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# Media Attention and Choice of Major: Evidence from Anti-Doctor Violence in China<sup>\*</sup>

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## Abstract

We study the relationship between media attention and major choices by evaluating how newspaper reports on violence against doctors in China deter students from choosing medicine as their college majors. We collect relevant articles from over 1,200 newspapers and combine them with an administrative dataset including the universe of students admitted to Chinese colleges from 2005 to 2011. An additional article on violence against doctors leads to a 0.5 percent decrease in the number of students choosing medicine majors, especially majors training physicians and nurses. Students attending elite colleges and with above-median test scores are more responsive to media attention. Consequently, it significantly reduces the quality of admitted medical students, measured by their entrance exam performance.

**Keywords:** Media attention; College majors; Occupational choice; Health care

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# 1 Introduction

How does media attention affect individual's decisions? Abundant evidence demonstrates the hypothesis that media persuasion exists (Dellavigna and Gentzkow 2010). For example, DellaVigna and Kaplan (2007) documented how media bias influenced citizens' voting behavior; Eisensee and Strömberg (2007) and Strömberg (2004) discussed how media attention swayed politicians' public spending decisions. However, existing studies primarily focus on the political sphere, and little is known outside this area (DellaVigna and La Ferrara 2015).

In this paper, we investigate how media attention affects high school graduates' choices of major. We focus on media coverage on violence against doctors in China. These events, commonly known as *yinao* in Chinese, surged in the early 2000s. A *yinao* event typically stems from disputes between patients and doctors over treatment procedures or outcomes and results in the use of violence by patients against doctors. Anti-doctor violence in China has attracted attention from both home and abroad. An editorial in the *Lancet* (2010) warned that "China's doctors are in crisis", and the *New Yorker* (Beam 2014) dedicated an article to an in-depth portrayal of one of these violent events in China. Anecdotal evidence suggests that doctors perceived this risk to be real and considered alternative career paths (Xu and Zhang 2014). A natural question to ask is whether media coverages of these violent events against doctors will discourage students from pursuing a career related to healthcare. This question has important policy implications since students' choices of college majors crucially determine the supply of human capital into the healthcare sector.

Our analysis makes use of two unique datasets, a news dataset and an administrative dataset on China's college entrance examinations. We construct the news dataset by crawling relevant articles published between 2000 and 2012 from more than 1,200 newspapers. The administrative dataset contains information on college entrance examination scores and college majors of fifteen million high school graduates between 2005 and 2011. Combining these two datasets enables us to provide new insights into media persuasion in the context of education decisions.

We operationalize the concept of media attention as the number of articles reporting anti-doctor violence published in newspapers circulating in each city and each academic year. We exploit variation in media attention across cities and over time to identify the persuasion effect. Using a generalized difference-in-differences framework, we find that one additional article leads to an approximately 0.5 percent decrease in the number of students choosing medicine majors. This effect doubles when we focus on sub-disciplines

training for physicians and nurses. Our findings are mainly driven by students attending elite colleges and scoring above-median test scores. Furthermore, we estimate a generalized triple-difference model to detect the effects of media exposure on the quality of students choosing medicine majors. We find a sizable quality drop in students in medicine majors as reports on violence against doctors increase. The average and minimum ranking of medicine majors in provinces with more violent reports are lower than those in provinces with less violent reports.

We show the validity of our identification strategy by verifying the parallel trend assumption. Our results are robust to an alternative measure of media attention, defined as the discounted total of historical articles published in newspapers circulating in each city, and for a wide range of discount factors. Moreover, we expand our controls to include a richer set of variables to further address the issue of confounding unobservables. Lastly, we implement a falsification test, based on the intuition that media attention on violence against doctors should not affect the number of students planning to study art in college. We find no evidence that rejects this hypothesis.

We contribute to a few strands of literature. First, we extend the focus of the literature on media persuasion to choices made in the context of education. The existing literature has a strong emphasis on how media affects both voters' and politicians' decisions (see [Strömberg \(2015\)](#) for a recent survey). [Gentzkow, Shapiro, and Sinkinson \(2011\)](#) showed that newspaper entries increased presidential and congressional turnout. [DellaVigna and Kaplan \(2007\)](#) and [Enikolopov, Petrova, and Zhuravskaya \(2011\)](#) provided evidence that media bias influenced voters' decisions. [Eisensee and Strömberg \(2007\)](#) suggested that politicians are more likely to provide relief funds when disasters received more media coverage caused by the lack of other newsworthy events. Similar findings were supported by [Strömberg \(2004\)](#), [Enikolopov, Petrova, and Sonin \(2018\)](#), [Lim, Snyder, and Strömberg \(2015\)](#) and [Snyder and Strömberg \(2010\)](#). [Yanagizawa-Drott \(2014\)](#), [Jetter \(2017\)](#) and [Durante and Zhuravskaya \(2018\)](#) examined the role of media on wars and conflict. Decisions in other areas are less thoroughly studied ([DellaVigna and La Ferrara 2015](#)). A few exceptions include [Qin \(2013\)](#) and [Gentzkow and Shapiro \(2008\)](#). To the best of our knowledge, our paper is the first to study the relationship between media exposure and choices of college major.

Second, we add to the literature that studies factors influencing students' choice of major. When choosing a major in college, students encounter uncertainties about their own ability, preferences and future income. The existing literature often study how new information about these factors influence students' choice of major. For instance, [Stinebrickner and Stinebrickner \(2013\)](#) found that students' mis-perceptions regarding their

ability to perform well academically in science drive students to choose a science degree upon entering college but to not graduate with one. [Zafar \(2011\)](#) attained a similar conclusion using subjective belief data, while [Wiswall and Zafar \(2014\)](#) found that earnings expectations and ability perceptions both play important roles in the choice of major. [Fricke, Grogger, and Steinmayr \(2018\)](#) found that exposure to a field of study influences students' major choices. To the best of our knowledge, our paper is one of the first to study the salience of occupational risks and students' major choices. Although we do not explicitly provide new information to students regarding their future income, the incidences of violence that we focus on can be interpreted as information regarding the risk-adjusted wage for medicine majors.

