent to which first two years are officered by men devoting entire time to teaching and evidences of original research work;" (ix) "extent to which the school is conducted for the profit of the faculty directly or indirectly rather than teaching;" and (x) "libraries, museums, charts, etc." (AMA 1907, p. 1702).

Journal of Medicine began a new series concerned with medical education, the introductory article was entitled "American Medical Education 100 Years after the Flexner Report" (Cooke et al. 2006), and in introducing a special centenary issue for the report in 2010, the editor of *Academic Medicine* assumes readers will be celebrating the 200th anniversary in 2110 (Kanter 2010). Why? While Flexner did not introduce new ideas to medical audiences, his 'muckraking' pronouncements were novel for general audiences and helped shape public opinion (Hudson 1992, Ludmerer 2010).

Despite its impact, the methodology of the *Flexner Report* was not overwhelmingly transparent. He provided brief details on each school's history, entrance requirements, fees, attendance, teaching staff, and other teaching resources. Emphasis was placed on laboratory facilities and clinical facilities. In several places in the text, Flexner makes personal recommendations as to which schools ought to remain in operation and which should be closed. Ultimately, he calls for a reduction from 147 to 31 schools in the United States.[37,38] Three of the eight Canadian schools were to be eliminated. When describing the quality of medical training at the schools he wanted closed, he was often eviscerating: both Milwaukee schools were "without a redeeming feature," (p. 319) and he described the dissecting facilities at Chicago's National Medical University as "a dirty, unused, and almost inaccessible room containing a putrid corpse, several of the members of which had been hacked off," (p. 213). His apparent goal was to shock and awe the public consciousness.

[37] Flexner states this as 155 to 31 (p. 154). This conflicts slightly with the tabulation of recommendations I provide below in Table 1. Flexner described 170 schools in the United States and Canada. Eight of these schools were Canadian, leaving 162 American schools. It is unclear how Flexner arrives at 155 schools in the United States. This number likely refers to 170 schools less the 3 schools which closed prior to his report and the 12 post-graduate or specialty schools for which he does not actually make recommendations, but includes Canadian schools. I subtract the remaining 8 Canadian schools that he kept in error. Flexner also includes all eight osteopathic schools in the number that ought to be closed, while the CME did not consider these medical schools (to this day they award DOs and not MDs) and therefore did not evaluate them. A reduction "from 139 to 31" may therefore be more accurate.

[38] The remaining 31 schools excludes Canada. Flexner provides a map for his suggested reconstruction on which there are thirty dots designating locations that ought to have a full medical school in the near future (Flexner 1910, p. 153). He lists only a single dot for Nashville TN despite his recommendation that both Vanderbilt and Meharry continue operations. This yields 31 medical schools in the United States, as stated. In Table 1, I record 38 schools which he suggests might remain open in some fashion, 5 in Canada. This leaves 33 in the United States. Part of the difference is that Flexner recommended two schools in Atlanta (Atlanta College of Physicians and Surgeons and Atlanta School of Medicine) merge, as should three schools in Chicago (Rush Medical College, Northwestern University Medical Department, and the College of Physicians and Surgeons). He also lists one dot (future school) for New York, but is ambivalent in the text about which schools should persevere. It is clear he thinks 'Cornell University Medical College' and the 'College of Physicians and Surgeons' (Columbia) have a future. He lists the future of 'University and Bellevue Hospital Medical College' as "less secure" but possible. In my baseline analyses, all three are recorded as 'Keep' by Flexner. The latter is treated as 'Close' in a sensitivity analysis. The remaining schools in the city are to be closed. These additional schools for Atlanta (1), New York (2), and Chicago (2) reduce the number of American schools to be kept open to 28. There are three additional locations that Flexner is counting. First, one of his dots is placed in Seattle, where in 1910 there did not yet exist a medical school; he applauds Washington's physicians for the current situation but discusses the potential need for a school there in the near future. Second, one of his dots is in Columbus. Flexner speaks poorly of the one medical school in Columbus, the independent Starling-Ohio Medical College, and appears to recommend that the Ohio State University find some way to take its resources (pp. 286-288). I therefore record the recommendation for physicians from this school as 'Close' but Columbus is one of the three additional locations Flexner recommends. The final difference concerns Alabama. Flexner is impressed by neither the 'Medical Department of the University of Alabama' in Mobile nor the 'Birmingham Medical College'. He recommends instead that the State University cease operations in Mobile and *eventually* conduct clinical work at Birmingham. For now, they should have a half-school in Tuscaloosa only (see pp. 185-187). Birmingham is listed as a dot on Flexner's map of 31 schools, but it is clear that the school presently there is not being evaluated in the affirmative.

It worked. The following morning, 6 June 1910, its publication was front-page news across the country. The Chicago Tribune's cover was emblazoned with "Scores Chicago's Medical Schools: Carnegie Foundation Says This City in That Line of Education Is Plague Spot of the Country" (Chicago Daily Tribune 6 June 1910, p. 1). In Boston, the Herald's front page alerted readers "Carnegie Report Bitterly Assails Medical Schools" (Boston Herald 6 June 1910, p. 1). In Baltimore, The American reported a defensive attitude: "Deans Defend the Schools: Attacked By a Carnegie Report" (Baltimore American 6 June 1910, p. 1). Across the country, the Omaha Morning World-Herald declared "Says Country Supports too Many Doctors: Abraham Flexner Scathes Medical Schools in Report to Carnegie Foundation" (Morning World-Herald 6 June 1910, p. 1), and in Little Rock, the Arkansas Gazette's cover put the matter simply in bold face, "Too Many Ill-Trained Doctors" (Arkansas Gazette 6 June 1910, p. 1).

The public criticism of the profession was thus immediate and intense. One newspaper referred to the report as "the most dramatic criticism of the medical colleges of Chicago ever uttered" (Rockford Register-Gazette 6 June 1910, p. 7). Public knowledge was suddenly and rapidly alerted to an idea that many of the nation's physicians were under-trained and not fit for their profession. I argue that this information shock constitutes plausibly exogenous variation to consumer information regarding the quality of general practitioners with different medical degrees, and national trends support a dramatic readjustment in markets for physician services strongly associated with the release of the *Flexner Report*. Figure 1 plots the density of physicians in the contiguous United States per thousand population over the period 1898-1918 based on the two major national medical directories of the era.[39] Physician density is effectively flat between 1898 and 1908, begins to decrease over the 1909-1912 period, and does not begin to increase again until 1916-1918.[40,41]

The precipitous drop around 1910 must be explained by some combination of: (i) a reduction in new physicians per capita;[42] or (ii) an accelerated exit of practicing physicians associated with the release of the *Flexner Report*. Flexner's recommendations likely did affect medical school survival (Hiatt & Stockton 2003, Miller & Weiss 2008, 2012, Weiss & Miller 2010), accelerating a downward trend: from a peak of 162 medical schools in the United States in 1906, there were 140 remaining in 1909, a figure which plummeted to 122 by 1911 (AMA 1919). Flexner's true contribution was expediting an ongoing process; the consolidation of American medical education began with the formation of the CME. The goal of this study is to identify whether the consumer information shock

[39] Physician counts for the United States were taken from the Polk Medical Registers (*Polk's Medical Register and Directory of North America* 1898-1917) and the American Medical Directories (AMA 1907-1922) for available years 1898-1918. Annual population estimates for the United States were taken from Carter et al. (2006).

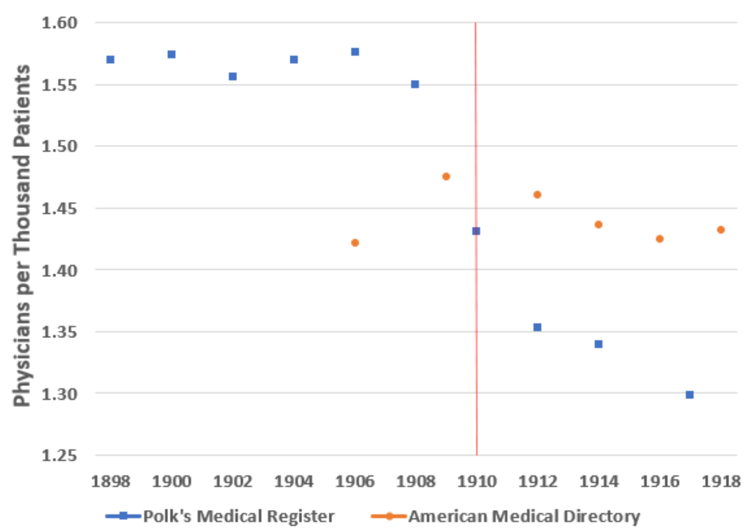
[40] Note that the *American Medical Directories* were first published in 1906, and so it is not clear that the increase in physician density recorded for 1906-1909 is valid: creating a physical index of all the physicians in the country is time-consuming. It is very likely that some physicians were missed in the first edition. A similar issue occurred with the first issue of *Polk*, published in 1886. In 1886, *Polk* recorded 85,671 physicians in the mainland United States. This jumped to 100,180 in 1890 (2nd edition) and stabilized. The third edition in 1893 listed 103,090 physicians.

[41] Total physician density in the United States has declined significantly from the period. In 2005, physicians per thousand persons was 1.146 and it further declined to 1.128 in 2015 (Basu et al. 2019, p. 508).

[42] The unpublished AMA report in 1907 and the subsequent closing of American medical schools likely had considerable supply-side effects. In 1904, there were 5,747 medical graduates in the United States; by 1909, this figure had already declined to 4,515 with the most dramatic reduction occurring between 1906 and 1907 (AMA 1919).

contained in Flexner's recommendations caused effect (ii), and whether physician relationships and reputation protected against his negative reviews. In Section 5.1, I describe the methods I employ to isolate these heterogeneous impacts of Flexner's reporting on the viability of practicing physicians.

Figure 1: Trends in Physician Density, United States, 1898-1917



2.3 Consumer Learning

Quality reports must facilitate consumer learning or constitute 'news' to have a significant effect on consumer decision-making (Dafny & Dranove 2008, Dranove & Sfekas 2008). If the public was already aware of the variations in medical training that Flexner reported, we should not expect them to change their consumption behavior, and so physician practice failure should be unaffected. While this seems unlikely based on the journalistic response, a less publicized but more official set of rankings were released within a fortnight which provides some comparison.

The CME began its second set of school inspections in 1909, the results of which were discussed June 7th at the St. Louis meeting of the AMA and released publicly on 18 June 1910 (AMA 1910*b*). In this second report, the CME combined grades A-C into class A "acceptable medical colleges," grades D-E into class B "medical colleges needing certain improvements to make them acceptable," and grade F was listed as class C "medical colleges which would require a complete reorganization to make them acceptable." Some 2-year programs excluded clinical instruction and were rated first-class in their pre-clinical education. Flexner referred to these schools as 'half-schools' and suggested that some schools be limited to this function, in addition to the multitude that ought be eliminated entirely. Table 1 compares the results of the official AMA evaluations against those made by Flexner regarding the future of American and Canadian medical schools.[43]

[43]Flexner also evaluated 8 osteopathic schools not evaluated by the CME. He discussed 12 post-graduate and specialty schools but did not always comment specifically on their future. Osteopaths are not included in my dataset and post-graduate or specialty degrees listed are very rare and dropped from the analysis. Flexner also evaluated three

Table 1: Flexner Recommendation v. CME Rating

	Flexner Recommendation			
CME Rating	Keep	Half	Close	Total
A [4-Year Program]	33	4	32	69
A [2-Year Program]	2	8	0	10
B	3	0	33	36
C	0	0	32	32
Not Rated - Osteopathy	0	0	8	8
Not Rated - Closed	0	0	3	3
Not Rated - Other	0	0	0	12
Total	38	12	108	170

There is a tight pattern between Flexner's recommendations and the more structured evaluations of the CME. All medical schools rated B or C by the CME, excepting three, were poorly rated by Flexner. The exceptions are explained by allowances Flexner made for regional and linguistic differences.[44] In the second row, we see 2 half-schools that Flexner recommends become full medical schools in the future. These are University of Wisconsin College of Medicine in Madison and University of Utah Department of Medicine in Salt Lake City. Regional considerations appear to dominate this calculation.[45] Three schools Flexner recommended be closed did in fact close their doors prior to the Report's release. The big difference with the CME report is found in the first row: Flexner wanted to close many schools that the CME rated A.

Recall that, relative to 1907, the CME combined medical schools with a wide range of scores into Class A. The report specifically cautions that "the Reference Committee is impressed by the *leniency* with which these ratings have been made. Consequently, we would urge the schools in Class A (rated over 70 per cent.) not to feel that they have reached perfection" (AMA 1910*b*, p. 2061).[46] Flexner was free to be harsh, and the differences between the ratings in Class A could be the result of unobserved quality differences in the CME report *or* independent judgment by a single man. After all, there is some evidence of bias against female-only and non-regular medical schools – Flexner recommended that all homeopathic, eclectic, and female-only schools be closed.[47]

It is possible that these schools were all lower quality than the top-rated regular schools, but the pattern is worth noting. Fully 40% of homeopathic schools were rated A by the CME but designated

schools which closed between the time of his evaluation and June 1910. These schools were nonetheless evaluated in his report, but excluded by the CME.

[44]The allowance for the south is explicit: "greater unevenness must be tolerated in the south" (Flexner 1910, p. 148). There were four medical schools in Atlanta GA in 1910, two of which were rated B and two of which were rated C by the CME. Flexner wanted the two C schools closed and the two B schools to merge into a single institution. This accounts for 2 of 3 schools in that cell. The third school was the French school in Québec City. A second French school was positioned in Montréal. Both were rated B by the CME, but Flexner appears to have made an allowance for the French population. While he refers to the school at Laval as 'feeble' he states "the needs of the Dominion could be met by the four better English schools and the Laval department at Quebec," (Flexner 1910, pp. 325-326).

[45]In the states surrounding Utah, there were only medical schools in Denver CO; Idaho, Wyoming, Nevada, New Mexico and Arizona had no medical schools. In Wisconsin, Flexner also recommended that two medical schools in Milwaukee – both rated B by the CME – be closed.

[46]Emphasis added.

[47]Table B1 shows how this blanket recommendation diverges from the ratings made by the CME.

for closure by Flexner. This might reflect a long history of animosity between the regular medical schools and the homeopaths.[48] Whereas the quality ratings recorded by the CME were partially objective, Flexner was not constricted by a points-based measure. His assessments are therefore generally questionable, though they appear related to CME-rated quality. Of the seven medical schools intended for primarily for black students, Meharry (Nashville TN) and Howard (Washington DC) were rated A by the CME and Flexner agreed they should remain open. One was rated B and four rated C, and Flexner predictably recommended they be closed.[49]

In the analyses which follow, I treat the release of the Flexner Report as a shock to consumer information which differentially affected physicians based upon the school from which they earned their medical degree. Specifically, if Flexner thought the school should be maintained (closed), this was treated as a positive (negative) shock to perceived quality. Differences between the second CME report and Flexner's recommendations are used to assess the importance of 'news' generated by Flexner's implicit certification scheme, with the second CME ratings treated as prior knowledge. The entirety of the impact on poorly-rated recent entrants' practice failure loads on individuals who attended institutions rated A by the CME. In the following section, I describe the data and the construction of these treatment variables.

3 Data

The primary dataset used in this paper consists of digitised versions of medical directories published by the New York State Medical Association (*Medical Directory of New York, New Jersey and Connecticut* 1903-1914). These documents contain lists of legally practicing physicians in each of these states in the associated year. Each entry lists a physician's name, medical degree, and year graduated, and is found under the post-office & county in which the doctor practiced.[50,51]

Entries for Connecticut, New Jersey, and New York were collected for 1903-1914.[52] In all, 120,989 individual entries were digitised and then manually reviewed for errors and processed

[48] Interested readers should consult Kaufman (1971) for a homeopathy-centered history of this conflict. King (1984) and Starr (1982) provide lengthy histories of American medicine which describe the interplay between these two largest groups of practitioners in the country.

[49] While Flexner and the CME agreed on the relative quality of the primarily black medical schools, the rankings relative to other schools could have been biased across both sources. It is beyond the scope of this paper to attempt to calculate the true quality of each medical school or evaluate how the sociological biases of the early twentieth century affected reported rankings.

[50] In some cases, the entry also includes the address, phone number, working hours, related medical positions, and society memberships held by the physician. This supplemental information is not consistently available, especially in the rural areas and smaller communities. For this reason, no variables are constructed from these additional data.

[51] Figure A1 displays two typical entries from New Haven, Connecticut, in 1908.

[52] The data excludes physicians for Manhattan, Bronx, and Brooklyn boroughs of New York City. This region of 'Old New York City' was excluded for two reasons. First, New York City is fundamentally different from every other region in the country in this time period. Any insights gained from an analysis of physicians in New York City would not extend beyond its narrow borders. Second, I argue below that large metropolitan areas and areas with medical schools should be excluded from analysis. As Long Island College Hospital was present in Brooklyn and *seven* other undergraduate medical schools were evaluated by Flexner in New York City, I omit the city from the scope of this paper. Both would also by excluded by the restriction to areas with population less than 100,000.

to isolate the name, address, education information, and other details. The strings representing degree-granting institution were then matched manually to a list of all medical institutions that ever existed in the United States and Canada.[53] In cases where the string could not be unambiguously matched to an institution, the link was marked as uncertain. Physicians were then linked across time systematically. First, doctors in different years were assumed to be the same person if: (a) they had the same post-office location; (b) their names perfectly matched; and (c) their degree was from the same educational institution. Second, physicians were manually matched against all physicians ever at the same post-office using name and education institution. Third, all physicians were listed alphabetically and manually matched against physicians 'nearby' in the list.[54]

At each stage, potential matches were intentionally liberal and any match that was uncertain was flagged as such.[55] Also flagged for additional investigation were physicians present in multiple locations in a single year. All flagged physicians were then located in one of the *American Medical Directories* or *Polk's Medical Register*. Information from these directories was used to assess whether matches should be sustained or dropped. A total of 14,261 unique individuals were isolated, of which only 47 (0.3%) could not be matched to a medical school.[56]

3.1 Market Definition

Geographic markets are required to determine the date of a physician's entry and practice survival time. In the medical directories, physicians are organized according to 2,103 distinct post-offices over the 12 year sample period.[57] As physical post-office locations shift over time, places in close proximity sometimes represent the same community. In addition, patients may not always hire the nearest physicians, leading to geographic chains of substitution through neighboring doctors.[58] I therefore combine nearby localities and construct 3km rolling markets for physician services, which group locations such that all post-offices within 3km of each other are in the same market.[59,60]

[53]Specifically, I used the list contained in Polk's Medical Register for 1914 (*Polk's Medical Register and Directory of North America* 1898-1917).

[54]When surnames included hyphens or multiple components, I also matched the physician as-if the components were reversed or some components were missing.

[55]For example, when physicians had similar names but different education institutions these were matched unless both were present at the same location in any single year. This accounts for the fact that the reporting of physician degrees was variable from year-to-year for the same physician, especially when a physician had several degrees.

[56]The physician entries in these national directories were also used to ascertain the correct medical institution for a listed degree when ambiguously matched to an institution in the 1914 index of the Polk Medical Register.

[57]While these offices served a larger catchment area, all physicians listed under the same post-office were assigned identical geographic coordinates. Coordinates were obtained using ArcGIS Online through Northwestern University. Post-offices were often given the name of the place they were located. Most were assigned the modern coordinates of the place with the same name in the same county. When matches were not perfect, locations were assigned within the correct county based on a wide array of internet searches.

[58]When urban areas are sufficiently close, physicians may compete for patients in the neighboring location. Consequently, nearby areas constitute a single market for primary care.

[59]Figure A2 demonstrates how these rolling markets are constructed in Southern Nassau County.

[60]Fundamentally, this assumes that the set of potential patients for a physician lies within a 3km radius of their listed post-office. While some urban areas are larger than 6km in diameter, all physicians and patients in an urban area are given the same coordinates, and so the entire urban area is included.

There are 1,727 such markets in the study area.[61]

3.2 Treatment Measure

The Flexner Report (Flexner 1910) provided a recommendation as to whether each school operating in the United States or Canada in 1910 ought to continue operations or be shuttered. Each medical degree in the dataset is mapped to one of the following categories: (a) Poor Rating (Flexner thinks the school should be closed); (b) Good Rating (Flexner thinks the school may usefully continue operations); (c) Half-School Rating (Flexner thinks the school should conduct only the first-two years of instruction and not pursue clinical instruction); (d) Foreign School; (e) School closed prior to Flexner's Report; (f) Licensed by a State Examining Board; or (g) Medical school to which degree refers cannot be determined.[62] When a medical school merged into a school that Flexner evaluated, I categorize these degrees as receiving 'indirect' ratings. As consumers cannot be expected to know the genealogy of medical schools, only 'direct' ratings are considered to be treatments; 'indirectly' treated physicians are considered untreated by the report.[63]

Some physicians in the dataset received degrees from multiple institutions.[64] For analysis purposes, I assign a single degree to each physician – that most recently received.[65] Approximately 45.7% of physicians in the three states held their most recent degree from an institution that Flexner disparaged, while 29.3% held degrees from those positively reviewed. Another 16.7% of physicians held degrees from institutions which no longer exist but merged into existing institutions. Only a small number of physicians hold other degrees: 3.5% from schools rated by Flexner as appropriate for non-clinical instruction, 1.5% from foreign schools, and only 2.6% from schools closed previously. The vast majority of physicians held degrees evaluated in the Flexner Report.[66]

[61] Sensitivity analyses will interchange 1km and 5km rolling markets in a future version of this paper. Fixed markets will not be used because some post-offices were coded as different names which map to slightly different locations. A minimum radius of 1km is required to not artificially separate the same market. There are 2,012 1km-rolling markets and 1,268 5km-rolling markets in the study area. Increasing the radius beyond 5km results in a rapid decline in the number of markets; a 10km definition, for example, yields only 154 markets in all three states. The 3km definition was selected to balance conflicting concerns: markets broad enough to capture the extent of competition faced by the physician, but narrow enough such that physicians can be thought of as 'local' to the area.

[62] For example, "Univ. Mich." or "Ann Arbor" can refer to either the regular department (given a good rating) or the homeopathic department (given a poor rating) of the University of Michigan at Ann Arbor. For most physicians, the correct medical school was determined from consultation of Polk and AMD directories. In a small number of cases, no determination could be made after intensive investigation.

[63] Figure A3 plots the percentage of physicians in each state who received direct negative ratings (left panel) and direct positive ratings (right panel). While positively rated physicians increase their market share basically uninterrupted throughout the period, trends in the market share for poorly rated physicians are visibly interrupted in 1910. This is highly suggestive. By contrast, Figure A4 shows that indirectly rated physicians differ markedly from those with 'direct' ratings. The share of these physicians was broadly decreasing throughout the sample period.

[64] This was uncommon. Of the 14,261 unique physicians in the data, 233 (1.63%) held a second degree.

[65] State licenses are dropped in favor of medical degrees whenever available, even when the license is more recent.

[66] Table B2 summarizes the distribution of physician ratings across states in 1909. Table B3 provides a full breakdown by institution of these ratings by state for the full panel of 120,989 physician-years, ordered by frequency in the panel. Table B4 provides the name, city state, Flexner rating, and sect (see below) for each institution code listed in Table B3 that Flexner evaluated. Table B5 provides explanations for other codes or physicians ambiguously linked.

3.2.1 Bad News

The CME released its lenient second report 13 days after the publication of the *Flexner Report*. This publication received considerably less attention than the 'independent' initiative and essentially no new information for patients. As the CME evaluations were designed to be non-confrontational, I use them as a yardstick for public knowledge prior to June 1910.

Specifically, I categorize direct ratings in the CME and the Flexner Report in the following way: individuals who attended an institution directly rated A by the CME are treated as receiving 'bad news' if their degree was disparaged by Flexner (41.9%), and as known high-quality doctors if endorsed by Flexner (29.2%).[67] I group degree holders from schools in CME class B or class C as known low-quality physicians if they are also denigrated by Flexner (3.7%), and as treated with 'good news' if Flexner said the school should nevertheless remain open (0.1%).[68] Some doctors attended schools rated poorly by Flexner but closed prior to the CME evaluations (0.1%), and all indirectly or non-rated physicians are considered untreated (25.0%).[69] There are very few physicians known to be low-quality or receiving 'Good News' from Flexner because 95.2% of physicians in the study area who attended institutions rated directly by the CME evaluations held class A degrees. In the analyses that follow, I separate the effect of 'Bad News' from the effect of being poorly rated by Flexner; the minuscule sample size for 'Good News' precludes a similar breakout for well-rated physicians.

3.2.2 School Type

Using the histories of each school evaluated by Flexner found in the AMD and Polk directories, each school was assigned to its sect: homeopathic, eclectic, or regular. It was also determined whether these schools were women-only or primarily oriented towards black students. For convenience, these latter two categories are coded as separate 'school types' but all black medical schools are also regular institutions. Of the poorly-rated physicians, almost three-quarters attended regular medical schools. The remainder are mostly homeopathic, who as a group constitute only about 10% of physicians in 1909, but 21.8% of poorly-rated physicians.[70] In fact, every single homeopathic, eclectic, and women-only degree in the dataset received a negative rating from Flexner.[71]

In baseline analyses, only regular physicians are included such that results for poorly-rated and well-rated degrees are directly comparable. As all homeopathic, eclectic, and women-only schools received negative ratings, no separate estimate of the report's broad impact within these groups is possible due to lack of treatment variation. On the other hand, there are sufficient homeopathic

[67] Percentages are for physicians practicing in the study area in 1909. Table B8 presents the variation by group and state for these practicing physicians exposed to the Flexner Report.

[68] More than 95% of the 8,052 physicians present in the 1909 sample that attended schools directly rated by the CME 1910 report were graduates of programs receiving a grade of A.

[69] See Figure A5 for a matrix representation of these consumer learning categories.

[70] Table B6 provides a breakdown across these school types of the 4,693 directly poorly-rated physicians in 1909.

[71] Table B7, which provides a breakdown across these school types for physicians with a direct good rating, is therefore nearly bare: almost every physician in this category attended a regular medical school.

physicians in the region to permit a separate analysis of the effect of receiving a poor rating on recent entrants relative to their more seasoned colleagues. These analyses are presented in Appendix F. As there are almost no physicians from eclectic, black, or women-only medical schools in the data, similar analyses within these groups are precluded.

3.3 Outcome Measures

The main measure of physician outcomes available in the dataset is survival time in local market m. A physician is either located in m in year t or not. Define the set of physicians in market m in year t by the vector $m(t)$. Then we write $i \in m(t)$ if physician i is in market m in year t and physician presence in market m in year t is given by $P_{imt} = \mathbb{1}(i \in m(t))$. Survival time for physician i in market m is given by $\tau_{im} \equiv \sum_t P_{imt}$. A physician-market pair (i, m) exists if a physician i is ever present in market m, that is, $\tau_{im} > 0$.

The basic unit of analysis is this physician-market pair (i, m). For convenience, substitute $j = (i, m)$. To investigate the effect of market tenure upon the impact of the Flexner Report on practicing physicians, we require some measure of time in market m. Define a physician-market's cohort ϕ_j by the earliest year a physician is present in market m: $\phi_j \equiv \mathbb{1}(\tau_j > 0)\left[\min_t : P_{jt} = 1\right] + \mathbb{1}(\tau_j = 0)\left[\varnothing\right]$, where the empty set is applied when the pair $j = (i, m)$ does not exist. A physician-market pair's cohort year is synonymous with its year of *market entry.*

Physician survival *to* any given year $t \geq \phi_j$ can therefore be tested by presence in a future year, that is, if $P_{jt} = 1$. Physician survival for z years in market m is given by the indicator $S_{jz} \equiv P_{j\tilde{t}}$ where $\tilde{t} \equiv \phi_j + z$. A survival curve extending k years for some group of physician-market pairs $\mathcal{J}$ – for example, the set of poorly rated physicians in New York – is then given by the ordered sequence $\overline{S}_{jz}\big|_{z=0}^{k}$, where $\overline{S}_{jz} \equiv \left[\sum_{j \in \mathcal{J}} S_{jz}\right] / \left[\sum_{j \in \mathcal{J}} 1\right]$ is average survival z years into the future.[72] I link survival curves to a probabilistic model of physician location choice in Section 5, motivating estimation of duration models.

3.4 Other Measures

i. Experience: Medical experience is defined as the difference between the analysis year and the year a physician received their medical degree. Experience is important for physician survival for three primary reasons: (i) patients may value medical experience when selecting a physician; (ii) experienced physicians have an established practice and may face different costs associated with

[72] Survival curves are a useful tool for visualizing the effect of the Flexner Report on the market survival of practicing physicians. Figure A6 plots the survival in 3km-rolling markets for the 1907-09 cohorts for directly rated physicians in New York against the the pooled cohorts for $\phi \leq 1903$. Established physicians – both well-rated and poorly rated – survive year-to-year in their local markets at a relatively high rate, and there is relatively little change in survival trends in the post-Flexner period. By contrast, failure rates are high when physicians are new, and sizable gaps in favor of the well-rated physicians emerge in these more recent cohorts starting in 1910. Visually, this is a clear indication that the introduction of the Flexner report was related to subsequent patterns of physician survival in their local market for recent entrants. See Figure A7 for the analogous survival curves of the 1904-06 cohorts. Note that medical centers of Albany, Buffalo, and Syracuse are excluded. See Appendix D for discussion and justification of this data restriction. Figures A8 and A9 plot survival curves which include medical centers.

moving; and (iii) experience is highly correlated with age, and older physicians are more likely to die or retire. Age is not directly observable in the local medical directories and therefore cannot be controlled for directly; however, it broadly subsumed by controls for experience.[73]

ii. Newspapers: In Section 2.2, I proposed the dispersal of novel information concerning the quality of physicians after the release of the Flexner Report to be a potential explanatory mechanism for the market readjustment that began in 1910. Access to novel information in 1903-1914 can be reasonably assessed by the features of the newspapers present in the medical consumer's market; radio, television, internet, and other methods of mass-distribution were not yet technologically available. I therefore collect information on newspapers from the "N. W. Ayer & Son's American Newspaper Annual and Directory" for 1910. This directory purports to contain information on every newspaper in the United States for 1910. Data on newspaper names, locations and counties, frequency of publication, political orientation, year established, sheet size, number of pages, subscription price, and circulation were digitized for Connecticut, New Jersey, and New York.[74] There were 1,601 newspapers in the study area in 1910.[75]

General-content newspapers are defined by political alignment as described in the Ayer directory.[76] Many newspapers are interest-focused and are therefore unlikely to distribute news such as the release of the Flexner Report.[77] Restricting to general content eliminates 19.1% of the newspapers, leaving 1,295 in the study area in 1910. Almost all general papers are published at least weekly, while less than 20% of papers are published daily. To capture the availability of news concerning physician quality, the baseline sample restricts attention to areas with (at least) weekly general-content newspapers published within 25km of any postoffice in the market.

3.5 Baseline Sample

In the entire study panel, 45.2% of the 120,989 physician-years are coded as receiving a direct negative report from Abraham Flexner and another 29.2% are coded as receiving a direct positive report.[78] There is significant variation along this dimension in each state; however, data for Connecticut and New Jersey must be excluded from the analysis sample. Entry data for these states contain aberrations which suggest that physician listings were not properly recorded and updated every year in the source documents.[79] Areas with medical schools are also excluded.[80]

[73]AMD directories sometimes include a birth year for physicians. Birth years were matched to 53.7% of practicing physicians in 1909, and age is indeed highly correlated with experience.

[74]Data on the quality of the circulation estimate, assessed by the source text, were also collected.

[75]Table B9 documents summary newspaper counts by state.

[76]These newspapers have political orientations in the following list: Democratic, Ind. Dem., Ind. Labor, Ind. Rep., Independent, Labor, Local, Neutral, Non-partisan, Non-political, Populist, Republican, Socialist, or Union Labor.

[77]For example, two newspapers are about horse interests, another two concern "Cats," one focuses on railway employees, and a whopping six are dedicated simply to "Poultry."

[78]Table B10 provides annual physician counts in the sample area for 1903-14 by the primary treatment measures.

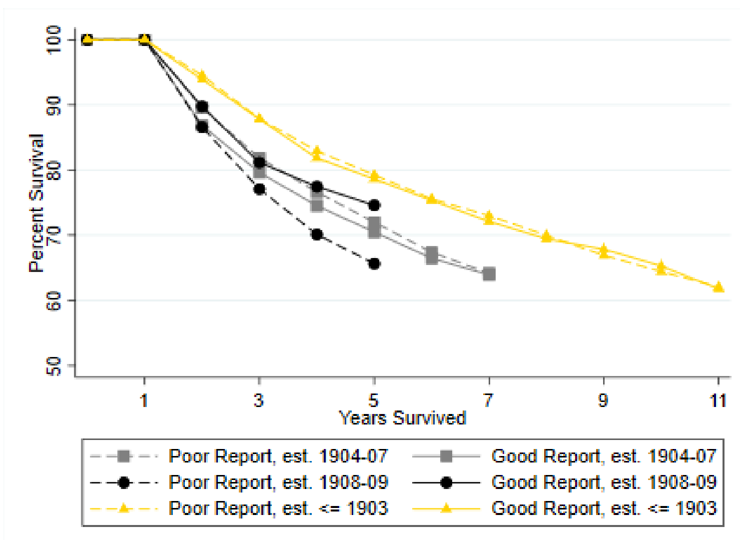
[79]This is not unexpected: these directory data were collected by the New York State Medical Association, which cannot be expected to maintain high-quality information on physicians practicing outside their jurisdiction. Appendix C provides details on corruption in these data; unless otherwise stated results are restricted to the state of New York.

[80]These 'medical centers' such as Albany and Buffalo are fundamentally different from other locations: an overwhelmingly high percentage of physicians were educated at the local school. Appendix D highlights the concentration

The remaining geographic area theoretically covered by this study is therefore all the cities and non-incorporated areas in the state of New York in which there was not a medical school. This leaves a panel of 62,911 physician-year observations for 1903-14, over which 47.5% of observations were physicians that attended schools rated poorly by Flexner and another 24.9% were physicians that attended well-rated schools.[81]

Using this subsample, Figure 2 provides preliminary visual evidence that the release of the *Flexner Report* impacted recent entrants to a local geographic market. Here, conditional survival curves for poorly-rated physicians are presented in dashed lines; the solid lines represent survival curves for physicians who attended well-rated schools. Black curves represent physicians who entered their local markets in 1908-09, and grey curves represent those entrants from 1904-07. For reference, the 'survival curves' for physicians entering their local market m in 1903 or earlier are also plotted.[82] The result is clear: the conditional survival curves for the low-quality and high-quality physicians, as rated by Flexner, are nearly identical for the 1904-07 cohorts. By contrast, they diverge dramatically for the 1908-09 cohorts. This divergence drives the estimated difference in hazard faced by the different cohort groups.[83]

Figure 2: Survival Z Years, New York, Conditional on Survival 1 Year



of selected physicians in these markets relative to elsewhere in the sample area. Opportunities such as faculty positions in the local medical school may further protect physicians from fluctuations in consumer demand, degrading the ability of practice survival to capture the impact of quality reporting in these markets. While most of these markets would typically also be excluded on the basis of differentiated competition restrictions, they are excluded from all models, including those that permit any level of competition.

[81]Consequently, more than 72% of the panel attended a school directly treated by the Flexner Report and there exists substantial variation. Table B11 provides a detailed summary of physicians by rating category in the sample.

[82]These are not technically survival curves, as survival is left-censored for these physicians. 'Years Survived' is actually 'Minimum Number of Years Survived' for this subset.

[83]See Figure A15 for the conditional survival curves for each cohort separately. Figure A14 plots survival curves for each cohort without conditioning for one year of survival in market m, and Figure A13 provides an unconditioned analogue to Figure 2.

This effect should be stronger in some markets than others. I select a baseline sample designed to include areas theoretically most impacted by the release of the *Flexner Report*. First, some degree of differentiated competition is required; if there are only physicians with degrees from the same institution, consumers do not receive a differentiated signal about physician quality. I restrict the baseline sample to areas where the same degree is held by at most 1/3 of practicing physicians. Second, physicians must not value local amenities too highly or have hospital appointments and other non-practice related income. For this reason, I remove post-offices with a population of 100,000 or more from the baseline sample. Third, consumers must have been exposed to information concerning the report. I restrict the baseline sample further to markets with a weekly general-content newspaper within 25km. After exploring the impact of the *Flexner Report* in the baseline sample, I vary these restrictions in Section 6.1. Finally, I also restrict the baseline sample to physicians educated at regular non-sectarian institutions not primarily focused on the education of female or black students. This is necessary for a clean comparison of physicians who attended poorly-rated and well-rated medical schools. I remove this restriction in Appendix F to test for the impact of the report by school type.[84]

I turn now to the empirical methods used to identify the impact of the reporting on practicing physicians. Owing to the unavailability of consumer data, I am limited to the investigation of physicians' practice survival in their local geographic markets. This is inherently a reduced-form exercise; however, as the *Flexner Report* was primarily a shock to consumer information, I discuss the patients' demand mechanism in Section 7.3. In the section which follows, I present preliminary evidence from simple models and discuss complications.

