Contextualised Admission: Does Province-Based Quota Policy Improve Geographical HE Equity in China?

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HE geographical equity is a significant societal problem in China. As the primary admission policy, Province-based Quota Policy has been implemented to ameliorate geographical disparity in HE admission. However, the contribution of this improvement is controversial. In order to evaluate this melioration, this study conducted a secondary data analysis of the latest admissions of all regular Higher Education Institutions (hereafter, HEIs) and HEIs in the World Double-First project in China through three indexes. The study found that provincial disparities in HE admission exist. Both regular HEIs and prestigious HEIs show more preferences to students from well-developed provinces, while less places in HE are prepared for those from inland, remote and under-developed provinces. The implications of this study for future policy making and implementation should be more balanced quota distributions and more educational investment in disadvantaged areas.

Keywords: Province-based Quota Policy; HE equity; geographical disparity; China

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Introduction

As the primary policy in HE admission in contemporary China, the Province-based Quota Policy (hereafter, PQP) is significant and well-known. Regarding each province (here, the term "province" includes provinces, municipalities and autonomous regions) as an admission unit, PQP distributes conventional admission quotas mainly set by government to these units (Tam & Jiang, 2015). This artificial distribution began with the intention to increase HE participation for students from remote provinces that are more likely to be deficient in economic, social and cultural capitals, which might associate with the lack of educational and other resources. Students, with less resources, from these poor areas might find it tougher to gain as good educational outcomes as their counterparts living in well-developed provinces. Then, due to meritocracy, HEIs, especially elite ones, tend to accept students with more outstanding performances, who often come from the latter. Therefore, in order to improve HE participation of the former group, PQP allocates imperative admission quotas to under-developed provinces and students there might receive HE with lower entry requirements.

In this way, PQP could be viewed as a kind of contextualised admission policy. Contextualised admission means to use contextual data to identify disadvantaged students and to take this information into account during admission decision-making (Gorard, 2018). PQP, based on the indicator of hometown provinces, adjusts HE enrolment quotas to help students in poor provinces get access to HE. However, despite its equity-orientation, PQP has been questioned about its actual contributions. Some scholars even claim that PQP gives preference to students from well-developed provinces (Ling, 2017) and has exacerbated the geographical HE inequality (Zhang, 2015).

Therefore, this study intends to explore: does PQP actually improve geographical HE equity? The primary methodology is secondary data analysis by introducing three different indexes. The following section discusses relevant previous studies; then the data collection and methods used in the study will be explained, finally followed by the results and conclusions.

Review of Previous Studies

Evaluations of PQP are quite extensive. Although some scholars argued for the fairness of contextualised quota allocation (Cai, 2005), many researchers criticised PQP and questioned its efficacy in rectifying the imbalanced distribution of educational resources and opportunities in China. For instance, Jacob (2006) conducted a cross-sectional survey in 10 universities and concluded that geographical and urban disparities were an impenetrable barrier to HE equity in China. In their small-scale review of studies, Sun and Barrientos (2009) also disclosed the preferences of HE admission to provinces in the east of China with richer resources after the decentralisation of HE funding. More recently, Ma (2012), Liu (2015) and Liu (2015) calculated the Admission Rate Index (hereafter, ARI) in provinces and, after comparing, confirmed a remarkable geographical disparity in HE enrolment. They highlighted the privileges of most eastern provinces.

Apart from ARI, some scholars introduced some economic indexes in their studies. Liu (2007) evaluated PQP through ARI, the Theil Indicator and the Gini Coefficient and concluded that 1) despite the improvement of HE equity in the east and middle of China until 2006, the polarisation of HE admission between municipalities and western provinces was still serious; 2) despite the amelioration of disparities between districts, the gaps in HE admission among provinces within the same districts continued to increase. These findings were partly echoed by Wang & Du (2013). They, employing the Wilson Coefficient and the Theil Indicator, argued that Shanghai, Beijing and Tianjin were highly privileged than other provinces, and that Jiangsu, Ningxia, Qinghai and Gansu were comparatively advantaged, while some provinces, including Henan and Hubei, were lagging behind in the HE admission.

The geographical gaps were even larger in the competition for more prestigious universities. Xie (2014) compared the admission proportions of first-tier HEIs from some provinces from 2010 to 2012 and found that Beijing always presented the highest proportions, with 20.1%, 27% and 25.5% respectively, almost five times higher than those from the bottom province. Yang & Wang (2020) also pointed out that there were 3 in every 100 students from Beijing entering first-tier HEIs, while the number was 0.4 from Henan, Guangxi, Jiangsu and Shandong.

The more selective HEIs are, the more considerable provincial disparities are. According to Pan et al. (2010) and Hamnett et al. (2019), HEIs affiliated under the Ministry of Education

(MOE) and top nine HEIs preferred students from well-resourced regions such as Beijing, Tianjin and Shanghai. Wu & Zhang (2010) also found an unequal distribution of admission to Peking University in 2004, as it allocated 308, 94, and 94 out of 1748 places to Beijing (60,000 candidates), Jiangsu (400,000 candidates) and Zhejiang (300,000 candidates) respectively. This inequality even existed in 2009 (Lu, 2019).

Peking University is not an exception. According to Xinhua News Agency (Chen & Li, 2006), Fudan University, Zhejiang University, Wuhan University and Nankai University distributed their quotas in a highly localised manner. Additionally, Ding (2011) criticised the unequal opportunities of getting access to Jilin University for students from Jilin, Henan, Jiangsu and Gansu. The local students enjoyed 4.5, 9.89 and 18.47 times higher entry probability than students from the other three provinces respectively.

To conclude, it seems clear that PQP is unsatisfactory in improving HE geographical equity, because the quotas allocated by PQP give preference to some areas, such as Beijing, Tianjin, Shanghai, Jiangsu and Zhejiang, but were very limited in Henan, Guizhou, Shaanxi and Yunnan. However, there are some limitations in the previous studies. First, most of these studies are somewhat outdated, and show the picture over a decade ago. Moreover, many of them only used several examples of HEIs/provinces instead of taking a nationwide view. Second, the utilization of ARI is somewhat problematic. ARI is popularly used to evaluate HE equity, but it actually ignores the wider population, including the totality of enrollees and applicants. It would be far from accurate to use ARI only. Third, many of these studies, problematically, viewed NCEE candidates as the eligible group for HE, which actually excluded an important tranche of potential HE participants who had been weeded out in the previous selective examination much earlier than NCEE. Some researchers have been aware of this issue and have taken into account the number of primary or middle school graduates (Liu, 2007; Wang & Du, 2013). However, there is still an assumption of no migration after completing primary and middle school, an arbitrary assumption which might skew the findings.

Thus, this study aims to collect the latest admission data of elite HEIs and all regular HEIs in every province from 2016 to 2019, and then, in addition to ARI, introduces the more accurate Gorard Segregation Index into the analysis. Finally, in order to take earlier education leavers into account, the Admission Opportunity Index is used.