The rest of this paper is organized as follows. Section 2 provides relevant institutional background. Section 3 describes the data. Section 4 presents the empirical strategy, results and robustness checks. Section 5 concludes.

## 2 Institutional Background

### 2.1 Health-care System and Violence Against Doctors in China

In this subsection, we describe how the Chinese health-care system functions and discuss some of its features that contribute to the escalating tension between patients and doctors.

*Medical Services.* The health-care system in China is structured into three-tiers. Primary-level clinics, such as community health centers, provide basic medical care. Secondary and tertiary hospitals provide specialized medical services. Patients are free to visit any public hospital without referral by primary-care providers, and they receive diagnostics, treatment and drug prescriptions there.

Despite considerable variations in the quality of care, hospitals in different tiers charge similar fees for outpatient and inpatient visits. Therefore, top-tier hospitals are often overcrowded, physicians are forced to reduce the length of consultations, and patients are often dissatisfied.

*Economic Incentives.* Public hospitals in China face two sources of financial difficulties. On the one hand, state investment in medical services has declined continuously since 1979, with the proportion of national health-care spending decreasing from 32 to 15 percent over the ensuing twenty years ([Liu, Liu, and Chen 2000](#)). On the other hand, the state

put in place strict controls over how much hospitals could charge for routine visits and services to ensure that everyone had access to basic health-care (Wu, Wang, Lam, and Hesketh 2014).

Consequently, Chinese hospitals must seek alternative sources of revenue to sustain themselves. The hospitals were permitted to earn profits from prescribing new drugs and providing high-tech tests, with a markup of 15 percent (Hesketh and Zhu 1997). In turn, hospitals encouraged physicians to prescribe drugs and issue tests by tying their income to the level of profits they can make for the hospital. This creation resulted in the over prescription of unnecessary and expensive pharmaceuticals and high-tech services such as imaging (Currie, Lin, and Meng 2014), leading patients to believe that doctors and hospitals conspire to increase charges (Lancet 2010).

*Violence Against Doctors.* Patient dissatisfaction, mistrust for physicians, and disputes over outcomes of medical treatments are important triggers of violence. Patients or their relatives may resort to various forms of physical violence to express their anger or may organize group protests to obtain compensation from hospitals. Below, we provide one example of each type of incidence to provide more context.

1. In 2006, a man visited a hospital to receive a diagnosis for his stomach problems and become involved in a dispute with his doctor over medical charges. The next day, he returned to the hospital and attacked the doctor with a knife, cutting off her right hand and causing a rupture in her left eyeball.<sup>1</sup>
2. In 2007, a woman gave birth to a dead baby in a hospital. Angry relatives congregated at the front hall of the hospital; they lit candles, burnt incense, put together funeral flowers and set off firecrackers, forcing the hospital to shut down its operations and send its patients elsewhere. The relatives left after the hospital agreed to pay two hundred thousand RMB in compensation a few days later.<sup>2</sup>

As illustrated by these examples, violence against doctors can cause large disruptions to hospitals and severe physical and psychological injuries to the affected doctors and/or nurses. In addition, this violence poses a serious threat to the safety and wellbeing of medical personnel.

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<sup>1</sup>Sohu, Inc. "Yiyuan Duoshou Shijian Zhong De Nan Zhujue." SOHU.com. <http://news.sohu.com/20070103/n247397673.shtml> (accessed August 29, 2018).

<sup>2</sup>Sohu, Inc. "Fujian Sheng Yige Yue Nei Lianxu Fasheng Siqu Yihuan Jiufen Shijian Fansi." SOHU.com. <http://news.sohu.com/20070821/n251690410.shtml> (accessed August 29, 2018).

## 2.2 College Admissions System in China

In China, all college-aspiring high school graduates must take the National College Entrance Examination (NCEE) and go through a centralized admissions process in which they are matched to a college.

*Examinations.* Students select either the science or the humanities track in Year 11 and take the NCEE at the end of Year 12. Each track has its own exam papers, admission quotas, and matching procedures. Exams and admissions are organized at the province level, and each provincial educational authority sets and grades papers independently. Therefore, only scores in the same province-year-track are comparable.

Each year, students sit for the exam in early June. Students are tested on six subjects, with three being compulsory and three being track electives. The compulsory subjects are Chinese, mathematics and English; science electives are biology, chemistry and physics, and humanities electives are politics, history and geography. Students in the science track face no restrictions in choosing college majors, whereas students in the humanities cannot enroll in science and engineering disciplines.

*Preferences and Admission.* High school graduates submit a ranked list of preferences for colleges and majors to the provincial educational authorities either before or immediately after taking the NCEE. Therefore, many lack important information on the content of study of specific majors, potential career paths and expected incomes for different disciplines. The students' choices of college and majors are prone to peer effects, family preferences and external information sources such as news reports. Since most Chinese colleges are public institutions, tuition fees are unlikely to be a concern in college preferences because fees are generally low and vary minimally across public institutions.<sup>3</sup>

In accordance with the examination and admissions systems, colleges also allocate quotas for each major at the province level and select students with the highest test scores from the entire pool of applicants. In other words, a student's admission outcome is determined jointly by her NCEE score, her preference and the relevant admission quota. Each student receives one offer every year and can choose to accept or reject it.

Since bachelor's degrees are highly valued in the Chinese labor market, nearly all programs have minimal trouble filling the assigned quota. Popular majors and programs will have higher admission scores.

*Medicine Admits.* The admission of medicine majors largely determines the future supply

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<sup>3</sup>Private colleges in China are usually in the lowest-tier in terms of education quality.

of doctors for two reasons. First, students cannot transfer between colleges, while a very small number of students, normally less than 5%, are allowed to transfer to a different major if they meet certain requirements set by their colleges and departments. Second, in China, a bachelor’s degree in medicine is the minimum prerequisite for obtaining physician certification. Therefore, the number of college medicine students will be approximately equal to the number of medicine admits and can serve as an upper bound on the number of eligible doctors in the future.