4 Event Study

A straightforward framework from which to investigate the effect of the Flexner Report on practicing physicians is the event study model. Define ι_t to be a binary variable equal to 1 if the year is t and 0 otherwise. Also define a dichotomous treatment variable $F_{j(i)}$ that equals 1 if the primary medical degree of the physician was given a direct negative review by Flexner. Then a simple event study of the effect of a physician's institution being poorly-rated on physician practice survival to period t is given by:

$$P_{jt} = \sum_{t} \beta_{0t}\iota_t + \sum_{t \neq 1909} \beta_{1t}\iota_t F_{j(i)} + \gamma_1 \exp_{j(i)} + \gamma_2 \exp^2_{j(i)} + \sum_{\phi} \alpha_\phi + \sum_{m} \alpha_m + \epsilon_{jt} \tag{1}$$

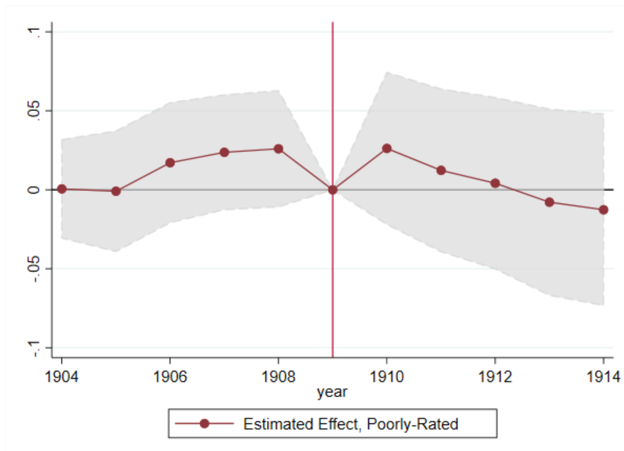
where $\exp_{j(i)}$ is the physician's experience at time of market entry, α_ϕ are a series of cohort fixed effects, and α_m are a series of 3km rolling-market fixed effects. Errors ϵ_{jt} are clustered at the market level, and the (unbalanced) panel includes an observation for every year after a physician

[84]Specifically, I will investigate the impact of the report on homeopaths and regular physicians separately. There will be insufficient sample size to evaluate the impact of the Flexner Report separately for eclectic schools or institutions primarily focused on the education of female or black students.

enters a local market ($t \geq \phi_j$) for each physician-market pair.

Figure 3 presents the series of estimates for the coefficients $\hat{\beta}_{1t}$, with $t = 1909$ omitted as the reference, pre-treatment year. No measurable impact of the quality rating can be found in the post-period, foreshadowing results in Section 6.[85] Similarly, no effect is measured when $F_{j(i)}$ is replaced by alternative dichotomous variables for holding a degree from an institution treated with 'bad news' or a well-rated school.[86] The Flexner Report had no discernible broad effect on physician practice failure.

Figure 3: Event Study, Poorly-Rated Physicians



By contrast, the event study approach fails to capture the combined effect of recent entrance to a local geographic market with $F_{j(i)}$. Consider an adaptation to Equation 1:

$$P_{jt} = \sum_t \beta_{0t}\iota_t + \sum_{t \neq 1909} \beta_{1t}\iota_t F^N_{j(i)} + \sum_{t \neq 1909} \beta_{2t}\iota_t(\mathbb{1}_{\phi \geq 1908})F^N_{j(i)} + \sum_{t \neq 1909} \beta_{3t}\iota_t F^Y_{j(i)}$$
$$+ \sum_{t \neq 1909} \beta_{4t}\iota_t(\mathbb{1}_{\phi \geq 1908})F^Y_{j(i)} + \gamma_1 \exp_{j(i)} + \gamma_2 \exp^2_{j(i)} + \sum_\phi \alpha_\phi + \sum_m \alpha_m + \epsilon_{jt} \qquad (2)$$

where the coefficients $\{\beta_{2t}\}_{t \neq 1909}$ capture the partial effect of recent entrance, conditional on being poorly rated, and coefficients $\{\beta_{3t}, \beta_{4t}\}_{t \neq 1909}$ isolate corresponding effects for well-rated physicians.

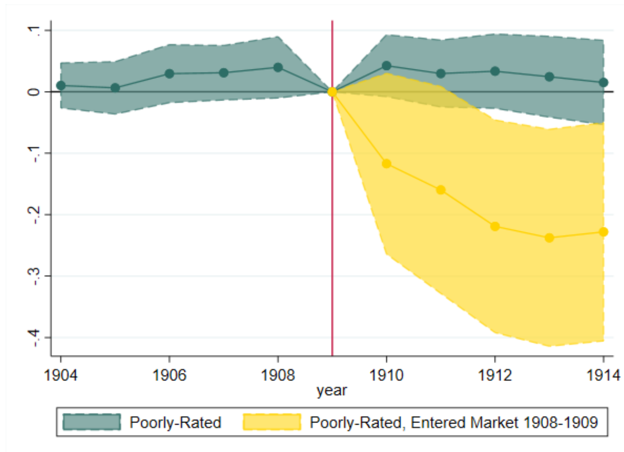
Figure 4 presents the sequence of estimates $\{\hat{\beta}_{1t}, \hat{\beta}_{2t}\}_{t \neq 1909}$. Once again, it is clear that the Report had no effect on poorly-rated physicians on aggregate, but a preliminary effect emerges for poorly-rated recent entrants. Unfortunately, no pre-period exists for these physicians, and no effect of the Flexner Report can be inferred from this event study in isolation. For example, the

[85] Regression panel is restricted to baseline sample: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded.

[86] See Figures A16 and A17, respectively.

interaction between poorly-rated and less time-in-market may have been deleterious to practice survival prior to the release of the Flexner Report, even after controlling for cohort fixed effects.

Figure 4: Event Study, Poorly-Rated Recent Entrants



Some insight can be gained from falsification analyses which re-run the analysis with incorrect hypothetical treatment years. Figure A18 plots estimates analogous to $\{\hat{\beta}_{1t}\hat{\beta}_{2t}\}_{t\neq 1909}$ above for these falsification studies. I find no significant divergence of the coefficients for the poorly-rated recent entrants when the hypothetical treatment year is prior to the release of the Flexner Report.[87,88] These results are only suggestive. A direct comparison between physician practice survival before and after the release of the Flexner Report, conditioning on time-in-market, will be required for more definitive statements.

To do this, I require a simplifying model which relates physician practice failure in the pre-period to that in the post-period. The estimation of an underlying 'hazard' of local practice failure through duration models permits such an analysis, and can be interpreted through the lens of a sequence of binary physician location decisions. I expand on this relationship and my estimation procedure in the section which follows.

5 Methods

Assume that physicians solve a second-stage profit-maximization problem for any of the innumerable locations they might choose to practice medicine. Physicians choose their practice location conditional on the equilibrium profits they can earn in each market m, given by π^*_{dm}. Assume that

[87] While it may seem unlikely that being a recent entrant has no effect, recall that Equation 2 controls for cohort fixed effects. It is therefore only the interaction between recent entrance and being poorly-rated which has no impact in these falsification tests.

[88] While there are similar effects treating 1909-10 as recent entrants for an event just prior to 1911, this can be explained by the tight window between the release of the Flexner Report (June) and the directory (September), as well as the inclusion of entrants from 1909. The effect dissipates as the falsification year moves to 1912 and 1913.

profits arise from some function with the feature that $\partial\pi^*_{dm}/\partial\hat{q}_{dm} > 0$, where $\hat{q}_{dm}$ represents local consumers' quality estimate of the physician. They also consider local market characteristics that might be separately appealing: a night-life, sports teams, cultural events, or anything else about an area that the physician values. This is indexed by a value of market m given by ν_m. Then a physician earns utility in market m according to some utility function:

$$V_{dm} = V(X_d, \nu_m, \pi^*_{dm}) \tag{3}$$

where $V(\cdot)$ is strictly increasing in π^*_{dm}. Define the set of options available to the physician by $m \in \mathbb{M} = \{0, 1, \ldots, M\}$, where $m = 0$ denotes the value of an outside option.[89] The physician maximizes over the set of options $m \in \mathbb{M}$, and selects a practice location $\tilde{m}$. This is a conditional choice model. Provided that $V(\cdot)$ is separable into general and idiosyncratic components and certain axioms hold, the logistic conditional choice model (McFadden 1973) can be applied provided that π^*_{dm} are observable or reasonably captured by ν_m and the columns of X_d.[90]

This paper is not directly concerned with practice choice location, but rather the effect of quality reporting on location choice *conditional* on already having previously selected a practice location. That is, we observe $\tilde{m}$ prior to the release of the report. If nothing changes, the physician will choose $\tilde{m}$ in the subsequent periods as well. Quality reporting changes the relative values of a physician's options through its effect on π^*_{dm} in each market via consumer updates to $\hat{q}_{dm}$. Consider an extreme case, where a negative quality report causes $\pi^*_{dm} = 0 \ \forall m = 1, \ldots, M$ such that the physician no longer has a profitable practice anywhere, and $V'_{dm} = V(X_d, \nu_m, 0)$. If location $\tilde{m}'$ maximizes the physician's utility $V(\cdot)|_{\pi^*_{dm}=0}$, there is no reason to believe that $\tilde{m} = \tilde{m}'$. This physician may still choose to practice medicine, but market characteristics unrelated to their medical business now dominate their location decision.

More generally, denote optimal profits in each market in the post-period by π'^*_{dm}. Then $V'_{dm} = V(X_d, \nu_m, \pi'^*_{dm})$ and the physician once again maximizes over $m \in \mathbb{M}$, selecting a new location $\tilde{m}'$. We are primarily interested in the statistic:

$$P(\tilde{m}' = \tilde{m} \mid X_d, \nu_{\tilde{m}}, \tilde{m} \neq 0) \tag{4}$$

across the population of physicians. This statistic measures the probability that a physician practice survives in their initial market $\tilde{m}$ in the post-period, conditional on characteristics X_d which may include quality reporting metrics.

By defining the years in which $\tilde{m}$ and $\tilde{m}'$ are selected for each cohort ϕ, the problem is transposed into the language of survival analysis introduced in Section 3.3. Recall that the cohort ϕ_j represents the first year a physician-market pair $j = (i, m)$ is observed in the medical directory, and define

[89] This could be anything from retirement, the uptake of a new career, or moving their practice across the country, away from the study area.

[90] For example, Moehling et al. (2020) use a conditional choice framework to estimate physicians' choice of urban versus rural location choice.

$\tilde{t}_z = \phi_j + z$. Then if $\tilde{m}$ is selected in ϕ_j and $\tilde{m}'$ is selected z years later, Equation 4 represents survival z years in market $\tilde{m}$, denoted by S_{jz}. Recall also that a survival curve extending k years for some group of physician-market pairs $\mathcal{J}$ is then given by the ordered sequence $\overline{S}_{jz}\Big|_{z=0}^{k}$, where $\overline{S}_{jz} \equiv \left[\sum_{j\in\mathcal{J}} S_{jz}\right] / \left[\sum_{j\in\mathcal{J}} 1\right]$ is average survival z years into the future. Sequential estimation of Equation 4 can therefore be used to estimate a survival curve for some group of physicians $\mathcal{J}$, such as the set of physicians who attended institutions rated poorly by Flexner.

Practice survival curves therefore emerge from the average of a series of binary practice location decisions made by individual physician: (i) remain in current market $\tilde{m}$; or (ii) switch to the next-best option. A physician that opts to remain in $\tilde{m}$ in period $z = 1$ still faces hazards – such as negative quality reporting – that may contribute to practice failure, and may yet exit $\tilde{m}$ in $z = 2$. There is no reason to believe that market readjustment in response to quality reporting will be immediate or occur in any given year, and so estimation of the effect of quality reporting on S_{jz} will only capture a subcomponent of its total impact. A more comprehensive approach estimates the impact of quality reporting on this *hazard* faced the physician in each period.

Hazards are tenure-specific failure rates which capture the probability that a physician's practice fails in period z, conditional on survival to period $z - 1$. A hazard function $\lambda(z-1, X_d, v_{\tilde{m}})$ can be interpreted as the complement probability of Equation 4:

$$\lambda(z-1, X_d, v_{\tilde{m}}) = 1 - P(\tilde{m}' = \tilde{m} \mid X_d, \nu_{\tilde{m}}, z, \tilde{m} \neq 0) \tag{5}$$

where the extra condition z denotes that the decision for market $\tilde{m}'$ occurs in period z. This corresponds to $E_{j\in\mathcal{J}}[1 - S_{jz} \mid X_d, \nu_{\tilde{m}}]$. Negative quality reports are expected to impact the hazard rates faced by individual physicians through the consumer demand mechanism. Decreased profits may increase the likelihood of practice relocation, retirement, or the pursuit of some other outside option; this is an increase in the hazard of practice failure. Hazard rates for practice failure in this setting are a function of the same variables as practice location choice.

5.1 Hazards Estimation

The goal of this study is to identify the effect on physicians' practice failure of receiving a negative review from Abraham Flexner in his famous report. I do this by estimating the impact of reporting on the hazard $\lambda(\cdot)$ faced by physicians, which requires a model for how changing market conditions affects the probability of practice failure over time. Such models are known as *duration* models because they exploit the length of time survived by each observation.

The Cox (1972) proportional hazards model provides suitable baseline estimates.[91] The hazard faced by a physician's practice in this model is given by:

$$\lambda(z, x) = e^{x'\beta} \lambda_0(z) \tag{6}$$

[91] In discrete time, the Cox set-up is equivalent to a series of logistic models where the universe selects which physicians fail in period z.

where x is a vector of physician practice characteristics which affect survival, β is a set of corresponding linear coefficients, and $\lambda_0(z)$ represents a standard time-varying hazard rate for $x = 0$. Time-specific hazard $\lambda(z)$ represents the probability of failure, conditional on not yet having failed, in the next period.[92]

This model can be implemented by maximum likelihood estimation. The relevant log-likelihood equation is given by:

$$\ln L(\beta) = \sum_{i=1}^{N} \zeta_i \left[x_i'\beta - \ln \sum_{j \in R(z_i)} e^{x_j'\beta} \right] \tag{7}$$

where ζ_i is a dichotomous variable denoting whether we observe failure time and $R(z_i)$ represents the set of individuals at risk at time z.[93] In this study, failure time is unobserved for all physician-market pairs present in the 1914 directory. These right-censored observations affect the likelihood component for each uncensored observation through their inclusion in the risk set $R(z_i)$. This semi-parametric framework sidesteps direct estimation of $\lambda_0(t)$.

The underlying linear design $x_i'\beta$ captures variations in physician characteristics which may affect practice failure, and may be highly flexible, permitting time-varying features. I specify a difference-in-differences design.[94] Recall the dichotomous treatment variable F_i, which equals 1 if the primary medical degree of the physician was given a direct negative review by Flexner. Then a model which separates the impact of the report by tenure in a local market area is given by:

$$\begin{aligned} x_i'\beta \equiv\ & \beta_0 + \beta_1 F_i + \beta_2 (\mathbb{1}_{\phi >= 1904}) F_i + \beta_3 (\mathbb{1}_{\phi >= 1908}) F_i + \gamma_1 \text{exp}_i + \gamma_2 \text{exp}_i^2 \\ & + \sum_{\phi} \alpha_\phi + \sum_{m} \alpha_m \left[+ \sum_{d} \alpha_d \right] \end{aligned} \tag{8}$$

where β_1 estimates the impact of the quality rating on physicians regardless of date of entry, β_2 estimates the added impact on physicians that entered a local market as early as 1904, and β_3 estimates the differential impact on physician practices established within two years prior of the release of the Flexner Report. In most analyses, β_3 is the primary coefficient of interest.

All specifications include medical experience variables exp_{it} and its square, where medical experience is defined as the number of years elapsed between a physician's graduation date and the first year we observe them in their local market.[95] Each model also includes market fixed effects

[92] In continuous time, the 'next' period is defined as $\Delta z \to 0$.

[93] Estimation can be difficult when multiple observations have the same survival time. I employ the Breslow (1972) solution to this computation problem.

[94] Similar underlying designs for duration models include Clotfelter et al. (2008), who specify a triple-differences model. Equation 8 can also be considered a triple-differences approach, but the third difference is mechanical rather than instructive.

[95] Note that while it is not possible to control for age directly, the coefficient β_4 should be highly co-linear with any hypothetical coefficient on age or birth year.

α_m and cohort fixed effects α_ϕ.[96] Institution-level fixed effects α_d are sometimes also included.[97] Importantly, the inclusion of cohort fixed effects absorb the effect of the proximity of cohorts 1908-09 to the release of the report, and are to necessary to interpret β_3 as a difference-in-differences parameter. In my approach, the differences are between year of entry and rating received in the *Flexner Report.* The coefficient β_2 is mechanical: it separates left-censored data from physicians for whom entry date is known.[98] This permits the interpretation of β_3 as the difference in hazard faced by poorly-rated physicians who recently entered compared to their more-tenured colleagues similarly rated poorly. I report estimates in exponential form $e^{\hat{\beta}}$, which are interpreted as proportional changes in the hazard faced by physicians for small variations in x.[99]

I modify this baseline specification throughout to capture various potential channels through which the *Flexner Report* may have impacted practicing physicians. In particular, by removing the cohort-effects given by β_2 and β_3, I test for effects of the Flexner Report on *all* physicians. I also substitute F_i for alternative definitions of treatment, including: (i) positive ratings from Flexner; (ii) ratings from the 1910 CME Evaluations; and (iii) 'Bad News' which indicates a negative evaluation by Flexner but a CME rating of A. The entire estimated effect on poorly-rated physicians will be shown to flow through 'Bad News,' highlighting the importance of news in the effect of quality reporting (Dranove & Sfekas 2008).

Much of the intuition for the results produced by hazards estimation is lost under-the-hood. To provide exposition and recover intuition, I explore variation by replacing the left-hand side of Equation 8 with some dependent variable Y_{it}, adding errors ϵ_{it} to the right-hand side, and estimating simple difference-in-differences regressions.[100,101] I consider two different Y_{it}: (a) an indicator of physician i's presence in year $t >= 1910$, P_{it}; and (b) survival z years from ϕ, S_{iz}. When $Y_{it} = P_{it}$, my baseline specifications condition on $P_{i,1909} = 1$ to capture the effect of the Flexner Report in

[96] Market fixed effects are required to control for geographic variation in the likelihood of practice failure: choosing between $\tilde{m}$ and the next-best option $m^* \in \mathbb{M}/\{m\}$ depends on $\tilde{m}$. By controlling for the year in which a physician entered a local market, these fixed effects control for year-to-year variations in economic conditions which affect practice survival over time.

[97] These control for a scenario where particularly low-quality schools produce more or fewer students in different time periods. If this occurs, the β_3 coefficient might otherwise include effects from the composition of each cohort by institution; however, due to sample size concerns, these controls cannot always be included. The space of institutions $\mathcal{D}$ includes: (a) all institutions evaluated by Flexner; (b) a separate indicator for each present institution's predecessor organizations; and (c) aggregated indicators for physicians that graduated from a foreign school, institutions that were closed at the time of Flexner's evaluation, physicians for whom degrees could not be determined, and physicians who were approved by state or county boards.

[98] All physicians present in market m in 1903 have an unknown entry date.

[99] Consider the addition of a novel variable v. Then $(\lambda(z,x,v))/(\lambda(z,x)) = (e^{x'\beta+v\beta_v}\lambda_0(z))/(e^{x'\beta}\lambda_0(z)) = e^{v\beta_v}$.

[100] In all specifications, errors are clustered at the market level.

[101] As the endogenous variables are binary, these expository regression specifications are linear probability models and are therefore subject to well-known criticisms. For example, many of the constants in my regressions exceed 100%, which is illogical. I argued in Section 5 that these outcomes are the results of a physician's practice location choice model. I therefore also apply McFadden (1973)'s conditional logit estimation procedure to estimate the non-linear probability a physician elects to exit market m using the same underlying specification. Estimates occasionally differ significantly from those given by the linear models because geographic fixed effects sometimes perfectly predict Y_{it}; however, both linear and logistic regressions predict an underlying impact of the *Flexner Report* on physician survival Z years in local market m.

the post-period only.[102] When $Y_{it} = S_{iz}$, my baseline specifications condition on $S_{i,1} = 1$ for two reasons. First, survival is relatively low in the first year and does not tend to vary across physician type; greater variation occurs in later years.[103] Second, I require this condition to ensure that β_3 captures only the post-Flexner era for physicians entering a local market in 1908. For the same reasons, Cox models estimating Equation 8 are restricted to physicians surviving at least one year in market m.

The adjustment to Equation 8 specifies a standard differences specification for the identification of the effect of β_3 in models when P_{it} or S_{iz} is the dependent variable – when the outcome occurs in a single year.[104] In panel models, I sometimes difference with the post-period $t \geq 1910$ to capture only the effect after the release of the *Flexner Report*. Define the matrix of treatment variables by $T_i = \left[1 \; F_i \; (\mathbb{1}_{\phi>=1904})F_i \; (\mathbb{1}_{\phi>=1908})F_i\right]$ and a set of period indicators $\eta_t = [1 \; \mathbb{1}(t \geq 1910)]$. Then a full triple-differences specification is given by:

$$x_i'\beta \equiv \beta\left[\eta_t \otimes T_i\right] + \gamma_1 \exp_i + \gamma_2 \exp_i^2 + \sum_{\phi} \alpha_\phi + \sum_m \alpha_m \left[+ \sum_d \alpha_d\right] \tag{9}$$

where $\otimes$ is the Kronecker product. In practice, degree fixed effects are omitted due to sample size concerns. When conditioning on survival 1 year, I use instead $\tilde{\eta}_t = [\mathbb{1}(t \geq 1910)]$, as no pre-period exists for recent entrants. I sometimes also use $\tilde{T}_i = [T_i \; G_{it} \; G_{it}F_i]$ where G_{it} denotes some measure of recent graduation.[105] This alternative specification permits the isolation of the effect on recent market entrants, controlling for the salience of medical training for recent graduate quality.

A primary threat to identification is a misspecification of $L(\beta)$. This could occur due to selection of the Cox model or an incorrect specification of the underlying equation $x_i'\beta$. To assuage concerns about these possibilities, I engage in sensitivity analysis. Cox models are interchanged with duration models based on the Weibull distribution.[106] I also replace the post-period indicators with 1910-only indicators as modern studies have found that the effect of reporting was quick but dissipated rapidly.[107] I find analogous results for the *Flexner Report*.

The underlying differences design requires an assumption restricting the time-dependence of physician practice failure by quality rating, but linearity and additivity in model specification is not required (Athey & Imbens 2006, Meghir et al. 2018). Such designs nested in proportional hazards models have recently been exploited in economic studies investigating the link between immigration status & criminal activity Mastrobuoni & Pinotti (2015), salary & teacher retention at high-poverty schools (Clotfelter et al. 2008), and education & mortality (Meghir et al. 2018).

[102]The 1910 directory has a Preface signed 17 September 1910. This directory is therefore approximately three months removed from the release of the report.

[103]See Figures A8 and A9.

[104]It can also be used in duration models when treatments are assumed to apply both before and after June 1910.

[105]I use two definitions: (i) graduation within 5 years of local market entry; or (ii) graduation in 1905 or later. Graduation in 1907 or later results in bin sizes two small for analysis and very sensitive estimates.

[106]The hazard function in a Weibull distribution is given by $\lambda(z) = \alpha e^{x'\beta} z^{\alpha-1}$ where α is a shape parameter.

[107]For example, Cutler et al. (2004) find that hospital volume was affected only in the first 12 months after the release of the CABG report cards in New York.

Figure 2 demonstrated that the empirical survival curves – and by extension the empirical hazard rate – for poorly-rated and well-rated physicians were almost coincident in the unaffected cohorts and time periods. Other economic factors specific to 1910, recent entrance, and quality-rating may result in estimation bias. While it is well-known that a major recession occurred in the same period, economic downturns were very common in this era, and I find no evidence of similar practice failure patterns during other time intervals in falsification testing.

Additional concerns include the inclusion of left-censored data for physician-market pairs present in 1903 and a competing risk: physician death. For these physicians, cohort ϕ is unknown but assigned 1903. In Equations 8 and 9, I have controlled for this with a mechanical difference through the inclusion of the indicators $(\mathbb{1}_{\phi>=1904})F_i$. I also omit these indicators and discard all left-censored data with ϕ = 1903; I find similar but less precise results due to smaller sample sizes. Finally, results may be spurious if physicians are not deciding to quit their practice, but instead dying from correlated causes such as economic conditions. To control for this, I collected data on physician death in 1910 and censor the survival data for physicians who died – we do not know what decisions these physicians would have made.[108] The main result – that recent entrance to a local geographic market, combined with a negative report on the quality of medical education, dramatically increased the risk of practice failure – is robust to these adjustments.

6 Results

As suggested by the preliminary results in Section 4, the *Flexner Report* did not broadly impact the survival of physicians in their local markets into subsequent periods. Table 2 reports the results of Cox models for physicians in the baseline sample when the terms for β_2 and β_3 are excluded.[109,110] There is no statistically significant pattern in the data. Column (1) presents results from a model that includes an indicator for a direct negative review from Flexner for all physicians in the baseline sample; column (2) removes left-censored data. Both models produce proportions that are strikingly close to 1 – no effect.[111] This may occur if consumers did not consider the reporting news for some providers (Dranove & Sfekas 2008), and I argued that the public may have been aware of the most

[108]Subsequent outcomes were determined for every physician who experienced market failure in 1910. If physicians could not be located in another market in the post-period, evidence of their death, retirement, or migration outside the study area was located from a variety of sources. The primary source for physician deaths was the *Directory of Deceased American Physicians*. Work on remaining years is ongoing due to high time costs.

[109]Table B12 presents similar results from the parametric Weibull model.

[110]The baseline sample is restricted to the study area theoretically most impacted in New York: markets where a specific degree is held by no more than one-third of practicing physicians, with a weekly general-content newspaper within 25km, with no medical schools, and with a population less than 100,000 individuals. To remove any interference from potential biases towards alternative physicians such as homeopaths and eclectics, or against female or non-white physicians, the sample was further restricted to doctors who attended regular medical schools that were not intended primarily for the education of black or female physicians. Market fixed effects control for market idiosyncrasies and cohort fixed effects control for years already present in a local area.

[111]Standard errors are for the proportion. The test performed assumes a null hypothesis under which the proportion equals unity. The alternative hypothesis is that the proportion is different from 1. Values less than 1 indicate decreased hazard (increased survival) and values larger than 1 indicate proportionally increased hazard of practice failure.

egregious medical schools prior to 1910. Columns (3) and (4) demonstrate that limiting attention to physicians who attended schools treated with 'bad news' makes little difference.[112]

Table 2: Cox Model, Baseline Sample, All Cohorts

	(1)	(2)	(3)	(4)
Poorly Rated	0.984	1.004		
	(0.119)	(0.313)		
'Bad News'			0.950	0.998
			(0.116)	(0.311)
Exp	0.998	1.031	0.998	1.031
	(0.0145)	(0.0281)	(0.0145)	(0.0282)
Exp^2	1.001***	1.000	1.001***	1.000
	(0.000268)	(0.000644)	(0.000268)	(0.000646)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
Incl. Left-Censored Data	Y	N	Y	N
Log-Likelihood	-3,073.1	-717.3	-3,073.0	-717.3
Pseudo-R^2	0.029	0.057	0.029	0.057
Years at Risk	12,077	2,718	12,077	2,718
Clusters	101	73	101	73
Failures	451	131	451	131
Observations	1,414	422	1,414	422

Notes: Results presented are proportional hazards from the Cox Proportional Hazards model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

[112] The primary reason for this non-result is precious little underlying variation in linear models of $X\beta$. Table B14 reports the results of a linear probability model of survival in local market m to a future year on 'bad news,' conditional on presence in m in 1909. CME ratings categories are included as additional controls. Results are broadly insignificant, and the sign on 'bad news' in 1910-1912 models suggest that these physicians actually do slightly *better* after the release of the report. Repeating this analysis including only the 1910 CME evaluations and excluding Flexner's recommendations yields similar results for the CME coefficients. See Table B15. The proportional hazards estimated in columns (3) and (4) in Table 2 also imply mildly favorable conditions for these physicians, though both pre-Flexner and post-period conditions are pooled.

Table 3: Time-Varying Hazards, Cox Model, Baseline Sample

Years:	*Interacted with:*	(1)	(2)	(3)	(4)	(5)	(6)
$Y \geq 1903$:	Poorly Rated	0.914			0.710		
		(0.143)			(0.258)		
	'Bad News'		0.904			0.709	
			(0.137)			(0.256)	
	Well-Rated			1.020			1.052
				(0.176)			(0.404)
$Y \geq 1910$:	All Physicians	0.957	0.976	1.029	0.675	0.676	0.814
		(0.269)	(0.275)	(0.288)	(0.269)	(0.278)	(0.338)
	Poorly Rated	1.126			1.673		
		(0.273)			(0.656)		
	'Bad News'		1.076			1.666	
			(0.258)			(0.686)	
	Well-Rated			0.921			0.970
				(0.216)			(0.389)
n/a:	Exp	0.998	0.997	0.997	1.029	1.029	1.032
		(0.0147)	(0.0147)	(0.0148)	(0.0270)	(0.0271)	(0.0235)
	Exp^2	1.001***	1.001***	1.001***	1.000	1.000	1.000
		(0.000271)	(0.000271)	(0.000275)	(0.000600)	(0.000603)	(0.000529)
	Market FE	Y	Y	Y	Y	Y	Y
	Cohort FE	Y	Y	Y	Y	Y	Y
	Degree FE	N	N	N	N	N	N
	Incl. L.-C. Data	Y	Y	Y	N	N	N
	Log-Likelihood	-3,058.3	-3,058.2	-3,058.4	-716.4	-716.4	-717.1
	Pseudo-R^2	0.030	0.030	0.030	0.058	0.058	0.057
	Years at Risk	12,057	12,057	12,057	2,718	2,718	2,718
	Clusters	101	101	101	73	73	73
	Failures	449	449	449	131	131	131
	Physicians	1,412	1,412	1,412	422	422	422
	Observations	13,345	13,345	13,345	3,099	3,099	3,099

Notes: ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Cox Proportional Hazards model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Market definition is baseline: 3km-rolling markets. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Favorable conditions for poorly-rated physicians prior to 1910 may swamp post-period effects. Table 3 provides results from the Cox Proportional hazards model when physician ratings are interacted with the post-period, including for physicians who attended well-rated institutions.[113]

[113] Results which include degree fixed effects are provided in Table B16. Analogous results for Weibull models are

Column (1) shows that an effect of being poorly rated *does* emerge in the post-period, but it is statistically insignificant. Column (2) shows the same pattern for 'Bad News' and column (3) shows an insignificant protective effect of being well-rated in the post-period. Columns (4)-(6) replicate the analysis excluding left-censored data; results are similar. Did the *Flexner Report* really have no statistically significant impact on physician survival whatsoever?

In Figure 2, we saw preliminary evidence that the Flexner Report affected the survival of poorly-rated physicians, but this effect was only prominent among doctors who entered their local market in 1908 or 1909. This fact motivates the estimation of underlying difference-in-difference equations which isolate the impact on these fresh faces. Table 4 presents baseline results from a linear probability model of survival N years from entry at $N = 0$ in a 3km-rolling market for physicians who entered their market prior to the release of the Flexner Report, conditional on surviving at least one year. The same baseline restrictions are made as in the previous models.[114]

provided in B17 and B18. Results are broadly similar.

[114] Analogous linear probablity models with pooled cohorts as in Tables 2 and 3 are insignificant. See Table B24 for a linear probability model of this form with indicators for well-rated and poorly-rated physicians who entered their local market in 1904 or later. As my earliest year of data is 1903, I cannot construct complete survival curves for other physicians; their date of entry is unknown. See Table B23 for a similar analysis with indicators for 'Bad News' and CME ratings categories. No discernible effect of quality reporting on practice survival is uncovered.

Table 4: Linear Probability Model, Difference-in-Difference

	Survival N Years = 100			
N:	2	3	4	5
Poorly Rated	2.272	4.169**	2.531	2.763
	(1.573)	(1.818)	(2.367)	(2.789)
Poorly Rated ($\phi \geq 1904$)	5.877	2.112	6.282	6.415
	(3.880)	(5.196)	(6.586)	(6.614)
Poorly Rated ($\phi \in [1908, 1909]$)	-13.45**	-23.62**	-32.17***	-27.22***
	(5.309)	(9.559)	(8.477)	(8.422)
Exp	0.360	0.692**	0.671**	0.516
	(0.272)	(0.331)	(0.338)	(0.413)
Exp^2	-0.00860	-0.0183**	-0.0214***	-0.0191**
	(0.00643)	(0.00795)	(0.00808)	(0.00928)
Constant	100.7***	99.08***	102.9***	105.2***
	(2.760)	(3.713)	(3.811)	(4.572)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
R^2	0.064	0.098	0.114	0.111
Clusters	101	101	101	101
Observations	1,402	1,402	1,402	1,402

Notes: ϕ denotes entry year cohort for the physician-market pair. Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Here, I compare physician survival within Flexner's rating categories but across cohorts: I difference the survival rate of poorly-rated physicians who entered a local area in 1904-07 to those who entered in 1908-09. The coefficient of interest is Poorly Rated (1908-09). These coefficients are negative and significant at the 1% level for 4 and 5-year survival. All else equal, these estimates imply that poorly rated recent entrants are approximately 30 percentage points more likely to exit their local market by their fourth or fifth year than their colleagues who entered in 1904-07.

These results are unique to physicians who entered in 1908-09 and are not replicated for poorly rated physicians that enter the market in 1907-08 (see Table B28) or 1906-07 (see Table B29). Figure A22 presents the results of a permutations test on Flexner's recommendation (clustered by county) on the 5-year model. The coefficient obtained from the true orientation of the data is more strongly negative than more than 99.5% of the permutations generated in 10,000 replications.[115]

[115] The same analysis for 2, 3, and 4-year models are presented in Figures A19-A21. The 2-year model is statistically significant at the 5% level and the 3 and 4-year models are also statistically significant at the 1% level.

Table B27 separates the effect for 1908 and 1909. Both cohorts are shown to be affected by the release of the Flexner Report; however, some statistical power is lost with the separation of cohorts. The decrease in survival is also not related to the composition of education among poorly-rated physician across cohorts.[116] Table B25 includes education-based fixed effects; coefficient estimates on poorly rated physicians who entered in 1908-09 are broadly replicated therein.[117]

Thus, the Flexner Report *did* have an impact on the survival of practicing physicians, if they were new to a local market. Table B30 shows that the entire effect of Flexner's reporting on these physicians is channeled through physicians receiving 'Bad News' relative to the CME evaluations. No effect is uncovered for physicians that attended the schools rated B or C by the CME in 1910; the coefficients are positive and very imprecisely measured. Results for the physicians receiving 'bad news' are almost exactly the same as the estimates obtained for poorly-rated physicians in Table 4. This heightened practice failure of poorly-rated recent entrants – and especially those treated with bad news – is broadly confirmed by logistic regression.[118]

Using this specification of $X\beta$ in the underlying equations estimating hazards, the results translate.[119] Table 5 provides proportional hazard estimates for both Cox and Weibull models.[120] I find that recent entrants newly disparaged as low-quality are about three times more likely to experience practice failure than physicians who attended the same quality schools but had greater market tenure. Both models show that 'Bad News' doesn't broadly affect survival. While models (1) and (3) use all physicians in the baseline sample, models (2) and (4) exclude left-censored data such that only *true* survival data are used in the analysis. Greatly reduced sample sizes result in decreased statistical significance, but estimates are in line with increased hazard by a factor of approximately

[116] It may be possible that physicians entering local markets in 1908 or 1909 may have been educated at different institutions than their more well-seasoned colleagues. For example, if School A grew in the size of its classes faster than School B over time, a higher share of poorly rated-students will have graduated from School A in later years than earlier years. If this is the case, the specification without education controls may be picking up the effect of particularly weak schools rather than the impact of the Flexner Report.

[117] In addition, all columns show an appreciable gain in R^2 with the inclusion of education fixed effects, and the model for 2-year survival is now significant at the 1% level.

[118] Survival N periods into the future can be modeled as a sequence of choices on whether to exit market m, which can be framed as a conditional choice model with quality reporting and cohort-comparisons as control variables. Using McFadden (1973)'s framework, I find much stronger impacts on poorly-rated recent entrants – results for all columns ($N \in [2,5]$) are significant at the 1% level (see Table B31). Focusing on 'bad news' broadly replicates these strong impacts, with an addition increase in the magnitude of the estimated impact considerably early on – for $N = 2$ (see Table B32). Coefficients for physicians rated B/C by the CME cannot be separately estimated for $N = 2$ due to lack of variation in the outcome variable, and estimates for $N \geq 3$ are highly unreliable due to low sample size in this 'treated' group. For this reason, results analogous to B30 are not produced. Note that Probit models also produce much stronger results than linear probability models (see Table B33).

[119] Table B19 presents proportional hazards estimates from Cox models by rating category without post-period interactions. Table B20 presents analogous results excluding left-censored data. Tables B21 and B22 provide estimates from Weibull models, including and excluding left-censored data, respectively. All models show heightened hazard for poorly-rated physicians by approximately a factor of 3, captured by physicians receiving 'Bad News'. In models excluding left-censored data, estimating coefficients for CME Rated B/C becomes highly unstable due to very small sample sizes in this category within cohort.

[120] The hazard function in a Weibull distribution is given by $\lambda(z) = \alpha e^{x'\beta} z^{\alpha-1}$ where α is a shape parameter. Model (1) estimates the shape parameter to be about 2.1, and so the baseline hazard is increasing in time. The hazard faced by a physician is unlikely to be increasing in time in their local market (see, for example, Figure A14). The protective coefficient estimated on the post-period may be an artifact of the best-fit for an ill-suited functional form.

three. The *Flexner Report* seems to have provided an information shock which derailed the careers of practicing physicians; however, the recommendations of this expert did not seem to matter once a physician had an established presence in their market.