Data Collection

The whole data collection has three main parts. The first part is collecting the provincial admission quotas of prestigious HEIs, here, referring to the 42 HEIs in the World Double-First Project (hereafter, WDF) in 2016, 2017, 2018 and 2019. Unfortunately, as not every HEIs published their provincial admission quota plans on the website, only quota plans from 22 WDF HEIs in 2016, 25 WDF HEIs in 2017, 31 WDF HEIs in 2018 and 34 WDF HEIs in 2019 have been collected (See Appendix 1). Another term that might need more explanation is "provincial quota plan". The admission quota plans here, as an appurtenance of PQP, only count students who take the National College Entrance Examination (hereafter, NCEE) and generally exclude those entering HE without taking the examination (Baosong) or with ten to twenty bonus scores due to outstanding talents, or those enjoying some compensatory credits in their NCEE scores through contextualised admission policies because of being disadvantaged. These students are admitted by HEIs without occupying any quotas, according to the stipulation.

The second part of the data collection is the numbers of NCEE candidates and enrollees of all regular HEIs in each province. Regular HEIs refer to those which are qualified to provide degree programmes to their applicants, including the highly selective WDF HEIs and also the lower-level four-year universities. However, they do not cover independent colleges, adult colleges or vocational colleges.

The number of NCEE candidates and that of student intakes in regular HEIs have been published in the official websites of provincial government, provincial educational departments and Sina Education. Despite the intention to collect data from all 31 provinces, however, the collection was only completed for 17, 13, 24 and 20 provinces in 2016, 2017, 2018 and 2019 respectively (See Appendix 2).

Thirdly, in order to analyse HE admission opportunity, enrolment rates and completion rates of primary schools, middle schools and high schools in each province have been collected from the website of MOE. HE admission opportunity here means the probability of 18-year-old teenagers, the common age group for HE entry in China, receiving HE. Due to the limited information on the size of the 18-age population, this study explores the intakes and accomplishments at every level of education to grasp progression rates in every educational transition as fully as possible.

Method

There are three main indexes used to evaluate the equality of PQP in this study. They are the Admission Rate Index, the Gorard Segregation Index (hereafter, GS Index) and the Admission Opportunity Index (hereafter, AOI). ARI is a widely-accepted index when evaluating educational equality, especially for making comparisons among different subgroups. The formula to calculate ARI is as follows:

$$ARi = Ai/Ci$$

Where:

ARi is the admission rate from province i;

Ai is the numbers of enrollees (in WDF HEIs or regular HEIs) from province i;

Ci is the numbers of NCEE candidates from province i.

Although ARI is commonly used in previous studies and is easily understandable, it is problematic due to the lack of information it gives about the whole population. Therefore, a more robust index is required. For this purpose, the GS Index is utilised (Gorard & See, 2013). The GS Index can clearly indicate the segregated level and disclose how potentially disadvantaged students or groups from some regions are under-represented in HE admission, and how their counterparts from privileged provinces (if there are any) are over-represented (ibid). The calculation formula is:

$$GS=0.5*(\sum|Ai/A - Ci/C|)$$

Where:

Ai is the number of students in the admission quota plans of WDF HEIs/admitted by regular HEIs in province i;

A is the total number of students in the admission quota plan of WDF HEIs/admitted by regular HEIs in China;

Ci is the number of NCEE candidates in province i;

C is the total number of NCEE candidates in China.

An additional explanation needs to be made here: because this study intends to make it clear whether students from some regions are over-represented or under-represented in targeted

HEIs, the absolute mark has been omitted during the calculation. If the segregation index is zero, that means there is no segregation for students from this region in this HEI. However, where there is a positively segregated trend or a negatively segregated trend, it refers to the over-representation or under-representation respectively of students from a particular region.

The third index used in this study is AOI. In China, selective meritocracy begins when pupils compete for a place at high school after finishing compulsory education, much earlier than HE. Therefore, disadvantaged subgroups might leave education before high school, or even before compulsory education is completed, although they might otherwise have been eligible for admission. If these early school leavers are not taken into account, the results might be biased through missing a much more disadvantaged group than the pupils who failed in the HE competition: young people who did not even become competitors for HE. In order to build a more complete picture of disadvantage, AOI is introduced in this study and the formula for this index is:

$$AOIi=ARUi*ARHi*CRHi*ARMi*CRMi*ARPi*CRPi$$

Where:

AOIi is the admission opportunity of students from province i;

ARUi is the admission rates of HEIs from province i;

ARHi/CRHi is the admission/completion rates of high schools from province i;

ARMi/CRMi is the admission/completion rates of middle schools from province i;

ARPi/CRPi is the admission/completion rates of primary schools from province i.

Results

Admission Rate Index

In this section, the ARI not only of all regular HEIs but also of prestigious HEIs in the WDF project in each province in mainland China will be compared.

Based on the calculation, the results of ARI are displayed in the column charts below. Figures 1 to 4 present the proportions of students from different provinces admitted to all regular HEIs from 2016 to 2019. The columns in the figures refer to the admission proportions of regular HEIs from corresponding provinces, while the red line means the average of admission ratios.

According to these figures, despite the deficiency of data, the following provinces were always outstanding in the HE enrolment competition whenever they appear in the charts: Beijing (advantaged in 2016, 2017, 2018 and 2019), Fujian (advantaged in 2016, 2018 and 2019), Hainan (advantaged in 2016), Jiangsu (advantaged in 2017, 2018 and 2019), Tianjin (advantaged in 2018 and 2019), Liaoning (advantaged in 2018), Heilongjiang (advantaged in 2018 and 2019) and Shanghai (advantaged in 2019).

On the other hand, these graphs reveal equity problems. Some provinces, in contrast to their more privileged counterparts, suffered from fierce competition in regular HEIs enrolment for a long time. Jiangxi, Henan, Hunan and Guangdong, for instance, were disadvantaged throughout the four years. Anhui, Gansu and Guangxi also show below average admission proportions for three years. Although the data from these provinces has only been collected for one or two years, Sichuan, Yunnan and Qinghai never surpassed the average.

