The Double Reduction Policy and Gender Disparity

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1 Introduction

1.1 Research Background

In July 2021, the Chinese Government introduced the “Double Reduction” Policy to alleviate the academic burden on students and enhance regulation of private tutoring companies. This initiative was designed in response to widespread concerns over excessive homework and rising costs of after-school tutoring, which have long been contentious issues within the education system (Zhao et al., 2024). The policy has been implemented as a pilot in 9 major regions, including Beijing, Shanghai, Shenyang, Guangzhou, Chengdu, Zhengzhou, Changzhi, Weihai, and Nantong, and requires each province to select at least one city for trial (Central Committee of the Communist Party of China & General Office of the State Council, 2021). The overarching aim is to reduce educational pressure on a national scale and improve students’ well-being.

1.2 Research Objectives

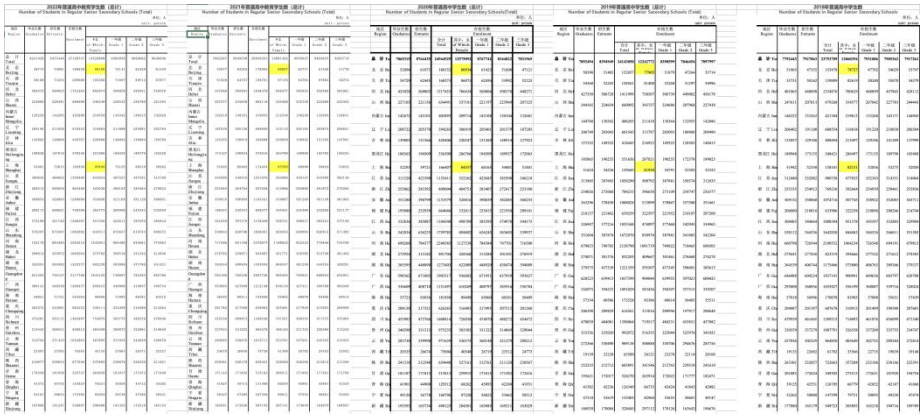
Despite its intentions, there is a noticeable gap in research concerning the policy's effects, particularly regarding gender disparities in academic performance. This study seeks to fill this gap by examining how the Double Reduction policy impacts students differently based on their gender. Specifically, the research aims to evaluate the overall effects of the policy on academic performance in the pilot cities, with a focus on any variations between male and female students. This includes assessing changes in performance metrics such as grades and homework completion, as well as understanding students’ perceptions and exploring potential long-term impacts. The findings will provide valuable insights for policymakers, helping to refine the policy and promote greater educational equity.

2 Data

The data processing includes two parts, data resources and method chosen. The main data is from the Ministry of Education of China where province-level data of entrants, graduates, enrollments and girls from 2018 to 2022 can be found, which is shown in Figure 1. We estimate the

approximate amount of new Grade 1 students as the number of entries that year to calculate entrance rate. Meanwhile, we add up the total number of students of the three grades in high school and use the sum to calculate enrollment rate. Girl proportion was used to generally measure the girls' academic performance relative to boys under the policy which help to analyze the impacts brought by the policy towards different sex.

Figure 1



Besides province-level data, we also found city-level data of the same subjects in Henan which is more detailed where Zhengzhou city is one of test cities of the Double Reduction Policy, as Figure 2 shows. This dataset from Henan Statistical Yearbook enabled us to have a closer and more precise analyzation about the influence of the policy on students that assisted us to make deeper research.

Figure 2

Statistics on Regular Senior Secondary Schools by City (2022)

单位：人 (person)

地区 Region	学校数(所) Number of Schools (unit)	教职工数 Teachers and Staff	#专任教师 Full-time Teachers	招生数 Entrants	在校学生数 Enrolment	#女生 Female	毕业生数 Graduates
全省 Total	1050	238239	211596	884485	2504510	1245851	742170
郑州市 Zhengzhou	137	23129	19904	85627	239884	118787	70910
开封市 Kaifeng	54	10135	8906	45686	132044	65995	44422
洛阳市 Luoyang	86	16046	14151	53496	155125	81161	49001
平顶山市 Pingdingshan	53	12282	11260	49623	138990	70554	36090

安 阳 市 Anyang	71	13895	11732	52728	148983	73745	40161
鹤 壁 市 Hebi	20	4317	3591	12681	38399	18457	12231
新 乡 市 Xinxiang	78	16232	13312	56083	159376	78889	44327
焦 作 市 Jiaozuo	33	6747	6050	23976	71279	35349	24339
濮 阳 市 Puyang	47	10063	8456	33488	95249	47063	28537
许 昌 市 Xuchang	42	9968	9000	40615	110696	54178	30064
漯 河 市 Luohe	21	4553	3996	17959	52301	26466	15581
三 门 峡 市 Sanmenxia	22	5035	4356	13675	39565	20782	12922
南 阳 市 Nanyang	135	32259	29441	115923	312107	156534	79952
商 丘 市 Shangqiu	44	14829	12908	62970	178757	89066	52712
信 阳 市 Xinyang	77	17687	16736	71239	208866	97555	64362
周 口 市 Zhoukou	66	20316	18297	76420	219949	109897	74579
驻 马 店 市 Zhumadian	57	19342	18216	67253	187180	93509	56755
济源示范区 Jiyuan	7	1404	1284	5043	15760	7864	5225