Table 5: Time-Varying Hazards, Baseline Specification, Post-Period Interactions

Years:	*Interacted with:*	*Cox Models:* (1)	(2)	*Weibull Models:* (1)	(2)
$Y \geq 1910$:	All Physicians	1.077	0.848	0.441***	0.274***
		(0.306)	(0.331)	(0.0644)	(0.102)
	'Bad News'	1.013		1.002	
		(0.240)		(0.244)	
	'Bad News' ($\phi \geq 1904$)	0.729	1.006	0.776	1.077
		(0.244)	(0.522)	(0.287)	(0.550)
	'Bad News' ($\phi \in [1908, 1909]$)	3.334***	2.910*	3.649***	3.534**
		(1.404)	(1.618)	(1.619)	(2.102)
n/a:	Exp	0.997	1.011	0.992	1.009
		(0.0144)	(0.0351)	(0.0153)	(0.0416)
	Exp^2	1.001***	1.000	1.001***	1.000
		(0.000271)	(0.000800)	(0.000308)	(0.00102)
	Shape Parameter	n/a	n/a	2.074***	2.397***
				(0.0724)	(0.200)
	Constant	n/a	n/a	0.00403***	5.53e-11***
				(0.00556)	(7.77e-11)
	Market (3km-Roll) FE	Y	Y	Y	Y
	Cohort FE	Y	Y	Y	Y
	Degree FE	Y	Y	Y	Y
	Incl. Left-Censored Data	Y	N	Y	N
	Log-Likelihood	-3,033.1	-692.6	-1,046.3	-264.0
	Pseudo-R^2	0.038	0.089	0.127	0.253
	Years at Risk	12,057	2,718	12,057	2,718
	Clusters	101	73	101	73
	Failures	449	131	449	131
	Physicians	1,412	422	1,412	422
	Observations	13,345	3,099	13,345	3,099

Notes: ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Cox Proportional Hazards model or the Weibull parametric survival model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. The 'Shape Parameter' represents p in the Weibull hazard function; larger values indicate increasing hazard over time. The 'Constant' gives baseline hazard when no other variables are included in the Weibull model. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value $<$ 0.01), ** (p-value $<$ 0.05), and * (p-value $<$ 0.10).

6.1 Information and Competition

I have thus far restricted analysis to a baseline sample designed to capture the effect of the *Flexner Report* on physician practice failure in highly competitive markets with access to newspapers. In this section, I vary these restrictions and investigate the importance of competitor quality. In addition, I show that the impact was rapid – effects are loaded on market exit in 1910. Restricting attention to practice failure in 1910, I demonstrate two important facts: (i) the effects are not driven by physician deaths; and (ii) effects are robust to the inclusion of interactions of reported quality with variables denoting recent graduation. This second fact separates narratives: the relevancy of information contained in the report is increased when local consumers are unfamiliar with the physician – and not simply because the information is more relevant for a recent graduate.[121]

Table 6: Time-Varying Hazards, Coefficient of Interest Sensitivity

	Maximum Degree Market Share				
	≤ 25%	≤ 33.3%	< 50%	≤ 50%	Any Share
Baseline:					
With Newspapers[1]	2.197	3.334***	2.029*	1.804	1.725*
	(1.545)	(1.404)	(0.782)	(0.658)	(0.505)
No Restriction	2.237	2.881***	1.988*	1.858*	1.698**
	(1.580)	(1.165)	(0.706)	(0.617)	(0.425)
Markets with a High-Quality Doctor:[2]					
With Newspapers	2.143	3.274***	2.168*	2.042*	1.923**
	(1.514)	(1.369)	(0.857)	(0.784)	(0.606)
No Restriction	2.182	2.810**	2.102**	2.252**	1.774**
	(1.548)	(1.131)	(0.766)	(0.802)	(0.490)

Notes: [1] 'With Newspapers' restricts to markets with a weekly general-content newspaper within 25km [2] Sample is restricted to markets where a well-rated physician was present in some year 1903-1909. [3] Coefficients correspond with 'Bad News' ($\phi \in [1908, 1909]$) in Table 5, where ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Cox Proportional Hazards model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. All estimates are restricted to the following restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; and (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table 6 investigates the impact of removing and adding restrictions related to the competitive environment faced by physicians, displaying the coefficient of interest {'Bad News' ($\phi \in$

[121] Recent graduates are by definition recent entrants to local market areas as well. Without these additional analyses, we could not differentiate between these stories.

$[1908, 1909])\}$. Access to newspapers has an ambiguous effect on the estimates.[122] In addition, coefficients lose significance if we insist that no degree has greater than 25% market share due to sample size. On the other hand, gradually loosening this restriction results in lower and lower estimates, and restricting to markets with a high-quality competitor increases both estimates and precision when the the market share requirements are weak. These latter two findings are consistent with consumer behavior – as the market share requirement is loosened, there is less differentiated competition in a market and so consumers have few alternative options.[123] When consumers have access to a high-quality option, the impact on low-quality recent entrants is much greater because an attractive option is available.

I also find that the effect of the *Flexner Report* are specific to 1910 as the post, and the impact of receiving a negative report are loaded on 1910. Estimates are insignificant in a model which defines the post-period as beginning in 1911.[124] In addition, linear probability models of the impact of bad news on single-period survival suggests that the effect of the reporting was loaded on 1910: markets respond quickly to information.[125] Finally, I investigate whether (i) the estimated effects arise due to the deaths of low-quality recent entrants, or (ii) the report actually impacted recent *graduates* instead of recent entrants to a local market. By construction, recent graduates are also entrants, but some recent entrants previously practiced elsewhere. Consumers may consider medical school quality as more relevant for recent graduates, and so omission of this variable may create significant bias.

Table 7 reports estimates from from a full triple-differences specification including differences for both recent entrants and recent graduates. All models are restricted to areas with a high-quality physician previously or currently present in 1903-1909 and with access to newspapers. Due to the large number of independent variables in the design, sample size considerations restrict our attention to markets with any amount of differentiation by degree (share ≤ 1), with additional columns for *some* differentiation (share < 1). Column (3) and (4) exclude left-censored data. As previous sensitivity analyses revealed the effect was loaded on 1910, the bottom panel redefines the impacted period as 1910 only, with physician survival unaffected for 1911-1914. Finally, the right-most panel right-censors physicians coded experiencing 'practice failure' in 1910 due to death.

[122] This could be because information spread rapidly by word of mouth, or that not all general-content newspapers provided useful information for consumers.

[123] Moreover, physicians with this degree have local power and may be able to counteract negative messaging. Competition is still differentiated on the physician tenure in the local market. Consequently, recent entrants are still affected – as observed in Table 6 – if consumers have a preference for physicians with whom they are familiar.

[124] See Table B34 for model estimates.

[125] See Table B35 for model estimates for each year 1909-10 through 1913-14 and sensitivity by maximal degree market share.

Table 7: Time-Varying Cox Model, Sensitivity: Deaths and Recent Graduates

	Failure: All Exits				**Failure: Censoring Deaths**			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post-Period Interaction Effects:								
Recent Grad: Within 5 years of Market Entry								
'Bad News' ($\phi \in [1908, 1909]$)	2.166*	2.109*	2.812**	2.799**	2.039	2.033	2.663*	2.702**
'Bad News' * Recent Grad	1.053	0.939	1.069	0.922	0.989	0.881	1.050	0.897
Recent Grad: Awarded Degree 1905 or later								
'Bad News' ($\phi \in [1908, 1909]$)	2.220*	2.153*	2.753**	2.713**	2.106*	2.103*	2.613*	2.648**
'Bad News' * Recent Grad	0.968	0.901	1.044	1.003	0.944	0.873	1.052	0.991
Interaction Effects with 1910 Only:								
Recent Grad: Within 5 years of Market Entry								
'Bad News' ($\phi \in [1908, 1909]$)	3.316**	3.647**	3.394**	3.886**	2.905*	3.506**	3.062*	3.818**
'Bad News' * Recent Grad	2.004*	2.006*	1.569	1.730	1.844	1.848	1.392	1.530
Recent Grad: Awarded Degree 1905 or later								
'Bad News' ($\phi \in [1908, 1909]$)	2.915**	3.033**	2.885*	3.096**	2.565	2.960*	2.597	3.059*
'Bad News' * Recent Grad	1.625	1.913	1.846	2.265*	1.637	1.862	1.885	2.234
Market (3km-Roll) FE	Y	Y	Y	Y	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y	Y	Y	Y	Y
Incl. Left-Censored Data	Y	Y	N	N	Y	Y	N	N
Maximal Degree Market Share	< 1	≤ 1	< 1	≤ 1	< 1	≤ 1	< 1	≤ 1

Notes: Coefficient estimates from a full triple differences specification including differences for both recent entrants and recent graduates, where ϕ denotes entry year cohort for the physician-market pair. When a physician's practice fails in 1910 and the physician was found to have died, the right-side panel censors these observations' outcomes at time of death. Results are from unconditional survival models: physicians that exit in their first year are included. Each column satisfies the following restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) only markets with a high-quality physician present in some year 1903-1909 are included. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

This table produces a clear message: recent entrants were the physicians primarily harmed by the release of bad news concerning their medical degree. Recent graduates are also recent entrants, and so were also affected; however, the scope is broader – all physicians for whom local consumers had not already formed impressions. In the words of our self-help manual for contemporary doctors: "Reputation is a thing that grows slowly, and every distant removal imperils part of the mover's practice, necessitates new efforts, and sometimes almost compels him to commence life over again" (Cathell & Cathell 1911, p. 6). When patients have little information on a physician, they are already skeptical about securing their services; when the only broadly available information is an authoritative recommendation, they may therefore choose to rely on this source. Information from previous patients and a good community reputation appear to be preferred when available. This supports the notion that accreditation can impact markets, but established reputations attenuate the effect of accreditation (Xiao 2010).

6.2 Endorsements

Table 8 replicates the underlying variation analysis of Table 4, replacing indicators for poorly-rated physicians with analogous indicators for attending an institution positively reviewed by Abraham Flexner. The effect of quality-reporting is attenuated with respect to low-quality physicians and only emerges after approximately four years in the local market, after which highly-rated recent entrants are more than 20 percentage points more likely to survive relative to their more tenured peers, all else equal. This is consistent with the observation that consumers respond asymmetrically with respect to good and bad information (Dranove & Sfekas 2008, Wang et al. 2011).[126] Proportional hazard models which isolate the post-period impact on recent entrants relative to their more established peers confirm the protective effect of endorsements, but evidence on the asymmetric response is mixed.[127] Due to the wider range of estimated results, I make a cautious assessment: highly-rated recent entrants appear to do at least twice as well as their more established high-quality colleagues after the release of the *Flexner Report*.

These results are consistent with the proclamations of Cathell & Cathell (1911). Consider a highly-rated physician who leaves market m for m' in the post-period. Perceived quality $\hat{q}_d$ increased in both m and m', but switching markets suggests that profits in m' increased relative to those in m. This could occur due to the exit of poorly-rated or other physicians in m' which makes the competitive situation more advantageous; however, Cathell & Cathell (1911) warns that physicians damage their local reputation by moving practice. Switching markets will therefore be most attractive when the initial reputation furnished by the physician in m was unsatisfactory, especially when initial patient opinions influence future opinions – a feature observed by Eyring (2020) for patient ratings in the University of Utah Health Care System – and when the report is highly valued as a signal in the new market. The fact that most well-rated recent physicians choose to remain in their current market is most consistent with (a) well-rated physicians did not likely have very bad reputations in their local market prior to the release of the report; and (b) the value of the report relative to actual local recommendations cannot be exceedingly large.

[126] Table B36 presents the results of static Cox models exploiting this underlying variation among the positively reviewed physicians. While poorly-rated recent entrants failed at a heightened clip relative to established physicians receiving the same report, highly-rated recent entrants saw survival gains relative to established peers.

[127] Table B37 presents estimated proportional hazards from time-varying Cox and Weibull models. Both models produce the asymmetric weaker protective response when left-censored data are excluded. On the other hand, both models which exclude left-censored data suggest that endorsed recent entrants are up to four times more likely to survive than their more established highly-rated peers.

Table 8: Linear Probability Model for Well-Rated Physicians

	Survival N Years = 100			
N:	2	3	4	5
Well-Rated	-1.203	-1.864	-1.068	-0.709
	(1.430)	(2.496)	(2.841)	(2.767)
Well-Rated ($\phi \geq 1904$)	-5.380	0.768	-2.273	-4.392
	(4.518)	(5.709)	(6.678)	(7.431)
Well-Rated ($\phi \in [1908, 1909]$)	8.022	13.63*	21.88***	23.63***
	(5.353)	(7.675)	(7.630)	(7.996)
Exp	0.255	0.649**	0.628*	0.456
	(0.272)	(0.320)	(0.321)	(0.399)
Exp^2	-0.00659	-0.0174**	-0.0204**	-0.0178*
	(0.00657)	(0.00786)	(0.00786)	(0.00909)
Constant	102.4***	99.79***	103.2***	105.9***
	(2.885)	(3.703)	(4.201)	(4.908)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
R^2	0.060	0.092	0.108	0.109
Clusters	101	101	101	101
Observations	1,402	1,402	1,402	1,402

Notes: ϕ denotes entry year cohort for the physician-market pair. Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

6.3 Relocation and Entry

We have seen that the release of the *Flexner Report* disproportionately impacted recent entrants to a local market area. In this section, I estimate practice location choice models for both relocating physicians and all market entrants. While the general trend was for relocating physicians to select urban, highly desirable areas, low-quality (*bad news*) competitors were more and more often selecting areas with fewer high-quality competitors. After the release of the *Flexner Report*, high-quality competitors also avoided high-quality competition more often. In addition, the post-period is associated with heightened entrance to desirable urban areas for all physicians except those treated with bad news. Finally, I find evidence which supports life cycle results found by Marder (1990) for doctors in 1971-83. Specifically, fresh physicians first select highly populated areas and then retreat to low-population markets after multiple relocations.

Defining urban areas as incorporated areas in the 1910 federal census, I track physician location decisions across the rural-urban divide.[128] While Moehling et al. (2020) find that changes in medical education requirements fueled the growth of this chasm, I find that relocating physicians are also moving to incorporated areas over time, both before and after Flexner's evaluations.[129] In addition, 57% of urban-to-urban switchers chose a new location with a larger population. This suggests that preferences were also changing broadly within the profession, and the urban-rural divide was not driven solely by changes in the composition of new physicians.

Recall from Equation 3 that physicians choose their practice location to maximize utility $V(\cdot)$. Rational physicians are actually concerned with the full lifetime utility stream $\sum_t \delta_t V_{mdt} = \sum_t \delta_t V(X_{dt}, \nu_{mt}, \pi^*_{mtd})$ where δ_t is a time-varying discount factor.[130] In the population of physicians, the probability that a physician chooses market m^* is given by:

$$P[m^*] = P\left[\sum_t \delta_t V(X_{dt}, \nu_{m^*t}, \pi^*_{m^*td}) > \sum_t \delta_t V(X_{dt}, \nu_{mt}, \pi^*_{mtd}) \ \forall m \in \mathbb{M} \backslash m^*\right] \tag{10}$$

This is a discrete choice problem which can be implemented using the approach of (McFadden 1973). When comparing all entrants, I group urban areas into m_u and rural areas into m_r and set $\mathbb{M}_{\mathbb{ur}} = \{m_u, m_r\}$ for ease of comparison.[131] The subset of relocating physicians initially selected some market $\tilde{m} \in \mathbb{M}$ and select m^* from $\mathbb{M} \backslash \tilde{m}$. To isolate the change in preferences driving relocation decisions the set of available markets $\mathbb{M}$ is segmented into $\tilde{m}$, $\overline{\mathbb{M}}$, and $\underline{\mathbb{M}}$ for each physician, where the set $\overline{\mathbb{M}}$ contains the subset of markets for which $W_{\overline{m}} > W_{\tilde{m}}$, where W_m is some real-valued market characteristic which physicians value and $\overline{m} \in \overline{\mathbb{M}}$. Similarly, the set $\underline{\mathbb{M}}$ contains the subset of markets for which $W_{\underline{\mathbb{m}}} < W_{\tilde{m}}$ with $\underline{m} \in \underline{\mathbb{M}}$. For ease of comparison, redefine $\overline{m}$ to be the best option for a physician in $\overline{\mathbb{M}}$ and $\underline{m}$ to be the best option for a physician in $\underline{\mathbb{M}}$. The probability that a relocating physician selects $\overline{m}$ is then given by:

$$P[\overline{m}] = P\left[\sum_t \delta_t V(X_{dt}, \nu_{\overline{m}t}, \pi^*_{\overline{m}td}) > \sum_t \delta_t V(X_{dt}, \nu_{\underline{m}t}, \pi^*_{\underline{m}td})\right] \tag{11}$$

which I again estimate using the conditional choice framework. To do so, I replace lifetime utility from selecting a market m with a reduced form expression which captures physician characteristics and changes in preferences over time by physician quality:

$$\beta_0 + \beta_1 \text{Prev}_{it} + \beta_2 \text{Exp}_{it} + \beta_3 \text{Exp}^2_{it} + \beta_4 t + \beta_5 (t * F_{Lit}) + \beta_6 (t * F_{Hit}) + \beta_7 (\text{Post}_t) \tag{12}$$

[128]Table B38 provides summary statistics for physicians who exit their local (3km-rolling) market and relocate to New York. When physicians exit their local market, I assign them as exiting an urban or rural area based on the last post-office in that market in which they resided. Their subsequent rural-urban decision is based on the next post-office for which they are recorded in a new market.

[129]Over all the physicians that relocate to New York, 11.9% moved away from rural areas and select new rural areas, while 27.6% move from rural to urban areas. Fully 44.1% are always urbanites, with only 16.4% leaving town for the countryside. Differences between new market entries in 1904-1909 versus 1910-1914 are immaterial.

[130]This detail was unnecessary in Section 5 and was thus omitted.

[131]Physicians select between their best urban and best rural alternatives.

$$+ \beta_8(\text{Post}_t * F_{Lit}) + \beta_9(\text{Post}_t * F_{Hit}) + \sum_d \alpha_d + \epsilon_{it}$$

where t is the relocation entry year, $\text{Post}_t = \mathbb{1}(t \geq 1910)$, and α_d are degree fixed-effects. F_{Lit} and F_{Hit} are binary variables denoting whether the physician's school was treated with bad news or endorsed by Flexner, respectively. Experience Exp_{it} is the difference between the graduation year of the physician and t, and Prev_{it} is a dichotomous variable indicating whether physician i had previously relocated. Standard errors ϵ_{it} are clustered at the degree level.

Table 9 presents findings from this analysis. The first column sets W to be the post-office location's population in the 1910 federal census, the second column sets W to be the location's physician density, and the final column sets W to be the number of well-rated physicians listed at the same post-office.[132] I uncover results consistent with Marder (1990) and which lend credence to Flexner's evaluations. First, I find that having previously switched markets is strongly negatively associated with choosing a new location with a larger population.[133] Physicians who fail repeatedly retreat to areas which are less populated. More experienced switchers, after controlling for multiple failures, actually move to areas with larger populations, though physicians again move to less populated areas as they approach an elevated age.[134]

Second, physicians who attended schools treated with bad news were already sorting themselves into markets with reduced high-quality competition prior to 1910, and were doing so at a greater rate each passing year. This suggests that relocating low-quality physicians were already weary of competing against high-quality physicians in new markets, and that features of the medical environment made locations with these competitors more unappealing over time. By contrast, no such trend is found for high-quality physicians. These patterns are consistent with Flexner's division of quality.

Third, this trend continues in post-period for low-quality physicians, but there is no additional impact. On the other hand, well-rated physicians who relocate avoided their high-quality peers more often in the post-period. These physicians now have an additional competitive edge against other physicians and may be exploiting this new-found advantage when choosing to relocate in the post-period.

Turning my attention to all entrants, whether fresh or relocating, I estimate Equation 10 with a similar expression for lifetime expected utility, but replacing Prev_{it} with Fresh_{it}, an indicator variable for whether the entry is the first observed entry for this physician in the data. I also include interaction terms with F_{Lit} and F_{Hit} as well as an additional interaction with Post_t for each of these three terms.[135] I find that first-time entrants are much more likely to select an urban

[132]Physician decisions are highly idiosyncratic, and so the pseudo-R^2 from each of these regressions is rather small.

[133]If population increases are replaced with population decreases, the coefficient is strongly positive. As all unincorporated areas are given the same population, this is an important distinction.

[134]This pattern may be a feature of the historical setting, increasing specialization and consultation over the course of a career, and the availability of hospital and teaching positions in the urban centers for initially successful physicians.

[135]Table B39 presents results from logistic regression of the physicians' urban-rural location choice, with varying definitions of minimum population required to be classified as urban. Once again, I find that location decisions are highly idiosyncratic.

area, consistent with Marder (1990)'s much later results. I also find that the release of the *Flexner Report* is associated with a generally heightened selection of urban areas – even after controlling for degree fixed effects – but not for physicians that attended institutions treated with bad news. The *Flexner Report* may have had some impact on the urban-rural location choices of physicians overall, and may have additionally contributed to the urban-rural divide.[136]

Table 9: Physician Relocation Preferences, New York

	Binary Outcome: Increase in Post-Office Characteristic		
	Population	Phys. Density	Well-Rated Options
Prev. Switch	-0.359***	0.115	-0.136
	(0.126)	(0.154)	(0.130)
Exp	0.0621***	-0.0512***	0.00603
	(0.0180)	(0.0188)	(0.0245)
Exp^2	-0.00135***	0.00104**	-0.000426
	(0.000481)	(0.000472)	(0.000610)
Trend	-0.0207	0.0736	0.0582
	(0.0668)	(0.0476)	(0.0469)
Trend: Bad News	-0.00499	0.0212	-0.126**
	(0.0892)	(0.0719)	(0.0579)
Trend: Well-Rated	0.0636	-0.0383	0.0305
	(0.0852)	(0.0753)	(0.0782)
Post	0.193	-0.0869	0.0805
	(0.384)	(0.254)	(0.262)
Post*Bad News	-0.00598	-0.407	0.485
	(0.573)	(0.408)	(0.328)
Post*Well-Rated	-0.167	-0.372	-0.697*
	(0.414)	(0.376)	(0.380)
Constant	37.87	-140.2	-112.1
	(127.4)	(90.87)	(89.36)
Degree FE	Y	Y	Y
Log-Likelihood	-1,150.6	-1,130.7	-1,140.0
Pseudo-R^2	0.025	0.029	0.027
Clusters	52	52	54
Observations	1,706	1,706	1,710

Notes: Results presented are from logit models. Outcome variables denote whether a physician's new post-office location has a larger value of the associated variable than their previous location. Populations are for incorporated areas in the 1910 federal census. Unincorporated areas are assigned a population of 100. Physician density is defined as 1000*{Number of Physicians}/Population. A well-rated option denotes the number of physicians who attended a school endorsed by the *Flexner Report*. All columns are restricted to physicians relocating to the state of New York and include degree fixed effects. Standard errors (in parentheses) are clustered at the degree level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

[136]The greatest impact is found when urban areas are defined as having at least 5,000 or at least 10,000 individuals in an incorporated area.

7 Discussion

The data reveals that the release of the *Flexner Report* led to heightened practice failure for physicians revealed as having low-quality medical degrees, but only if they were recent entrants to a local market. Relocating physicians chose less competitive settings, and avoided high-quality competitors. In this section, I investigate whether doctors reinvested in additional medical education or attempted to game the system. I then describe equilibrium trends in the national market for physicians and outline a model of reputation and consumer demand broadly consistent with my findings. I conclude with lessons for policy-makers and questions for researchers in the modern era.

7.1 Gaming and Quality Investments

A significant concern surrounding quality reporting initiatives are forms of economic gaming which may emerge from the programs. For example, the introduction of risk-adjusted mortality reporting for CABG surgeries has been related with high-risk surgery refusal (Schneider & Epstein 1996, Burack et al. 1999). Quality reports have also been found to cause provider-patient sorting (Dranove et al. 2003, Cutler et al. 2004, Mukamel et al. 2004, Yoon 2020), which may be driven by gaming behavior or capacity constraints. On the other hand, quality reports can drive provider quality improvements (Cutler et al. 2004, Hibbard et al. 2005, Smith et al. 2012, Vallance et al. 2018, Eyring 2020). In this section, I show that there is little evidence of reinvestment in medical education (quality improvements) or changes in the frequency of misreporting education information in the medical directories (gaming).

The *Flexner Report* leaves few avenues for physician gaming of the system. Physicians might attempt to convince prospective patients of their skill or obscure their true background in the strategic style of Cathell & Cathell (1911). In the post-period, this could mean stressing high-quality qualifications over low-quality ones: if a physician has attended two medical schools, they might highlight only the higher-rated institution.[137] In some rare cases, this may have amounted to intentional or accidental education fraud.[138] While I cannot tell how physicians framed their qualifications to prospective patients, we can assess whether their education details in the *Medical Directory of New York, New Jersey and Connecticut* (1903-1914) were ambiguous or misleading.[139] Such decisions could be accidental on the part of the Directory's typist or intentional on the part

[137] For example, Dr. Clayton Morgan Axtell was present in the New York data for 1912-14 in Sidney [Center], Delaware County. Axtell graduated from Cornell in 1909 but also University and Bellevue Hospital in 1911. His first listing in 1912 referenced the most recent degree; the listings in 1913-14 made reference instead to the 1909 degree from Cornell.

[138] One New Jersey physician has their education listed as "Med. & Surg., Phila." with a graduation year of 1866 for 1903-1912. Based on cross-referencing with AMD and Polk directories, I determined this physician attended the *Eclectic Medical College of Pennsylvania* in Philadelphia. This school was known to be a fraudulent institution itself and closed three decades prior. According to the 1916 edition of the AMD: "Incorporated in 1856. After a few years it came under the control of one Buchanan and became fraudulent. Extinct 1880" (p. 82). In 1913-14, this physician's listing reports only an education from "Univ. Pa." from the same year. While he attended a school in Pennsylvania, he never attended the prestigious "University of Pennsylvania" for which Flexner advocated, as far as I can tell.

[139] I do not claim that patients perused these directories when searching for a physician; however, motivated physicians could provide corrections and so its entries may reflect the information physicians desired be made public.

of the physician.

To assess the impact of quality reporting on this behavior, I run simple reduced-form logistic regressions which predict the publication of misleading or ambiguous education data in the medical directories.[140] I find that the incidence of misleading details for individuals who attended medical schools treated with bad news was increasing over time. This problem was reduced in the post-period, with a downward deviation from the trend after the release of the *Flexner Report*. While this deviation was not large, if anything the typists of the directories may have been slightly more careful about specifying the correct medical school for these physicians in the post-period. I therefore find no direct evidence of systematic deception in medical directory listings caused by quality certification.

A physician could also improve their degree quality by attending a higher-rated institution. This would be additional human capital investment representing a legitimate gain in knowledge and skill. Approximately 0% of physicians did so between 1910 and 1914.[141] Similarly, physicians could have anticipated the public reporting of medical school quality in 1910 and prepared through early reinvestment in education. There is little evidence for this either.[142] If the release of the *Flexner Report* spurred education reinvestments for practicing physicians, these were not made rapidly; however, this null result does not preclude quality improvements. Physicians may have improved quality along unobservable dimensions such as bedside manner, and I cannot rule out additional degrees awarded after 1914.[143]

7.2 National Trends

The foregoing analysis focused on the partial equilibrium effects of Flexner's recommendations. Available data do not permit general equilibrium analysis; however, available national-level trends in the market for physician services between 1909 and 1929 are most consistent with a reduction in demand for physician services.

[140] Table B40 presents the results of this analysis. I include a time trend, interaction terms with F_{Lit} and F_{Hit} as defined in the previous section, as well as an indicator for the post-period and interaction of the post-period with F_{Lit} and F_{Hit}. Experience and its square, as well market, degree, and cohort fixed effects are included as controls.

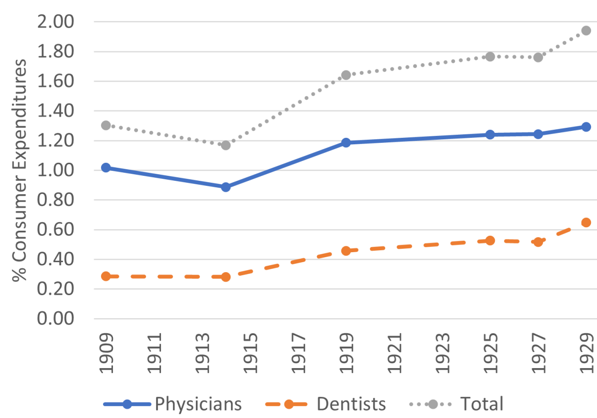
[141] Of the 14,261 unique physicians in the data, 12,097 were present in some year between 1910 and 1914 but I observe only 5 physicians – all in New York – who obtained a second medical degree in the post-period. None of these physicians practiced in the study area prior to obtaining their second degree, and each of these second degrees was from a New York school. Interestingly, three of these individuals had degrees from schools that Flexner rated positively and took a second degree from a disparaged school. One physician upgraded their degree, and another doubled-down on poorly-rated schools.

[142] Only 10 physicians obtained a second medical degree in the period 1907-1909. Of these, only 1 improved from a poorly-rated school to a school Flexner accepted. Two others improved by pursuing education in Europe. Another had a high-quality education at McGill then went abroad. Two more had foreign medical degrees but went on to obtain domestic degrees (one that Flexner rated highly and one that he disparaged). The remaining four obtained new low-quality degrees in addition to a previous license in Ontario [1], a previous low-quality degree [2], or a previous degree that could not be verified [1]. Taken together with the preceding footnote, only 15 individuals improved their medical background with a second degree between 1907 and 1914, and the pattern of secondary degrees does not support reinvestment due to concerns about quality reporting.

[143] Flexner recommended program lengths of at least 4 years in duration, and the better schools had the longer programs. The length of the post-period was designed to capture practice failure; it is not long enough to capture long-term physician reinvestment in education caused by the Flexner Report.

Figure 5 presents calculations of physician and dentist expenditure as a percentage of consumer expenditures in available years.[144] I find that between between 1909 and 1914, while dentist expenditures per capita kept pace with consumer spending growth, physician spending did not, and actually decreased in total expenditure from $3.24 to $2.99 per capita.[145] This is consistent with a physician-specific shock to the market for medical services – dentists were not evaluated in this period. I also investigate trends in physician income.[146] Assuming that consumer physician expenditures equals patient-derived physician income in the economy, I find that the estimated average mean physician income in the United States in 1909 was somewhere around $2,150 and that this remained roughly constant between 1909-1914.[147] Thereafter, mean physician income rose dramatically to about $4,900 in 1919, well out-pacing growth in gross consumer expenditures.

Figure 5: Physician and Dentist Expenditures, 1909-1929



Recall from Figure 1 that there was a precipitous drop in national physician density between 1909 and 1914. There is mixed evidence concerning the national stock of physicians: while *Polk* registers a decrease for 1908-10 and 1910-12, the AMD suggests an increase in the national stock of physicians between each edition until 1918-21. The primary cause of the decrease in physician density was population growth rates exceeding the growth rate within the profession. These facts are consistent with several models of markets for physician services, but imply that after the release of the *Flexner Report*, each physician had a larger pool of potential patients on average, but earned the same mean income. The fall in expenditures and stagnation in income could arise from a combination of two factors: (i) the relative price of physician services fell; or (ii) the aggregate quantity demanded for physician services fell.[148] These facts are most consistent with a national

[144] Dollar values of consumer expenditures are taken from Derks (1999) for each of the available years.

[145] Note that $2.99 in 1914 is about $77.38 in 2020 USD, based on calculations from the Bureau of Labor Statistics's Consumer Price Index for all Urban Consumers [Series ID: CUUR0000SA0, accessed: 7 August 2021].

[146] Table B41 produces these statistics on mean physician income.

[147] Depending on the source used for the national stock of physicians, average income either increases or decreases very slightly between 1909 and 1914. Data are not available to assess trends in the intervening or earlier years.

[148] It is not possible to differentiate between an intensive or extensive margin of patient quantity demanded with

decrease in demand for physician services.[149]

7.3 Reputation and Consumer Demand

While the available data do not permit me to make any specific conclusions about consumer demand, I argued in Section 2 that physicians were already aware of the relative quality of medical schools. The observed patterns in consumer practice failure are therefore likely due to changing consumer perceptions of physician quality. My results confirm that recent entrants fail at a heightened rate at an increased rate in markets where newspapers are available, where a high quality option was previously or currently available, and in markets with a greater extent of differentiated competition by medical degree. Each of these facts suggest that consumer decision-making in markets for physician services was responsible for the increased practice failure. In this section, I describe a simple model of consumer demand and reputation consistent with the results described.[150]

The marketplace for healthcare services is populated by individual consumers, denoted by i, and by individual doctors, denoted by d. From the perspective of consumers, each doctor is endowed with some uncertain quality q_d, which is perceived to be $\hat{q}_d$. Actual and perceived physician quality may differ due to systematic biases in recommendations or evaluations of the physician's performance, heterogeneous quality in physician efficacy across patient ailments, and random error in the performance of the physician. Quality reporting such as the *Flexner Report* shifts the public's estimate of physician quality $\hat{q}_d$.

The measure $\hat{q}_d$ is a function of the R recommendations and evaluations collected by local consumers concerning the physician's quality. Denote by r_{dj} the jth evaluation of physician d's quality obtained by the consumer. Then, $\hat{q}_d \equiv \hat{q}_d(r_{d1}, \ldots, r_{dR})$. For simplicity, assume that physicians and consumers contract directly on price such that perceived price and actual price are identical and given by p_d for treatment of a specific ailment. True quality conditional on observable characteristics, $q_d|_X$, is publicly known to be distributed according to some distribution Q_X. Prospective patients would like to evaluate a candidate physician according to some utility function U given by:

$$U = U_i(X_d, p_d, q_d) \tag{13}$$

where U_i is assumed to be strictly decreasing in p_d and weakly increasing in q_d. That is, consumer utility is based on true quality, not its perceived value $\hat{q}_d$. As this information is not available when deciding whether to contract the physician's services, they must therefore evaluate the expected

the data available.

[149]On the other hand, a reduction in the stock of physicians could decrease search costs, resulting in lower prices even if demand is unchanged. Satterthwaite (1979) showed that additional physicians may actually increase prices in markets due to increased search costs and accompanying demand elasticity. Pauly & Satterthwaite (1981) provide evidence of this effect using data on primary care physicians in 92 American metropolitan areas for 1973.

[150]This example is based upon the defining feature of quality errors built into the consumer search process in Dranove & Satterthwaite (1992).

value of utility they expect to receive:

$$E_Q[U_i(X_d, p_d, q_d) \mid X_d, p_d, \hat{q}_d] \equiv f(X_d, p_d, \hat{q}_d) \tag{14}$$

where the expectation is formed using the consumer's knowledge of the distribution Q_X and $f(\cdot)$ is weakly increasing in $\hat{q}_d$.

The manner in which consumers estimate $\hat{q}_d$ matters. Consider the simple case where consumers collect R recommendations or evaluations from friends, families, and other sources. Each piece of information is converted into a quality estimate by the consumer. This vector of quality estimates $(r_1, \ldots, r_R)$ can be thought of as the reputation of the provider in the prospective patient's community. Quality is then estimated as a simple weighted average of these data:

$$\hat{q}_d = \frac{1}{R}\sum_{j=1}^{R} w_j r_j, \text{ with weights such that } \sum_{j=1}^{R} w_j = R \tag{15}$$

when no authoritative recommendations exist. Suppose an authority releases recommendations denoted by $F_d \in \{0,1\}$ as part of a certification scheme such as the *Flexner Report*. The consumer treats the new information as just another recommendation, though they may weight it much more heavily than other observations. The post-reporting quality estimate is thus given by:

$$\hat{q}'_d = \frac{1}{R+\kappa}\left[\kappa F_d + \sum_{j=1}^{R} w_j r_j\right] \tag{16}$$

where $\kappa \geq 0$ denotes the weight assigned to the new quality report in terms of recommendations from family and friends.[151] The change in expected quality in this case is denoted by $\Delta\hat{q}_d$:

$$\Delta\hat{q}_d = \hat{q}'_d - \hat{q}_d = \frac{\kappa}{R+\kappa}(F_d - \hat{q}_d) \tag{17}$$

This is a form of conditional Bayesian updating related to consumer Bayesian updating of hospital quality in Dranove & Sfekas (2008).[152] But Equation 17 reveals an important difference in predictions: for fixed κ and $R \to \infty$, we see that $\lim_{R\to\infty} \Delta\hat{q}_d = 0$. If prospective patients consider

[151] For example, if $\kappa = 3$ then consumers consider the authoritative recommendation equal in value to three good recommendations from family and friends; if $\kappa \in [0,1)$ then prospective patients care less about the official evaluation than the opinions of their relations.