### 3 Data Description

In this section, we describe the datasets used in this paper.

#### 3.1 News Dataset

Since no public statistics exist on the media coverage of violence against doctors, we extract relevant newspaper articles from the digital archives of WiseNews, a Hong Kong-based data provider of newspaper content. [Qin, Strömberg, and Wu \(2018\)](#) use this dataset to study media bias in China. We automate a keyword search process for news articles published between 2000 and 2011. We first use a generic keyword search to extract a set of newspaper articles reporting incidents of violence against doctors across China from 2000 to 2011. From these articles, we obtain a list of violent events against doctors, construct unique keywords for each event and repeat the automated search process using those keywords.<sup>4</sup>

We find 1292 relevant articles from 258 violent events against doctors. For each article, we observe a rich set of information: full content, date of publication, name of the newspaper in which it was published, and the city in which the newspaper circulated. [Figure 1](#) provides an overview of the spatial distribution of these articles. Media attention of violent events are not restricted to a few provinces, but are widespread across China. [Figure 2](#) shows that media attention steadily increased after 2001.

We construct our key measure of media attention on violence towards doctors based on this dataset. We define the measure of media attention,  $MA$ , as the sum of all articles regarding violent events against doctors published in each city between two consecutive

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<sup>4</sup>The generic keywords that we use are *yinao* and its several variants and synonyms, all of which mean violence against doctors. Since some articles do not contain these terms, we use unique keywords to ensure we obtain a complete list of articles.



college entrance exams. An implicit assumption underlies this measure: individuals have a short memory, and only recent reports affect students' choices of college majors. We relax this assumption in our estimations in the robustness check section, where we include past reports at a discounted rate.

An apparent disadvantage of this strategy is that we only observe media coverage through newspapers. Any discussion of violence against doctors in other media outlets are not captured in our dataset. Although it is beneficial to include media coverages from other outlets, there is no reliable source providing historical records of these reports.

### **3.2 Administrative Dataset on College Admission**

We utilize a unique individual-level administrative dataset on college admission in China. The dataset contains all students who took the NCEE and were admitted into colleges between 2005 and 2011. For each student, we observe his/her academic track in high school, the city of residence, the test score and the college and major to which he/she was admitted. This dataset allows us to observe the change in the quantity and the quality of students enrolled in medicine majors.

Table 1 presents summary statistics of this dataset. This dataset covers all 30 provinces in mainland China except for Tibet.<sup>5</sup> Due to expansion of tertiary education, the number of students enrolled in college each year steadily increased from 2 million to 2.7 million during this period. The total number of students studying medicine majors increased by approximately 30 percent for the same reason. Column 4 suggests that the ratio of students choosing medicine majors among all college students remained approximately constant. This pattern arises from the quota system and the consent option discussed in the institutional background section.

### **3.3 Other Data**

Many other factors influence students' major choices and may potentially correlate with the measure of media attention that we constructed. To ease concerns of endogeneity, we use a city-level administrative dataset to obtain information on local GDP, total population, local fiscal revenue and expenditure, as well as the number of doctors and hospital beds.

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<sup>5</sup>Due to the unknown errors in the data collection process, we do not have data for Jiangsu province from 2009 and Zhejiang province from 2011.

## 4 Empirical Strategy and Results

We begin this section discussing our empirical strategy and specification. Then, we present our main results. Lastly, we implement a few robustness checks and falsification tests.

### 4.1 Empirical Strategy

We use a generalized difference-in-difference estimator to achieve identification. [Dahl and Dellavigna \(2009\)](#) and [Jacobsen \(2011\)](#) used similar strategies to identify the impact of films on violent crimes and the carbon offsets purchase decision.

Our baseline specification is provided below:

$$y_{ijt} = \alpha + \beta MA_{ijt} + \gamma' X_{ijt} + \delta_i + \phi_{jt} + \epsilon_{ijt} \quad (1)$$

where  $y_{ijt}$  is the outcome variable of interest for city  $i$  of province  $j$  in year  $t$ ;  $MA_{ijt}$  is the measure of media attention in city  $i$  of province  $j$  during year  $t$ ;  $X_{ijt}$  is a vector of control variables including the logarithm of local GDP, population and the number of hospital beds;  $\delta_i$  denotes city fixed effects;  $\phi_{jt}$  represents province-by-year fixed effects; and  $\epsilon_{ijt}$  is the random error term.

Our identification exploits variation in media attention on violence against doctors. There are a few threats to this identification strategy. First, it is possible that cities with different levels of media attention on these events also differ in other characteristics that can influence students' choice of major in college as well. We include city fixed effects to alleviate this concern. Second, the level of media attention on these events in a city may be correlated with time-varying factors, such as economic development and scarcity of health-care resources. These factors, in turn, could affect students' decision regarding what to study in college. We control for a rich set of time-varying characteristics at the city to deal with the omitted-variable bias, including GDP, population and the number of hospital beds. However, the validity of our DID strategy relies on the parallel trend assumption. We perform a series of tests to ensure the appropriateness of this assumption later.

Besides the baseline DID model investigating the effect on the quantity of students choosing medicine majors at the city level, we propose a generalized triple-differences model to investigate potential quality effects of students enrolling in medicine majors at the province-major level:

$$y_{mjt} = \alpha + \beta Medicine_m * MA_{jt} + \phi_{jt} + \eta_{mt} + \mu_{mj} + \epsilon_{mjt} \quad (2)$$

where  $y_{mjt}$  is the enrollment quality of major  $m$  in province  $j$  in year  $t$ . We use the average and lowest enrollment ranking percentile to measure the enrollment quality of a major.  $Medicine_m$  indicates whether major  $m$  is a medicine major.  $MA_{jt}$  is the measure of media attention in province  $j$  during year  $t$ ;  $\phi_{jt}$ ,  $\eta_{mt}$  and  $\mu_{mj}$  capture province-by-year, major-by-year and province-by-major fixed effects respectively.