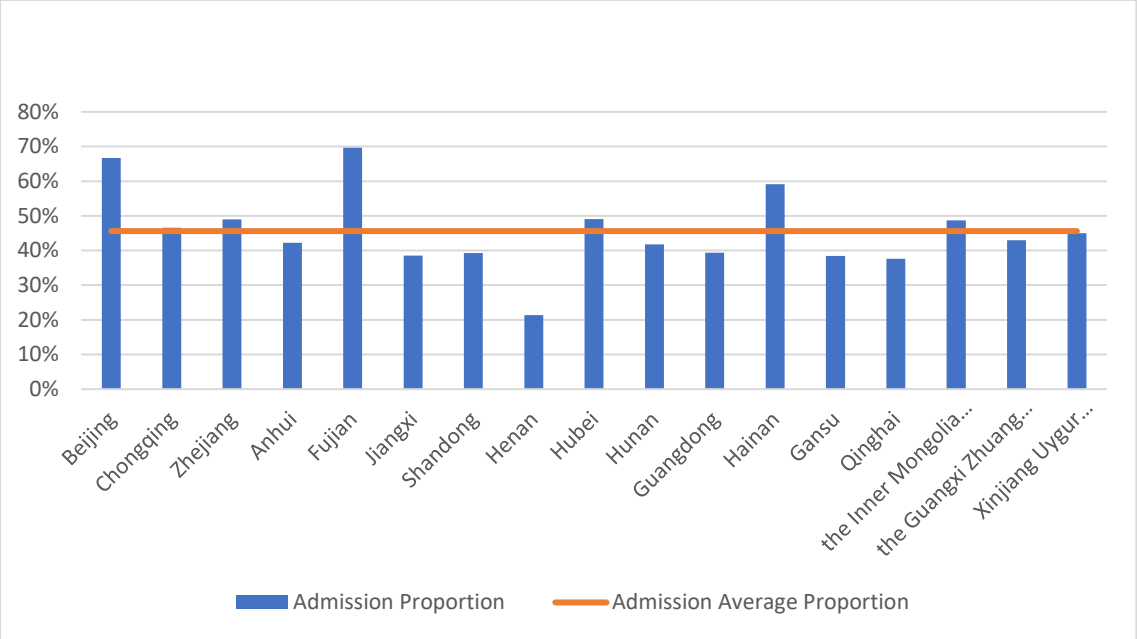
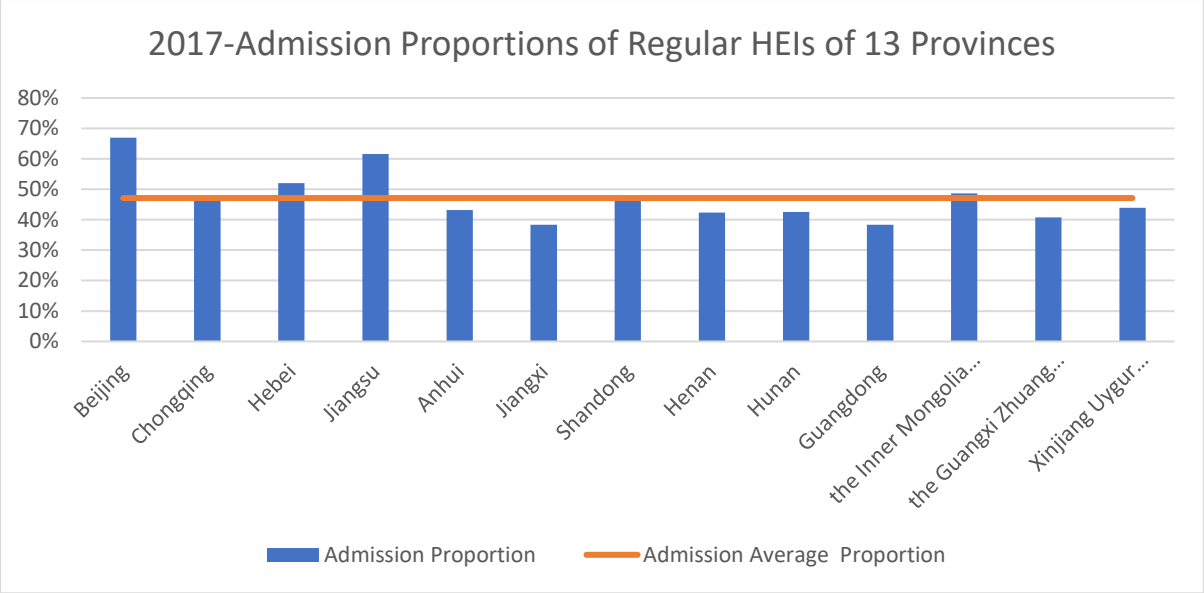


Figure 1



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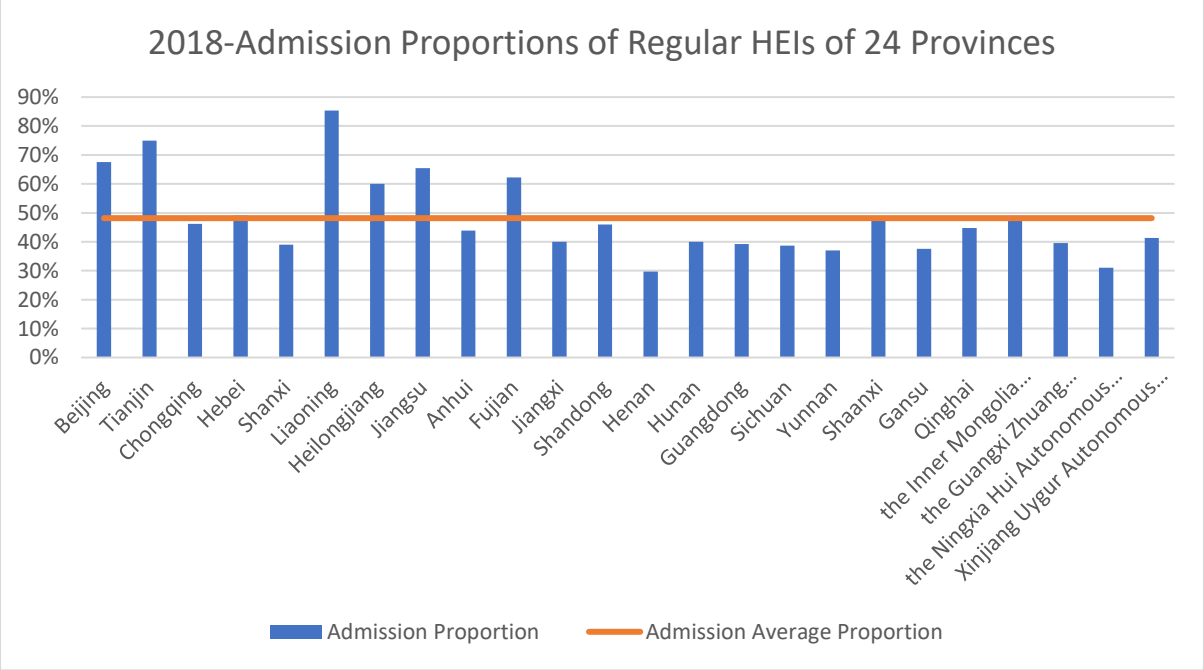