[152] In the typical case, consumers compute their posterior estimate of expected quality using Bayes's Formula. To make this calculation tractable, researchers assume the prior evaluation of expected quality was the mean of some normal distribution $N(\mu_0, \tau_0^2)$. Quality reporting data is also assumed to actually have the normal distribution $N(\mu, \tau^2)$ and so the posterior mean μ_1 can be calculated provided a sample mean $\tilde{\mu}$ and sample variance $\tilde{\tau}^2$ of μ and τ^2 are available: $\mu_1 = \mu_0 + [\tau_0^2/(\tau_0^2 + \tilde{\tau}^2)](\tilde{\mu} - \mu_0)$. With estimates of the prior quality estimate μ_0 and the quality report $\tilde{\mu}$ on hand, studies like that by Dranove & Sfekas (2008) place expected quality in a utility equation for the typical consumer and estimate the parameter on "news", or $(\tilde{\mu} - \mu_0)$. Denote $\theta = \tau_0^2/(\tau_0^2 + \tilde{\tau}^2)$. If we set $\theta = \kappa/(R+\kappa)$, we obtain $\kappa = \theta R/(1-\theta)$. This is the case where consumers value the new quality report at a constant proportion relative to their old stock of information. Asymptotic arguments also make standard Bayesian updating ideal in scenarios where R is very large and the metric used to measure quality is continuous.

authoritative quality reporting information as equivalent to κ reports from family, friends, and other individuals, then the importance of quality reporting diminishes as a provider establishes a reputation. In this case, the effect of 'news' varies by provider systematically.[153] Unless the physician is famous in early 20th century New York, entering a new market resets local reputation and so R is close to zero, and the effect of the *Flexner Report* should be elevated for recent entrants. Recent graduates are only a subset of the most affected physicians.

My results match the predictions of this simple model. Moreover, it can shown that when consumers have access to a prior authoritative recommendation F_d – such as the information contained in the 1910 CME evaluations – the negative effects of certification on perceived quality is loaded on physicians treated with bad news: physicians who attended institutions rated 'Class A' by the CME but disparaged by Flexner. It can also be shown that if consumers consider Flexner more credible than previous authorities, then physicians that attended known high-quality institutions benefit from the report's release with slightly higher perceived quality. In both cases, these prediction disappear as $R \to \infty$, matching results obtained in Section 6.[154]

This recommendation-averaging model of estimated physician quality is especially appealing in the context of the *Flexner Report*. Assume that $r_{dj} \in \{0,1\}$ with each r_{dj} a draw from a Bernoulli distribution with probability p that a physician will be recommended: then perceived physician quality is the likelihood of patient satisfaction. Consumers may prefer to use patient satisfaction information instead of direct quality measures (Martino et al. 2012), and κ measures the relative value of authoritative opinion to patient opinion. Other quality reporting has focused on continuous outcome measures such as risk-adjusted mortality (Dranove et al. 2003, Cutler et al. 2004, Dranove & Sfekas 2008, Wang et al. 2011, Yoon 2020) or ordered rankings (Hibbard et al. 2005, Pope 2009), which the consumer must convert using some unknown, and perhaps idiosyncratic, function to compare with recommendations from family and local sources.

Available data do not permit estimation of κ, but the results of Section 6.2 suggest that κ cannot be very large, or well-rated recent entrants might also have been compelled to switch markets. In addition, I find that more than 2 years in a local market offsets a negative review by Abraham Flexner: the value of authoritative opinion cannot be very large relative to the difference between the average number of recommendations obtained after three years and two years in a local market, all else equal.

7.4 Lessons and Questions

I have shown that in the presence of licensing, consumers may still respond to additional coarse quality information.[155] This information need not be directed at a specific physician to have an impact on their market prospects – in 1910, it was sufficient to target medical credentials – which

[153] This can easily be accommodated in the Bayesian updating formula by separating the effect by provider tenure. The use of Equation 17 is informative because it provides theoretical justification for such an adaptation.

[154] See Appendix E for discussion of models of changing authoritative recommendations and increased credibility.

[155] This may be because licensing boards were ineffective at assuring quality standards (Flexner 1910, p. 170). If consumers have faith in the licensing process, they may not respond to additional certification.

suggests potential policy options. In other industries, it may be possible to target brands instead of specific products, or both simultaneously. Additional research should investigate how consumers trade-off quality reporting when information is available at different degrees of product specificity. As consumers often value coarse measures even when additional information is available (Spranca et al. 2000, Houde 2018, Barahona et al. 2021), it is not clear what impact the availability of both grouped and disaggregated information will have on decision-making in confluence.

On the other hand, the impact of this additional information is greatly attenuated by market learning. When local consumers had more than two years of experience with a physician, they did not systematically reduce demand for the poorly-rated doctors by enough to compel market exit. This is consistent with the results of Xiao (2010) in markets for childcare, who found that consumers respond to voluntary accreditation but that this effect was attenuated for older firms: consumers relied on established reputation. Policy-makers must remain attentive to reputation and established relationships when designing reporting initiatives in markets where reputation, trust, and interpersonal relationships are especially important.[156] An alternative strategy which targets existing relationships may be more powerful at disrupting the business of established providers.

In modern settings, Jha & Epstein (2006) found that New York CABG surgeons exposed as having the highest mortality rates were more likely to quit their practice within two years, and Yoon (2020) found similar patterns in New Jersey.[157] My results suggest that these patterns may vary systematically not just with quality but also with reputation and established relationships; however, it may not be patients that matter for specialist demand.[158] In Pennsylvania, consumers appear to have simply followed the recommendations of their cardiologist and were largely unaware of the ratings (Schneider & Epstein 1996, 1998)[159,160] In the market for CABG surgeries, it is cardiologists who form expectations over $\hat{q}_d$ for each surgeon and make the pertinent decisions. Only 2% of cardiologists noted the reports as having a significant impact on their referrals, and 87% claimed it had minimal impact or none whatsoever (Schneider & Epstein 1996). To shift demand for specialists dramatically through reporting, regulators may need to understand the beliefs and interpersonal relationships linking specialists and referring physicians. Future work should investigate whether the most affected CABG surgeons were those with weaker ties to local cardiologists.[161]

[156] Measuring the degree of the factors in a given market may be difficult, but future research should investigate whether these results are reproduced in markets where these features are lacking. If so, an alternative explanation will be required.

[157] In New York, there were only 31 surgeons who quit their practice between 1989 and 1999 (Jha & Epstein 2006, p. 850). In New Jersey, Yoon (2020) can exploit variation in a total of only 87 surgeons.

[158] Patients don't generally form long-lasting relationships with CABG surgeons, and it seems unlikely that the typical patient will be able to collect reliable information on heart surgery from family and friends.

[159] Schneider & Epstein (1996) conducted a survey of cardiologists and cardiac surgeons in the state, receiving complete responses from 279 cardiologists and 58 cardiac surgeons. All the cardiac surgeons knew about the program, as did 82% of the cardiologists. About 95% of cardiologists reported that no more than 10% of patients deviated from their first recommendation.

[160] Schneider & Epstein (1998) survey patients regarding the same program. Of the 474 surveyed, only 12% knew about the reporting prior to undergoing surgery and less than 1% both knew the correct rating of their provider and claimed it had a material impact on their decision-making.

[161] Defining markets and tracing referral networks will be harder in modern settings. In Pennsylvania and New York,

Due to the large concentration of general practitioners in 1903-14, my results are a potentially useful gauge for how consumers may respond to expert recommendations concerning primary care physicians [PCPs]. Evaluating PCP quality can be haphazard – which measures matter for a consumer and which doctor bears responsibility for a complex outcome?[162] I have shown that one potentially effective solution is to instead report on PCP training, such as the residency program attended by the physician. Such a scheme would limit the potential for deleterious welfare impacts caused by patient sorting when initiatives report on outcomes (Dranove et al. 2003).[163] Depending on the specific design of such a program, regulators may also be able to implement additional incentives for high-quality training.[164]

Unfortunately, policy-makers cannot be assured that training-based reporting would increase consumer welfare. Consumers may have more information than third-parties concerning their idiosyncratic preferences for physicians, but may nevertheless choose to use reporting as a substitute for market learning when the latter is unavailable. Consequently, the release of quality reports or recommendations may inadvertently sway consumers away from an idiosyncratic match they would have preferred to keep had the relationship already been established, decreasing welfare. The contexts in which healthcare consumers who ignore authoritative recommendations are rationally weighing additional information or making an irrational choice due to misplaced trust and cognitive biases must be known to fully assess the consequences of a successful quality reporting initiative.

In addition, my results suggest that a well-publicized, respected, and effective quality reporting tool may generate an additional market friction in the long-run. If physicians expect future quality reports will be more damaging to the careers of recent entrants to geographic markets, they may find it optimal to remain in practice in their current location, even when it is both profit and welfare-increasing for them to move the location of their practice in the absence of quality reporting. This is a potential form of 'job lock', where established reputations and relationships insure against negative quality signals.[165] A potential unforeseen consequence of a regular national quality reporting system for individual physicians may therefore be reduced geographic mobility.[166]

Finally, while Xiao (2010) demonstrated that the impact of voluntary accreditation was at-

many surgeons admitted to refusing high-risk patients after quality reporting initiatives began (Schneider & Epstein 1996, Burack et al. 1999). Omoigui et al. (1996) provide a strong argument that the highest-risk patients from New York may instead be referred out-of-state using data for the Cleveland Clinic (1980-1993) in Ohio.

[162] In their letter to the CMS Privacy Officer concerning the development of the proposed Performance Measurement and Reporting System in 2007, the American Academy of Family Physicians wrote "Patient care is the composite product of many interwoven processes and activities within and across practice care settings. This is particularly valid with respect to primary care. Publicly releasing large amounts of data attributing a single event to a single physician based on billing patterns creates a view of health care that could be skewed, dangerous or both" (Kellerman 2007, p. 2).

[163] Surgeons may refuse some high-risk patients (Schneider & Epstein 1996, Burack et al. 1999).

[164] It is beyond the scope of this paper to investigate the incentive structures of potential training-targeted reporting programs for physicians.

[165] I find no systematic evidence of decreased market switching in the post-period. There is very mild insignificant evidence that the percentage of physicians who attended institutions treated with bad news that choose to switch markets when they change markets declines slightly in the post-period (See Figure A28). While the CME continued evaluating physicians after 1910, the publicity of the *Flexner Report* was an isolated shock. It is unclear how physicians would have responded had they expected the public to be regularly updated on the quality of their medical degrees.

[166] This hypothesis will be hard to test due to the state-by-state implementation of specialist report cards.

tenuated by existing reputations, and this study found similar results for an indirect third-party certification scheme, there is a fundamental difference between certification and reporting continuous measures of quality. As simple recommendations may be limited in information concerning provider quality, consumers may value specific estimates of quality (Rogerson 1983). It is unclear how the typical physician would have fared had Flexner simply provided salient, perhaps continuous, measures of medical school quality. Though consumers may ignore expert recommendations when market learning-based sources of information such as established reputations are available, whether consumers can be persuaded away from trusted physicians on the basis of more precise data is left an open question.

8 Conclusion

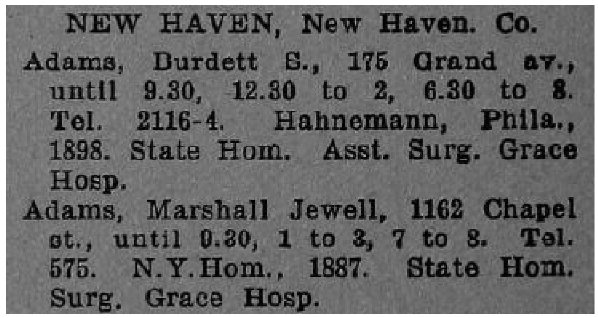
The landmark Flexner (1910) medical school evaluations constituted an imprecise signal of physician quality for healthcare consumers. Though its expert recommendations were both coarse and not doctor-specific, I find dramatic effects on physician practice viability for doctors without an established local presence. Entrants to a local geographic market in the preceding two years who attended poorly-reviewed schools – and not just the recent graduates thereof, for whom the information should be more temporally relevant – were about three times more likely to relocate or retire after the report's release.

These results imply reductions in perceived physician quality and expected demand large enough to compel market exit. Imprecise quality information can therefore be very effective at shifting outcomes in markets for physician services, which may give policy-makers added confidence that well-designed expert reporting can be used to implement incentives for high-quality care. On the other hand, these expert recommendations had considerably less impact when consumers had time to learn about local physicians, and no impact on practice failure can be detected for the average poorly-rated doctor.

The *Flexner Report* was a massive, public, and widely publicized campaign in an era with minimal competing sources of quality information. The dramatic effect on local practice failure for recent entrants who attended poorly-rated institutions therefore illustrates the potential power of well-disseminated expert quality recommendations, but the aggregate result demonstrates that market-based learning (local experience) dominated authoritative reporting. This solves a puzzle for regulators who cannot increase the impact of their reporting initiatives: design & information control may not be primary issues. Instead, policy-makers may be unable to dramatically alter demand for medical practitioners with quality information alone in contexts where trust, reputation, and interpersonal relationships are important market features. Alternative strategies may instead be necessary, and additional research will be required to determine how to most effectively influence consumer behavior in this context.

Appendix A: Appendix Figures

Figure A1: Sample Directory Entries

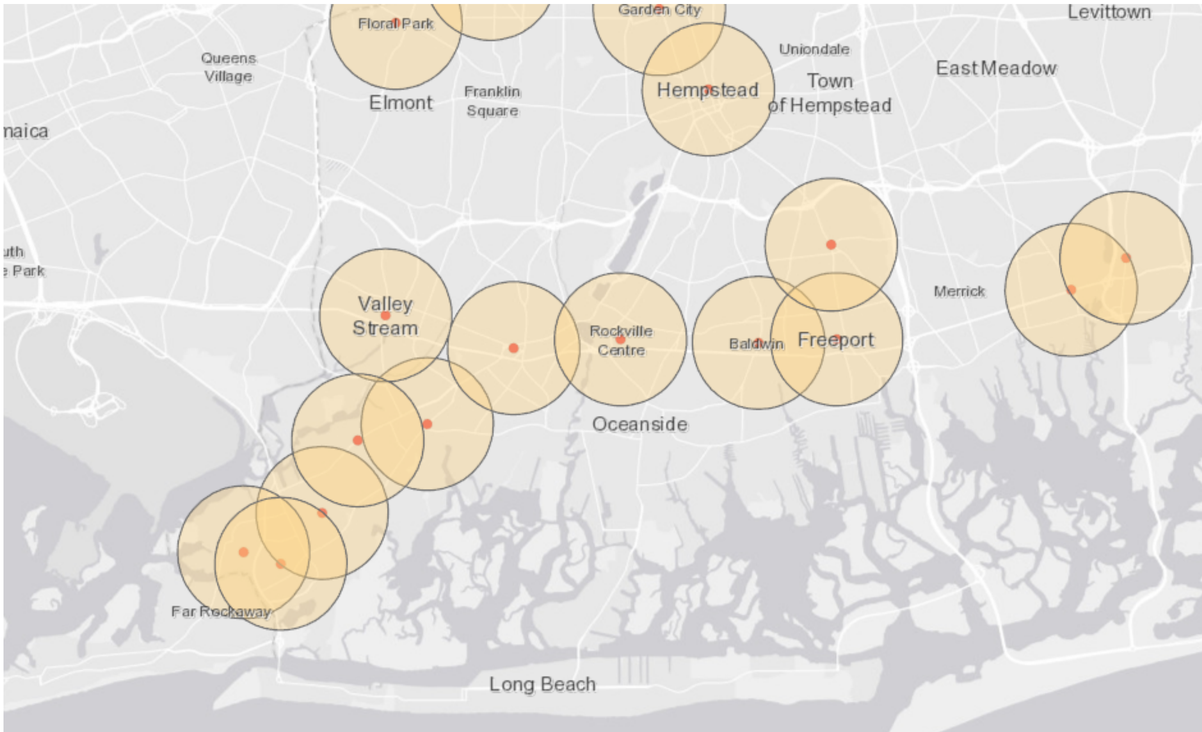


NEW HAVEN, New Haven. Co.

Adams, Durdett S., 175 Grand av., until 9.30, 12.30 to 2, 6.30 to 8. Tel. 2116-4. Hahnemann, Phila., 1898. State Hom. Asst. Surg. Grace Hosp.

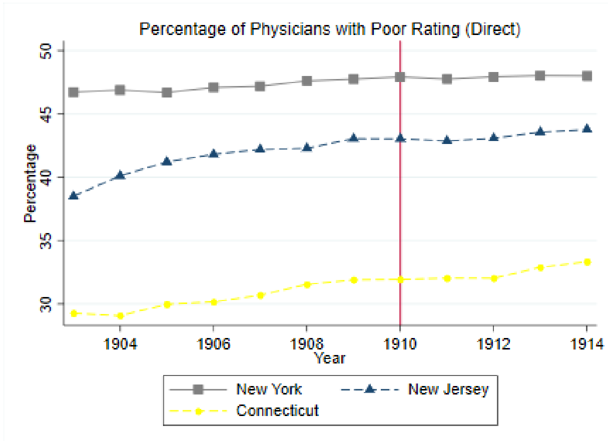
Adams, Marshall Jewell, 1162 Chapel st., until 9.30, 1 to 3, 7 to 8. Tel. 575. N.Y.Hom., 1887. State Hom. Surg. Grace Hosp.

Figure A2: Southern Nassau County, Rolling 3km Markets



Notes: This figure was produced using ArcGIS Online through Northwestern University. Each circle has radius 1.5km from the geocoded place in which a postoffice, designated by a red dot, was located. Overlapping circles indicate that markets are within 3km of each other; these markets are consequently pooled. For example, Cedarhurst and Rockville Center in Nassau County, New York are located 7.8km apart; however, both are in the same rolling 3km market – a market which also includes Inwood, Valley Stream, Lawrence, Woodmere, Hewlett, and Lynbrook. This market is represented in the figure by the chain of orange buffers which connect Rockville Center in the middle of the map all the way down to Far Rockaway south of what is now John F. Kennedy International Airport. Geographic markets can become quite large when the distance between markets is increased; Hempstead and the three other locations in the northern limit of the map join the Rockville Center 5km-rolling market.

Figure A3: Trends in Directly Rated Physician Counts



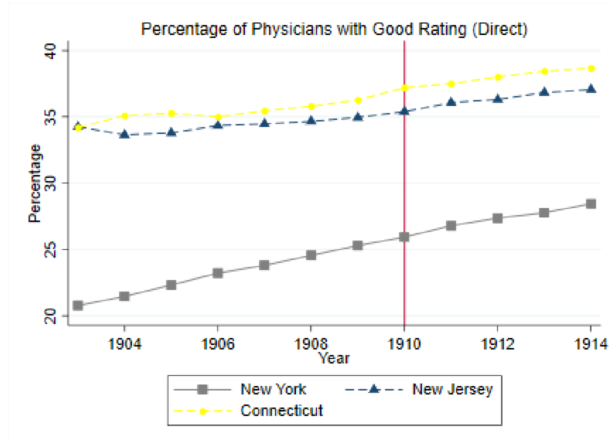


Figure A4: Trends in Indirectly Rated Physician Counts

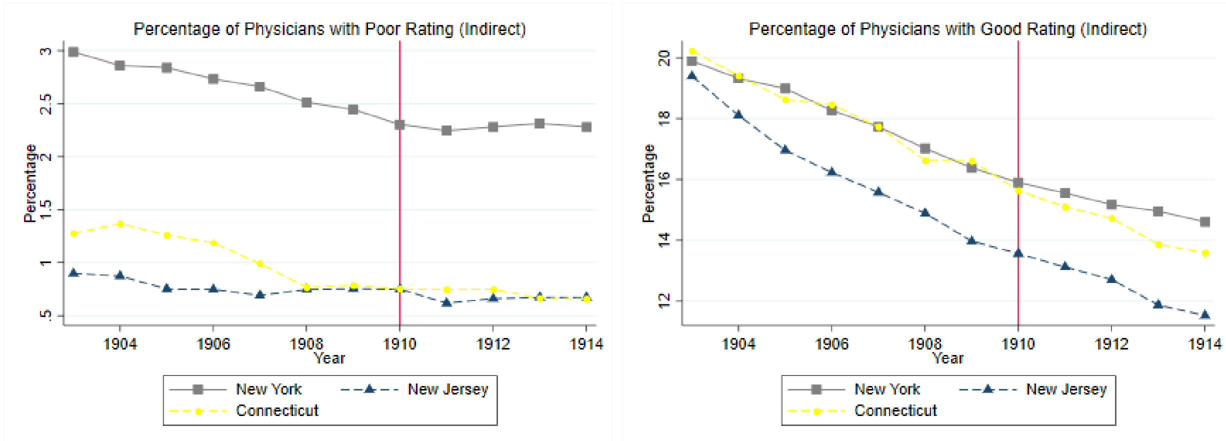


Figure A5: Consumer Learning Categories Matrix

		Flexner Rating	
		Close	Keep
CME	A	Bad News	Known High-Quality
	B/C	Known Low-Quality	Good News

Notes: CME refers to the 1910 CME Evaluation category assigned to the medical school attended by the physician. Class B and Class C are grouped into a low-quality bin. All categories are limited to 'direct' ratings: the school evaluated by Flexner or the CME is the same school as the physician attended, and not a descendant institution via merger or acquisition.