## 4.2 Main results

### 4.2.1 Are Students Discouraged from Studying Medicine?

Our first hypothesis is that students are less likely to pursue careers related to health-care in cities with a higher level of media attention regarding violence against doctors. We examine this hypothesis by estimating equation 1 with the log number of students choosing majors related to health-care in each city as the dependent variable, controlling for the log number of total college admits.

The first three columns of Table 2 reports the baseline results. Column 1 shows regression estimates of the generalized DID model with year fixed effects. Column 2 replaces them with province by year fixed effects. Column 3 adds control variables. These controls include the logarithm of GDP per capita, the population and the number of hospital beds.

We find that an additional article is associated with a 0.5 percent to 1 percent decrease in the number of students studying health-care related majors. In our preferred specification controlling for city fixed effects, province by year fixed effects and time-varying control variables, an additional article leads to a 0.52% decrease in the number of students studying health-care related majors each year. The estimated coefficient is statistically significant at the 1% level. Since the average number of medicine admits in each city is 491, this means that, on average, a one-unit increase in the number of violence-related articles leads to 2.55 fewer medicine admissions in each city. As there are approximately 5 news articles per event, the coefficient translates into 12.77 fewer medicine students in a city, in response to one violent event.

Violence against doctors most directly affects hospital physicians and nurses, who are usually graduates in the disciplines of clinical medicine and nursing. Therefore, we hypothesize that the persuasion effect is more likely to concentrate in majors training clinicians and nurses. In other words, a higher incidence of violence should produce the strongest effect on enrollment numbers in clinical medicine and nursing. We estimate the same specifications, using the number of students in these two majors as dependent vari-

able. Column 4 to 6 report these estimation results. The persuasion effect nearly doubled to approximately 1 percent, supporting our hypothesis. One more article will lead to a decrease of 2.40 students in clinical medicine and nursing. Comparing the magnitude of this change with the change for all medicine students, we can observe that the effect of media exposure on medicine admits is concentrated on students who enroll in clinical medicine and nursing.

Taken together, the baseline results in Table 2 suggest that students are responsive to information in the form of news articles.

#### 4.2.2 Who Are Discouraged from Studying Medicine?

The evidence presented above indicates that media persuasion exists, and students are discouraged from medicine majors after exposure to the news on violence against doctors. However, what we have showed is a type of substitution effect. With the quota system, media attention on violence against doctors shifted the composition of students majoring in medicine from one city with more media coverage to another city with less media attention. The welfare implication is not immediately clear. To achieve a clear welfare implication, it is necessary to analyze who are discouraged from pursuing medicine majors and who substitute in.

In this section, we investigate the more pressing issue: do students with higher ability, proxied by higher test scores, more likely to respond to media attention? If this were the case, the quality of the workforce in the health-care sector will deteriorate.

First, we examine the hypothesis that students with higher test scores and having more career options are more likely to switch to careers unrelated to health-care. We first classify colleges as elite or non-elite. The elite colleges are the 112 colleges from Project 211, and the remainder are the non-elite colleges. This is a standard way that scholars classify elite colleges in the Chinese higher education system (Jia and Li 2017). We estimate the baseline equation separately for students enrolled in health-care related majors in elite and non-elite colleges. Table 3 reports these results. The persuasion effect is stronger in elite colleges, supporting our hypothesis. We can observe that one additional news article on anti-doctor violence leads to a 0.72 percent decrease in the number of medicine admits at Project-211 universities, while the effect is 0.46 percent at non-211 universities. The estimated coefficient of interest is statistically significant across all specifications of the regression for both Project 211 and non-Project 211 medicine students.

We then group students based on their test score quartile. Here, a higher quartile suggests higher test scores: students in quartile 1 have the lowest scores, and students in

quartile 4 have the highest scores. We focus on students in the science track. As biology and chemistry are prerequisites for studying medicine, colleges normally allocate nearly all admission quotas to students in the science track. We make sure to control for the log number of total college admits in the science track in each quartile. We estimate the base-line equation for students in each quartile separately and report these results in Table 4. We find that media persuasion effects are significant for students in the third and fourth quartiles, while the effect is close to zero and statistically insignificant in lower quartiles. This finding confirms our hypothesis and suggests that media attention on violence against doctors causes a brain-drain in the health-care sector in China. This finding implies that above-median students are more easily deterred from careers in medicine. Possible explanations are those students have better outside options and a higher propensity to read newspapers and therefore violence-reporting articles. This result is also consistent with our findings in the Project 211 vs. non-Project 211 decomposition. Since enrollments at Project 211 universities are considerably less than 25%, the decrease in the number of medicine admits at Project 211 universities is purely driven by the top students in quartile 4. The decrease in the number of medicine admits at non-Project 211 universities is driven by students in quartile 3 and the remaining students in quartile 4.

### 4.2.3 The Consequences of Discouraging Students

From the discussions above, we showed that media attention on violent events against doctors discourages students from choosing medicine majors. We observe a reduction in the number of students admitted by medicine majors at the city level. However, this finding does not necessarily induce welfare loss. The reason is that the total number of college admissions is fixed by the quota system. As introduced in the background section, Chinese colleges, together with the Ministry of Education, collectively decide how to allocate quotas to each province every year. Although we have observed that the number of students choosing medicine majors at the city level will be reduced by the violent event articles, the total number of medicine students in a province may be unaffected given the central-planned quota for any major in each province. Students from other cities with low-level violent events can substitute those discouraged by high city-level violent event reports and fill the given quota, without any welfare loss. As shown in Table 1, the total number and ratio of medicine students remain stable over time.

In this subsection, we will show that the media attention on violent events against doctors yields a significant welfare loss even the total number of medicine students at the province level is dictated by quotas. We evaluate whether the quality of admitted medicine students decreases after exposure to news reports. Specifically, we test the fol-

lowing hypothesis: compared with a non-medicine major, for a given medicine major, admission rankings from provinces with more news reports are lower than otherwise. We propose a generalized triple-difference model for this test, shown in Equation 2. The intuition of the triple-difference specification is as follows. We first compare differences in enrollment rankings in medicine majors between more-report provinces and less-report provinces, before and after those event articles, which is a common double-difference model. Then we compare similar differences in non-medicine majors. Finally, we take one more difference between differences in medicine and non-medicine majors, which forms a triple-difference design. The control group in this specification is non-medicine majors, which should not be affected by violent events targeting doctors. In this specification, the key independent variable of interest is the interaction of the number of local newspaper articles on violent events against doctors in a province and the medicine major dummy.