3 Methodology

3.1 Estimation Strategy

In this project, we will use the difference-in-differences model. Since the Senior High School Entrance Examination is arranged in Junes and the Double Reduction Policy was implemented in July, 2021, we regard years before 2021 as pre-policy period. Post-policy period contains only 2022. Thus, we define the pre-post dummy D_{post} as:

$$D_{post} = \begin{cases} 1, \ if \ in \ 2022 \\ 0, \ if \ before \ 2022 \end{cases}$$

For the setting of treatment, we will use three different ways according to their representation ability in the province-level dataset. And in the city-level dataset, Zhengzhou was the only early-adopter city, so we set Treatment as 1 for Zhengzhou and 0 for the other 17 controlled cities. The model can be expressed as:

$$GirlProportion = \beta_0 + \beta_1 D_{post} + \beta_2 D_T + \beta_3 D_{post} D_T + e$$

in which the dependent variable is defined as:

$$GirlProportion = \frac{\#\ Girl\ Students}{\#\ Total\ Students} \times 100\%$$

We multiply the ratio by a hundred so the unit is percentage in order to clearly showcase the significant digits in the regression table. We mainly focus on the OLS estimation of β_3, which is numerically equal to DID.

3.2 Setting of Treatment

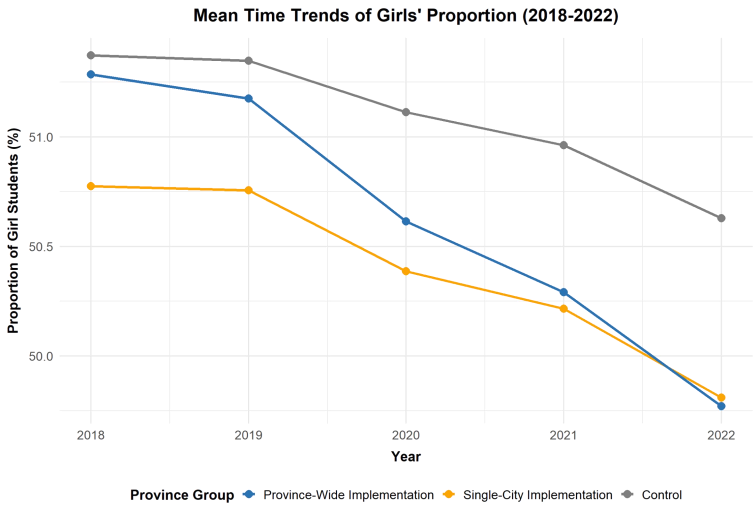
In the governmental document *Opinions on further reducing the burden of homework and off-campus training for students in compulsory education* launched in July 2021, the government set 2 provinces and 7 cities as the early-adopter regions. Actually, we use three methods to set the values of Treatment variable. First, we only focus on the "pure" policy effect, so we exclude the 7 single-city-implemented provinces and only set Treatment as 1 for Beijing and Shanghai. Second, to make full use of the dataset, we use the ratio of the pilot cities to the total number of the cities as the value of Treatment. And considering students are not proportionately distributed among cities, we employ a third approach, which is to set the Treatment value in proportion to the students in that pilot city who were affected by the policy, that is, the ratio of the number of senior high school entrants in this city to the total of entrants, in an attempt to make it better simulate the reality. All of the three ways are based on the province-level data. By comparing them with the city-level data whose Treatment setting is introduced in 4.1, we can get some further insight.

4 Results

4.1 Time Trend Graph

In this part we show the time trends of girls' proportions from 2018 to 2022. Based on the province-level dataset, we divide all the 31 provinces into 3 groups. In Figure 3, the blue line represents the average value of girl students' proportion in Beijing and Shanghai. The orange one shows the average of those in the 7 single-city-implemented provinces. And the gray line is the control group. We can see that in general the girls' proportions were going down in almost all kinds of provinces before 2022. And if we neglect single-city-implemented provinces for a while and only focus on the blue line and gray line, there seems to exist a negative policy impact of the Double Reduction Policy.

Figure 3



Next we turn to our city-level dataset in Henan. According to the administrative division of China, Henan province has 18 provincial prefecture-level divisions, we call them “cities” in the rest of this paper. Similar to Figure 3, we show the time trends of girl student’s proportion in Zhengzhou city and the mean time trends of the 17 controlled ones in Figure 4. Furthermore, we noticed that the numbers of students vary among cities in Henna, so we add an alternative graph as Figure 5 shows, where we employ the proportion of a city’s senior high school entrants in a year to all the entrants in the controlled cities as its weight to calculate the weighted average, offering a fairer and more accurate reflection of girls’ proportion.