Figure A6: Survival by Report, New York, Excluding Medical Centers, 1907-09

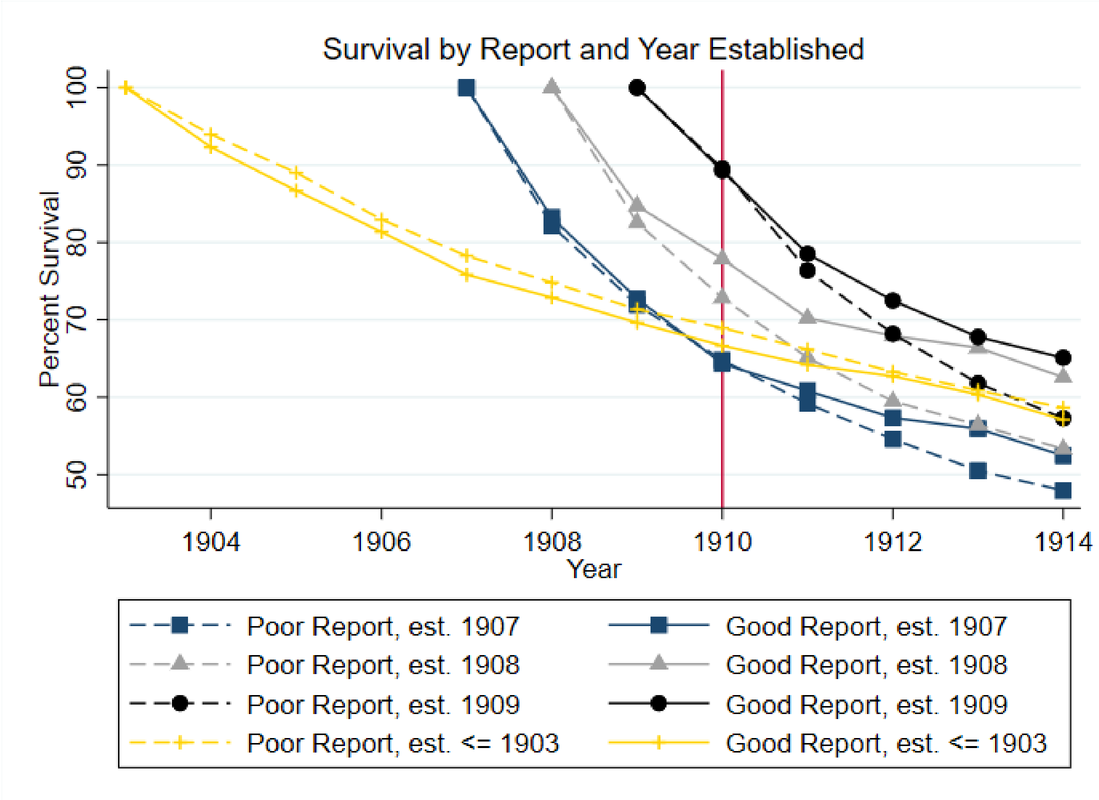


Figure A7: Survival by Report, New York, Excluding Medical Centers, 1904-06

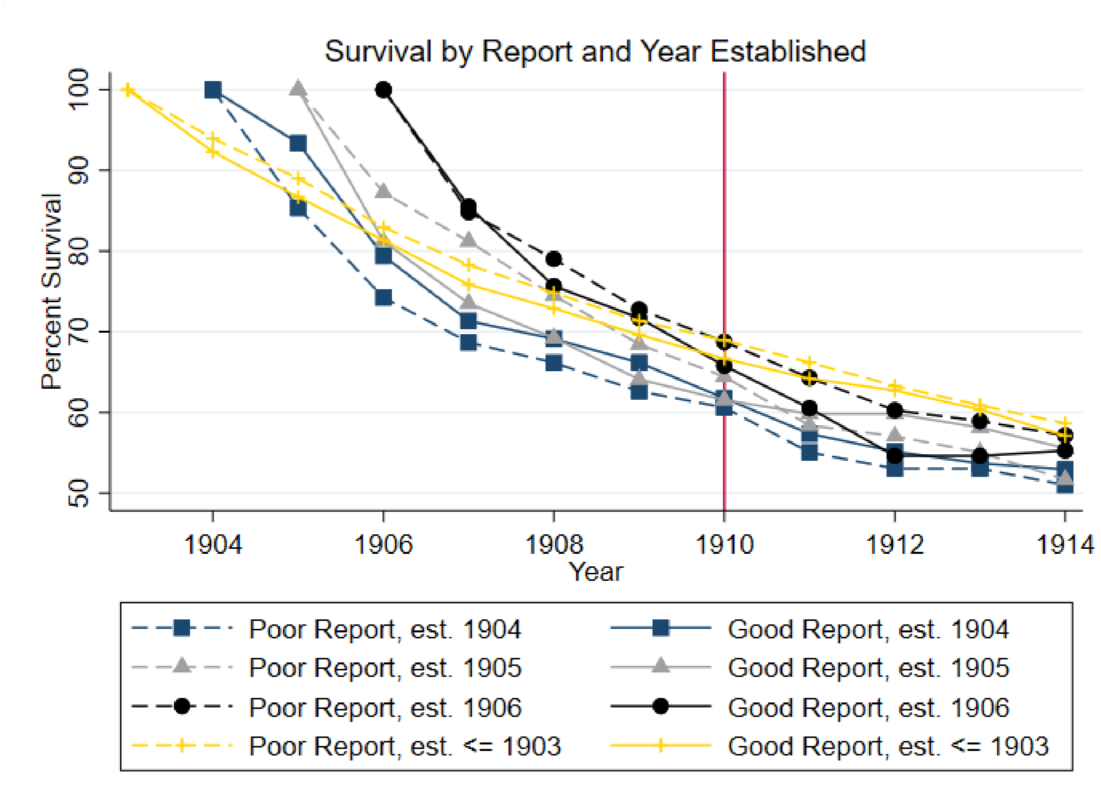


Figure A8: Survival by Report and Year Established, New York, 1907-09 Cohorts

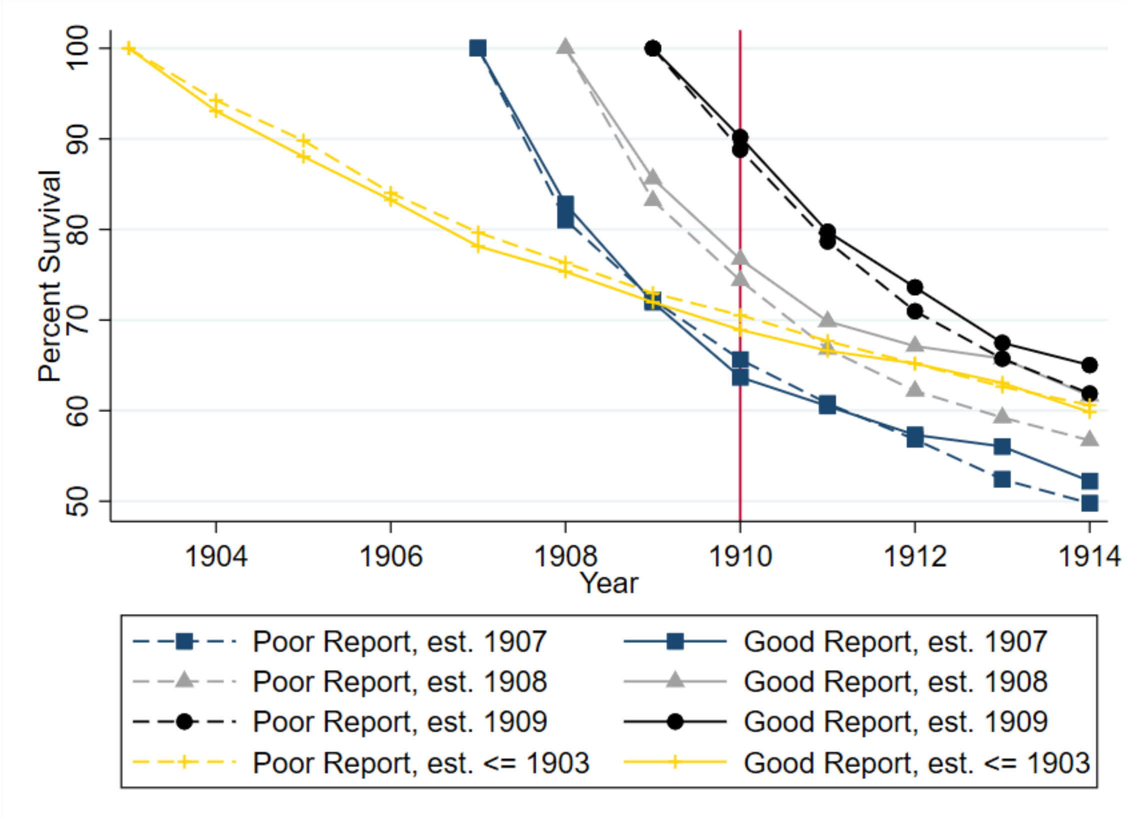


Figure A9: Survival by Report and Year Established, New York, 1904-06 Cohorts

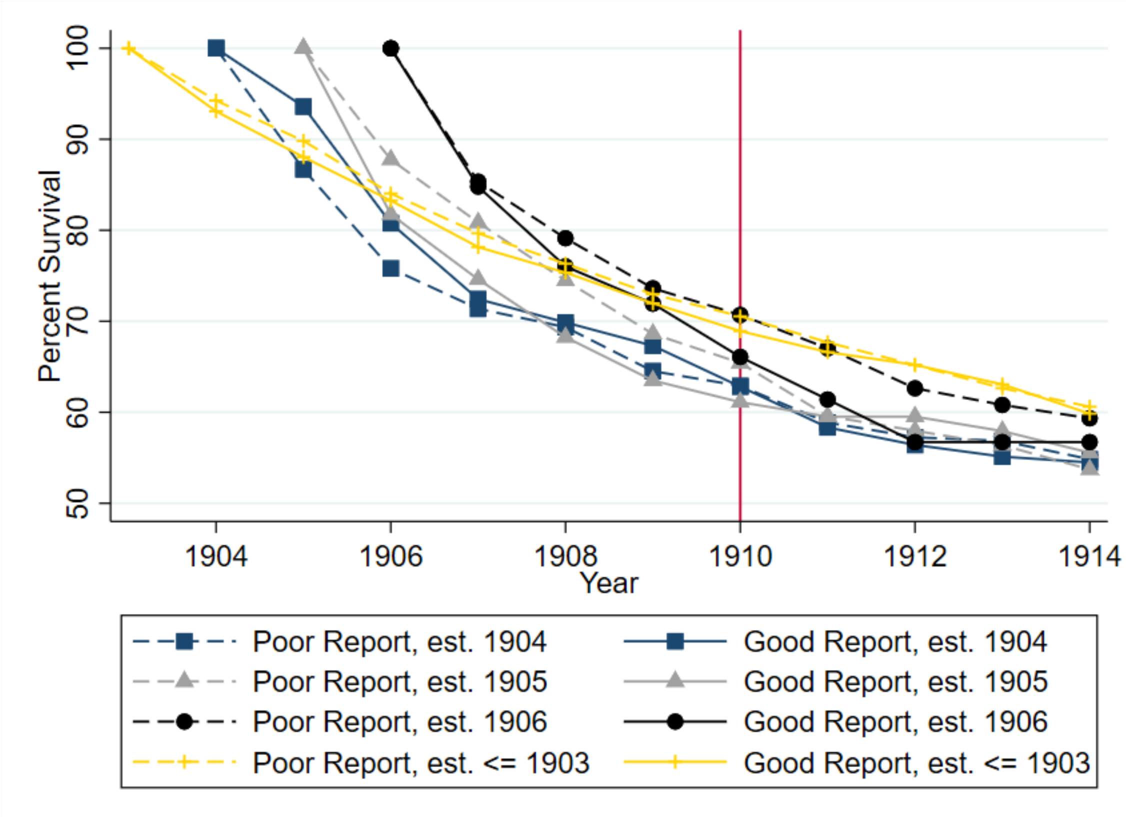


Figure A10: Survival by Rating and Cohort, New Jersey, 1904-06

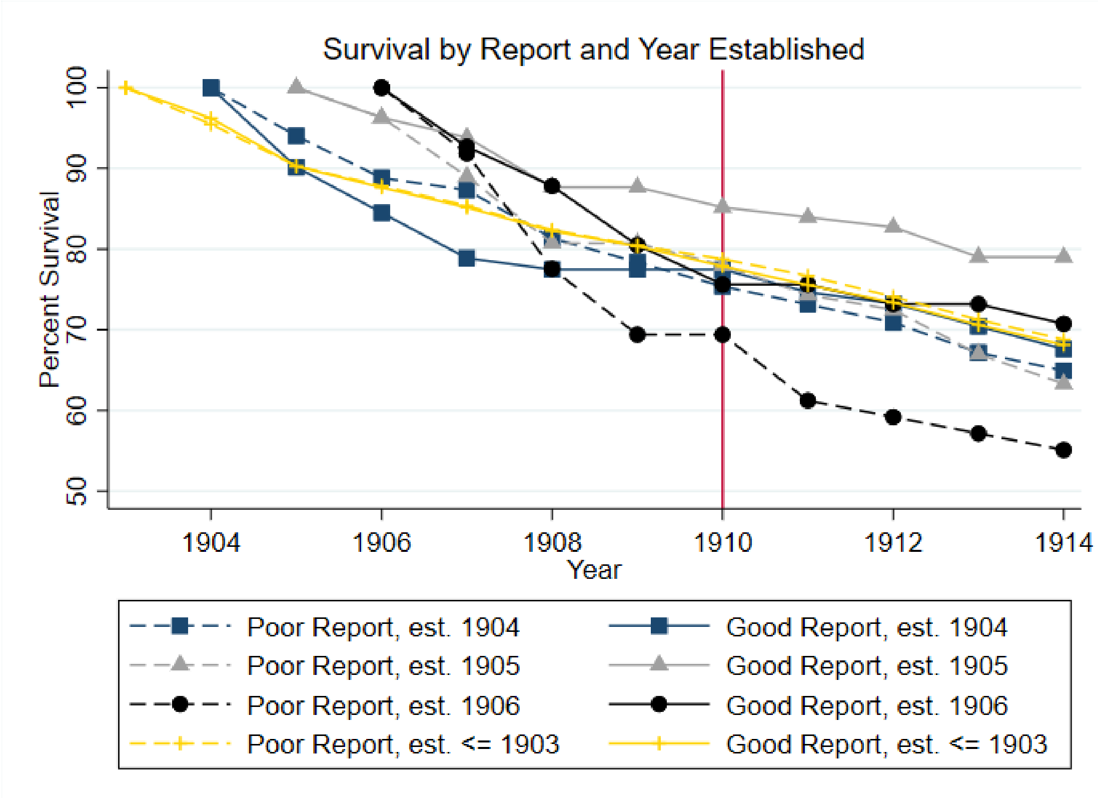


Figure A11: Survival by Rating and Cohort, Connecticut, 1904-06

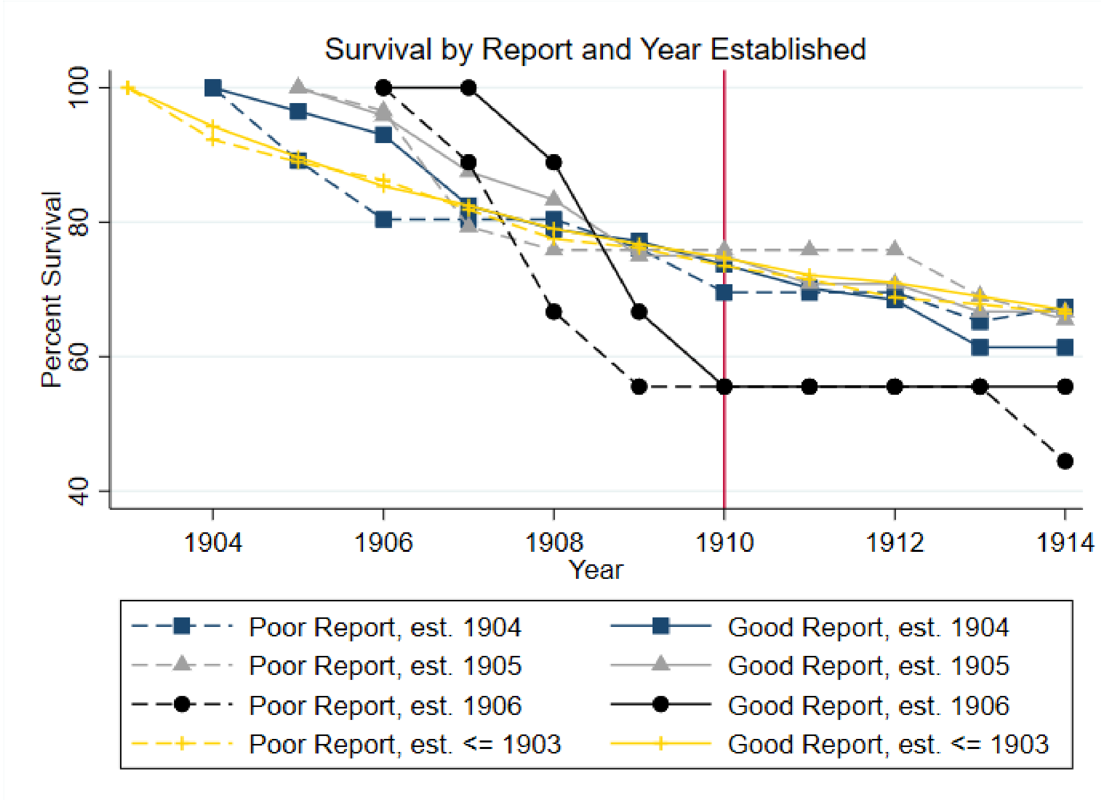


Figure A12: Number of New Practices Recorded by Year

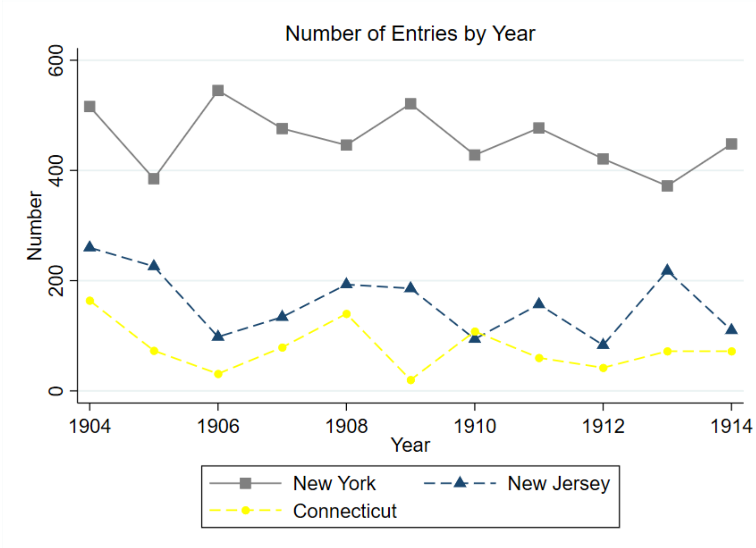


Figure A13: Survival Z Years, New York, Excl. Medical Centers

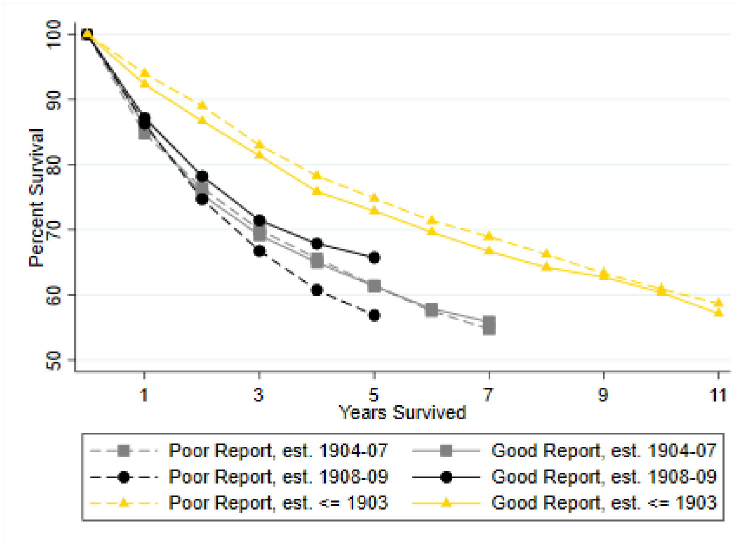


Figure A14: Survival Z Years, New York, Excluding Medical Centers

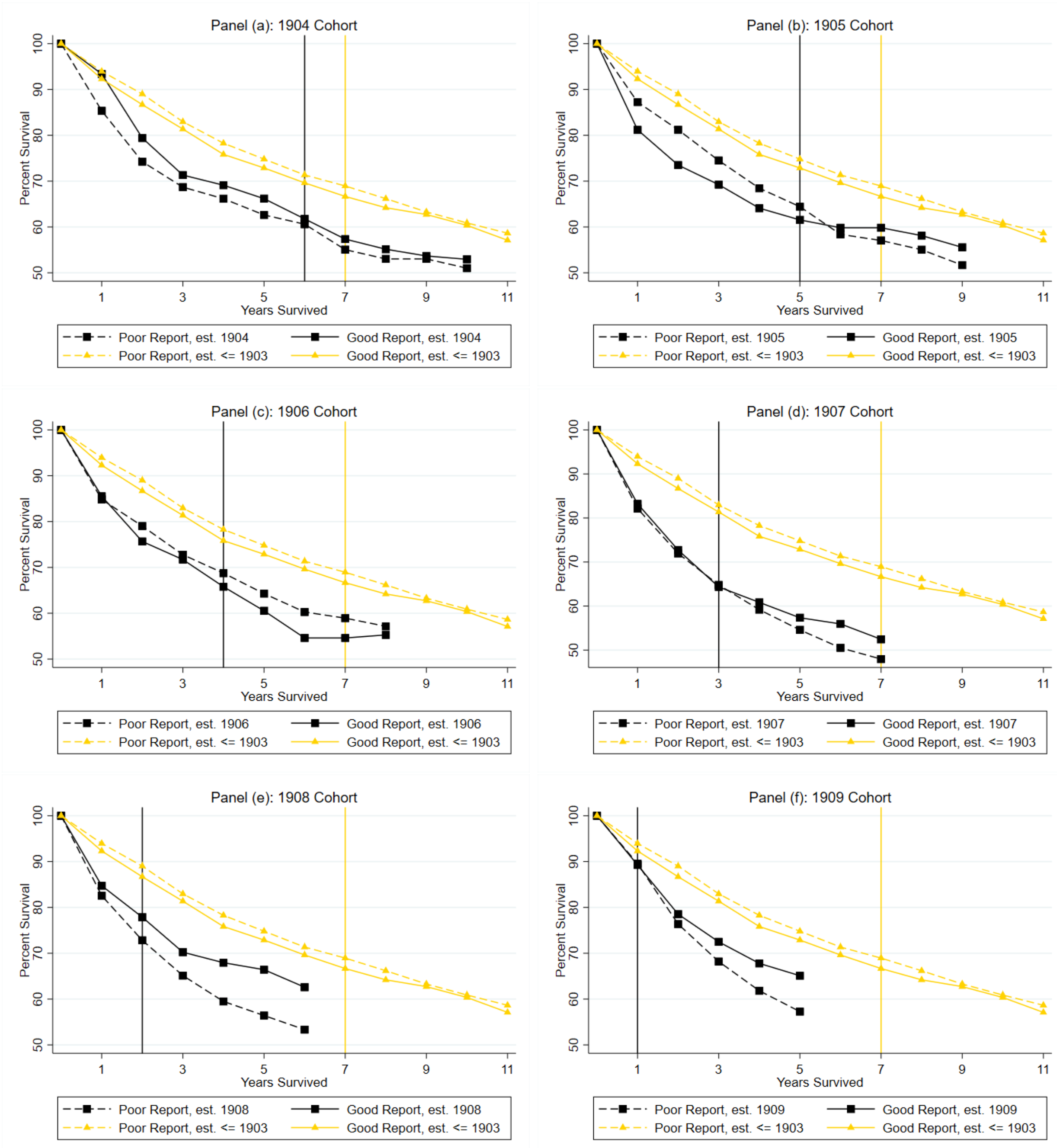


Figure A15: Survival Z Years, New York, Conditional on Survival 1 Year

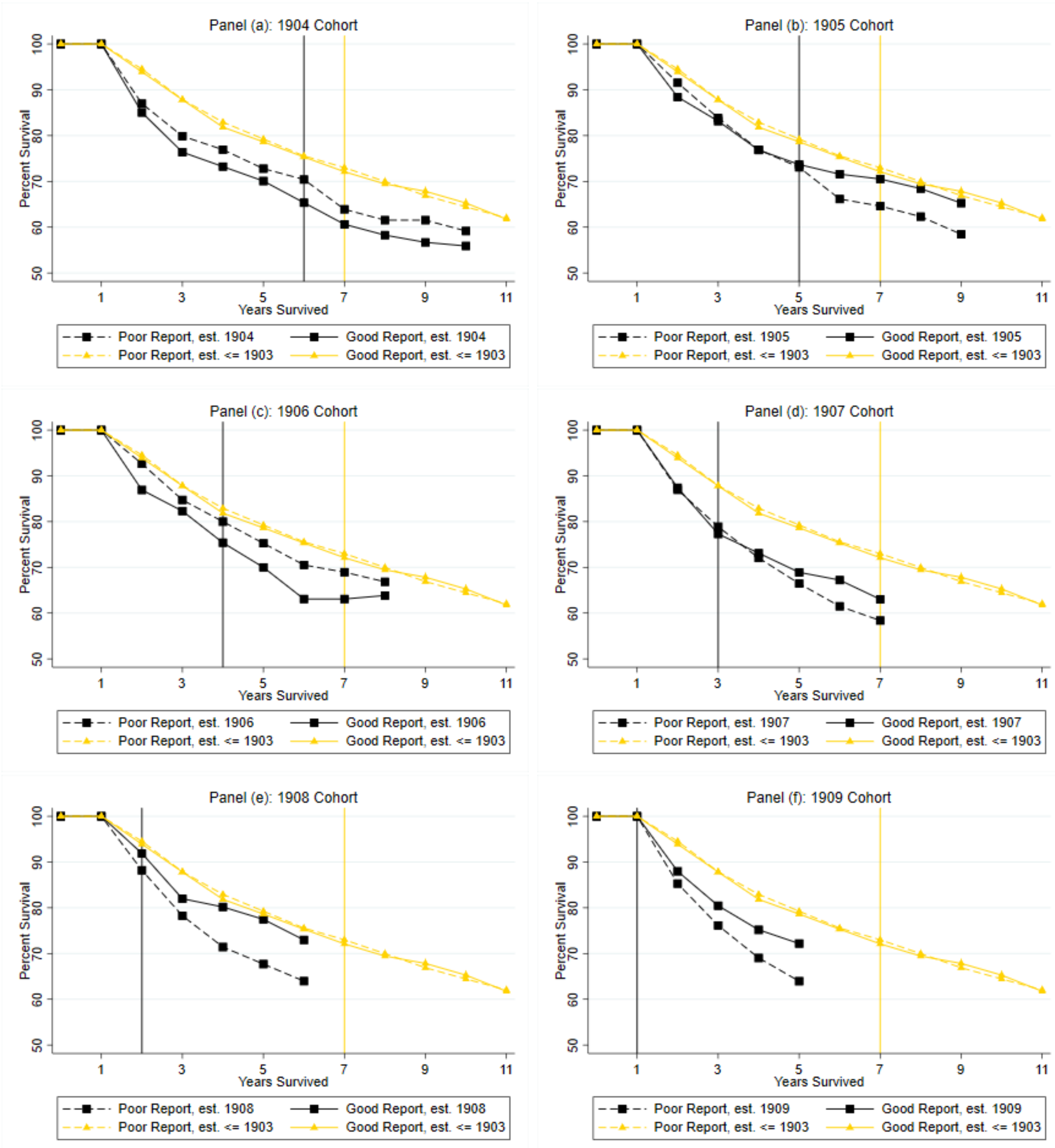
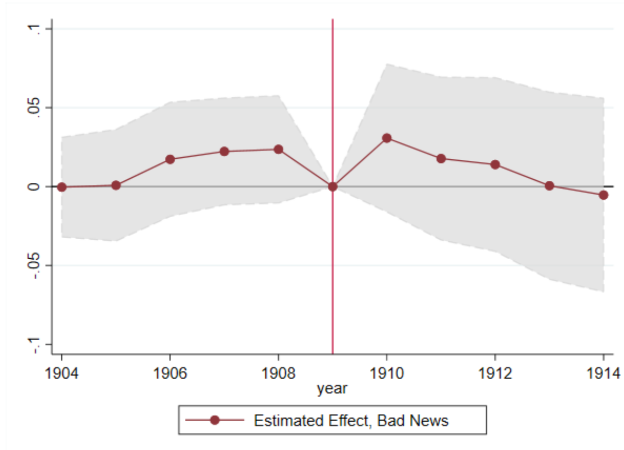
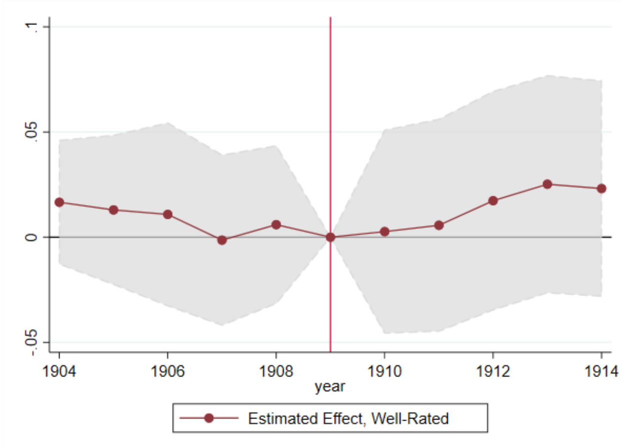


Figure A16: Event Study, Treated with Bad News



Notes: Regression panel is restricted to baseline sample: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Standard errors are clustered at the 3km-rolling market level.

Figure A17: Event Study, Well-Rated Physicians

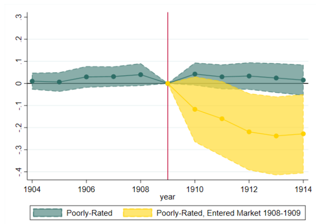


Notes: Regression panel is restricted to baseline sample: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Standard errors are clustered at the 3km-rolling market level.

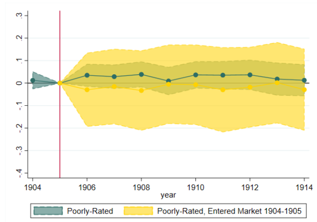
Figure A18: Falsification of Event Study Year, Poorly-Rated Recent Entrants

True Event:

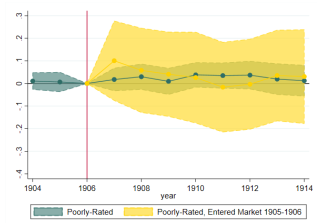
Entrants for 1908-09



(a) Entrants for 1904-05

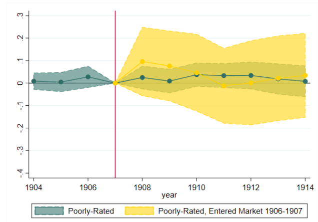


(b) Entrants for 1905-06

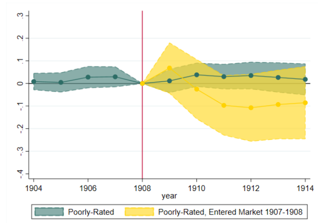


(c) Entrants for 1906-07

(d) Entrants for 1906-07



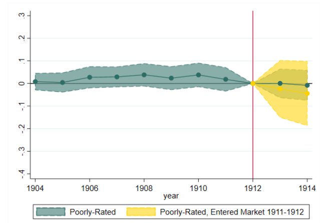
(e) Entrants for 1907-08



(f) Entrants for 1909-10

(g) Entrants for 1910-11

(h) Entrants for 1911-12



(i) Entrants for 1912-13

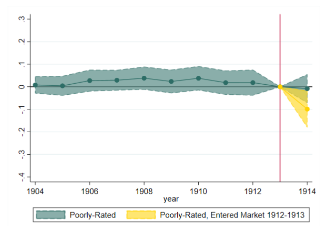


Figure A19: Permutations Test for S_{i2} Coefficients

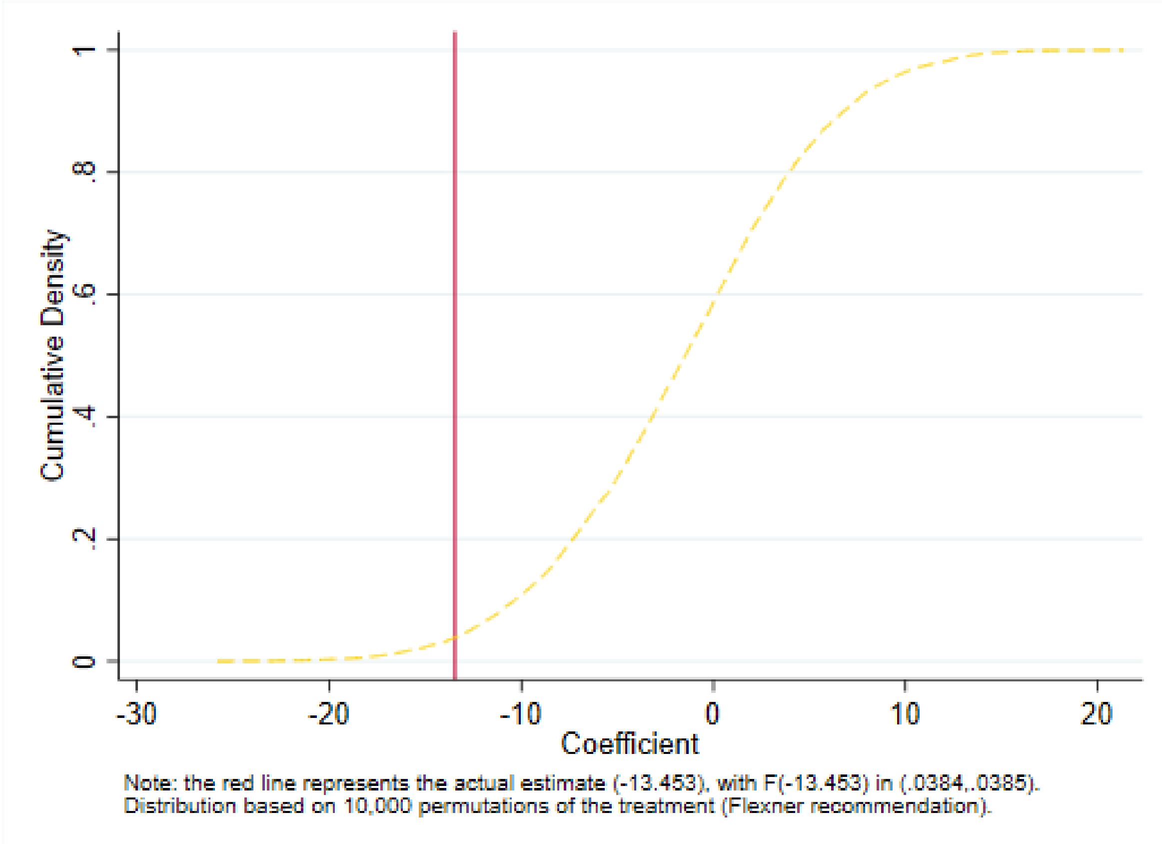


Figure A20: Permutations Test for S_{i3} Coefficients

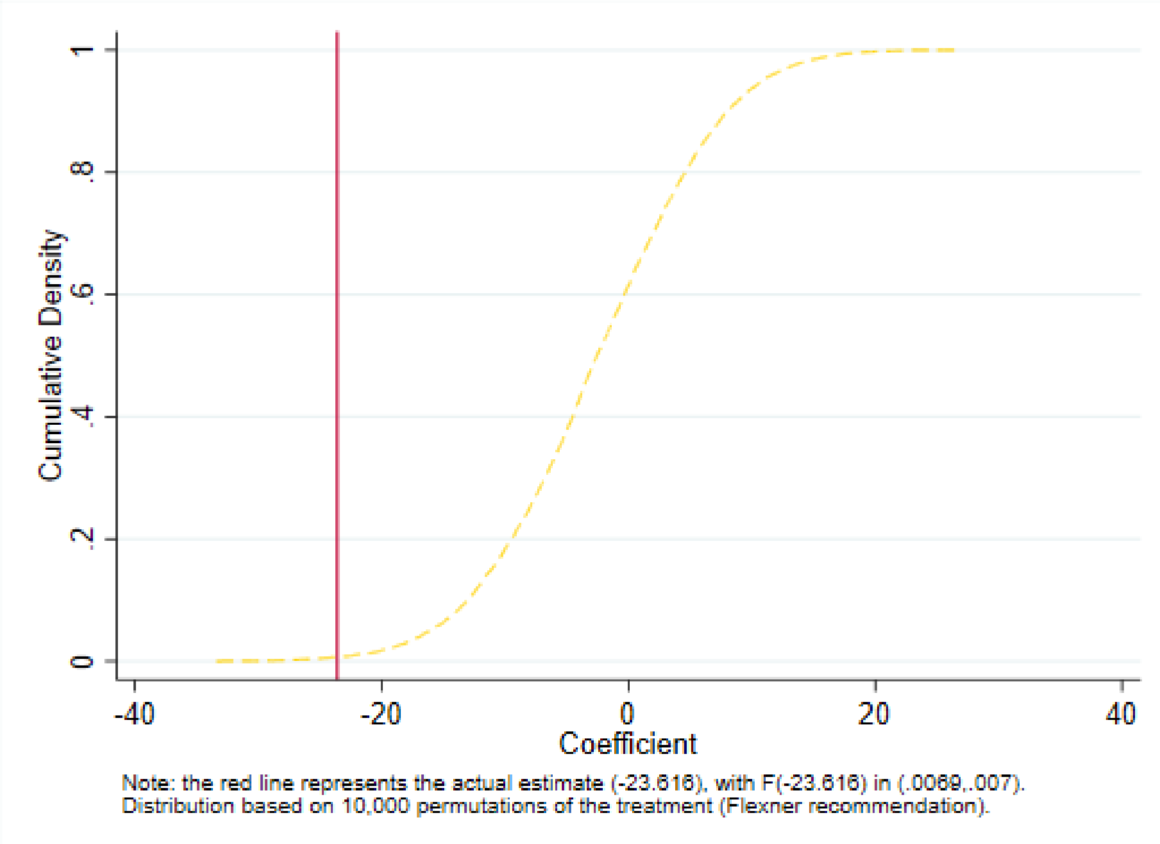


Figure A21: Permutations Test for S_{i4} Coefficients

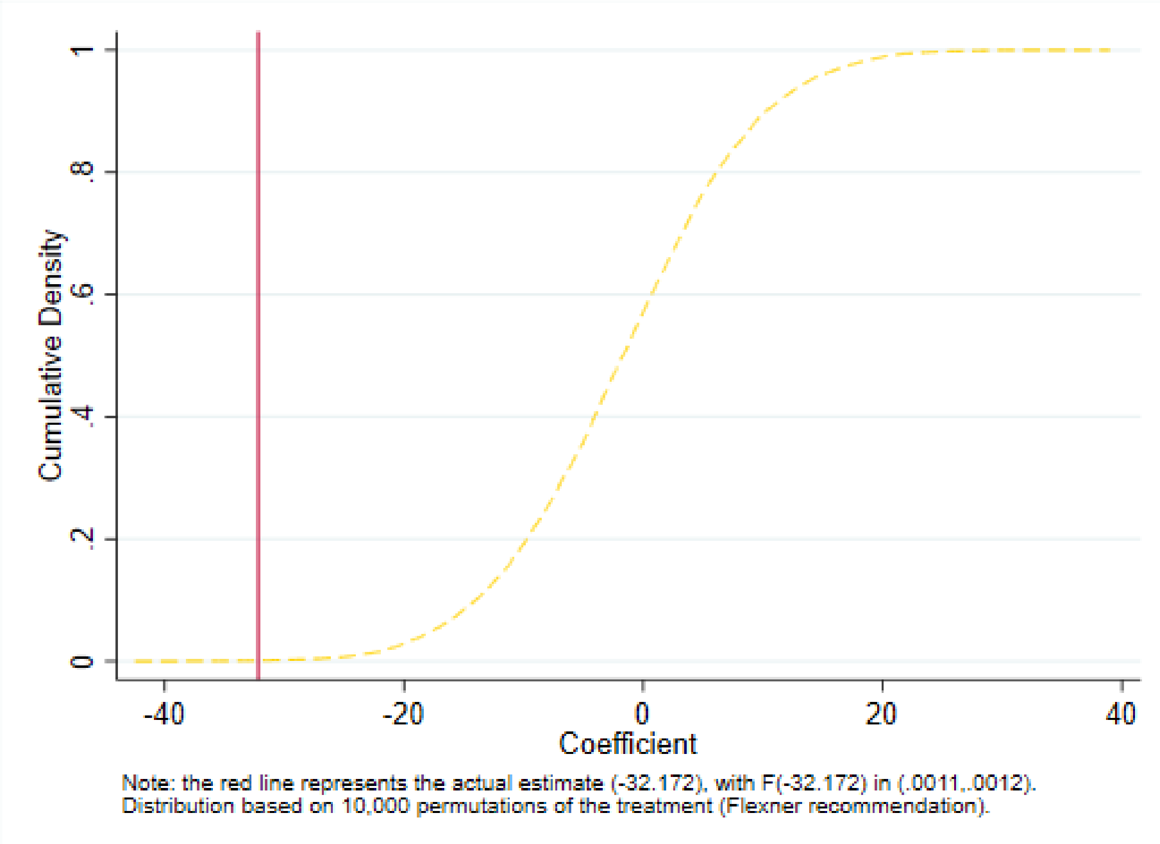


Figure A22: Permutations Test for S_{i5} Coefficients

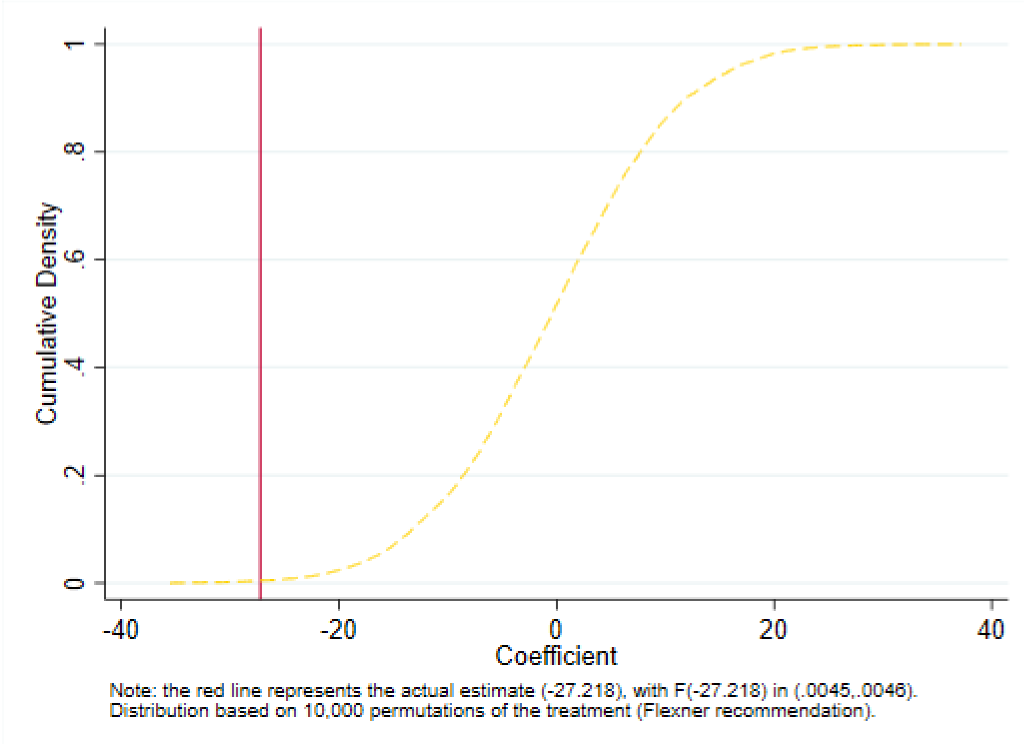


Figure A23: Permutations Test for $P_{i,1910}$ Coefficients

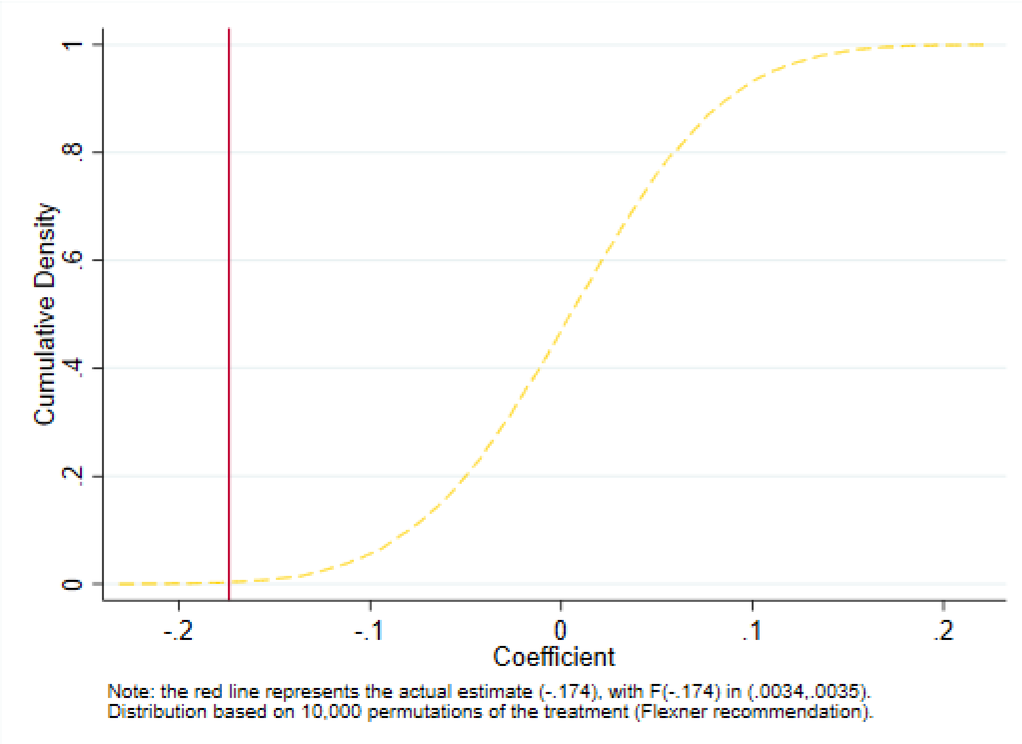


Figure A24: Permutations Test for $P_{i,1911}$ Coefficients

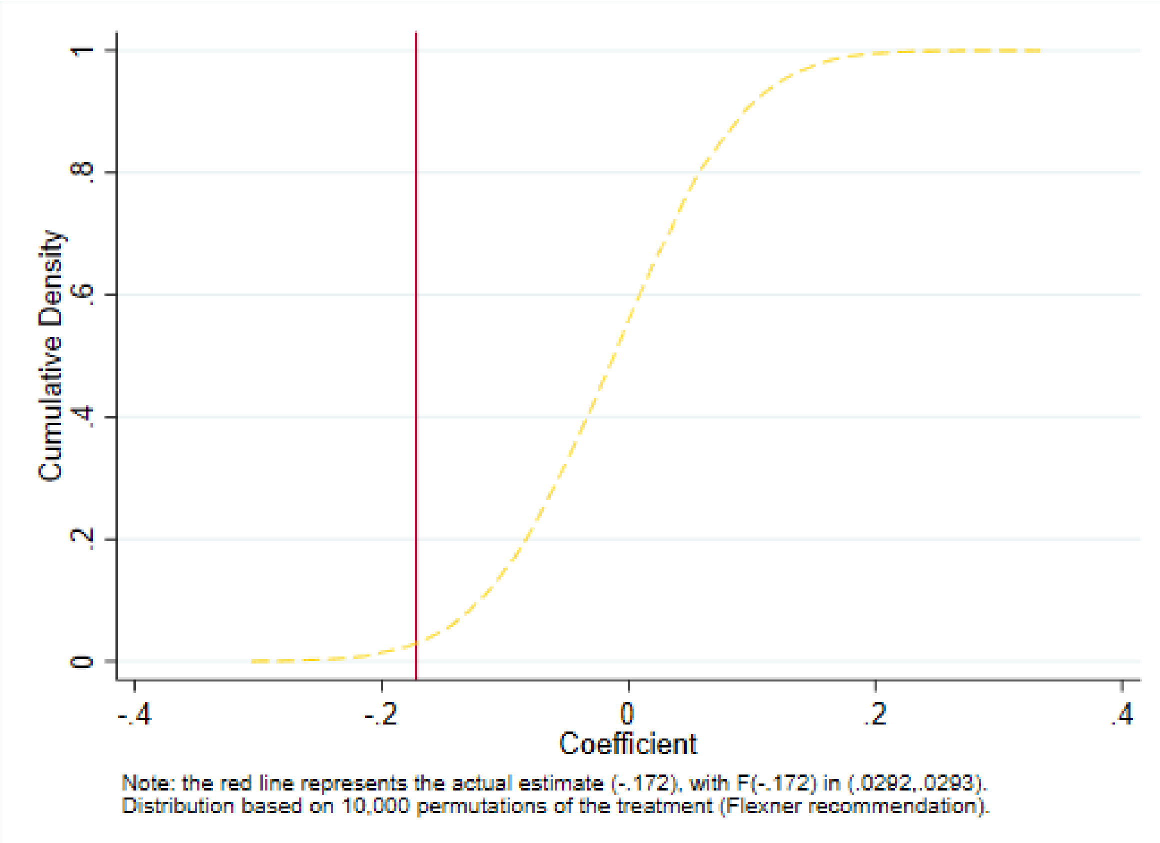
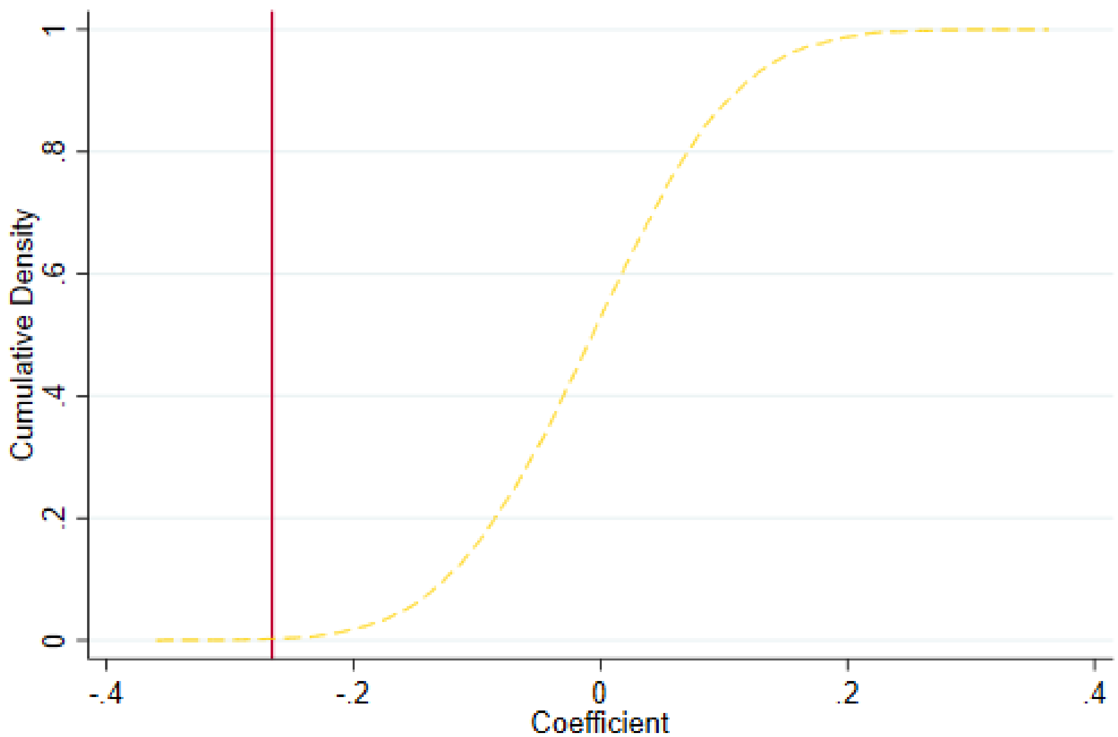


Figure A25: Permutations Test for $P_{i,1912}$ Coefficients



Note: the red line represents the actual estimate (-.266), with F(-.266) in (.0023,.0024).
Distribution based on 10,000 permutations of the treatment (Flexner recommendation).