The results are presented in Table 5 below. For simplicity, we only report results for the science track, since most medicine majors only admit students from the science track. We separate the sample by elite or non-elite colleges, motivated by the significant heterogeneity between them reported in Table 3. For elite colleges, column one uses the average percentile ranking of admitted students for each major in every province as the dependent variable. The second column uses the lowest percentile ranking of admitted students for each major in every province. Relative to non-medicine majors, a one-standard-deviation increase in provincial-level violent event reports (about 11.88) will reduce average enrollment rankings of medicine majors by 0.47, and reduce the lowest enrollment scores by 0.34. Both estimates are statistically significant. Combining with the provincial average total number of students in the science track, our findings suggest that a one-standard-deviation increase in provincial-level violent event reports lower the average ranking of students in medicine majors' by 300. However, for non-elite colleges, shown in column three and four, the effects are not significant. A natural explanation for the difference between elite and non-elite colleges lies in their heterogeneous response to the violent event reports as revealed in Table 3.

### 4.3 Robustness Checks

In this section, we check our results' robustness using alternative definitions of media attention.

### 4.3.1 Alternative Measure of Media Attention

The measure of media attention is key to our analysis above. We define media attention as the total number of relevant newspaper articles published in the year when students took the NCEE. We implicitly assume that students only respond to these recent media coverages. However, it is possible that students, with a long memory, respond to historical coverages of media attention as well.

In this section, we adopt the alternative assumption and define the media exposure as the discounted total number of newspaper articles about violence against doctors. We allow individuals to discount historical reports at a rate,  $\delta$ , which can be interpreted as the probability that individuals recall an article published in the previous year. Specifically, we define the discounted total reports as

$$DMA_{ijt} = \sum_{k \geq 0} \delta^k * MA_{ijt-k},$$

where  $\delta$  is the discount rate, and other terms are defined as above. Table 6 reproduces Table 2, allowing the discount rate to range from 0.1 to 1. We find that the coefficients for variables denoting media attention are always significant, regardless of the discount rate. The magnitude of the coefficient declines at a positive rate when the discount rate increases. Similarly, we check our findings in Table 3 and 4 and confirm their robustness.

### 4.3.2 More Control Variables

In our baseline regression, we add a set of control variables, including the logarithm of local GDP, population and the number of hospital beds. The variables help to address the concerns regarding time-varying unobservable factors that relate with reports on violent events and possibly affect the choices of students. In this subsection, we add more available time-varying variables to control for more unobservable confounders.

The first set of extended controls include the logarithm of manufacturing output, fiscal revenue and expenditure of local governments and urbanization rate (measured by percentage of urban population). These controls address concerns regarding unobservable confounders. For example, the output in the manufacturing sector may be an indicator of students' alternative career options in the manufacturing sector, and the fiscal revenue and expenditure could be related with the quality of local hospitals. We add these variables into the baseline specification and present the results in the first column of Table 7. The result is nearly the same as the baseline regression. The other set of extended controls are the number of hospitals and doctors. It is straightforward to consider these controls as

important confounders when discussing the choice of medicine majors. The reason why we do not include these controls in the baseline regression is because there are a large number of missing observations for these two variables. The results controlling for the logarithm of hospital and doctor numbers are in the second column of 7. It can be seen that the number of observations decrease by approximately 20% compared with the baseline regression. However, the estimated coefficient is similar to the previous and remain significant at the 1% level. Columns 3 and 4 repeat the same exercises using a stock of total newspaper articles at a discount rate of 0.5. The results remain robust.

## 4.4 Identification

### 4.4.1 Balance Check

The largest concern regarding the identification is the non-randomness of the main independent variable, the media exposure to anti-doctor violence in a city. To ease that concern, we first check whether media exposure to anti-doctor violence is correlated with observable city-level characteristics. If a correlation exists, we may worry that the media exposure to anti-doctor violence is not a random event, and the identification assumption may not be hold. Specifically, we regress the number of local newspaper articles on violence events, the main measure of the media exposure, on other control variables in the baseline regression, including the city-level logarithms of the number of total student enrollment in all majors, GDP, the population and the number of hospital beds. The results are reported in Table 8. All results are conditional on city and province-by-year fixed effects. We find that nearly all the coefficients of all variables are not significant from zero. The only weak significant correlation exists between the log of population and the number of local newspaper articles on violence events. It is not surprising that a city with a larger population will produce more newspaper articles. In general, the results in this balance check suggest that the media exposure to violence may likely occur randomly to local students. This finding adds to our confidence that the baseline results can be interpreted causally.

### 4.4.2 Parallel Trend

A common pre-trend condition is necessary for the consistency of a differences-in-differences estimator. To verify this statement, we propose an event-study to show the trends of the treatment effects before and after the news event. The identification assumption is questionable if treatment cities and control cities appeared to be following different time



trends before the first news article. Specifically, we test the identification assumption by estimating a set of yearly treatment effects beginning three years prior to the first local news article. The specification can be written as follows:

$$y_{ijt} = \alpha + \sum_{\tau=-3}^0 \beta_{\tau} I(\text{YearSinceFirstNews}_{ijt}) * MA_{ij\tau} + \gamma * X_{ijt} + \delta_i + \phi_{jt} + \epsilon_{ijt} \quad (3)$$

where  $I()$  is an indicator function and  $\text{YearSinceFirstNews}_{ijt}$  counts the years at time  $t$  since city  $i$  is hit by the first violent event;  $y_{ijt}$  is our main outcome variable, the log number of medicine admits. Then,  $\text{YearSinceFirstNews}_{ijt}$  takes negative values counting the years before the first incidence of violence and zero when and after the first violent event.