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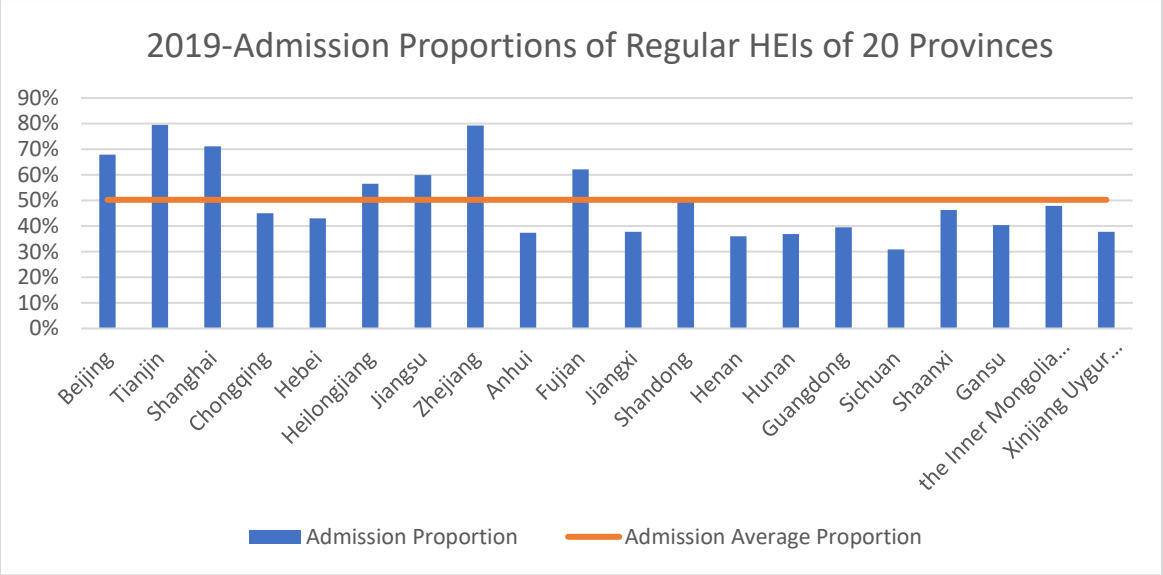


Figure 4

Figures 5 to 8 describe the admission rates of WDF HEIs from the various provinces. From these figures, firstly, it is easy to confirm the privilege of Beijing, Tianjin and Shanghai in elite HEI enrolment, which somewhat echoes the findings of Zhang and Li (2019). They called these three municipalities "absolutely superior regions in elite HEIs enrolment" due to their consistently advantaged position. Beijing, Tianjin and Shanghai are rich in economic and educational resources and it is very likely for students from these municipalities to become beneficiaries of reproduction. In addition, the admission proportions of WDF HEIs from Jilin were also high and sometimes even exceeded those from traditionally privilege-labelled municipalities. This might mainly be attributed to The fact that Jilin University not only planned to accept huge student intakes in the studied four years, but allocated many of these places to students from Jilin. This could account for the admission rates of students from Jilin being much higher than the average.

Secondly, there are some other relatively superior provinces with obscurer advantages such as Hainan, Fujian, Liaoning, Chongqing and Qinghai. The ARI of WDF HEIs in them surpassed the line, which refers to the average.

Thirdly, on the contrary, some provinces are continuously in a lagging position in the intakes of WDF HEIs. For example, Hebei, Zhejiang, Anhui, Jiangxi and Hunan all showed subaverage enrolment rates in elite HEIs. Furthermore, the most disadvantaged areas are in the west of China, which include Sichuan, Guizhou, Yunnan, Gansu, Inner Mongolia, Guangxi, Tibet and

Xinjiang. The admission proportions of all provinces mentioned above were lower than the average.

However, caution is needed in drawing conclusions based on these findings. As the data of WDF HEIs are not complete, the missing data in some HEIs/provinces/years might lead to biases. Xinjiang, for example, remained at a disadvantaged position in WDF HEI enrolment, but this might result from the lack of data on Xinjiang University, a university in the WDF group located in Xinjiang. Due to the localised admission quota distribution, the absence of Xinjiang University might miss a large group of students from Xinjiang who were enrolled in prestigious HEIs.

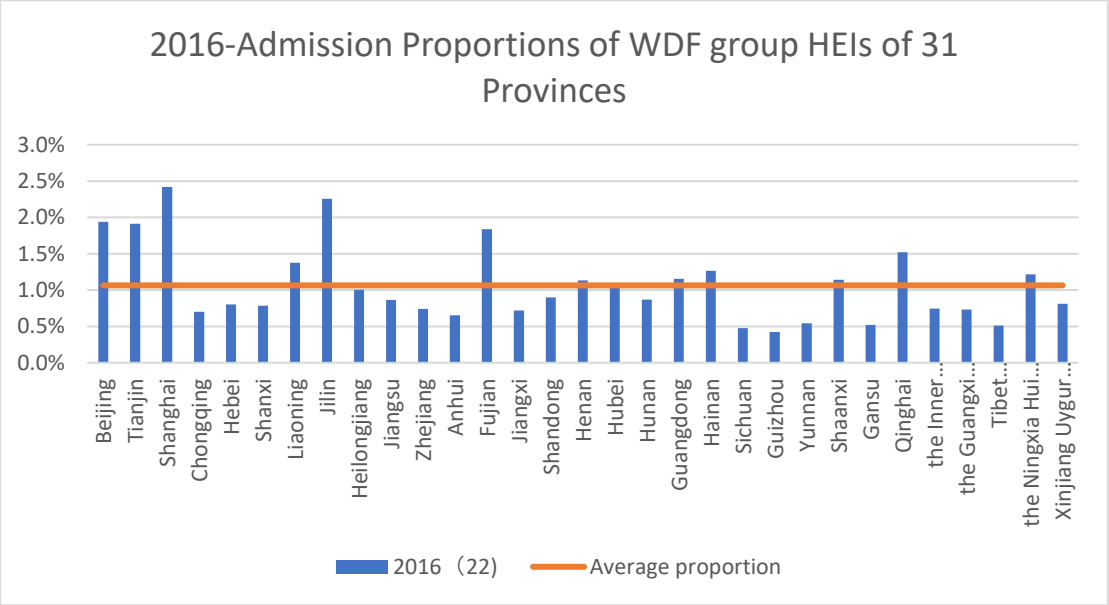
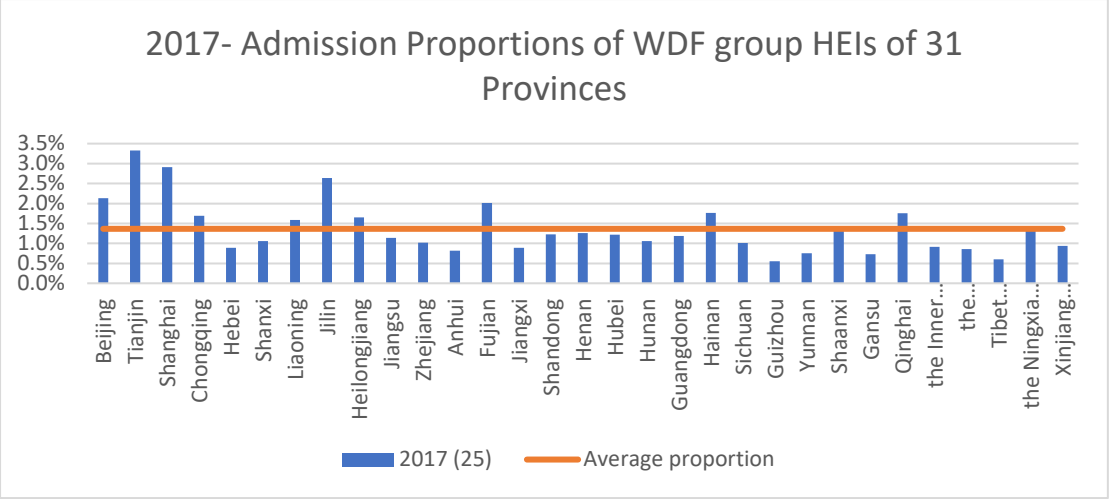