Figure A26: Permutations Test for $P_{i,1913}$ Coefficients

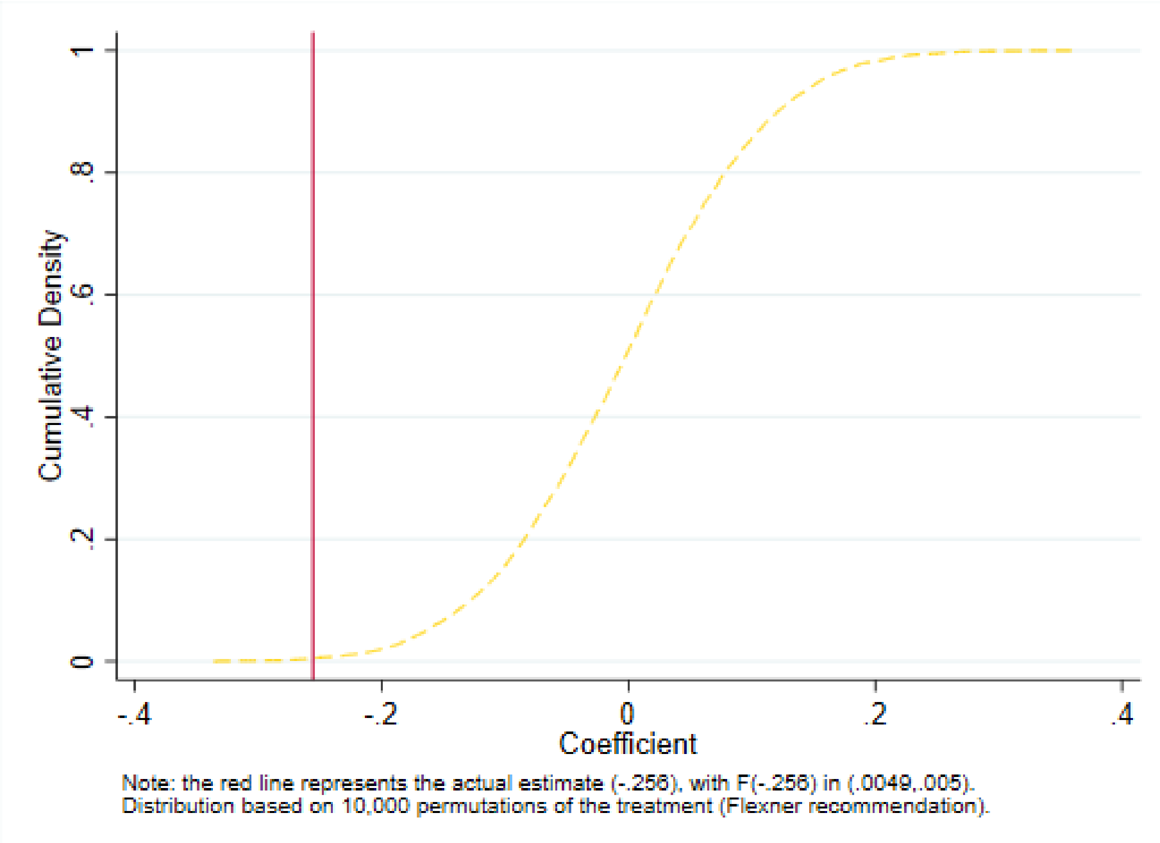
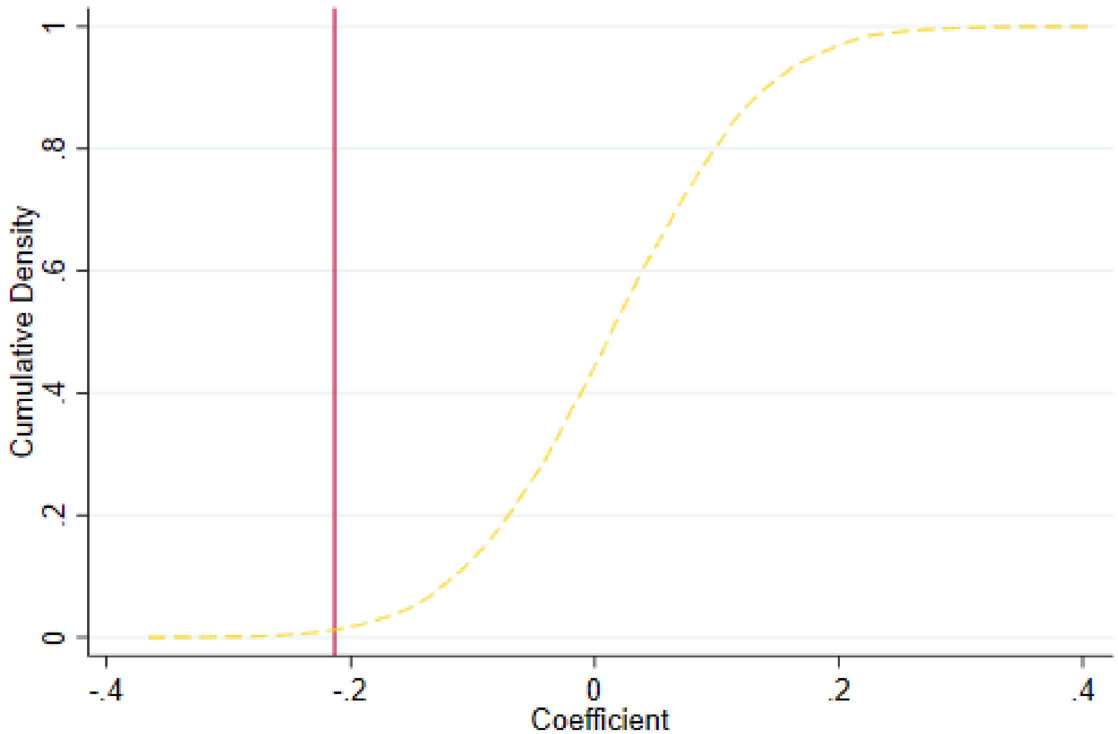


Figure A27: Permutations Test for $P_{i,1914}$ Coefficients



Note: the red line represents the actual estimate (-.213), with F(-.213) in (.0124,.0125).
Distribution based on 10,000 permutations of the treatment (Flexner recommendation).

Figure A28: Percent of Failing Physicians that Switch Markets

Note: The red line signifies physicians who exited their old 3km-rolling market in 1909 and therefore entered their new market in the post-period. Shaded area represents +/- standard error.

Appendix B: Appendix Tables

Table B1: CME Rating in 1910, by School Type

	School Type		
	Homeopathic	Eclectic	Women-only
A [4-Year Program]	6	1	1
A [2-Year Program]	0	0	0
B	4	4	1
C	5	7	0
Not Rated - Closed	0	0	1
Total	15	12	3

Notes: One school rated B by the CME is listed in both the Homeopathic and Women-only columns.

Table B2: Flexner Ratings by State, 1909

	Number of Physicians				*Percentage of Physicians*			
	NY	**NJ**	**CT**	**Panel**	**NY**	**NJ**	**CT**	**Panel**
Direct Poor Rating	3,208	1,085	400	4,693	50.0	43.1	29.9	45.7
Indirect Poor Rating	199	19	12	230	3.1	0.8	0.9	2.2
Direct Good Rating	1,582	881	548	3,011	24.7	35.0	40.9	29.3
Indirect Good Rating	942	352	200	1,494	14.7	14.0	14.9	14.5
Half-School Rating	221	40	101	362	3.4	1.6	7.5	3.5
Foreign School	62	69	27	158	1.0	2.7	2.0	1.5
Closed prior to Flexner	151	70	48	269	2.4	2.8	3.6	2.6
Licensed by Exam. Board	35	2	3	40	0.5	0.1	0.2	0.4
Cannot be determined	11	2	1	14	0.2	0.1	0.1	0.1
TOTAL	6,411	2,520	1,340	10,271	100.0	100.0	100.0	100.0

Table B3: Distribution of Physician-Years by Medical School

Inst. ID	**New York**		**New Jersey**		**Connecticut**		**Panel**			
Direct:	N	Y	N	Y	N	Y	N	Y	**Total**	**%**
103	10,264	780	4,079	518	2,225	124	16,568	1,422	17,990	14.9
100	992	12,768	36	81	28	136	1,056	12,985	14,041	11.6
101	0	6,224	0	4,640	0	1,900	0	12,764	12,764	10.5
98	0	10,764	0	215	0	207	0	11,186	11,186	9.2
130	0	1,450	0	3,633	0	332	0	5,415	5,415	4.5
107	0	3,265	0	1,369	0	735	0	5,369	5,369	4.4
131	0	706	0	3,490	0	400	0	4,596	4,596	3.8
108	307	4,022	7	42	17	0	331	4,064	4,395	3.6
99	0	2,302	0	820	0	550	0	3,672	3,672	3.0
17	0	258	0	173	0	3,100	0	3,531	3,531	2.9
134	39	1,041	8	1,915	4	310	51	3,266	3,317	2.7
155	0	2,201	0	262	0	781	0	3,244	3,244	2.7
Closed	1,804	0	813	0	583	0	3,200	0	3,200	2.6
62	12	900	0	783	0	413	12	2,096	2,108	1.7
73	0	1,689	0	211	0	115	0	2,015	2,015	1.7
64	0	799	0	803	0	305	0	1,907	1,907	1.6
Foreign	744	0	753	0	362	0	1,859	0	1,859	1.5
102	0	1,097	0	408	0	94	0	1,599	1,599	1.3
121	508	648	24	76	3	36	535	760	1,295	1.1
106	0	820	0	146	0	269	0	1,235	1,235	1.0
40	274	622	20	161	7	98	301	881	1,182	1.0
132	0	116	0	870	0	79	0	1,065	1,065	0.9
135	0	312	0	444	0	190	0	946	946	0.8
167	651	133	71	0	65	25	787	158	945	0.8
68	0	430	0	82	0	362	0	874	874	0.7
168	43	607	12	57	10	86	65	750	815	0.7
97	0	343	0	131	0	327	0	801	801	0.7
165	39	655	0	35	0	22	39	712	751	0.6
119	0	562	0	48	2	98	2	708	710	0.6
105	0	280	0	273	0	49	0	602	602	0.5
61	0	359	0	58	0	165	0	582	582	0.5
63	0	240	0	239	0	85	0	564	564	0.5
70	8	192	0	38	0	230	8	460	468	0.4
55	124	26	26	54	34	16	184	96	280	0.2
State Board	190	0	30	0	43	0	263	0	263	0.2
28	0	168	0	66	0	24	0	258	258	0.2
118	170	0	41	0	38	0	249	0	249	0.2
19	0	134	0	57	0	48	0	239	239	0.2
122	0	198	0	12	0	23	0	233	233	0.2
LIC*223	216	0	2	0	0	0	218	0	218	0.2
156	0	76	0	87	0	51	0	214	214	0.2
120	0	203	0	8	0	0	0	211	211	0.2
60	0	73	0	50	0	84	0	207	207	0.2
74	0	185	0	5	0	12	0	202	202	0.2
76	74	99	0	28	0	0	74	127	201	0.2
124	98	27	32	0	36	0	166	27	193	0.2
18	111	31	13	11	12	9	136	51	187	0.2
29	0	137	0	18	0	24	0	179	179	0.1
69	0	74	0	9	0	77	0	160	160	0.1
169	0	75	0	0	0	84	0	159	159	0.1

20	0	44	0	113	0	0	0	157	157	0.1
123	79	11	24	6	0	13	103	30	133	0.1
30	0	72	0	23	0	31	0	126	126	0.1
39	0	69	0	32	5	12	5	113	118	0.1
65	0	51	0	43	0	7	0	101	101	0.1
71	0	36	0	44	0	20	0	100	100	0.1
32	0	63	0	0	0	28	0	91	91	0.1
66	0	0	0	18	0	70	0	88	88	0.1
170	0	60	0	0	0	26	0	86	86	0.1
87	16	19	13	0	12	16	41	35	76	0.1
67	32	0	10	14	16	0	58	14	72	0.1
CBV	53	0	18	0	1	0	72	0	72	0.1
166	0	59	0	1	0	0	0	60	60	0.0
78	0	12	0	11	8	28	8	51	59	0.0
n/a	45	0	13	0	0	0	58	0	58	0.0
15	35	6	0	5	11	0	46	11	57	0.0
46	4	22	7	0	17	0	28	22	50	0.0
125	0	36	0	0	0	12	0	48	48	0.0
58	0	25	0	4	0	12	0	41	41	0.0
33 or 75	0	27	0	10	0	0	0	37	37	0.0
35	0	6	0	30	0	0	0	36	36	0.0
50	0	36	0	0	0	0	0	36	36	0.0
77	0	24	0	0	0	12	0	36	36	0.0
157	0	12	0	15	0	7	0	34	34	0.0
116	0	0	0	33	0	0	0	33	33	0.0
147	0	7	0	24	0	0	0	31	31	0.0
27	0	14	0	3	0	12	0	29	29	0.0
161	0	5	0	0	0	23	0	28	28	0.0
48	24	3	0	0	0	0	24	3	27	0.0
158	0	0	0	12	0	14	0	26	26	0.0
148	4	7	12	2	0	0	16	9	25	0.0
51	0	18	0	7	0	0	0	25	25	0.0
139	0	5	0	7	0	12	0	24	24	0.0
52	24	0	0	0	0	0	24	0	24	0.0
88	12	4	7	0	0	0	19	4	23	0.0
12	13	0	0	0	5	0	18	0	18	0.0
23	4	7	1	0	6	0	11	7	18	0.0
94	0	0	0	12	5	0	5	12	17	0.0
104	0	12	0	3	0	1	0	16	16	0.0
137	0	0	15	0	0	0	15	0	15	0.0
164	0	1	0	12	0	0	0	13	13	0.0
144 or 145	0	0	0	0	0	12	0	12	12	0.0
25	0	0	0	0	0	12	0	12	12	0.0
37	0	0	0	0	0	12	0	12	12	0.0
122 or 123	12	0	0	0	0	0	12	0	12	0.0
128	0	11	0	0	0	0	0	11	11	0.0
150	0	0	0	10	0	0	0	10	10	0.0
31 or 47	0	1	0	6	0	3	0	10	10	0.0
YOP	0	0	0	0	10	0	10	0	10	0.0
91	0	0	0	9	0	0	0	9	9	0.0
2	0	0	0	0	0	7	0	7	7	0.0
162	0	5	0	0	0	0	0	5	5	0.0
6 or 11	0	2	0	3	0	0	0	5	5	0.0
DROP	0	0	5	0	0	0	5	0	5	0.0

54	0	0	0	0	0	4	0	4	4	0.0
153	0	0	0	3	0	0	0	3	3	0.0
82	0	2	0	0	0	0	0	2	2	0.0
Total	17,025	58,885	6,092	22,941	3,565	12,481	26,682	94,307	120,989	100.0

Table B4: Flexner Rating and Sect by Schools Present in Dataset

ID	Rating	Sect	Institution	City	State
2	Poor	Regular	Medical Department of the University of Alabama	Mobile	Alabama
12	Half	Regular	Leland Stanford Junior University School of Medicine, on the Cooper Medical College Foundation	San Francisco	California
15	Poor	Regular	Denver and Gross College of Medicine	Denver	Colorado
17	Good	Regular	Yale Medical School	New Haven	Connecticut
18	Poor	Regular	George Washington University, Department of Medicine	Washington	District of Columbia
19	Poor	Regular	Georgetown University School of Medicine	Washington	District of Columbia
20	Good	Primarily Black	Howard University Medical College	Washington	District of Columbia
23	Good	Regular	Atlanta College of Physicians and Surgeons	Atlanta	Georgia
25	Poor	Eclectic	Georgia College of Eclectic Medicine and Surgery	Atlanta	Georgia
27	Poor	Regular	Medical College of Georgia	Augusta	Georgia
28	Good	Regular	Rush Medical College	Chicago	Illinois
29	Good	Regular	Northwestern University Medical Department	Chicago	Illinois
30	Good	Regular	College of Physicians and Surgeons	Chicago	Illinois
32	Poor	Eclectic	Bennett Medical College	Chicago	Illinois
35	Poor	Regular	Illinois Medical College	Chicago	Illinois
37	Poor	Not Matched	National Medical University	Chicago	Illinois
39	Poor	Homeopathic	Hering Medical College	Chicago	Illinois
40	Poor	Homeopathic	Hahnemann Medical College	Chicago	Illinois
46	Good	Regular	Indiana University School of Medicine	Bloomington-Indianapolis	Indiana
48	Poor	Eclectic	Drake University College of Medicine	Des Moines	Iowa
50	Good	Regular	State University of Iowa College of Medicine	Iowa City	Iowa
51	Poor	Homeopathic	State University of Iowa College of Homeopathic Medicine	Iowa City	Iowa
52	Good	Regular	University of Kansas School of Medicine	Lawrence-Rosedale; Suburb of both Kansas Cities	Kansas
54	Poor	Regular	Kansas Medical College	Topeka	Kansas
55	Poor	Regular	University of Louisville Medical Department	Louisville	Kentucky
58	Good	Regular	Medical Department of the Tulane University of Louisiana	New Orleans	Louisiana
60	Half	Regular	Medical School of Maine	Brunswick-Portland	Maine
61	Good	Regular	Medical Department of the Johns Hopkins University	Baltimore	Maryland

62	Poor	Regular	College of Physicians and Surgeons	Baltimore	Maryland
63	Poor	Regular	University of Maryland School of Medicine	Baltimore	Maryland
64	Poor	Regular	Baltimore Medical College	Baltimore	Maryland
65	Poor	Women-only	Woman's Medical College of Baltimore	Baltimore	Maryland
66	Poor	Regular	Maryland Medical College	Baltimore	Maryland
67	Poor	Homeopathic	Atlantic Medical College	Baltimore	Maryland
68	Good	Regular	Medical School of Harvard University	Boston	Massachusetts
69	Poor	Regular	Tufts College Medical School	Boston	Massachusetts
70	Poor	Homeopathic	Boston University School of Medicine	Boston	Massachusetts
71	Poor	Regular	College of Physicians and Surgeons	Boston	Massachusetts
73	Good	Regular	University of Michigan Department of Medicine and Surgery	Ann Arbor	Michigan
74	Poor	Homeopathic	University of Michigan Homeopathic College	Ann Arbor	Michigan
76	Poor	Regular	Detroit College of Medicine	Detroit	Michigan
77	Poor	Homeopathic	Detroit Homeopathic College	Detroit	Michigan
78	Good	Regular	University of Minnesota College of Medicine and Surgery	Minneapolis-St. Paul	Minnesota
82	Poor	Regular	University Medical College	Kansas City	Missouri
87	Good	Regular	Washington University Medical Department	St. Louis	Missouri
88	Poor	Regular	St. Louis University	St. Louis	Missouri
91	Poor	Eclectic	American Medical College	St. Louis	Missouri
94	Good	Regular	College of Medicine, University of Nebraska	Lincoln-Omaha	Nebraska
97	Half	Regular	Dartmouth Medical School	Hanover	New Hampshire
98	Poor	Regular	Albany Medical College	Albany	New York
99	Poor	Regular	Long Island College Hospital	Brooklyn	New York
100	Poor	Regular	University of Buffalo Medical Department	Buffalo	New York
101	Good	Regular	College of Physicians and Surgeons	New York	New York
102	Good	Regular	Cornell University Medical College	New York	New York
103	Good	Regular	University and Bellevue Hospital Medical College	New York	New York
104	Poor	Regular	Fordham University School of Medicine	New York	New York
105	Poor	Women & Hom.	New York Medical College and Hospital for Women	New York	New York
106	Poor	Eclectic	Eclectic Medical College	New York	New York
107	Poor	Homeopathic	New York Homeopathic Medical College and Flower Hospital	New York	New York
108	Good	Regular	College of Medicine, Syracuse University	Syracuse	New York
116	Poor	Primarily Black	Leonard Medical School	Raleigh	North Carolina
118	Good	Regular	Ohio-Miami Medical College of the University of Cincinnati	Cincinnati	Ohio

119	Poor	Eclectic	Eclectic Medical Institute	Cincinnati	Ohio
120	Poor	Homeopathic	Pulte Medical College	Cincinnati	Ohio
121	Poor	Homeopathic	Cleveland Homeopathic Medical College	Cleveland	Ohio
122	Good	Regular	Western Reserve University Medical Department	Cleveland	Ohio
123	Poor	Regular	College of Physicians and Surgeons	Cleveland	Ohio
124	Poor	Regular	Starling-Ohio Medical College	Columbus	Ohio
125	Poor	Regular	Toledo Medical College	Toledo	Ohio
128	Poor	Regular	University of Oregon Medical Department	Portland	Oregon
130	Good	Regular	University of Pennsylvania Department of Medicine	Philadelphia	Pennsylvania
131	Poor	Regular	Jefferson Medical College	Philadelphia	Pennsylvania
132	Poor	Regular	Medico-Chirurgical College of Philadelphia	Philadelphia	Pennsylvania
134	Poor	Homeopathic	Hahnemann Medical College and Hospital	Philadelphia	Pennsylvania
135	Poor	Women-only	Woman's Medical College of Pennsylvania	Philadelphia	Pennsylvania
137	Good	Regular	University of Pittsburgh, Medical Department	Pittsburgh	Pennsylvania
139	Poor	Regular	Medical College of the State of South Carolina	Charleston	South Carolina
147	Good	Regular	Vanderbilt University Medical Department	Nashville	Tennessee
148	Poor	Regular	Universities of Nashville and Tennessee Medical Department	Nashville	Tennessee
150	Poor	Regular	Baylor University College of Medicine	Dallas	Texas
153	Good	Regular	University of Texas, Department of Medicine	Galveston	Texas
155	Half	Regular	University of Vermont College of Medicine	Burlington	Vermont
156	Good	Regular	University of Virginia, Department of Medicine	Charlottesville	Virginia
157	Poor	Regular	Medical College of Virginia	Richmond	Virginia
158	Poor	Regular	University College of Medicine	Richmond	Virginia
161	Poor	Regular	Milwaukee Medical College	Milwaukee	Wisconsin
162	Poor	Regular	Wisconsin College of Physicians and Surgeons	Milwaukee	Wisconsin
164	Poor	Regular	Halifax Medical College	Halifax	Nova Scotia
165	Good	Regular	Medical Department of Queen's University	Kingston	Ontario
166	Poor	Regular	Western University Medical Department	London	Ontario
167	Good	Regular	University of Toronto Faculty of Medicine	Toronto	Ontario
168	Good	Regular	McGill University Medical Faculty	Montreal	Quebec
169	Poor	Regular	Laval University Medical Department	Montreal	Quebec

170	Good	Regular	Laval University Medical Department	Quebec	Quebec

Table B5: Additional Designations

ID	Rating	Sect	Description
6 or 11	Cannot be Determined	Regular	University of California: Clinical Department [Los Angeles; Poor Rating] OR University of California Medical Department [San Francisco; Good Rating]
31 or 47	Poor	Eclectic	Chicago College of Medicine and Surgery [Chicago, IL] OR Valparaiso University [Valparaiso, Indiana]
33 or 75	Poor	Regular	American Medical Missionary College [Chicago, IL] OR American Medical Missionary College [Battle Creek, MI]
122 or 123	Cannot be Determined	Regular	Western Reserve University Medical Department [Cleveland, OH; Good Rating] OR College of Physicians and Surgeons [Cleveland, OH; Poor Rating]
144 or 145	Poor	Regular	College of Physicians and Surgeons [Memphis, TN] OR Memphis Hospital Medical College [Memphis, TN]
CBV	Cannot be Determined	n/a	"Cannot Be Validated" [Uncertain Match]
Closed	Closed Prior to Report	n/a	School Closed Prior to Flexner's Inspections
DROP	Cannot be Determined	n/a	Degree Listed Determined to not be Undergraduate Medical Degree.
Foreign	Foreign	n/a	Foreign Medical School. Not evaluated by Flexner in 1910 Report.
LIC*223	Lic. by Exam. Board	n/a	Degree Listed as "UNIV. STATE N.Y." or similar in local medical directories. This was determined most likely to refer to a State Board. In a small number of cases, this may refer to "Univ. N.Y." which merged into institution id 103 in 1898.
State Board	Lic. by Exam. Board	n/a	Practicing medicine on the basis of approval by State Board.
YOP	Cannot be Determined	n/a	Allowed to practice based on "Years of Practice" laws.
n/a	Cannot be Determined	n/a	No degree listed.

Table B6: School Type, Direct Poor Rating, 1909

	Number of Physicians				*Percentage of Physicians*			
	NY	**NJ**	**CT**	**Panel**	**NY**	**NJ**	**CT**	**Panel**
Regular Med. Schools	2,510	675	220	3,405	78.2	62.2	55.1	72.6
Homeopathic Med. Schools	553	341	127	1,021	17.2	31.4	31.8	21.8
Eclectic Med. Schools	115	19	34	168	3.6	1.8	8.5	3.6
Black Med. Schools	0	3	0	3	0.0	0.3	0.0	0.1
Women-only Med. Schools	53	72	23	148	1.7	6.6	5.8	3.2
Women's Hom. Med. Schools	23	25	5	53	0.7	2.3	1.3	1.1
All Direct Poor Ratings	3,208	1,085	399	4,692	100.0	100.0	100.0	100.0

Notes: (i) A single observation in Connecticut could not be allocated to a school type; (ii) Physicians that attended Women's Homeopathic Medical Schools are included in three rows.

Table B7: School Type, Direct Good Rating, 1909

	Number of Physicians				*Percentage of Physicians*			
	NY	**NJ**	**CT**	**Panel**	**NY**	**NJ**	**CT**	**Panel**
Regular Med. Schools	1,579	871	548	2,998	99.8	98.9	100.0	99.6
Homeopathic Med. Schools	0	0	0	0	0.0	0.0	0.0	0.0
Eclectic Med. Schools	0	0	0	0	0.0	0.0	0.0	0.0
Black Med. Schools	3	10	0	13	0.2	1.1	0.0	0.4
Women-only Med. Schools	0	0	0	0	0.0	0.0	0.0	0.0
Women's Hom. Med. Schools	0	0	0	0	0.0	0.0	0.0	0.0
All Direct Good Ratings	1,582	881	548	3,011	100.0	100.0	100.0	100.0

Table B8: Physicians by Learning Category, 1909

	Number of Physicians				*Percentage of Physicians*			
	NY	**NJ**	**CT**	**Panel**	**NY**	**NJ**	**CT**	**Panel**
Bad News	2,959	1,009	333	4,301	46.2	40.0	24.9	41.9
Good News	6	0	2	8	0.1	0.0	0.1	0.1
Known Low-Quality	243	71	65	379	3.8	2.8	4.9	3.7
Known High-Quality	1,576	881	546	3,003	24.6	35.0	40.7	29.2
Poorly-Rated, Closed	6	5	2	13	0.1	0.2	0.1	0.1
Untreated	1,621	554	392	2,567	25.3	22.0	29.3	25.0
Total	6,411	2,520	1,340	10,271	100.0	100.0	100.0	100.0

Table B9: Ayer Data, Newspaper Counts

	New York	**New Jersey**	**Connecticut**	**Panel**
All Newspapers:				
Daily	146	48	36	230
Weekly	914	320	129	1,363
Total	1,062	372	167	1,601
General Newspapers:				
Daily	136	47	34	217
Weekly	871	299	117	1,287
Total	876	301	118	1,295

Table B10: Number of Physicians by Flexner Rating and Year, Tri-State Area

	1903	**1904**	**1905**	**1906**	**1907**	**1908**	**1909**	**1910**	**1911**	**1912**	**1913**	**1914**	**Panel**
Direct Poor Rating	3,937	4,151	4,252	4,325	4,400	4,542	4,693	4,774	4,818	4,847	4,921	5,013	54,673
Indirect Poor Rating	246	252	248	241	236	231	230	225	221	223	222	221	2,796
Direct Good Rating	2,356	2,526	2,625	2,699	2,768	2,903	3,011	3,115	3,228	3,282	3,388	3,476	35,377
Indirect Good Rating	1,654	1,663	1,636	1,588	1,559	1,527	1,494	1,469	1,444	1,407	1,375	1,355	18,171
Half-School Rating	349	363	350	345	352	357	362	367	365	355	352	353	4,270
Foreign School	128	133	143	138	146	157	158	167	178	176	169	166	1,859
Closed prior to Flexner	288	306	301	288	282	284	269	262	252	233	223	212	3,200
Licensed by Exam. Board	35	38	44	43	40	40	40	41	41	40	40	39	481
Cannot be determined	22	17	14	10	15	12	14	14	11	11	12	10	162
Total	9,015	9,449	9,613	9,677	9,798	10,053	10,271	10,434	10,558	10,574	10,702	10,845	120,989

Table B11: Number of Physicians by Flexner Rating and Year

	1903	**1904**	**1905**	**1906**	**1907**	**1908**	**1909**	**1910**	**1911**	**1912**	**1913**	**1914**	**Panel**
Direct Poor Rating	2,283	2,344	2,351	2,395	2,430	2,482	2,539	2,581	2,595	2,607	2,617	2,653	29,877
Indirect Poor Rating	146	143	143	139	137	131	130	124	122	124	126	126	1,591
Direct Good Rating	1,014	1,072	1,123	1,180	1,225	1,279	1,344	1,396	1,455	1,488	1,513	1,572	15,661
Indirect Good Rating	972	966	956	929	913	887	871	856	845	825	815	807	10,642
Half-School Rating	218	218	211	205	207	205	210	212	208	199	196	196	2,485
Foreign School	43	44	43	41	46	43	43	44	44	46	41	40	518
Closed prior to Flexner	174	177	170	159	152	149	140	134	126	113	106	99	1,699
Licensed by Exam. Board	26	27	30	32	31	30	32	31	32	30	30	29	360
Cannot be determined	9	8	7	5	8	6	7	7	6	6	5	4	78
Total	4,885	4,999	5,034	5,085	5,149	5,212	5,316	5,385	5,433	5,438	5,449	5,526	62,911

Table B12: Weibull Model, Baseline, All Cohorts

	(1)	(2)	(3)	(4)
Poorly Rated	0.978	0.963		
	(0.125)	(0.346)		
'Bad News'			0.943	0.955
			(0.123)	(0.343)
Exp	0.994	1.032	0.994	1.032
	(0.0154)	(0.0333)	(0.0154)	(0.0334)
Exp^2	1.001***	1.000	1.001***	1.000
	(0.000298)	(0.000821)	(0.000297)	(0.000825)
Shape Parameter	1.588***	1.645***	1.588***	1.645***
	(0.0477)	(0.0755)	(0.0477)	(0.0757)
Constant	0.00638***	2.30e-09***	0.00637***	2.30e-09***
	(0.00155)	(2.45e-09)	(0.00156)	(2.44e-09)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
Incl. Left-Censored Data	Y	N	Y	N
Log-Likelihood	-1,093.6	-301.3	-1,093.5	-301.3
Pseudo-R^2	0.089	0.147	0.089	0.147
Years at Risk	12,077	2,718	12,077	2,718
Clusters	101	73	101	73
Failures	451	131	451	131
Observations	1,414	422	1,414	422

Notes: Results presented are proportional hazards from the Weibull parametric survival model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. The 'Shape Parameter' represents p in the Weibull hazard function; larger values indicate increasing hazard over time. The 'Constant' gives baseline hazard when no other variables are included. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B13: Level Model, Linear Regression

	Survival to Year Y = 1				
Y:	1910	1911	1912	1913	1914
Well-Rated	0.00505	0.00468	0.0241	0.0135	-0.00681
	(0.0180)	(0.0233)	(0.0266)	(0.0250)	(0.0274)
Poorly-Rated	0.0301*	0.0125	0.0140	-0.00224	-0.0208
	(0.0164)	(0.0253)	(0.0292)	(0.0326)	(0.0359)
Exp	0.00604**	0.00411	0.00309	0.000621	-0.000843
	(0.00298)	(0.00329)	(0.00332)	(0.00387)	(0.00424)
Exp^2	-0.000210***	-0.000198**	-0.000171**	-0.000189*	-0.000197*
	(7.66e-05)	(8.21e-05)	(8.28e-05)	(0.000106)	(0.000108)
Constant	1.009***	1.049***	0.839***	0.683***	0.724***
	(0.0246)	(0.0356)	(0.0331)	(0.0311)	(0.0372)
Market (3km-Roll) FE	Y	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y	Y
R^2	0.111	0.117	0.123	0.141	0.141
Clusters	101	101	101	101	101
Observations	1,212	1,212	1,212	1,212	1,212

Notes: Only physician-markets pairs observed in 1909 are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B14: Level Model with Bad News, Linear Regression

	Survival to Year Y = 1				
Y:	1910	1911	1912	1913	1914
'Bad News'	0.0338*	0.0199	0.0106	-0.000482	-0.00258
	(0.0197)	(0.0259)	(0.0304)	(0.0323)	(0.0352)
CME: Rated A	-0.00320	-0.0100	-0.00178	-0.00544	-0.0201
	(0.0184)	(0.0222)	(0.0265)	(0.0238)	(0.0250)
CME: Rated B/C	-0.130	-0.176	-0.271*	-0.222	-0.231*
	(0.106)	(0.126)	(0.143)	(0.138)	(0.136)
Exp	0.00569*	0.00358	0.00214	-6.64e-05	-0.00131
	(0.00307)	(0.00330)	(0.00341)	(0.00403)	(0.00433)
Exp^2	-0.000204**	-0.000188**	-0.000153*	-0.000176	-0.000188*
	(7.81e-05)	(8.27e-05)	(8.51e-05)	(0.000109)	(0.000110)
Constant	1.016***	1.063***	0.860***	0.699***	0.739***
	(0.0275)	(0.0367)	(0.0361)	(0.0352)	(0.0393)
Market (3km-Roll) FE	Y	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y	Y
R^2	0.116	0.121	0.129	0.144	0.144
Clusters	101	101	101	101	101
Observations	1,212	1,212	1,212	1,212	1,212

Notes: Only physician-markets pairs observed in 1909 are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B15: Level Model, CME Ratings, Simple Linear Regression

	Survival to Year Y = 1				
Y:	1910	1911	1912	1913	1914
CME: Rated A	0.0135	-0.000206	0.00347	-0.00568	-0.0213
	(0.0145)	(0.0195)	(0.0238)	(0.0228)	(0.0251)
CME: Rated B/C	-0.128	-0.174	-0.271*	-0.222	-0.231*
	(0.105)	(0.126)	(0.143)	(0.138)	(0.135)
Exp	0.00606*	0.00379	0.00226	-7.16e-05	-0.00134
	(0.00310)	(0.00335)	(0.00344)	(0.00399)	(0.00426)
Exp^2	-0.000211***	-0.000192**	-0.000155*	-0.000176	-0.000188*
	(7.85e-05)	(8.30e-05)	(8.49e-05)	(0.000108)	(0.000108)
Constant	1.000***	1.053***	0.855***	0.700***	0.740***
	(0.0268)	(0.0376)	(0.0372)	(0.0336)	(0.0389)
Market (3km-Roll) FE	Y	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y	Y
R^2	0.112	0.120	0.128	0.144	0.144
Clusters	101	101	101	101	101
Observations	1,212	1,212	1,212	1,212	1,212

Notes: Only physician-markets pairs observed in 1909 are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B16: Time-Varying Hazards, Cox Model, With Degree FE

Years:	*Interacted with:*	(1)	(2)	(3)	(4)	(5)	(6)
$Y \geq 1910$:	All Physicians	0.978	1.005	1.042	0.781	0.781	0.820
		(0.275)	(0.283)	(0.295)	(0.304)	(0.304)	(0.321)
	Poorly Rated	1.113			1.356		
		(0.270)			(0.582)		
	'Bad News'		1.036			1.356	
			(0.252)			(0.582)	
	Well-Rated			0.937			1.127
				(0.226)			(0.483)
n/a:	Exp	0.996	0.996	0.996	1.010	1.010	1.009
		(0.0143)	(0.0143)	(0.0143)	(0.0351)	(0.0351)	(0.0352)
	Exp^2	1.001***	1.001***	1.001***	1.000	1.000	1.000
		(0.000274)	(0.000274)	(0.000272)	(0.000801)	(0.000801)	(0.000812)
	Market FE	Y	Y	Y	Y	Y	Y
	Cohort FE	Y	Y	Y	Y	Y	Y
	Degree FE	Y	Y	Y	Y	Y	Y
	Incl. L.-C. Data	Y	Y	Y	N	N	N
	Log-Likelihood	-3,036.1	-3,036.2	-3,036.2	-694.4	-694.4	-694.6
	Pseudo-R^2	0.037	0.037	0.037	0.087	0.087	0.087
	Years at Risk	12,057	12,057	12,057	2,718	2,718	2,718
	Clusters	101	101	101	73	73	73
	Failures	449	449	449	131	131	131
	Physicians	1,412	1,412	1,412	422	422	422
	Observations	13,345	13,345	13,345	3,099	3,099	3,099

Notes: ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Cox Proportional Hazards model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Market definition is baseline: 3km-rolling markets. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B17: Time-Varying Hazards, Weibull Model, Baseline Sample

Years:	*Interacted with:*	(1)	(2)	(3)	(4)	(5)	(6)
$Y \geq 1903$:	Poorly Rated	0.904			0.603		
		(0.146)			(0.228)		
	'Bad News'		0.895			0.655	
			(0.140)			(0.243)	
	Well-Rated			1.017			1.094
				(0.183)			(0.409)
$Y \geq 1910$:	All Physicians	0.414***	0.422***	0.446***	0.216***	0.227***	0.283***
		(0.0610)	(0.0621)	(0.0568)	(0.0782)	(0.0851)	(0.103)
	Poorly Rated	1.148			2.047*		
		(0.288)			(0.836)		
	'Bad News'		1.091			1.807	
			(0.270)			(0.755)	
	Well-Rated			0.922			0.951
				(0.221)			(0.346)
n/a:	Exp	0.993	0.993	0.993	1.029	1.029	1.032
		(0.0156)	(0.0156)	(0.0157)	(0.0312)	(0.0314)	(0.0276)
	Exp^2	1.001***	1.001***	1.001***	1.000	1.000	1.000
		(0.000302)	(0.000302)	(0.000307)	(0.000755)	(0.000765)	(0.000666)
	Shape Parameter	2.034***	2.034***	2.035***	2.279***	2.275***	2.274***
		(0.0668)	(0.0669)	(0.0666)	(0.183)	(0.182)	(0.183)
	Constant	0.00373***	0.00368***	0.00367***	4.48e-10***	4.37e-10***	3.58e-10***
		(0.00101)	(0.00100)	(0.00109)	(4.97e-10)	(4.84e-10)	(4.03e-10)
	Market FE	Y	Y	Y	Y	Y	Y
	Cohort FE	Y	Y	Y	Y	Y	Y
	Degree FE	N	N	N	N	N	N
	Incl. L.-C. Data	Y	Y	Y	N	N	N
	Log-Likelihood	-1,074.5	-1,074.5	-1,074.6	-291.5	-292.0	-292.9
	Pseudo-R^2	0.104	0.104	0.104	0.175	0.174	0.171
	Years at Risk	12,057	12,057	12,057	2,718	2,718	2,718
	Clusters	101	101	101	73	73	73
	Failures	449	449	449	131	131	131
	Physicians	1,412	1,412	1,412	422	422	422
	Observations	13,345	13,345	13,345	3,099	3,099	3,099