It is a more flexible form of the baseline regression to allow the effect to vary by year in relation to the first newspaper article. This form enables us to check pre-trends in these yearly treatment effects to secure the appropriateness of the identification assumption; if the parallel trend assumption holds prior to the first violent event,  $\beta_{\tau} = 0$  when  $\tau < 0$ . We present a coefficient plot for 3, 2 and 1 year prior to the year of the first incidence of violence as in Figure 3.

Figure 3 indicates that treatment and control cities followed very similar trends before the first media coverage. There are no significant differences in pre-existing trends; the coefficients before the first incidence of violence are all insignificant and close to zero. Thus, cities exposed to news shocks earlier or later in calendar years followed a similar trend in the number of students admitted to medicine majors. In other words, the absence of evidence on differential pre-trends suggests that the incidence of news reports on violence is independent of the change of the number of students admitted to medicine majors in the college entrance exam. Therefore, the negative effects found in the baseline regressions can be interpreted causally with confidence.

#### 4.4.3 Falsification Test

Lastly, we implement a falsification test. The intuition is that media attention on violence against doctors should have no effect on the number of students admitted to majors related to art. If the results find otherwise, it suggests that our identification strategy may be problematic. In this spirit, we estimate equation one, using the log of the number of students majoring in art as the dependent variable. Table 9 reports these results and find no evidence suggesting that media attention on violence against doctors' influence students' decision to study art.

## 5 Conclusion

In this paper, we study how media attention affects students' choice of college major. In particular, we focus on how newspaper coverage of violence against doctors in China influences students choosing health-care related majors in college. These violent events surged in China in the early 2000s. We exploit regional and temporal variation in media reports regarding these events. We find that an additional article leads to an approximately 0.5 percent decrease in the number of students studying health-care related majors. This effect is concentrated in on sub-disciplines training physicians and nurses. Students attending elite colleges or with test scores above the median are more responsive to media attention. Besides the quantity effect, the exposure to the newspaper articles of violent events also reduce average and lowest admission scores of medicine majors, implying a quality effect from media attention. Combining the quantity and the quality effect, our results suggest that the anti-doctor violence has negative effects on both intensive and extensive margins of the supply of doctors in China.

This finding suggests that policies that aim to address anti-doctor violence and to maintain a friendly working environment for medical staff will produce positive effects in both the short and the long run. Subsidizing hospitals' expenses on hiring security personnel and on installing and maintaining surveillance cameras would yield immediate short-term results. Moreover, since a considerable amount of the anti-doctor violence was a result of medical disputes between patients and doctors, this suggests that policies should be designed to improve the current system of health-care liability and malpractice insurance and to accelerate the administrative process of dispute resolution.

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Table 1: Summary Statistics of the Administrative Test Dataset

Year	Number of Provinces	Number of Students	Number of Students in Medical Related Majors	Ratio of Students in Medical Related Majors
2005	30	2,064,052	130,373	0.0632
2006	30	2,212,660	149,883	0.0677
2007	30	2,419,560	159,312	0.0658
2008	30	2,617,349	171,866	0.0657
2009	29	2,564,988	174,550	0.0681
2010	29	2,738,889	183,923	0.0672
2011	28	2,690,016	182,768	0.0679

Table 2: Effect of Media Attention on Students' Choice of Medicine Majors

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Log Number of Students in Health-Care Majors	Log Number of Students in Clinical or Nursing Majors	Log Number of Students in Health-Care Majors	Log Number of Students in Clinical or Nursing Majors	Log Number of Students in Clinical or Nursing Majors	Log Number of Students in Clinical or Nursing Majors
MA	-0.0133*** (0.0030)	-0.0052*** (0.0016)	-0.0052*** (0.0016)	-0.0122*** (0.0020)	-0.0096*** (0.0019)	-0.0095*** (0.0019)
Num of Obs	2,249	2,249	2,233	2,249	2,249	2,233
R-squared	0.97569	0.98483	0.98478	0.96452	0.97383	0.97514
City FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Year	ProvYear	ProvYear	Year	ProvYear	ProvYear
Controls	No	No	Yes	No	No	Yes
Dep Var Mean (Level)	491	491	491	240.3	240.3	240.3

Note: \*\*\* denotes significance at 0.01, \*\* at 0.05, and \* at 0.1. The outcome variables are the log number of students admitted to health-care majors and clinical or nursing majors at city level. The main independent variable is the number of local newspaper reports on violent events against doctors. Baseline control variables include the logarithm of local GDP, population and the number of hospital beds. City and year fixed effects are included in all regressions. Robust standard errors are two-way clustered at the province and year level.

Table 3: Effect of Media Attention on Students' Choice of Medicine Majors by College Type

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Elite Colleges		Non-elite Colleges			
MA	-0.0112** (0.0044)	-0.0070** (0.0027)	-0.0072*** (0.0027)	-0.0126*** (0.0031)	-0.0047*** (0.0016)	-0.0046*** (0.0016)
Num of Obs	2,249	2,249	2,233	2,249	2,249	2,233
R-squared	0.89124	0.92381	0.92377	0.97225	0.98363	0.98375
Pref FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Year	ProvYear	ProvYear	Year	ProvYear	ProvYear
Controls	No	No	Yes	No	No	Yes
Dep Var Mean (Level)	45.86	45.86	45.86	445.2	445.2	445.2

Note: \*\*\* denotes significance at 0.01, \*\* at 0.05, and \* at 0.1. The outcome variables are the log number of students admitted to health-care majors in elite or non-elite colleges. The main independent variable is the number of local newspaper reports on violent events against doctors. Baseline control variables include the logarithm of local GDP, population and the number of hospital beds. City and year fixed effects are included in all regressions. Robust standard errors are two-way clustered at the province and year level.