Figure 5



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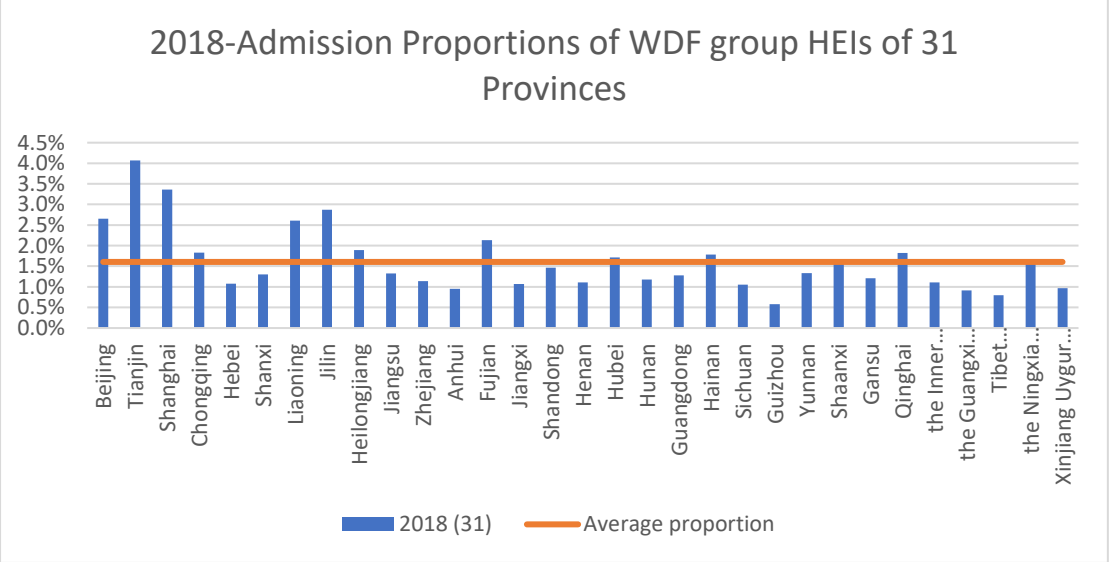


Figure 7

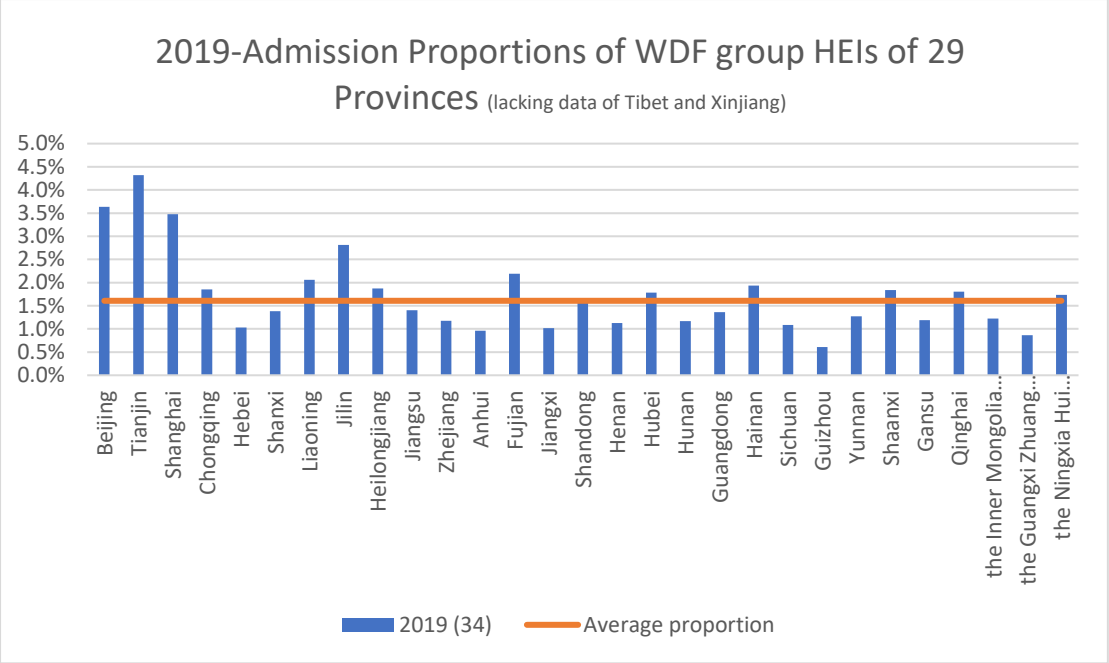


Figure 8

Gorard Segregation Index

Because of the limitations of ARI, a more accurate evaluating index is required. The GS Index, therefore, is applied in the analysis of this section. The columns in Figures 9 to 12 show the provincial segregation indices of enrolment in regular HEIs. They draw a slightly different picture from the previous analysis. First, students from Beijing, Tianjin and Shanghai were not in the most favoured group anymore. The segregation indices in these areas were only a little higher than the zero line in all four years. Instead, students from Jiangsu, Zhejiang and Fujian were the most over-represented in regular HEI admissions, followed by Beijing, Tianjin, Shanghai, Liaoning, Heilongjiang, Shandong, Inner Mongolia, Chongqing and Shaanxi.

In contrast, the inclusion of disadvantaged group repeats the previous findings. Henan, for instance, shows extremely under-represented indices from 2016 to 2019 in the figures below. Guangdong and Sichuan then follow as the second and the third most under-represented. In addition, other provinces, including Jiangxi, Hunan, Gansu, Yunnan, Hebei and Xinjiang also show negative segregation indices.