Notes: ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Weibull parametric survival model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. The 'Shape Parameter' represents p in the Weibull hazard function; larger values indicate increasing hazard over time. The 'Constant' gives baseline hazard when no other variables are included. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Market definition is baseline: 3km-rolling markets. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B18: Time-Varying Hazards, Weibull Model, With Degree FE

Years:	*Interacted with:*	(1)	(2)	(3)	(4)	(5)	(6)
$Y \geq 1910$:	All Physicians	0.415***	0.427***	0.443***	0.236***	0.251***	0.275***
		(0.0620)	(0.0644)	(0.0585)	(0.0860)	(0.0924)	(0.0968)
	Poorly Rated	1.143			1.731		
		(0.288)			(0.778)		
	'Bad News'		1.058			1.478	
			(0.267)			(0.658)	
	Well-Rated			0.943			1.098
				(0.231)			(0.430)
n/a:	Exp	0.992	0.992	0.992	1.009	1.009	1.008
		(0.0155)	(0.0155)	(0.0155)	(0.0413)	(0.0415)	(0.0415)
	Exp^2	1.001***	1.001***	1.001***	1.000	1.000	1.000
		(0.000316)	(0.000315)	(0.000315)	(0.00101)	(0.00102)	(0.00103)
	Shape Parameter	2.069***	2.069***	2.070***	2.391***	2.390***	2.391***
		(0.0704)	(0.0705)	(0.0701)	(0.197)	(0.196)	(0.197)
	Constant	0.00427***	0.00420***	0.00413***	6.15e-11***	6.75e-11***	8.82e-11***
		(0.00594)	(0.00585)	(0.00567)	(8.57e-11)	(9.42e-11)	(1.24e-10)
	Market FE	Y	Y	Y	Y	Y	Y
	Cohort FE	Y	Y	Y	Y	Y	Y
	Degree FE	N	N	N	N	N	N
	Incl. L.-C. Data	Y	Y	Y	N	N	N
	Log-Likelihood	-1,049.8	-1,050.0	-1,050.0	-266.1	-266.5	-266.9
	Pseudo-R^2	0.124	0.124	0.124	0.247	0.246	0.245
	Years at Risk	12,057	12,057	12,057	2,718	2,718	2,718
	Clusters	101	101	101	73	73	73
	Failures	449	449	449	131	131	131
	Physicians	1,412	1,412	1,412	422	422	422
	Observations	13,345	13,345	13,345	3,099	3,099	3,099

Notes: ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Weibull parametric survival model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. The 'Shape Parameter' represents p in the Weibull hazard function; larger values indicate increasing hazard over time. The 'Constant' gives baseline hazard when no other variables are included. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Market definition is baseline: 3km-rolling markets. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B19: Cox Model, Difference-in-Difference, By Newsiness, Incl. Left-Censored Data

	(1)	(2)	(3)	(4)	(5)
Poorly Rated ($\phi \geq 1904$)	0.761		0.669		
	(0.222)		(0.220)		
Poorly Rated ($\phi \in [1908, 1909]$)	3.023***		4.499***		
	(1.136)		(1.820)		
CME: Rated B/C ($\phi \geq 1904$)		1.003			0.942
		(1.495)			(1.405)
CME: Rated B/C ($\phi \in [1908, 1909]$)		0.607			1.053
		(1.893)			(3.261)
'Bad News' ($\phi \geq 1904$)				0.754	0.754
				(0.221)	(0.221)
'Bad News' ($\phi \in [1908, 1909]$)				3.115***	3.120***
				(1.094)	(1.140)
Exp	0.998	0.997	1.010	0.998	0.998
	(0.0143)	(0.0143)	(0.0176)	(0.0143)	(0.0144)
Exp^2	1.001***	1.001***	1.001*	1.001***	1.001***
	(0.000270)	(0.000273)	(0.000317)	(0.000271)	(0.000271)
Market (3km-Roll) FE	Y	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y	Y
Degree FE	Y	Y	Y	Y	Y
Incl. Left-Censored Data	Y	Y	Y	Y	Y
Rest. to CME Rating:	N	N	Y	N	N
Log-Likelihood	-3,048.0	-3,050.9	-2,060.3	-3,047.8	-3,047.8
Pseudo-R^2	0.037	0.036	0.050	0.037	0.037
Years at Risk	12,077	12,077	8,699	12,077	12,077
Clusters	101	101	101	101	101
Failures	451	451	324	451	451
Observations	1,414	1,414	1,034	1,414	1,414

Notes: ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Cox Proportional Hazards model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Column (3) additionally restricts the sample to physicians who attended institutions that received a rating of A from the CME. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B20: Cox Model, Difference-in-Difference, By Newsiness, Excl. Left-Censored Data

	(1)	(2)	(3)	(4)	(5)
Poorly Rated ($\phi \in [1908, 1909]$)	2.901**		4.721***		
	(1.347)		(2.455)		
CME: Rated B/C ($\phi \in [1908, 1909]$)		0.108***			0.125***
		(0.0756)			(0.0930)
'Bad News' ($\phi \in [1908, 1909]$)				2.901**	2.901**
				(1.347)	(1.347)
Exp	1.012	1.010	1.023	1.012	1.012
	(0.0355)	(0.0357)	(0.0374)	(0.0355)	(0.0355)
Exp^2	1.000	1.000	1.000	1.000	1.000
	(0.000814)	(0.000827)	(0.000778)	(0.000814)	(0.000814)
Market (3km-Roll) FE	Y	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y	Y
Degree FE	Y	Y	Y	Y	Y
Incl. Left-Censored Data	N	N	N	N	N
Rest. to CME Rating:	N	N	Y	N	N
Log-Likelihood	-692.7	-694.7	-556.2	-692.7	-692.7
Pseudo-R^2	0.089	0.086	0.101	0.089	0.089
Years at Risk	2,718	2,718	2,305	2,718	2,718
Clusters	73	73	70	73	73
Failures	131	131	110	131	131
Observations	422	422	359	422	422

Notes: ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Cox Proportional Hazards model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Column (3) additionally restricts the sample to physicians who attended institutions that received a rating of A from the CME. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B21: Weibull Model, Difference-in-Difference, By Newsiness, Incl. Left-Censored Data

	(1)	(2)	(3)	(4)	(5)
Poorly Rated ($\phi \geq 1904$)	0.742		0.643		
	(0.235)		(0.231)		
Poorly Rated ($\phi \in [1908, 1909]$)	3.276***		5.076***		
	(1.320)		(2.253)		
CME: Rated B/C ($\phi \geq 1904$)		1.038			0.973
		(1.656)			(1.560)
CME: Rated B/C ($\phi \in [1908, 1909]$)		0.606			1.078
		(2.765)			(4.934)
'Bad News' ($\phi \geq 1904$)				0.736	0.735
				(0.232)	(0.233)
'Bad News' ($\phi \in [1908, 1909]$)				3.358***	3.364***
				(1.258)	(1.303)
Exp	0.994	0.993	1.006	0.994	0.994
	(0.0153)	(0.0153)	(0.0190)	(0.0153)	(0.0153)
Exp^2	1.001***	1.001***	1.001**	1.001***	1.001***
	(0.000304)	(0.000309)	(0.000358)	(0.000304)	(0.000305)
Shape Parameter	1.625***	1.621***	1.683***	1.625***	1.625***
	(0.0493)	(0.0495)	(0.0587)	(0.0499)	(0.0499)
Constant	0.00695***	0.00719***	0.00236***	0.00695***	0.00695***
	(0.00934)	(0.00976)	(0.000844)	(0.00937)	(0.00936)
Market (3km-Roll) FE	Y	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y	Y
Degree FE	Y	Y	Y	Y	Y
Incl. Left-Censored Data	Y	Y	Y	Y	Y
Rest. to CME Rating:	N	N	Y	N	N
Log-Likelihood	-1,065.4	-1,068.7	-742.4	-1,065.2	-1,065.2
Pseudo-R^2	0.113	0.110	0.144	0.113	0.113
Years at Risk	12,077	12,077	8,699	12,077	12,077
Clusters	101	101	101	101	101
Failures	451	451	324	451	451
Observations	1,414	1,414	1,034	1,414	1,414

Notes: ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Weibull parametric survival model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. The 'Shape Parameter' represents p in the Weibull hazard function; larger values indicate increasing hazard over time. The 'Constant' gives baseline hazard when no other variables are included. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Column (3) additionally restricts the sample to physicians who attended institutions that received a rating of A from the CME. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value $<$ 0.01), ** (p-value $<$ 0.05), and * (p-value $<$ 0.10).

Table B22: Weibull Model, Difference-in-Difference, By Newsiness, Excl. Left-Censored Data

	(1)	(2)	(3)	(4)	(5)
Poorly Rated ($\phi \in [1908, 1909]$)	3.210**		5.735***		
	(1.711)		(3.592)		
CME: Rated B/C ($\phi \in [1908, 1909]$)		22.29**			26.55***
		(27.67)			(32.46)
'Bad News' ($\phi \in [1908, 1909]$)				3.210**	3.210**
				(1.711)	(1.711)
Exp	1.009	1.008	1.025	1.009	1.009
	(0.0445)	(0.0440)	(0.0465)	(0.0445)	(0.0445)
Exp^2	1.000	1.000	1.000	1.000	1.000
	(0.00109)	(0.00108)	(0.00105)	(0.00109)	(0.00109)
Shape Parameter	1.774***	1.765***	1.858***	1.774***	1.774***
	(0.0915)	(0.0896)	(0.123)	(0.0915)	(0.0915)
Constant	7.25e-11***	2.86e-10***	9.42e-11***	7.25e-11***	7.25e-11***
	(1.02e-10)	(3.96e-10)	(1.19e-10)	(1.02e-10)	(1.02e-10)
Market (3km-Roll) FE	Y	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y	Y
Degree FE	Y	Y	Y	Y	Y
Incl. Left-Censored Data	N	N	N	N	N
Rest. to CME Rating:	N	N	Y	N	N
Log-Likelihood	-272.3	-274.6	-220.9	-272.3	-272.3
Pseudo-R^2	0.229	0.223	0.251	0.229	0.229
Years at Risk	2,718	2,718	2,305	2,718	2,718
Clusters	73	73	70	73	73
Failures	131	131	110	131	131
Observations	422	422	359	422	422

Notes: ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Weibull parametric survival model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. The 'Shape Parameter' represents p in the Weibull hazard function; larger values indicate increasing hazard over time. The 'Constant' gives baseline hazard when no other variables are included. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Column (3) additionally restricts the sample to physicians who attended institutions that received a rating of A from the CME. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value $<$ 0.01), ** (p-value $<$ 0.05), and * (p-value $<$ 0.10).

Table B23: Survival with Bad News, Linear Regression

	Survival N Years = 100			
N:	2	3	4	5
'Bad News' ($\phi \geq 1904$)	3.700	-1.565	-1.711	-0.215
	(3.744)	(4.273)	(5.843)	(6.070)
CME: Rated A ($\phi \geq 1904$)	0.321	5.625	5.334	6.505
	(6.203)	(6.265)	(7.062)	(7.897)
CME: Rated B/C ($\phi \geq 1904$)	11.17	-18.65	-13.23	-6.646
	(6.757)	(23.70)	(23.76)	(25.43)
Exp	0.351	0.724**	0.709**	0.571
	(0.273)	(0.337)	(0.338)	(0.406)
Exp^2	-0.00839	-0.0188**	-0.0220***	-0.0200**
	(0.00651)	(0.00820)	(0.00823)	(0.00943)
Constant	100.4***	97.71***	100.9***	103.2***
	(2.933)	(3.786)	(3.901)	(4.551)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
R^2	0.058	0.091	0.103	0.105
Clusters	101	101	101	101
Observations	1,402	1,402	1,402	1,402

Notes: Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B24: Survival Model, Linear Regression

	Survival N Years = 100			
N:	2	3	4	5
Well-Rated ($\phi \geq 1904$)	-2.879	4.604	4.812	4.931
	(5.162)	(6.117)	(6.628)	(7.012)
Poorly Rated ($\phi \geq 1904$)	1.871	2.350	2.471	4.427
	(5.035)	(5.532)	(6.776)	(6.677)
Exp	0.305	0.725**	0.714**	0.560
	(0.273)	(0.325)	(0.323)	(0.387)
Exp^2	-0.00753	-0.0188**	-0.0220***	-0.0198**
	(0.00653)	(0.00791)	(0.00788)	(0.00898)
Constant	101.1***	97.69***	100.8***	103.4***
	(2.911)	(4.024)	(4.041)	(4.663)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
R^2	0.058	0.089	0.103	0.104
Clusters	101	101	101	101
Observations	1,402	1,402	1,402	1,402

Notes: Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B25: Survival Model, Difference-in-Difference with Education Controls

	Survival N Years = 100			
N:	2	3	4	5
Poorly Rated ($\phi \geq 1904$)	6.012	2.325	6.712	6.665
	(4.097)	(4.720)	(6.233)	(6.644)
Poorly Rated ($\phi \in [1908, 1909]$)	-14.10**	-22.68**	-31.08***	-25.43***
	(5.393)	(9.487)	(8.275)	(9.332)
Exp	0.375	0.860**	0.924***	0.711
	(0.278)	(0.346)	(0.338)	(0.436)
Exp^2	-0.00913	-0.0219**	-0.0265***	-0.0226**
	(0.00692)	(0.00842)	(0.00812)	(0.00974)
Constant	81.18***	87.11***	92.01***	95.36***
	(18.60)	(16.94)	(18.23)	(18.94)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
Degree FE	Y	Y	Y	Y
R^2	0.110	0.136	0.149	0.141
Clusters	101	101	101	101
Observations	1,402	1,402	1,402	1,402

Notes: ϕ denotes entry year cohort for the physician-market pair. Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B26: Survival, Bad News, Restricted to CME Rating A, Logit Model

	Survival N Years = 100			
N:	2	3	4	5
'Bad News'	0.816*	0.612**	0.268	0.151
	(0.458)	(0.242)	(0.263)	(0.252)
'Bad News' ($\phi \geq 1904$)	0.455	-0.0777	0.392	0.485
	(0.870)	(0.468)	(0.482)	(0.489)
'Bad News' ($\phi \in [1908, 1909]$)	-1.868**	-2.064***	-2.306***	-2.088***
	(0.742)	(0.716)	(0.465)	(0.452)
Exp	0.0466	0.0635**	0.0476*	0.0288
	(0.0409)	(0.0274)	(0.0255)	(0.0290)
Exp^2	-0.00145*	-0.00188***	-0.00168***	-0.00126**
	(0.000834)	(0.000529)	(0.000507)	(0.000559)
Constant	2.923***	2.065***	2.314***	2.184***
	(0.526)	(0.385)	(0.332)	(0.344)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
Pseudo-R^2	0.104	0.114	0.114	0.115
Log Likelihood	-187.7	-305.4	-371.3	-400.6
Clusters	34	45	51	54
Observations	727	818	860	880

Notes: Results presented are from logit models. Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. The sample is additionally restricted to physicians who attended institutions directly rated A by the CME in 1910. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B27: Survival, 1908 and 1909 Separated

	Survival N Years = 100			
N:	2	3	4	5
Poorly Rated	2.283	4.175**	2.537	2.760
	(1.570)	(1.817)	(2.368)	(2.796)
Poorly Rated ($\phi \geq 1904$)	5.914	2.133	6.303	6.404
	(3.873)	(5.186)	(6.583)	(6.600)
Poorly Rated ($\phi = 1908$)	-19.40**	-27.06**	-35.61***	-25.41*
	(7.932)	(12.86)	(12.93)	(14.90)
Poorly Rated ($\phi = 1909$)	-7.672	-20.27*	-28.83**	-28.98**
	(6.210)	(11.11)	(12.08)	(12.39)
Exp	0.344	0.683**	0.662*	0.521
	(0.272)	(0.335)	(0.342)	(0.418)
Exp^2	-0.00835	-0.0182**	-0.0212**	-0.0191**
	(0.00640)	(0.00805)	(0.00821)	(0.00944)
Constant	100.9***	99.18***	103.0***	105.2***
	(2.767)	(3.649)	(3.725)	(4.441)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
R^2	0.065	0.099	0.114	0.111
Clusters	101	101	101	101
Observations	1,402	1,402	1,402	1,402

Notes: ϕ denotes entry year cohort for the physician-market pair. Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B28: Survival, Falsification Test (1907-08)

	Survival N Years = 100			
N:	2	3	4	5
Poorly Rated	2.078	3.943**	2.278	2.629
	(1.552)	(1.821)	(2.343)	(2.749)
Poorly Rated ($\phi \geq 1904$)	4.946	-0.359	6.232	5.736
	(5.102)	(6.548)	(8.152)	(7.355)
Poorly Rated ($\phi \in [1907, 1908]$)	-6.516	-5.586	-15.36	-9.358
	(6.523)	(8.607)	(10.55)	(9.109)
Exp	0.342	0.691**	0.796**	0.654
	(0.270)	(0.341)	(0.354)	(0.406)
Exp^2	-0.00814	-0.0183**	-0.0239***	-0.0216**
	(0.00649)	(0.00833)	(0.00839)	(0.00933)
Constant	100.6***	98.66***	101.8***	103.8***
	(2.766)	(3.826)	(3.867)	(4.469)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
R^2	0.065	0.093	0.105	0.106
Clusters	101	101	101	101
Observations	1,340	1,340	1,340	1,340

Notes: ϕ denotes entry year cohort for the physician-market pair. Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1908 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value $<$ 0.01), ** (p-value $<$ 0.05), and * (p-value $<$ 0.10).

Table B29: Survival, Falsification Test (1906-07)

	Survival N Years = 100			
N:	2	3	4	5
Poorly Rated	1.945	3.928**	2.326	2.770
	(1.537)	(1.795)	(2.325)	(2.721)
Poorly Rated ($\phi \geq 1904$)	7.070	2.333	6.747	8.267
	(5.773)	(6.474)	(6.624)	(6.234)
Poorly Rated ($\phi \in [1906, 1907]$)	-1.519	-0.0394	-0.413	-3.138
	(7.678)	(7.536)	(8.757)	(9.865)
Exp	0.377	0.648*	0.734**	0.662
	(0.283)	(0.361)	(0.370)	(0.421)
Exp^2	-0.00877	-0.0177**	-0.0229***	-0.0215**
	(0.00668)	(0.00867)	(0.00865)	(0.00959)
Constant	100.5***	99.53***	102.5***	103.8***
	(2.786)	(3.852)	(4.034)	(4.308)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
R^2	0.071	0.097	0.111	0.112
Clusters	101	101	101	101
Observations	1,283	1,283	1,283	1,283

Notes: ϕ denotes entry year cohort for the physician-market pair. Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1907 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B30: LPM, Bad News v. Poor CME Rating, Difference-in-Difference

	Survival N Years = 100			
N:	2	3	4	5
'Bad News'	2.579*	4.470***	2.766	2.964
	(1.452)	(1.682)	(2.250)	(2.675)
'Bad News' ($\phi \geq 1904$)	5.548	2.478	6.672	6.702
	(3.874)	(5.146)	(6.560)	(6.579)
'Bad News' ($\phi \in [1908, 1909]$)	-14.35**	-23.96**	-33.14***	-28.02***
	(5.600)	(9.133)	(8.149)	(8.075)
CME: Rated B/C	-9.115	-6.875	-6.394	-4.851
	(11.00)	(11.49)	(11.67)	(11.77)
CME: Rated B/C ($\phi \geq 1904$)	17.03	-27.90	-23.72	-16.51
	(11.15)	(36.73)	(36.26)	(39.79)
CME: Rated B/C ($\phi \in [1908, 1909]$)	1.349	12.07	11.39	7.724
	(4.920)	(44.31)	(44.59)	(48.12)
Exp	0.368	0.685**	0.667*	0.513
	(0.273)	(0.330)	(0.337)	(0.412)
Exp^2	-0.00881	-0.0183**	-0.0214***	-0.0191**
	(0.00644)	(0.00794)	(0.00809)	(0.00928)
Constant	100.7***	99.15***	102.9***	105.2***
	(2.772)	(3.697)	(3.805)	(4.563)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
R^2	0.066	0.101	0.115	0.112
Clusters	101	101	101	101
Observations	1,402	1,402	1,402	1,402

Notes: ϕ denotes entry year cohort for the physician-market pair. Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B31: Survival, Logit Model

	Survival N Years = 100			
N:	2	3	4	5
Poorly-Rated	0.620	0.536**	0.270	0.237
	(0.461)	(0.223)	(0.226)	(0.231)
Poorly-Rated ($\phi \geq 1904$)	0.600	-0.0292	0.296	0.289
	(0.776)	(0.451)	(0.442)	(0.418)
Poorly-Rated ($\phi \in [1908, 1909]$)	-1.855**	-2.102***	-2.090***	-1.562***
	(0.737)	(0.723)	(0.485)	(0.454)
Exp	0.0623	0.0607**	0.0464**	0.0298
	(0.0403)	(0.0248)	(0.0226)	(0.0263)
Exp^2	-0.00149*	-0.00157***	-0.00148***	-0.00116**
	(0.000869)	(0.000513)	(0.000480)	(0.000533)
Constant	2.928***	1.992***	2.223***	2.008***
	(0.429)	(0.304)	(0.262)	(0.308)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
Pseudo-R^2	0.081	0.086	0.086	0.080
Log Likelihood	-261.9	-442.4	-526.7	-581.9
Clusters	39	51	57	62
Observations	1,078	1,174	1,207	1,239

Notes: Results presented are from logit models. Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B32: Survival, Bad News, Logit Model

	Survival N Years = 100			
N:	2	3	4	5
'Bad News'	0.751*	0.584***	0.299	0.258
	(0.415)	(0.199)	(0.206)	(0.212)
'Bad News' ($\phi \geq 1904$)	0.466	0.00840	0.330	0.311
	(0.750)	(0.448)	(0.437)	(0.411)
'Bad News' ($\phi \in [1908, 1909]$)	-2.041***	-1.993***	-2.085***	-1.574***
	(0.763)	(0.628)	(0.461)	(0.412)
Exp	0.0637	0.0615**	0.0472**	0.0303
	(0.0403)	(0.0247)	(0.0224)	(0.0263)
Exp^2	-0.00153*	-0.00159***	-0.00150***	-0.00117**
	(0.000870)	(0.000510)	(0.000477)	(0.000531)
Constant	2.894***	2.000***	2.227***	2.010***
	(0.427)	(0.297)	(0.258)	(0.304)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
Pseudo-R^2	0.084	0.086	0.086	0.080
Log Likelihood	-261.1	-442.4	-526.6	-581.7
Clusters	39	51	57	62
Observations	1,078	1,174	1,207	1,239

Notes: Results presented are from logit models. Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B33: Survival, Probit Model

	Survival N Years = 100			
N:	2	3	4	5
Poorly-Rated	0.286	0.281**	0.132	0.126
	(0.230)	(0.124)	(0.129)	(0.134)
Poorly-Rated ($\phi \geq 1904$)	0.305	-0.0123	0.190	0.190
	(0.383)	(0.247)	(0.249)	(0.239)
Poorly-Rated ($\phi \in [1908, 1909]$)	-0.903**	-1.129***	-1.207***	-0.923***
	(0.365)	(0.400)	(0.283)	(0.265)
Exp	0.0298	0.0315**	0.0245*	0.0162
	(0.0197)	(0.0141)	(0.0132)	(0.0155)
Exp^2	-0.000719*	-0.000827***	-0.000807***	-0.000652**
	(0.000430)	(0.000301)	(0.000287)	(0.000320)
Constant	1.640***	1.183***	1.312***	1.193***
	(0.217)	(0.174)	(0.152)	(0.179)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
Pseudo-R^2	0.080	0.084	0.085	0.080
Log Likelihood	-262.3	-443.0	-527.1	-582.0
Clusters	39	51	57	62
Observations	1,078	1,174	1,207	1,239

Notes: Results presented are from probit models. Only physician-markets pairs surviving at least one year are included. All columns are restricted to baseline restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B34: Time-Varying Hazards, Baseline Specification, Post-Period Starts 1911

Years:	*Interacted with:*	*Cox Models:* (1)	(2)	*Weibull Models:* (1)	(2)
$Y \geq 1911$:	All Physicians	0.686	0.804	0.367***	0.212***
		(0.194)	(0.326)	(0.0562)	(0.0666)
	'Bad News'	1.467		1.469	
		(0.354)		(0.356)	
	'Bad News' ($\phi \geq 1904$)	0.998	1.822	0.833	1.500
		(0.392)	(0.857)	(0.327)	(0.714)
	'Bad News' ($\phi \in [1908, 1909]$)	1.013	0.703	1.808	1.481
		(0.533)	(0.445)	(0.913)	(0.883)
n/a:	Exp	0.930***	0.912*	0.915***	0.870**
		(0.0170)	(0.0431)	(0.0186)	(0.0568)
	Exp^2	1.002***	1.002**	1.002***	1.003**
		(0.000296)	(0.000913)	(0.000333)	(0.00133)
	Shape Parameter	n/a	n/a	2.080***	2.771***
				(0.0861)	(0.211)
	Constant	n/a	n/a	0.00905***	1.37e-10***
				(0.0125)	(1.99e-10)
	Market (3km-Roll) FE	Y	Y	Y	Y
	Cohort FE	Y	Y	Y	Y
	Degree FE	Y	Y	Y	Y
	Incl. Left-Censored Data	Y	N	Y	N
	Log-Likelihood	-3,032.9	-691.2	-1,043.6	-255.5
	Pseudo-R^2	0.038	0.091	0.130	0.277
	Years at Risk	12,057	2,718	12,057	2,718
	Clusters	101	73	101	73
	Failures	449	131	449	131
	Physicians	1,412	422	1,412	422
	Observations	13,345	3,099	13,345	3,099

Notes: ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Cox Proportional Hazards model or the Weibull parametric survival model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. The 'Shape Parameter' represents p in the Weibull hazard function; larger values indicate increasing hazard over time. The 'Constant' gives baseline hazard when no other variables are included in the Weibull model. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value $<$ 0.01), ** (p-value $<$ 0.05), and * (p-value $<$ 0.10).

Table B35: Single-Year Survival, By Degree Share, LPM

	Survival to Year Y = 1[1]				
	No High-Quality Competitor Restriction				
Max. Share	**1909-10**	**1910-11**	**1911-12**	**1912-13**	**1913-14**
≤ 25%	-0.180**	0.0176	-0.174*	0.0527	0.00828
	(0.0834)	(0.0818)	(0.0887)	(0.123)	(0.0210)
≤ 33.3%	-0.169**	0.0173	-0.131**	-0.0132	0.0534
	(0.0685)	(0.0670)	(0.0517)	(0.0667)	(0.0597)
< 50%	-0.123**	0.0110	-0.0271	-0.0954*	0.0538
	(0.0482)	(0.0531)	(0.0533)	(0.0535)	(0.0439)
≤ 50%	-0.127***	-0.000386	-0.0318	-0.0257	0.0518
	(0.0465)	(0.0492)	(0.0485)	(0.0504)	(0.0424)
< 100%	-0.0851**	-0.0234	-0.00611	-0.0142	0.0372
	(0.0404)	(0.0410)	(0.0434)	(0.0400)	(0.0350)
Any Share	-0.0842**	-0.0217	-0.00672	-0.0211	0.0221
	(0.0397)	(0.0408)	(0.0427)	(0.0394)	(0.0353)
	Restricted to Areas with High-Quality Competition[2]				
Max. Share	**1909-10**	**1910-11**	**1911-12**	**1912-13**	**1913-14**
≤ 25%	-0.184**	0.0205	-0.180*	0.0542	0.00893
	(0.0840)	(0.0827)	(0.0909)	(0.126)	(0.0214)
≤ 33.3%	-0.171**	0.0169	-0.134**	-0.0139	0.0534
	(0.0687)	(0.0673)	(0.0526)	(0.0677)	(0.0609)
< 50%	-0.133***	0.00958	-0.0448	-0.0939*	0.0549
	(0.0486)	(0.0547)	(0.0533)	(0.0543)	(0.0448)
≤ 50%	-0.127***	-0.00193	-0.0448	-0.0457	0.0416
	(0.0471)	(0.0516)	(0.0490)	(0.0502)	(0.0428)
< 100%	-0.0967**	-0.0154	-0.00899	-0.0392	0.0313
	(0.0414)	(0.0439)	(0.0440)	(0.0417)	(0.0360)
Any Share	-0.104**	-0.0126	-0.00994	-0.0472	0.0265
	(0.0413)	(0.0443)	(0.0433)	(0.0418)	(0.0359)

Notes: [1] Dependent variable is survival to end year, conditional on survival to start year. [2] The bottom panel is restricted to markets where a well-rated physician was present in some year 1903-1909. [3] Coefficients correspond with 'Bad News' ($\phi \in [1908, 1909]$) in a linear probability model, where ϕ denotes entry year cohort for the physician-market pair. All estimates are restricted to the following restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) only physicians graduating from regular institutions still operating in 1909 are included; and (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B36: Cox Model, Well-Rated Physicians

	(1)	(2)	(3)	(4)	(5)
Well-Rated	0.974				
	(0.114)				
Well-Rated ($\phi \geq 1904$)			1.365		
			(0.372)		
Well-Rated ($\phi \in [1908, 1909]$)			0.346***		
			(0.122)		
Well-Rated & CME: A		0.950			
		(0.116)			
Well-Rated & CME: A ($\phi \geq 1904$)				1.365	
				(0.372)	
Well-Rated & CME: A ($\phi \in [1908, 1909]$)				0.346***	0.336**
				(0.122)	(0.156)
Exp	0.998	0.998	0.999	0.999	1.014
	(0.0147)	(0.0145)	(0.0147)	(0.0147)	(0.0370)
Exp^2	1.001***	1.001***	1.001**	1.001**	1.000
	(0.000274)	(0.000268)	(0.000279)	(0.000279)	(0.000829)
Market (3km-Roll) FE	Y	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y	Y
Degree FE	N	N	Y	Y	Y
Incl. Left-Censored Data	Y	Y	Y	Y	N
Log-Likelihood	-3,073.1	-3,073.0	-3,048.4	-3,048.4	-692.8
Pseudo-R^2	0.029	0.029	0.037	0.037	0.089
Years at Risk	12,077	12,077	12,077	12,077	2,718
Clusters	101	101	101	101	73
Failures	451	451	451	451	131
Observations	1,414	1,414	1,414	1,414	422

Notes: ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Cox Proportional Hazards model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B37: Time-Varying Hazards, Well-Rated Physicians, Post-Period Interactions

Years:	*Interacted with:*	*Cox Models:* (1)	(2)	*Weibull Models:* (1)	(2)
$Y \geq 1910$:	All Physicians	1.015	0.683	0.429***	0.235***
		(0.290)	(0.299)	(0.0589)	(0.0914)
	Well-Rated	1.058		1.044	
		(0.269)		(0.270)	
	Well-Rated ($\phi \geq 1904$)	0.930	1.535	0.979	1.447
		(0.286)	(0.821)	(0.301)	(0.664)
	Well-Rated ($\phi \in [1908, 1909]$)	0.428*	0.274**	0.412**	0.272**
		(0.187)	(0.165)	(0.183)	(0.164)
n/a:	Exp	0.996	1.013	0.992	1.011
		(0.0145)	(0.0370)	(0.0158)	(0.0431)
	Exp^2	1.001***	1.000	1.001***	1.000
		(0.000278)	(0.000829)	(0.000323)	(0.00104)
	Shape Parameter	n/a	n/a	2.077***	2.428***
				(0.0715)	(0.204)
	Constant	n/a	n/a	0.00413***	6.81e-11***
				(0.00558)	(9.74e-11)
	Market (3km-Roll) FE	Y	Y	Y	Y
	Cohort FE	Y	Y	Y	Y
	Degree FE	Y	Y	Y	Y
	Incl. Left-Censored Data	Y	N	Y	N
	Log-Likelihood	-3,034.3	-692.2	-1,048.1	-264.4
	Pseudo-R^2	0.037	0.090	0.126	0.252
	Years at Risk	12,057	2,718	12,057	2,718
	Clusters	101	73	101	73
	Failures	449	131	449	131
	Physicians	1,412	422	1,412	422
	Observations	13,345	3,099	13,345	3,099

Notes: ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Cox Proportional Hazards model or the Weibull parametric survival model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. The 'Shape Parameter' represents p in the Weibull hazard function; larger values indicate increasing hazard over time. The 'Constant' gives baseline hazard when no other variables are included in the Weibull model. All columns are restricted to baseline restrictions: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) only physicians graduating from regular institutions still operating in 1909 are included; (vi) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vii) only areas with a weekly general-content newspaper within 25km of the market are included; and (viii) markets where a specific degree is held by more than one-third of physicians are excluded. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B38: Sorting: Changing Practice Locations, New York

	From Rural		*From Urban*			*Population Change*		*Urban to Urban*	
	Rural	Urban	Rural	Urban	**Total**	↑	↓	↑	↓
1904	24	39	12	45	120	61	35	22	23
1905	12	41	19	50	122	73	37	32	18
1906	18	39	23	65	145	76	51	37	28
1907	17	45	23	86	171	98	56	53	33
1908	21	43	30	61	155	71	63	28	33
1909	23	46	29	71	169	85	61	39	32
1910	16	35	27	70	148	79	53	44	26
1911	24	50	34	86	194	99	71	49	37
1912	24	54	31	79	188	96	68	42	37
1913	15	47	34	72	168	89	64	42	30
1914	12	39	23	80	154	88	54	49	31
Total:	206	478	285	765	1,734	915	613	437	328
1904-09 (%):	13.0	28.7	15.4	42.9	100.0	52.6	34.4	23.9	18.9
1910-14 (%):	10.7	26.4	17.5	45.4	100.0	52.9	36.4	26.5	18.9
Overall (%):	11.9	27.6	16.4	44.1	100.0	52.8	35.4	25.2	18.9

Notes: Data are restricted to physicians who relocate to New York from some initial market. Years refer to the date of relocation. Comparison data for locations are from the last post-office the physician was listed under in their previous 3km-rolling market. Urban areas are defined as incorporated areas in the 1910 federal census; all other areas are listed as rural. The right panel counts the number of physicians who moved to areas with higher or lower total population than their former post-office location, with the two rightmost columns restricting to physicians moving between two incorporated places. In both samples, physicians relocate more often to areas with higher populations than to areas with lower populations, both in the pre-period and the post-period.

Table B39: Physician Location Choice, New York

	Binary Outcome: Entered Urban Area			
	Urb_1	Urb_5	Urb_{10}	Urb_{25}
Exp	-0.00719	-0.00729	-0.00993	-0.00919
	(0.00844)	(0.00763)	(0.00836)	(0.00822)
Exp^2	-7.23e-05	-0.000172	-0.000169	-0.000189
	(0.000154)	(0.000130)	(0.000147)	(0.000158)
Trend	0.00380	0.00285	0.0161	0.0292
	(0.0244)	(0.0212)	(0.0256)	(0.0335)
Trend: Bad News	0.0240	0.0254	0.0150	0.0243
	(0.0420)	(0.0353)	(0.0381)	(0.0378)
Trend: Well-Rated	-0.0138	-0.0264	-0.0330	-0.0110
	(0.0277)	(0.0284)	(0.0308)	(0.0401)
Post	0.256	0.405**	0.373**	0.432
	(0.213)	(0.160)	(0.176)	(0.271)
Post*Bad News	-0.357	-0.405**	-0.354*	-0.542*
	(0.272)	(0.199)	(0.208)	(0.282)
Post*Well-Rated	-0.0409	-0.167	-0.107	-0.398
	(0.278)	(0.318)	(0.300)	(0.423)
Fresh Entry	0.416**	0.438**	0.491***	0.716***
	(0.199)	(0.179)	(0.181)	(0.179)
Fresh*Bad News	0.0935	0.313	0.349	0.208
	(0.257)	(0.266)	(0.273)	(0.325)
Fresh*Well-Rated	0.294	0.216	0.170	0.0732
	(0.234)	(0.267)	(0.261)	(0.301)
Post*Fresh	-0.146	-0.205	-0.240	-0.416*
	(0.179)	(0.294)	(0.250)	(0.217)
Post*Fresh*Bad News	0.328	0.233	0.206	0.364
	(0.224)	(0.316)	(0.282)	(0.262)
Post*Fresh*Well-Rated	-0.216	-0.00651	-0.0249	0.0759
	(0.249)	(0.329)	(0.282)	(0.274)
Constant	-5.365	-4.024	-29.42	-55.01
	(46.53)	(40.38)	(48.89)	(63.94)
Degree FE	Y	Y	Y	Y
Log-Likelihood	-6,171.1	-7,114.8	-7,137.0	-6,887.0
Pseudo-R^2	0.038	0.044	0.046	0.053
Clusters	83	86	87	89
Observations	10,768	10,790	10,792	10,800

Notes: Results presented are from logit models. Outcome variables denote whether a physician's post-office location choice is an urban area, where urban area is defined by a population equal to or exceeding m-thousand for the variable Urb_m. Populations are for incorporated areas in the 1910 federal census. All columns are restricted to physicians locating to the state of New York and include degree fixed effects. Standard errors (in parentheses) are clustered at the degree level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B40: Dishonesty in Education Reporting, New York

	Ambiguous or Misleading Education String			
	(1)	(2)	(3)	(4)
Trend	-0.0904***	-0.102***		
	(0.0235)	(0.0242)		
Trend: Bad News	0.870**	0.964**	0.644***	0.714***
	(0.422)	(0.449)	(0.152)	(0.152)
Trend: Well-Rated	0.276	0.308	0.285	0.317
	(0.272)	(0.290)	(0.185)	(0.197)
Post	0.219**	0.199***		
	(0.0867)	(0.0750)		
Post*Bad News	-3.881**	-4.122**	-2.925***	-2.998***
	(1.746)	(1.947)	(0.453)	(0.509)
Post*Well-Rated	-1.276	-1.520	-1.409**	-1.655**
	(0.986)	(1.021)	(0.679)	(0.701)
Constant	169.1***	192.2***	-5.514***	-5.024**
	(44.81)	(45.89)	(1.917)	(2.006)
Incl. Post-Period Entrants	Y	N	Y	N
Cohort FE	Y	Y	Y	Y
Year FE	N	N	Y	Y
Degree FE	Y	Y	Y	Y
Market (3km-roll) FE	Y	Y	Y	Y
Log-Likelihood	-4,838.7	-4,324.6	-4,353.1	-3,862.0
Pseudo-R^2	0.796	0.796	0.816	0.818
Clusters	58	54	58	54
Observations	39,921	35,195	39,921	35,195

Notes: Results presented are from logit models. Sample area is New York state excluding medical centers and post-offices with populations of 100k or more. Experience and its square are included as control variables; neither variable is significant in any model. Standard errors (in parentheses) are clustered at the degree level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table B41: Consumer Spending per Physician, USA, 1909-1919

	1909	**1914**	**1919**
Population (000s)	90,490	99,111	104,514
	Per Capita Annual Expenditure		
Physicians	$3.24	$2.99	$6.87
Dentists	$0.91	$0.95	$2.65
Food	$81.43	$90.34	$177.53
Consumer Expenditures	$318.42	$336.95	$579.57
	Estimates for USA Economy		
Physician Expenditures	$293,187,600	$296,341,890	$718,011,180
# Physicians (AMD)	133,487	142,332	147,074[1]
Mean Physician Income	$2,196.38	$2,082.05	$4,881.98
# Phys (Polk)	137,431[2]	132,760	
Mean Physician Income	$2,133.34	$2,232.16	

Sources:

[a] Population: Census Bureau Statistical Abstract of the US for 1921.