Table 4: Effect of Media Attention on Students' Choice of Medicine Majors by Score Quartile

VARIABLES Quartiles	Log Number of Students by Score Quartile			
	1	2	3	4
MA	0.0030 (0.00352)	-0.0028 (0.00409)	-0.0089*** (0.0023)	-0.0075** (0.0033)
Num of Obs	2,036	2,036	2,036	2,036
R-squared	0.9508	0.9610	0.9629	0.9540
City FE	Yes	Yes	Yes	Yes
Time FE	ProvYear	ProvYear	ProvYear	ProvYear
Controls	Yes	Yes	Yes	Yes
Dep Var Mean (Level)	88.29	128.5	117.6	89.29

Note: \*\*\* denotes significance at 0.01, \*\* at 0.05, and \* at 0.1. The outcome variables are the log number of students admitted to health-care majors, divided by score quartiles. The main independent variable is the number of local newspaper reports on violent events against doctors. Baseline control variables include the logarithm of local GDP, population and the number of hospital beds. City and province-by-year fixed effects are included in all regressions. Robust standard errors are two-way clustered at the province and year level.

Table 5: Effect of Media Attention on Quality of Students Choosing Medicine Majors

VARIABLES	(1)	(2)	(3)	(4)
Sample	mean rank (%) Elite colleges	min rank (%)	mean rank (%) Non-elite colleges	min rank (%)
medicine major $\times$ MA	-0.0396*** (0.0137)	-0.0286*** (0.0097)	0.0203 (0.0127)	0.0250 (0.0182)
Num of Obs	24,779	24,779	128,390	128,390
R-squared	0.1506	0.1320	0.0746	0.0960
ProvYear FE	Yes	Yes	Yes	Yes
MajorYear FE	Yes	Yes	Yes	Yes
ProvMajor FE	Yes	Yes	Yes	Yes

Note: \*\*\* denotes significance at 0.01, \*\* at 0.05, and \* at 0.1. The outcome variables are the mean and minimum percentile rankings of students admitted to a major in a province. The main independent variable is the interaction of the number of local newspaper reports on violent events against doctors in a province and the medicine major dummy. Province-by-year, major-by-year and province-by-major fixed effects are included in all regressions. Robust standard errors are two-way clustered at the province and year level.

Table 6: Discounted Total of Media Attention On Students' Choice of Medicine Majors

VARIABLES	(1) Total	(2) Sub-Disciplines	(3) Elite	(4) Non-elite
MA: $\delta=1$	-0.00383*** (0.00076)	-0.00589*** (0.00073)	-0.00310* (0.00161)	-0.00347*** (0.00071)
MA: $\delta=0.9$	-0.00448*** (0.00091)	-0.00710*** (0.00083)	-0.00351** (0.00177)	-0.00418*** (0.00090)
MA: $\delta=0.8$	-0.00499*** (0.00107)	-0.00812*** (0.00094)	-0.00387** (0.00189)	-0.00473*** (0.00110)
MA: $\delta=0.7$	-0.00541*** (0.00125)	-0.00896*** (0.00109)	-0.00426** (0.00199)	-0.00514*** (0.00131)
MA: $\delta=0.6$	-0.00574*** (0.00143)	-0.00965*** (0.00125)	-0.00469** (0.00207)	-0.00543*** (0.00150)
MA: $\delta=0.5$	-0.00597*** (0.00159)	-0.01015*** (0.00141)	-0.00515** (0.00213)	-0.00561*** (0.00165)
MA: $\delta=0$	-0.00521** (0.00165)	-0.00949*** (0.00190)	-0.00659*** (0.00248)	-0.00465*** (0.00166)
Num of Obs	2,229	2,227	2,194	2,194
City FE	Yes	Yes	Yes	Yes
Time FE	ProvYear	ProvYear	ProvYear	ProvYear
Controls	Yes	Yes	Yes	Yes
Dep Var Mean (Level)	489	240	45	444

Note: \*\*\* denotes significance at 0.01, \*\* at 0.05, and \* at 0.1. The outcome variables are the log number of students admitted to health-care majors in various sub-samples. The main independent variable is the stock of local newspaper reports on violent events against doctors in different discounted rates. Each cell represents an estimated coefficient of the stock of local newspaper reports in a specific discounted rate from the corresponding regression. Baseline control variables include the logarithm of local GDP, population and the number of hospital beds. City and province-by-year fixed effects are included in all regressions. Robust standard errors are two-way clustered at the province and year level.

Table 7: Robustness: More Control Variables

VARIABLES	(1)	(2)	(3)	(4)
	Log Number of Students in Health-Care Majors			
MA	-0.00512*** (0.00161)	-0.00545*** (0.00162)		
MA: $\phi=0.5$			-0.00550*** (0.00147)	-0.00519*** (0.00136)
Observations	2,150	1,713	2,150	1,713
R-squared	0.98592	0.98480	0.98594	0.98482
City FE	Yes	Yes	Yes	Yes
Time FE	ProvYear	ProvYear	ProvYear	ProvYear
Controls	Yes	Yes	Yes	Yes
More controls	Yes	Yes	Yes	Yes
Hospital&doctors	No	Yes	No	Yes
Level Mean	498.2	566.5	498.2	566.5
Level SD	360.3	356.2	360.3	356.2

Note: \*\*\* denotes significance at 0.01, \*\* at 0.05, and \* at 0.1. The outcome variables are the log number of students admitted to health-care majors at city level. The main independent variable is the number of local newspaper reports on violent events against doctors or the discounted stock of the reports. Baseline control variables include the logarithm of local GDP, population and the number of hospital beds. City and province-by-year fixed effects are included in all regressions. Robust standard errors are two-way clustered at the province and year level.

Table 8: Balance Check

VARIABLES	(1)	(2)	(3) MA	(4)	(5)
log number of total admission	-0.01829 (0.06908)	-0.02275 (0.07007)			
log GDP per capita	-0.09696 (0.14161)		-0.06598 (0.13588)		
log population	0.40806* (0.21323)			0.37158 (0.23169)	
log number of hospital beds	-0.05493 (0.03948)				-0.01918 (0.05139)
Observations	2,233	2,249	2,234	2,249	2,248
R-squared	0.53810	0.53958	0.53782	0.53977	0.53958
City FE	Yes	Yes	Yes	Yes	Yes
Time FE	ProvYear	ProvYear	ProvYear	ProvYear	ProvYear

Note: \*\*\* denotes significance at 0.01, \*\* at 0.05, and \* at 0.1. The outcome variables are the number of local newspaper reports on violent events against doctors. The main independent variable is the vector of baseline control variables, including the logarithm of local GDP, population and the number of hospital beds. City and province-by-year fixed effects are included in all regressions. Robust standard errors are two-way clustered at the province and year level.