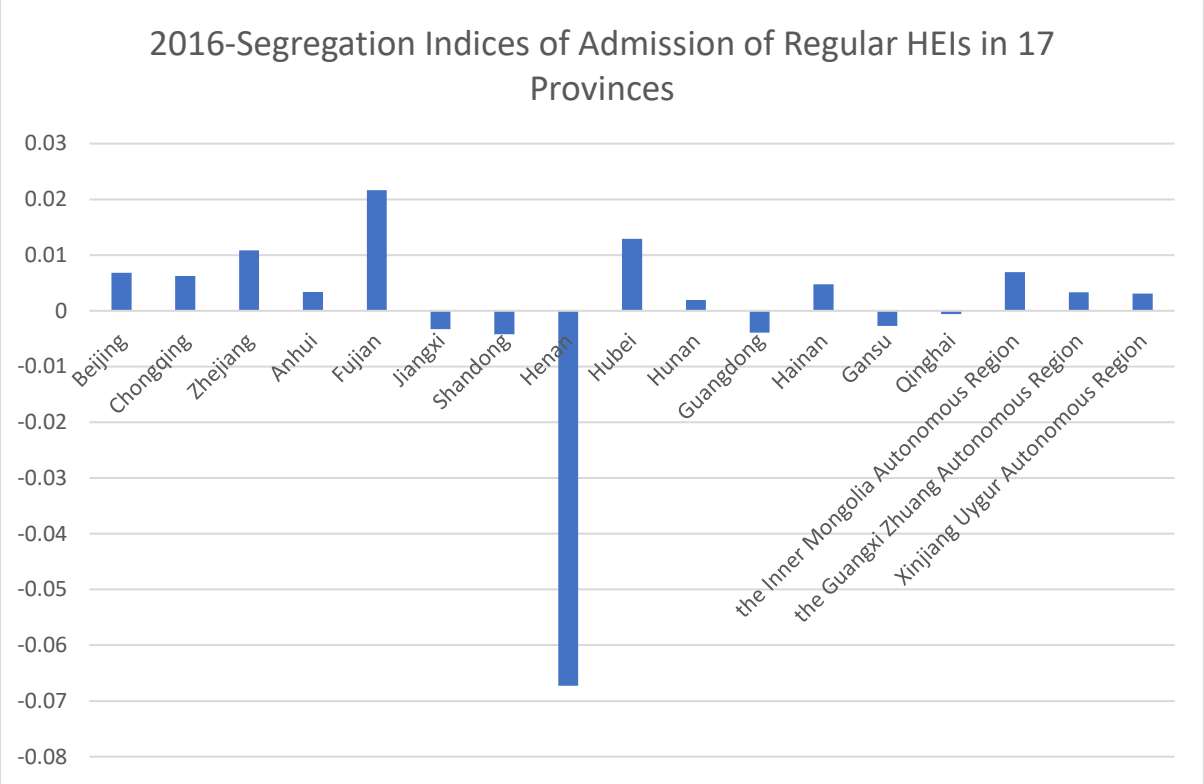


Figure 9

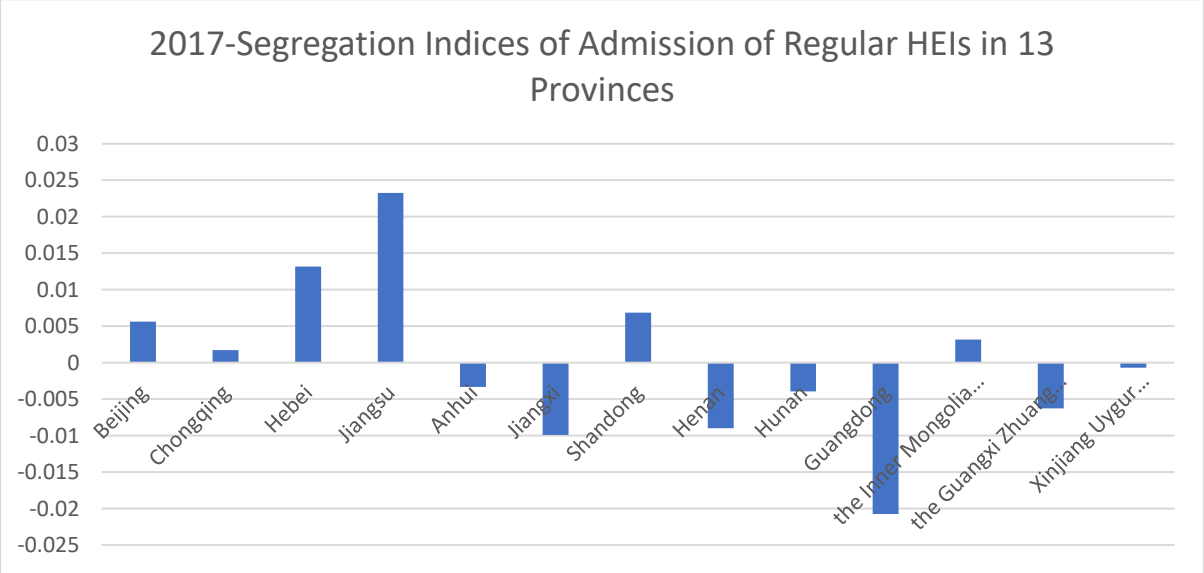


Figure 10

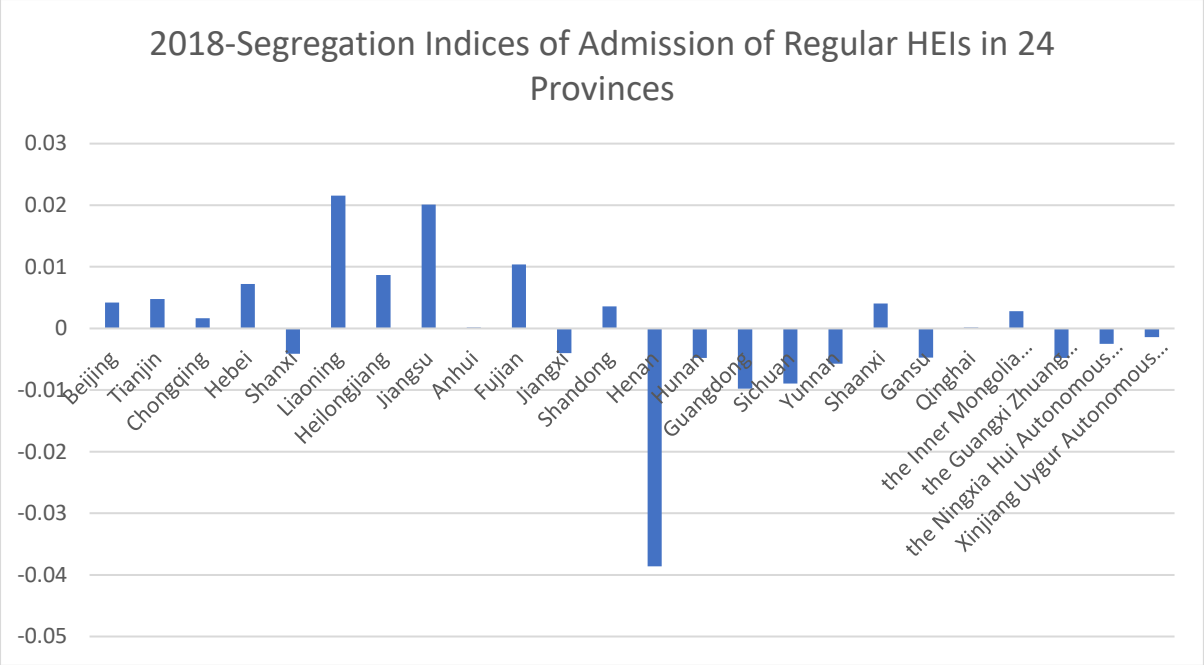


Figure 11

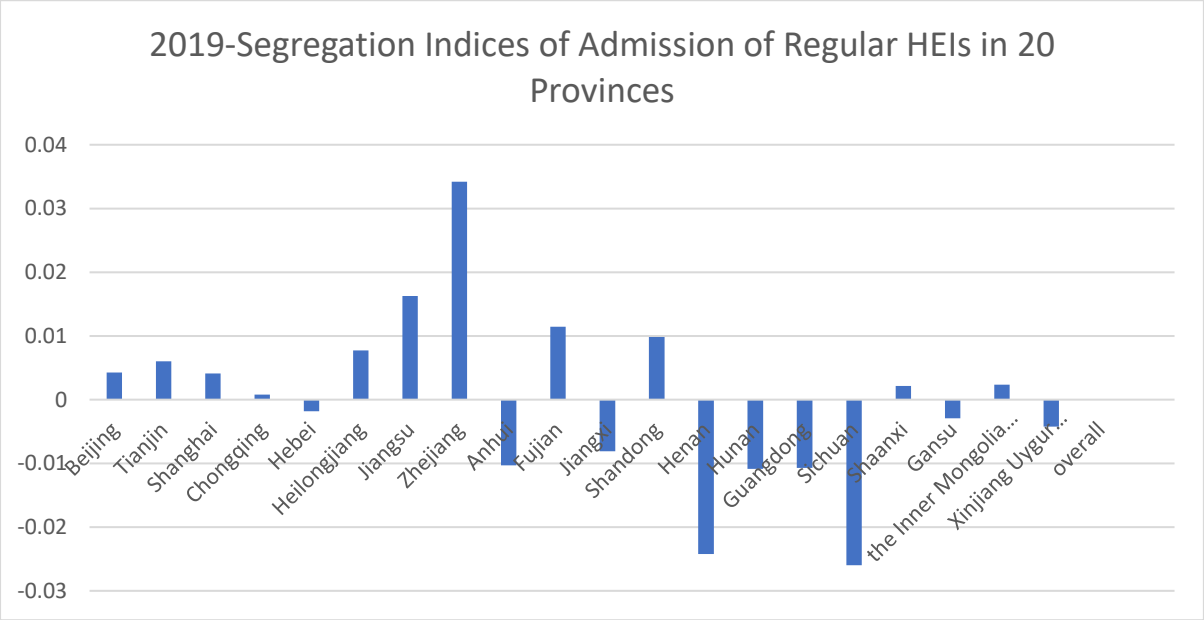


Figure 12

Figures 13 to 17 show the GS Index of Admission of WDF HEIs in provinces throughout the four years. In order to make them easier to understand, the results have been separately presented in five figures according to different locations. From Figure 13, it can be clearly seen

that the segregation indices in all municipalities were positive, which means that students from municipalities were over-represented in WDF HEIs. Chongqing has presented the highest indices since 2017, with nearly 0.4, followed by Shanghai, Tianjin and Beijing.

In Figure 14, most provinces in the north and east of China were advantaged, especially Jilin and Fujian. Two exceptions were Zhejiang and Hebei, which always remained in a disadvantaged position. The reason for the under-representation of Zhejiang might be the deficiency of quota plans from Zhejiang University. Jiangsu displayed an under-representation in 2016 and 2017 and then increased over the zero-line, while Guangdong showed the opposite trend.

Figure 15 demonstrates the GS Index in the middle of China. Except for Hubei, other provinces were disadvantaged in selective HEI enrolment and the worst cases were Anhui, Henan and Jiangxi. Moreover, Henan deserves more attention, as its indices were positive in 2016 and 2017 then decreased sharply to be negative. This might be because there were many missing WDF HEIs in the first two years, while the data from Zhengzhou University, a WDF university located in Henan, were complete, which increased the representation of students from Henan due to localised admission.

The last two figures involve the most disadvantaged areas. Students from provinces in the west of China listed in Figure 16 were seriously under-represented in the WDF HEIs with extremely low GS indices. In addition, according to Figure 17, only in Ningxia have segregation indices kept positive, while those in the other four Ethnic Autonomous Regions were all negative, especially Guangxi, where the indices were the lowest and have kept declining.

To sum up, the analysis by GS Index does not completely overturn the conclusions drawn in the last section. Students from municipalities and eastern provinces remained in the advantaged position, while their counterparts in the inland areas were always under-represented throughout the four years. Changes only occasionally occur within each group. For example, Jilin showed prominent GS indices in elite HEI admission but not in all regular HEI admission from 2016 to 2019.