Figure 4

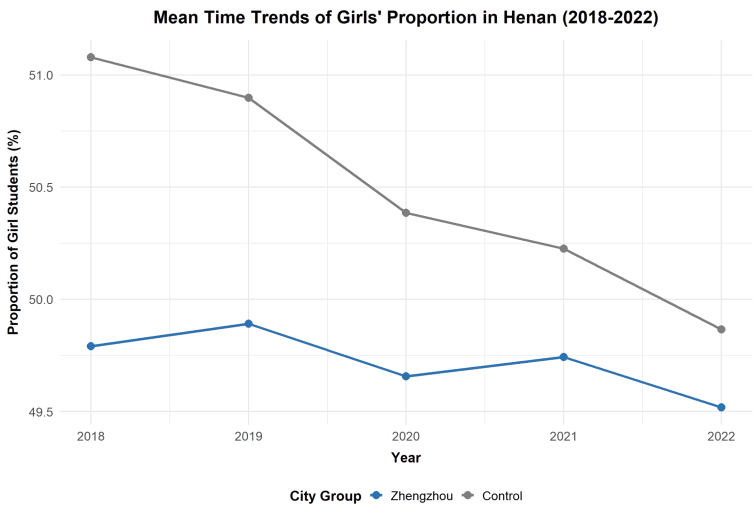
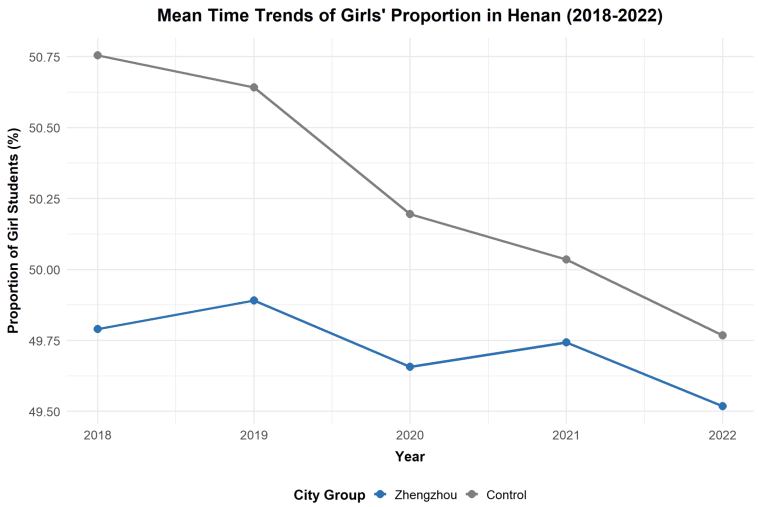


Figure 5



Unfortunately, in all the three figures shown above, the parallel trend assumption does not hold water, which undermines the validation of the policy effect. In Chapter 5 we will further discuss about several possible reasons on that.

4.2 DID Regression Results

The DID regression results are shown in Table 1.

Table 1

	(1)	(2)	(3)	(4)
PolicyAdopter	−0.357	−0.311	−0.257	−0.877
	(0.952)	(0.875)	(0.870)	(0.771)
PolicyAdopter * Post	−0.500	−0.513	−0.427	0.530
	(2.130)	(1.957)	(1.946)	(1.724)
Data Level	province-level	province-level	province-level	city-level (in Henan)
Observational Units	24	31	31	18
Observations	120	155	155	90
R^2	0.012	0.014	0.013	0.055

Column 1 to 3 is based on the province-level dataset. Using 3 approaches which estimate different aspect of the policy effect, we gain three quite approximate estimates of -0.500, -0.513, -0.427 which are all around -0.5. We can interpret the results as this: The Double Reduction Policy made

an approximately 0.5% decline in the girl student proportion in senior high school, which might lead to an inference of boys' better capacity to learn. But much to our surprise, in the city-level dataset of which results are shown in Column 4, DID estimate is positive 0.53, which means girls, on the contrary, excelled academically better than boys. And we can further conclude that even if girls' proportion in Henan went down in 2022, it should have been mainly ascribed to cities that did not implement the Double Reduction Policy in Henan, but not Zhengzhou, which was an early adopter.

5 Discussion

In our interpretation of the results, we find different data levels produce contrary conclusions, so that whether girls academically outdid boys under the double reduction policy remains uncertain. In this part, we want to further discuss on possible reasons of that. The violation of the parallel trend assumption in both dataset makes the conclusion not so valid. For instance, in Figure 3, Beijing and Shanghai had already seen a quicker decline in their girls' proportion before 2021, so we cannot assure whether the more dramatic decline in the post-policy period were caused by the time trend itself or by the implementation of the policy. The same analysis can be applied in the city-level time trends in Figure 4, for the trend of decline in the Zhengzhou's proportion of girl students per se had been slower than the average in other cities since 2018.

The reason behind might be that, as the time series data is on a yearly basis, we might wrongly attribute the outcomes to the single Double Reduction Policy. Because within a whole year, there is so much uncertainty, factors, other policies and events that collectively produce an outcome of female students' proportion in a region. As a result, it is not strange that we fail to find the parallel trends assumption satisfied. We believe that if we could use more direct data based on students' performance in a specific school, such as their monthly quiz scores, the DID results would be more effective and credible.

Bibliography

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