Table 9: Falsification test: Effect on on Students' Choice of Art Majors

VARIABLES	(1)	(2)	(3)	(4)
	Log Number of Students in Art Majors			
MA	-0.0007 (0.0011)	-0.0005 (0.0011)		
MA: $\phi=0.5$			-0.0007 (0.0010)	-0.0006 (0.0009)
Observations	2,245	2,229	2,245	2,229
R-squared	0.9915	0.9914	0.9915	0.9914
City FE	Yes	Yes	Yes	Yes
Time FE	ProvYear	ProvYear	ProvYear	ProvYear
Controls	No	Yes	No	Yes

Note: \*\*\* denotes significance at 0.01, \*\* at 0.05, and \* at 0.1. The outcome variables are the log number of students admitted to art majors at city level. The main independent variable is the number of local newspaper reports on violent events against doctors or the discounted stock of the reports. Baseline control variables include the logarithm of local GDP, population and the number of hospital beds. City and province-by-year fixed effects are included in all regressions. Robust standard errors are two-way clustered at the province and year level.

Figure 1: Geographic Distribution of Newspaper Articles on Violence against Doctors (*yinao*) across China

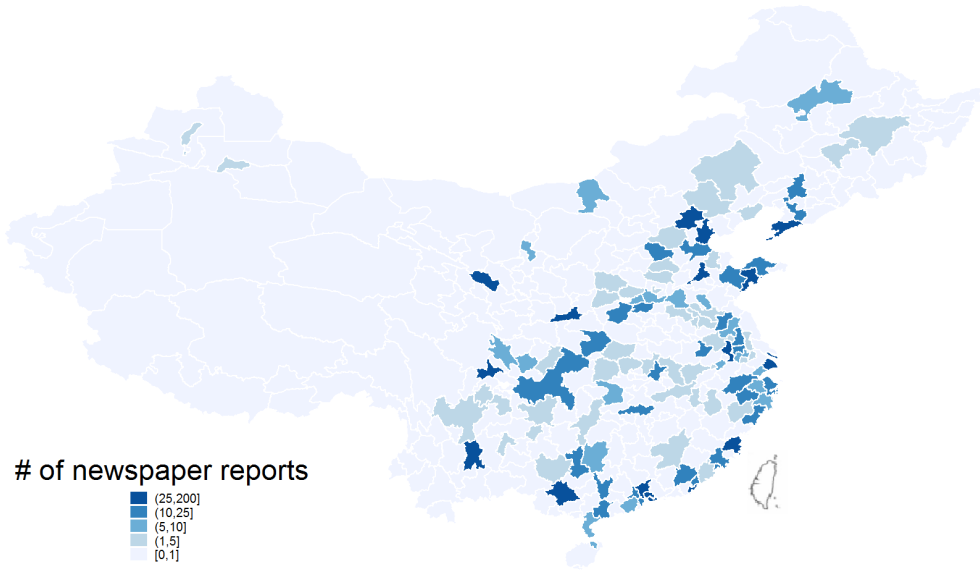


Figure 2: Trend of Newspaper Articles on Violence against Doctors (*yinao*)

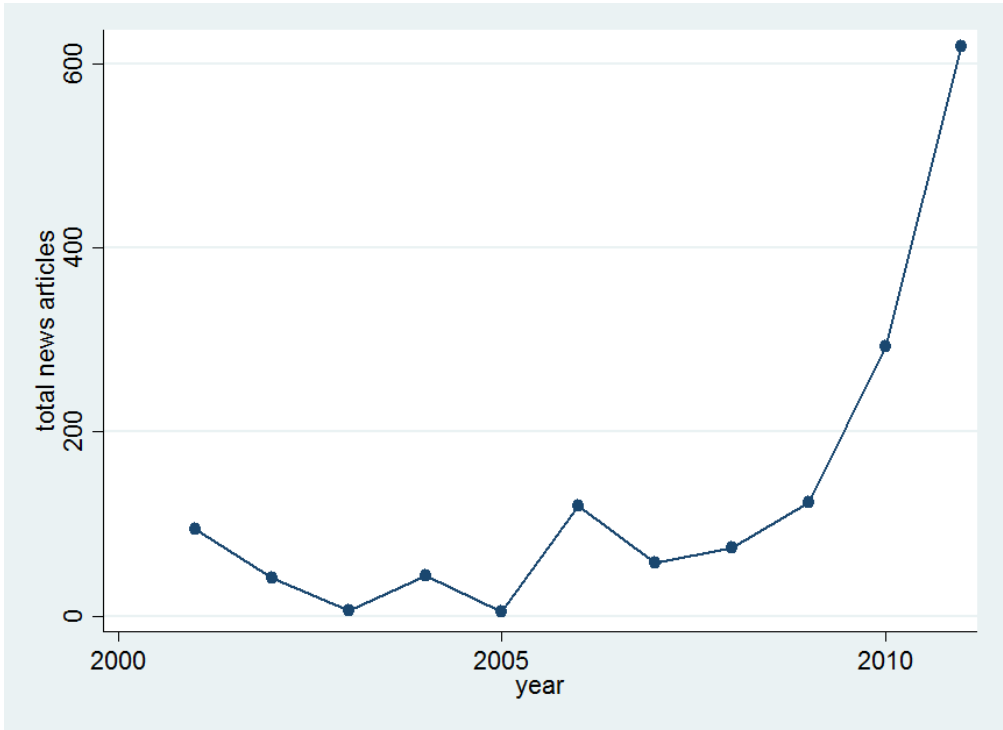


Figure 3: Event Study Graph