[b] Expenditures: Derks (1999)

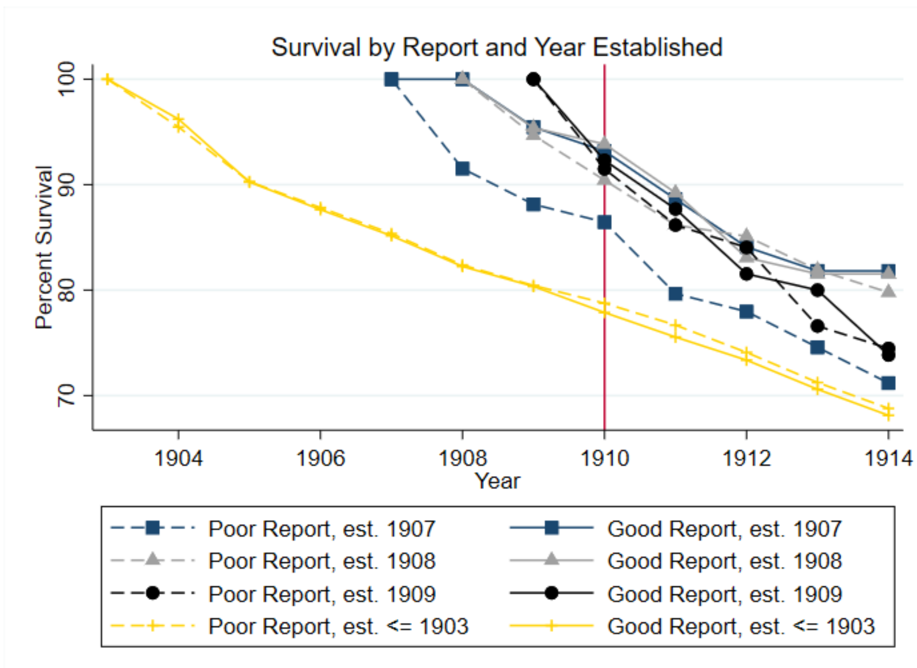
[c] Bottom Panel: author calculations.

Notes: [1] Count is for 1918. [2] Count is for 1908.

Appendix C: Connecticut and New Jersey

Figure A6 provided compelling visual evidence that the Flexner Report had an impact on the survival of physician practices in the state of New York. I find mixed evidence of this impact in New Jersey and no evidence for it in Connecticut. Figures C1 and C2 plot corresponding survival curves for New Jersey and Connecticut physicians, respectively.[167]

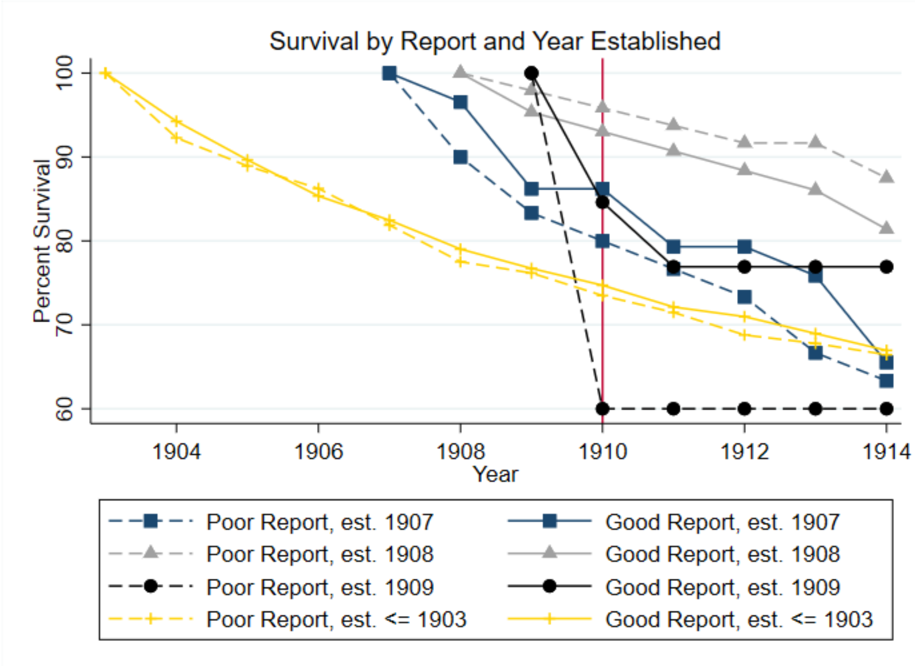
Figure C1: Survival by Rating and Cohort, New Jersey, 1907-09



In Jersey, there appears to be no impact on the 1909 cohort and a minimal effect that was not sustained on the 1908 cohort. The 1907 cohort sees an immediate improvement in the survival of the well-rated physicians in 1908 relative to the poorly rated – well before the introduction of the Flexner Report. In Connecticut, the survival curves exhibit a lot of noise, especially for the 1909 cohort. Although it does show a substantial gap for this cohort, no failures are recorded between 1911 and 1914. The 1907 and and 1908 cohorts also do not behave as expected.

[167] As it is a medical center, New Haven is excluded from the the Connecticut analysis.

Figure C2: Survival by Rating and Cohort, Connecticut, 1907-09



While the results in Connecticut could be explained by the smaller population of physicians in the state, and explanation could be posited for the patterns observed in New Jersey, there are hints of a more pernicious systematic problem in the data for these states. Table C1 lists the number of market entries for each cohort by state.[168] Outlier years are immediately noticeable for both Connecticut and New Jersey, but not New York. In Connecticut, many entries were recorded in 1904, 1908, and 1910, but very few were recorded in 1906 or 1909. In New Jersey, many entries were recorded in 1904, 1905, and 1913 but very few were recorded in 1906, 1910, or 1912. This bunching hints at a recording problem in the original directories: updates for Connecticut and New Jersey may have been made only sporadically.

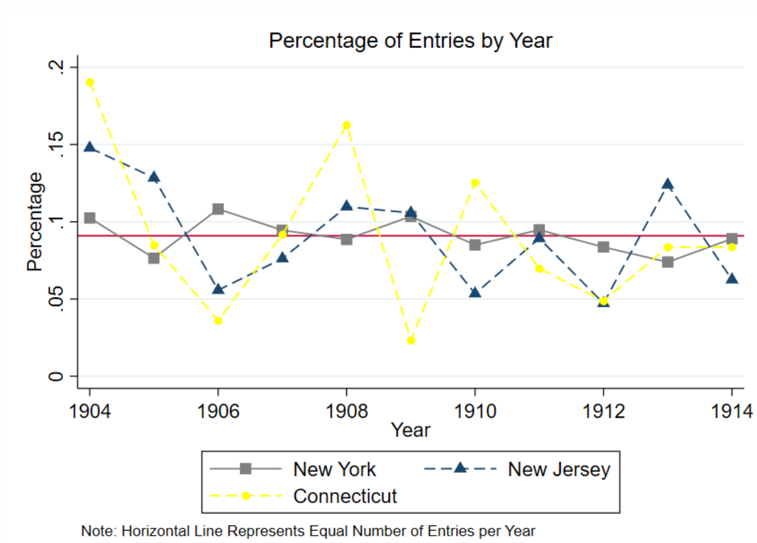
[168]See Figure A12 for a chart with these data plotted for 1904-1914.

Table C1: Market Entries (3km, Rolling)

Year	CT	NJ	NY
≤1903	1,181	1,996	5,811
1904	164	260	516
1905	73	226	385
1906	31	98	545
1907	79	134	476
1908	140	193	446
1909	20	186	521
1910	108	94	428
1911	60	157	477
1912	42	83	421
1913	72	218	372
1914	72	110	448
Panel	2,042	3,755	10,846

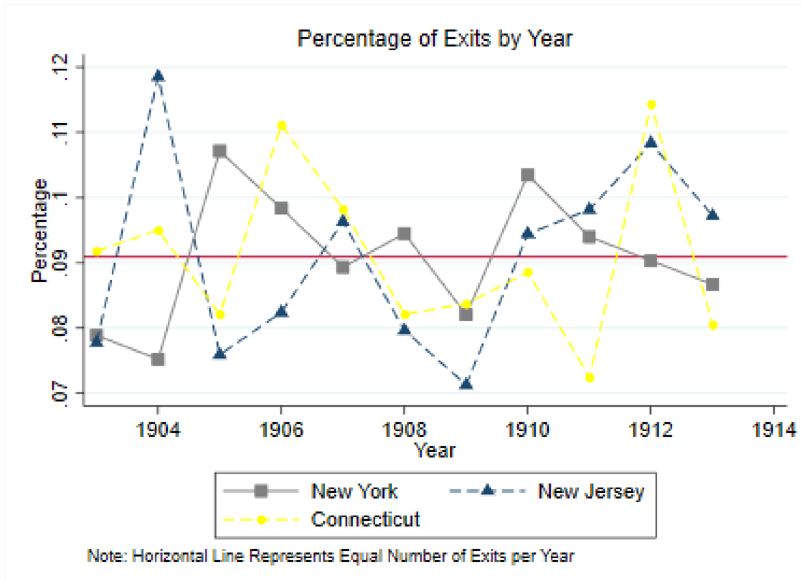
Figure C3 plots the percentage of total market entries in a state over the period 1904-1914 by year, with a horizontal line denoting an equal number of entries per year. The takeaway is stark: New York data has a similar percentage of entries recorded every year whereas the plots for Connecticut and New Jersey are erratic. It is clear that new entries are not necessarily recorded in each year outside New York. Given this failure in the underlying data generating process, I inspect next whether market exits – which determine physician survival – are properly recorded.

Figure C3: Percent of Practices by Year Entered



The percentage of market exits is expected to vary more turbulently by year than market entries, especially in the post-Flexner era. Figure C4 confirms this intuition, and shows a small increase in physicians exiting their local markets in New York over the 1909-1913 period. While useful, this figure does little to resolve the uncertainty surrounding the validity of exit data for New Jersey and Connecticut.

Figure C4: Percent of Market Exits by Year

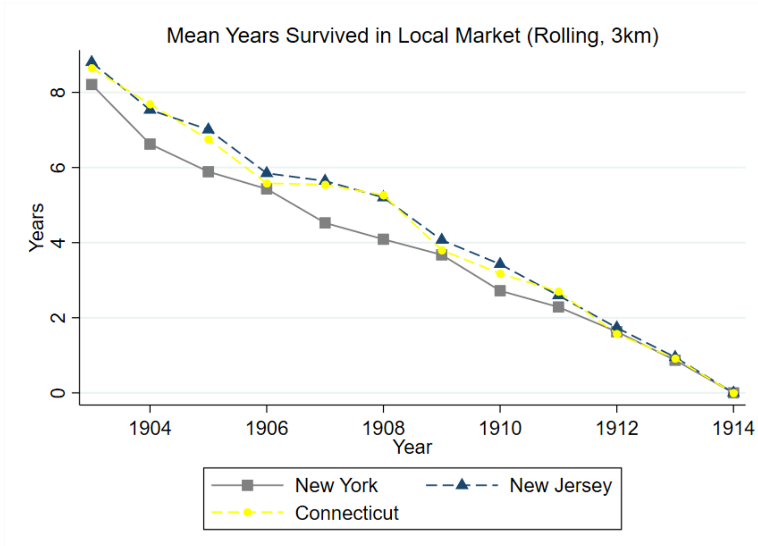


To resolve this uncertainty, I fix the date of entry and plot mean survival time for each cohort by state in Figure C5. Excluding observations from medical centers, the mean time observed in a 3km-rolling market is 4.4 and 4.3 years in New Jersey and Connecticut, respectively. By contrast, the typical New York physician was observed in the same market of this type for 3.8 years. More pertinently, the curve for New York declines in a near-linear fashion, whereas the curves for New Jersey and Connecticut exhibit years where the curves are relatively flat. For example, the period 1906-1908 is relatively flat in these states, suggesting that physicians who entered in 1906, 1907, and 1908 survive a similar number of years, on average, despite physicians entering in 1906 having *two* extra years of survival time available.

Over this period, the curves for New Jersey and Connecticut lie considerably above the curve for New York. In addition, the curves for these states lie consistently above the New York plot. Both of these facts imply that physicians are not being removed from post-office listings as rapidly in New Jersey and Connecticut as the physicians are likely leaving. These patterns for New Jersey and

Connecticut are concerning but not unexpected. The data were sourced from directories furnished and published by the New York State Medical Association (*Medical Directory of New York, New Jersey and Connecticut* 1903-1914). The state medical society can be expected to have much better records on the presence of physicians in their own state than those in adjacent states.

Figure C5: Mean Years Observed by Year Practice Established



While neither of these interpretations can be proven, and the data in New Jersey or Connecticut could reflect reality, it is most likely that neither entry date nor exit date in any given market can be trusted for these states. To avoid measurement error in the exogenous variables and attenuation bias from the improperly coded exit dates, data for New Jersey and Connecticut are used sparingly in the analyses that follow. Results for New York alone are highlighted.

Appendix D: Medical Centers

This paper analyzes the effect of Flexner's recommendations for the future prospects of medical schools on physicians who earned each degree. There are four undergraduate medical schools in the study area: Albany Medical College (Albany, NY), the University of Buffalo Medical Department (Buffalo, NY), the College of Medicine of Syracuse University (Syracuse, NY), and Yale Medical School (New Haven, CT). There were no medical schools in existence in New Jersey. Of these schools, Flexner recommended that Albany and Buffalo be closed. There were seven addition medical schools in New York City, and one in Brooklyn.[169]

Table D1: Degree Distribution within Local Market, 1909

Local Market	Physicians	Local Degree	Other Degrees	% Local
Albany, NY	169	130	39	76.9%
Buffalo, NY	677	398	279	58.8%
Syracuse, NY	249	111	138	44.6%
New Haven, CT	196	107	89	54.6%

The mechanism by which Flexner's recommendations may have affected practicing physicians is through an information shock where consumers update their expectation of the physician's quality. Decreased demand for an individual physician's services may cause them to change markets. This mechanism may fail in a medical center for several reasons. First, the very presence of a medical school provides an anchor for the physician in the local market. As an alumnus, they may wish to remain in the market with a large network. As well, many physicians (of any degree) have a working relationship with the school and are less likely to move. Second, this local network may provide a countervailing force in information in the local market and act as a bulwark against damages to reputation. Third, residents may have a bias in favor of locally-educated physicians and local pride may inhibit the information shock. Finally, Table D1 shows that an overwhelming percentage of physicians in each medical center has the local degree in 1909.

[169]In Brooklyn, the Long Island College Hospital received a poor rating. In New York City, the College of Physicians and Surgeons and Cornell University Medical College received good ratings. The University and Bellevue Hospital Medical College was 'less secure' in its standing. In the baseline specifications, 'less secure' is treated as a positive review as Flexner does not commit to recommending the school be closed. This will be allowed to vary in sensitivity analyses. The remaining schools each received a negative review: (i) Fordham University School of Medicine; (ii) New York Medical College and Hospital for Women; (iii) Eclectic Medical College; and (iv) New York Homeopathic Medical College and Flower Hospital.

Table D2: Degree Distribution outside Local Market, 1909

Reference School	Other Markets	Ref. Degree	Other Degrees	% Ref.
Albany Medical College	10,102	812	9,290	8.0%
Univ. Buffalo Med. Dept.	9,594	723	8,871	7.5%
Coll. of Med., Syracuse Univ.	10,022	239	9,783	2.4%
Yale Medical School	10,075	183	9,892	1.8%

By contrast, the percentage of physicians in other markets that have the same degree is much lower (see Table D2), even when restricting to the home state (see Table D3). For example, while only 8.0% of physicians outside Albany (12.5% in New York) have their most recent medical degree from the Albany Medical College, more than three-quarters of physicians in Albany hold that designation. From a consumer's perspective, there is very little variation in the degree of the local physicians available, and so acting on Flexner's recommendations may be more difficult even when attempted.

Table D3: Distribution outside Local Market, Same State, 1909

Reference School	Other Markets	Ref. Degree	Other Degrees	% Ref.
Albany Medical College	6,242	779	5,463	12.5%
Univ. Buffalo Med. Dept.	5,734	705	5,029	12.3%
Coll. of Med., Syracuse Univ.	6,162	234	5,928	3.8%
Yale Medical School	1,144	146	998	12.8%

The above arguments produce two sets of concerns: an attenuation effect relative to other markets and added noise. For both these reasons, all medical centers are removed from baseline specifications and all subsequent analyses unless otherwise noted.[170]

[170] In addition, note that Brooklyn and New York City would be removed from the analyses as well. The baseline study area is complete.

Appendix E: Recommendation Averaging

Updated Certification:

If the prior authoritative recommendation was F_d^0 and evaluated with relative weight κ^0, then the change in estimated quality is:

$$\begin{aligned}\Delta\hat{q}_d &= \hat{q}_d' - \hat{q}_d^0 \\ &= \frac{1}{R+\kappa}\left[\kappa F_d + \sum_{j=1}^{R} w_j r_j\right] - \frac{1}{R+\kappa^0}\left[\kappa^0 F_d^0 + \sum_{j=1}^{R} w_j r_j\right] \\ &= \frac{(R+\kappa^0)\kappa F_d - (R+\kappa)\kappa^0 F_d^0}{(R+\kappa)(R+\kappa^0)} + \frac{\kappa^0-\kappa}{(R+\kappa)(R+\kappa^0)}\sum_{j=1}^{R} w_j r_j \end{aligned} \tag{E1}$$

which reduces to $[\kappa/(R+\kappa)](F_d - F_d^0)$ when $\kappa = \kappa^0$. The term $F_d - F_d^0$ represents the news in the *Flexner Report* relative to prior beliefs. If consumers treat both sources of information separately, and simply add the new information to the old estimate instead of substituting information, we instead again obtain Equation 17. Either way, the prediction is that physicians who attended institutions rated A by the 1910 CME evaluations ($F_d^0 = 1$) but disparaged by Flexner ($F_d = 0$) will be be treated with a negative shock to perceived quality, but only when R is small – when they are recent entrants to a local geographic market.

Credibility:

We obtained above Equation E1 as the expression which defined the change in estimated physician quality when a consumer updates from prior authoritative recommendation F_d^0 to new information F_d, and the new recommendation has relative weight κ while the old recommendation had relative weight κ^0:

$$\Delta\hat{q}_d = \frac{(R+\kappa^0)\kappa F_d - (R+\kappa)\kappa^0 F_d^0}{(R+\kappa)(R+\kappa^0)} + \frac{\kappa^0-\kappa}{(R+\kappa)(R+\kappa^0)}\sum_{j=1}^{R} w_j r_j$$

Next, I show how changes in credibility κ of the authoritative information may affect estimated physician quality in the absence of any 'news': when $F_d = F_d^0$. The above expression simplifies to:

$$\Delta\hat{q}_d = \frac{R(\kappa-\kappa^0)}{(R+\kappa)(R+\kappa^0)}(F_d - \hat{q}_d) \tag{E2}$$

where $\hat{q}_d$ is the estimate of physician quality in the absence of any authoritative information. For fixed κ and κ^0, but $R \to \infty$, we again obtain $\Delta\hat{q}_d \to 0$. Physicians with an established reputation are also not affected by small changes in the credibility of authoritative information.

Consider physicians who attended institutions rated positively by the Flexner Report ($F_d = 1$). The vast majority of these institutions were also rated A in the 1910 CME Report ($F_d^0 = 1$). There is no news contained in the Flexner pronouncements; however, the fame of the Carnegie Foundation, the widespread dissemination of the report, and the details contained in the document may have increased the credibility of any such information already available to the public concerning these medical schools. In this case, $\kappa > \kappa^0$. Two predictions emerge: (i) recent entrants will be far more affected than established physicians; and (ii) perceived quality will increase for these physicians, and the increase in estimated quality will be proportional to the increase in the authority's credibility.

Most of the physicians rated poorly by Flexner were treated with both bad news ($F_d^0 = 1$ but $F_d = 0$) and an increase in credibility $\kappa > \kappa_0$. In this case, Equation E1 reduces instead to:

$$\Delta\hat{q}_d = \frac{-(R+\kappa)\kappa^0}{(R+\kappa)(R+\kappa^0)} - \frac{R(\kappa-\kappa^0)}{(R+\kappa)(R+\kappa^0)}\hat{q}_d \tag{E3}$$

Notice that the second term is equivalent to the expression in Equation E2: the first term can be interpreted as the reduction in estimated quality due to bad news, conditional on the prevailing credibility κ^0, and the second term is the reduction in perceived physician quality due to increased credibility of the authoritative information. Both terms are (weakly) negative and tend to 0 as $R \to \infty$.

Appendix F: Homeopathy

I focused in the main text on physicians who attended regular non-sectarian schools that were not dedicated to the instruction of black or female students. This was necessary for a clean-comparison of poorly-rated and well-rated physicians because Flexner disparaged every homeopathic, eclectic, and female-only school, and there are not enough black doctors in New York to compare physicians by cohort; however, there are enough homeopathic practitioners to estimate an impact for this group of physicians separately.

Homeopathic practitioners were very popular among the wealthy classes in the nineteenth century Western world despite their methods having been shown to be ineffective relative to a placebo in one of the first known randomized double-blind trials in 1835 (Stolberg 2006). In the United States, homeopathy was introduced in 1825, and was well-established by the 1840s, but gained in popularity after perceived successes in the cholera epidemic which raged from 1848 to 1852 (Kaufman 1971, p. 29).[171] By the mid 1850s, wealthy clientele in New York City were petitioning to have wards at Bellevue Hospital placed under the control of homeopathic practitioners (Kaufman 1971, p. 65). Homeopathy was popular among a relatively low-risk population.[172] The argument that the best physicians receive the toughest cases, and these patients avoid homeopathic practitioners was made by many, including the caustic physician and essayist Oliver Wendell Holmes, Sr. in his lectures *Homeopathy and Its Kindred Delusions* (Holmes 1842).[173] In brief, the profession had been attempting to convince the public of the shortfalls of homeopathic medicine for decades.

[171] The American Institute of Homeopathy was established in 1844, preceding the foundation of the AMA.

[172] This fact may be surprising to the modern reader. Discussing the relative merits of homeopathy and regular medical practice in the nineteenth century at any length is beyond the scope of this paper. Suffice it to say that while homeopathic remedies may have been ineffective, regular practice was often downright dangerous in the nineteenth century. Even in 1884, a doctor wrote a case study of 'A Case of Jaundice with Fatty Excretions' for the *Journal of the American Medical Association*. He treated the patient with "mercurials with rapid favorable results" (Swift 1884). The medical profession was once filled with such mercurial men, and was accompanied by other 'heroic' practices, in the 19th century. See Kaufman (1971) for a good summary of the historical context which lead to the appeal of homeopathic medicine.

[173] This argument was made in response to homeopathic claims of reduction in mortality: "When, therefore, Dr. Muhlenbein, as stated in the Homœopathic Examiner, and quoted in yesterday's Daily Advertiser, asserts that the mortality among his patients is only one per cent, since he has practised Homœopathy, whereas it was six per cent, when he employed the common mode of practice, I am convinced by this, his own statement, that the citizens of Brunswick, whenever they are *seriously* sick, take good care not to send for Dr. Muhlenbein!" (Holmes 1842, p. 52). In his diatribe against homeopathy, Holmes also cautions against earlier claims of homeopathic success curing cholera on the basis of sample selection.

Table F1: LPM, Poorly-Rated by School Type, Difference-in-Difference

	Survival N Years = 100			
N:	2	3	4	5
Poorly-Rated Interacted With:				
Regular	2.593*	4.427***	3.424	4.183
	(1.395)	(1.619)	(2.175)	(2.543)
Regular ($\phi \geq 1904$)	6.118	1.636	4.617	4.565
	(3.942)	(5.436)	(6.478)	(6.428)
Regular ($\phi \in [1908, 1909]$)	-12.36**	-22.35**	-29.09***	-24.30***
	(5.744)	(9.949)	(9.441)	(8.058)
Homeopathic	0.341	-1.443	-3.293	-2.679
	(1.695)	(3.089)	(3.057)	(3.322)
Homeopathic ($\phi \geq 1904$)	11.58**	13.02*	16.13**	16.52**
	(4.683)	(6.957)	(7.746)	(7.704)
Homeopathic ($\phi \in [1908, 1909]$)	-12.48	-23.42**	-28.37**	-33.47**
	(8.220)	(10.93)	(12.58)	(14.23)
No Interaction Terms:				
Exp	0.354*	0.575**	0.472	0.569
	(0.203)	(0.249)	(0.287)	(0.349)
Exp^2	-0.00851*	-0.0153***	-0.0154**	-0.0204***
	(0.00472)	(0.00569)	(0.00632)	(0.00719)
Constant	99.99***	99.56***	102.9***	103.7***
	(2.133)	(3.065)	(3.289)	(3.680)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
R^2	0.060	0.083	0.089	0.093
Clusters	101	101	101	101
Observations	1,835	1,835	1,835	1,835

Notes: ϕ denotes entry year cohort for the physician-market pair. Only physician-markets pairs surviving at least one year are included. All columns are subject to the following restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (v) only areas with a weekly general-content newspaper within 25km of the market are included; and (vi) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table F1 demonstrates the power of a credible reporting initiative. Broadening the baseline sample by removing the restriction to regular schools not dedicated to the instruction of black or female students, I provide a breakout of the linear probability model of survival N years in market m, conditional on survival at least one year. Each row specifies medical school type (regular or homeopathic) and cohort group interacted with receiving a poor review from Abraham Flexner. Interestingly, despite the long history of disparagement directed at homeopaths, these physicians also appear to have been affected by the release of the *Flexner Report.* Coefficient estimates on the recent entrants, with the exception of the model for $N = 5$, are strikingly similar for homeopaths and regulars.[174] A key difference appears to be that homeopathic practitioners were doing relatively well for entrants 1904-1907.[175] Insignificant estimates for eclectics and graduates of institutions that accepted only female students were excluded for brevity.[176] This non-result is likely due to the small number of physicians educated at such institutions; I cannot rule out similar effects for these physicians which my sample fails to capture. Results from proportional hazards models support the conclusion that homeopathic recent entrants were also impacted by the *Flexner Report.*[177] This was a historic achievement.

[174] One difference is that estimates for the regular profession are more precise. Similar results are found in logit regressions. See Table F2.

[175] This may reflect the admission of homeopaths to the medical profession and the AMA in 1903.

[176] See Table F3 for an extended analysis which includes these medical school types. Note that there are some physicians coded as both female-only graduates and homeopathic, and so some physicians are represented in both sets of differences.

[177] Table F4 presents proportional hazards estimates from Cox and Weibull models which uses this underlying specification of $X\beta$ and extension of the baseline sample. Broadly speaking, results for regular physician remain within one standard error of a proportional hazard equal to a factor of 3, though they are slightly attenuated. Results for homeopathic physicians are broadly analogous, though with slightly reduced magnitude and greater imprecision.

Table F2: Survival by School Type, Logit Model

	Survival N Years = 100			
N:	2	3	4	5
Poorly-Rated Interacted With:				
Regular	0.696*	0.540***	0.329	0.344*
	(0.416)	(0.205)	(0.200)	(0.206)
Regular ($\phi \geq 1904$)	0.607	-0.0644	0.174	0.155
	(0.799)	(0.472)	(0.430)	(0.397)
Regular ($\phi \in [1908, 1909]$)	-1.661**	-1.858**	-1.794***	-1.363***
	(0.751)	(0.735)	(0.556)	(0.414)
Homeopathic	0.138	-0.131	-0.249	-0.179
	(0.384)	(0.286)	(0.225)	(0.221)
Homeopathic ($\phi \geq 1904$)	2.107	1.196*	1.145**	1.046**
	(1.290)	(0.705)	(0.568)	(0.521)
Homeopathic ($\phi \in [1908, 1909]$)	-2.240*	-2.195**	-1.866**	-1.885***
	(1.359)	(0.902)	(0.774)	(0.717)
No Interaction Terms:				
Exp	0.0587**	0.0497**	0.0302	0.0293
	(0.0297)	(0.0197)	(0.0189)	(0.0213)
Exp^2	-0.00138**	-0.00131***	-0.00100***	-0.00111***
	(0.000625)	(0.000393)	(0.000374)	(0.000404)
Constant	2.740***	1.951***	2.056***	1.789***
	(0.336)	(0.234)	(0.204)	(0.207)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
Pseudo-R^2	0.082	0.076	0.069	0.074
Log Likelihood	-354.0	-607.2	-739.0	-817.1
Clusters	47	62	69	75
Observations	1,466	1,613	1,656	1,714

Notes: Results presented are from logit models. ϕ denotes entry year cohort for the physician-market pair. Only physician-markets pairs surviving at least one year are included. All columns are subject to the following restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (v) only areas with a weekly general-content newspaper within 25km of the market are included; and (vi) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table F3: Survival Model by School Type, Linear Regression

	Survival N Years = 100			
N:	2	3	4	5
Poorly-Rated Interacted With:				
Regular	2.626*	4.652***	3.550	4.216
	(1.436)	(1.715)	(2.218)	(2.618)
Regular ($\phi \geq 1904$)	6.521	1.784	5.425	5.698
	(3.971)	(5.566)	(6.626)	(6.580)
Regular ($\phi \in [1908, 1909]$)	-12.11**	-21.84**	-28.72***	-23.77***
	(5.796)	(10.08)	(9.548)	(8.355)
Homeopathic	0.284	-1.150	-3.152	-2.364
	(1.643)	(3.065)	(3.045)	(3.392)
Homeopathic ($\phi \geq 1904$)	12.54**	12.82*	16.25**	16.27**
	(5.113)	(7.264)	(8.038)	(7.847)
Homeopathic ($\phi \in [1908, 1909]$)	-12.62	-22.67**	-27.32**	-31.89**
	(8.459)	(11.30)	(12.96)	(14.61)
Eclectic	-0.0769	5.937	3.185	3.757
	(4.517)	(4.904)	(6.579)	(7.028)
Eclectic ($\phi \geq 1904$)	11.82**	1.077	15.96	19.06
	(5.158)	(11.91)	(13.70)	(13.84)
Eclectic ($\phi \in [1908, 1909]$)	1.425	7.004	1.164	0.729
	(5.237)	(11.71)	(12.77)	(12.79)
Women-only	3.497***	-2.297	0.803	-7.667
	(0.712)	(11.33)	(10.98)	(11.33)
Women-only ($\phi \geq 1904$)	-7.748	5.818	7.980	21.11
	(13.28)	(16.50)	(15.12)	(16.66)
Women-only ($\phi \in [1908, 1909]$)	16.28	13.61	15.35	18.93
	(15.53)	(17.17)	(19.03)	(19.32)
No Interaction Terms:				
Exp	0.334	0.557**	0.442	0.541
	(0.205)	(0.252)	(0.292)	(0.351)
Exp^2	-0.00816*	-0.0150**	-0.0149**	-0.0200***
	(0.00475)	(0.00575)	(0.00637)	(0.00720)
Constant	100.3***	99.77***	103.5***	104.4***
	(2.179)	(3.149)	(3.388)	(3.741)
Market (3km-Roll) FE	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
R^2	0.062	0.084	0.091	0.097
Clusters	101	101	101	101
Observations	1,835	1,835	1,835	1,835

Notes: ϕ denotes entry year cohort for the physician-market pair. Only physician-markets pairs surviving at least one year are included. All columns are subject to the following restrictions: (i) only NY is included; (ii) medical centers are excluded; (iii) areas with population 100,000 or above are excluded; (iv) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (v) only areas with a weekly general-content newspaper within 25km of the market are included; and (vi) markets where a specific degree is held by more than one-third of physicians are excluded. Experience is calculated based on year of market-entry. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

Table F4: Survival Analysis, By School Type

	Cox Models:			Weibull Models:		
	(1)	(2)	(3)	(1)	(2)	(3)
Poorly-Rated Interaction:						
Regular		0.938			0.937	
		(0.111)			(0.116)	
Regular ($\phi \geq 1904$)	0.876	0.837	0.794	0.863	0.824	0.756
	(0.241)	(0.227)	(0.250)	(0.255)	(0.237)	(0.264)
Regular ($\phi \in [1908, 1909]$)	2.614***	2.593**	2.445**	2.807***	2.716**	2.645**
	(0.967)	(0.960)	(1.033)	(1.120)	(1.054)	(1.229)
Homeo.		1.212			1.225	
		(0.167)			(0.177)	
Homeo. ($\phi \geq 1904$)	0.614	0.764	0.844	0.582	0.750	0.849
	(0.241)	(0.283)	(0.258)	(0.241)	(0.289)	(0.287)
Homeo. ($\phi \in [1908, 1909]$)	2.508**	2.025	2.076	2.645**	2.065	2.053
	(1.156)	(0.906)	(1.076)	(1.302)	(0.960)	(1.159)
No Interaction Terms:						
Exp	0.992	0.988	1.000	0.988	0.985	0.995
	(0.0111)	(0.0114)	(0.0229)	(0.0119)	(0.0120)	(0.0266)
Exp^2	1.001***	1.001***	1.000	1.001***	1.001***	1.001
	(0.000207)	(0.000206)	(0.000490)	(0.000230)	(0.000224)	(0.000594)
Shape Parameter	n/a	n/a	n/a			
Constant	n/a	n/a	n/a			
Market (3km-Roll) FE	Y	Y	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y	Y	Y
Degree FE	Y	N	N	Y	N	N
Incl. Left-Censored Data	Y	Y	N	Y	Y	N
Log-Likelihood	-4,417.9	-4,462.3	-1,021.4	-1,440.6	-1,490.2	-403.0
Pseudo-R^2	0.035	0.025	0.043	0.114	0.083	0.122
Years at Risk	15,625	15,625	3,445	15,625	15,625	3,445
Clusters	101	101	77	101	101	77
Failures	629	629	177	629	629	177
Observations	1,847	1,847	537	1,847	1,847	537

Notes: In this table, all variables listing 'Regular' and 'Homeo.' physicians were those rated poorly by Flexner. 'Homeo.' is an abbreviation for 'Homeopathic.' ϕ denotes entry year cohort for the physician-market pair. Results presented are proportional hazards from the Cox Proportional Hazards model or the Weibull parametric survival model; values equal to 1 indicate no difference in the hazard of practice failure, while values smaller than 1 are proportional decreases in hazard. Values larger than 1 represent proportional increases in the hazard of practice failure. The 'Shape Parameter' represents p in the Weibull hazard function; larger values indicate increasing hazard over time. The 'Constant' gives baseline hazard when no other variables are included in the Weibull model. All columns are restricted to the following: (i) these are conditional hazards – only physicians surviving at least one year in local market m are included; (ii) only NY is included; (iii) medical centers are excluded; (iv) areas with population 100,000 or above are excluded; (v) physicians must have entered their market prior to the release of the *Flexner Report* to be included; (vi) only areas with a weekly general-content newspaper within 25km of the market are included; and (vii) markets where a specific degree is held by more than one-third of physicians are excluded. Standard errors (in parentheses) are clustered at the 3km-rolling market level. Statistical significance is denoted by the following: *** (p-value < 0.01), ** (p-value < 0.05), and * (p-value < 0.10).

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