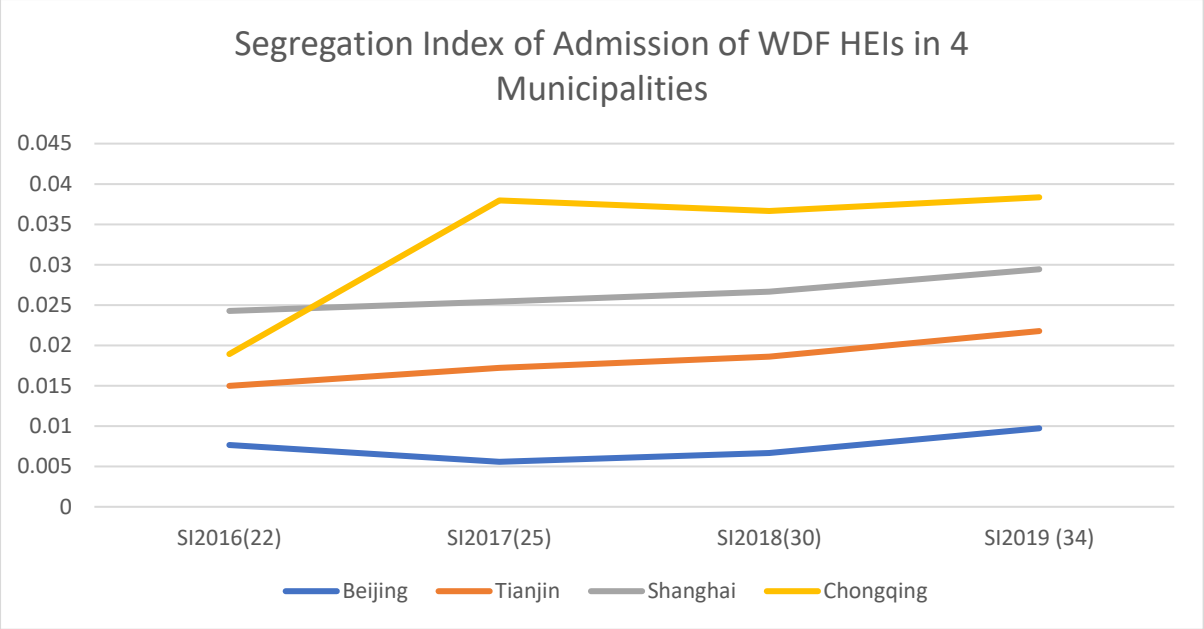
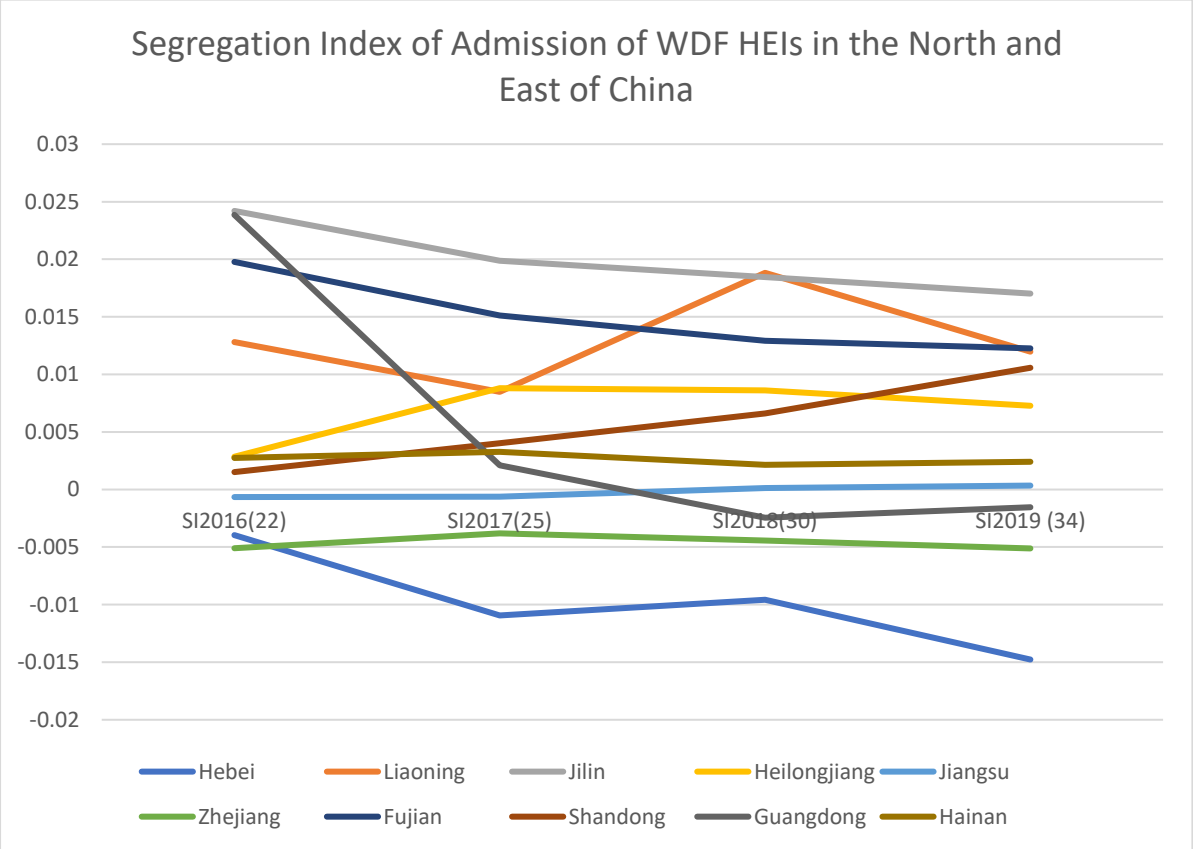


Figure 13



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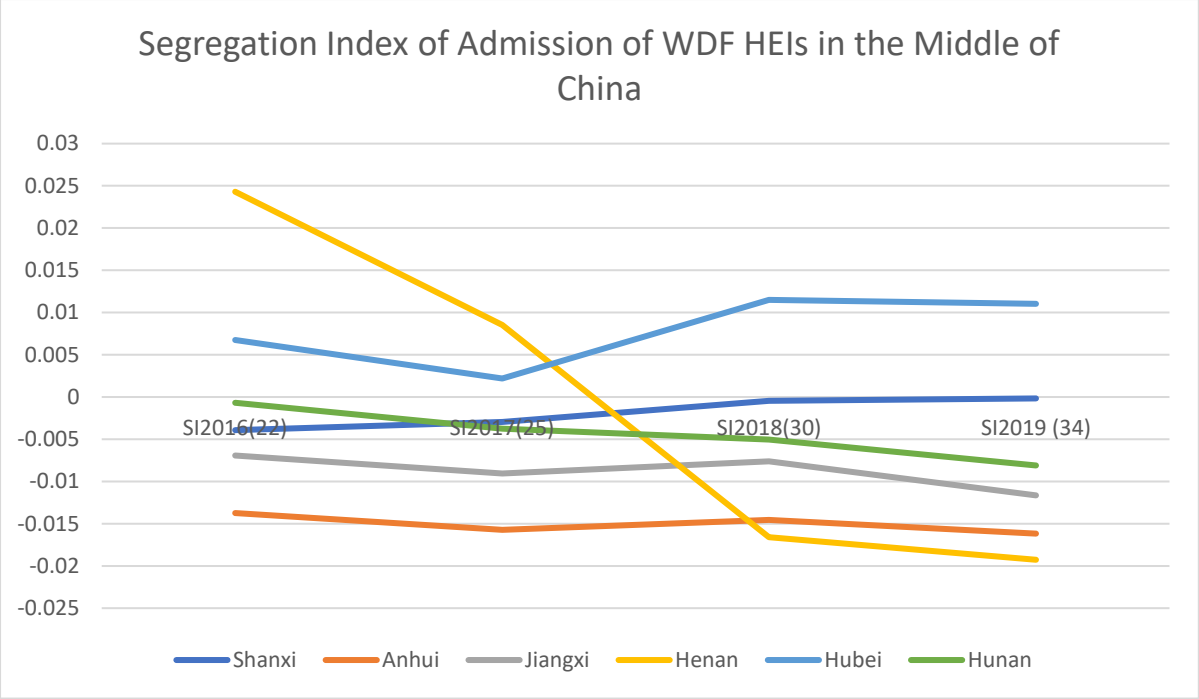

Figure 15

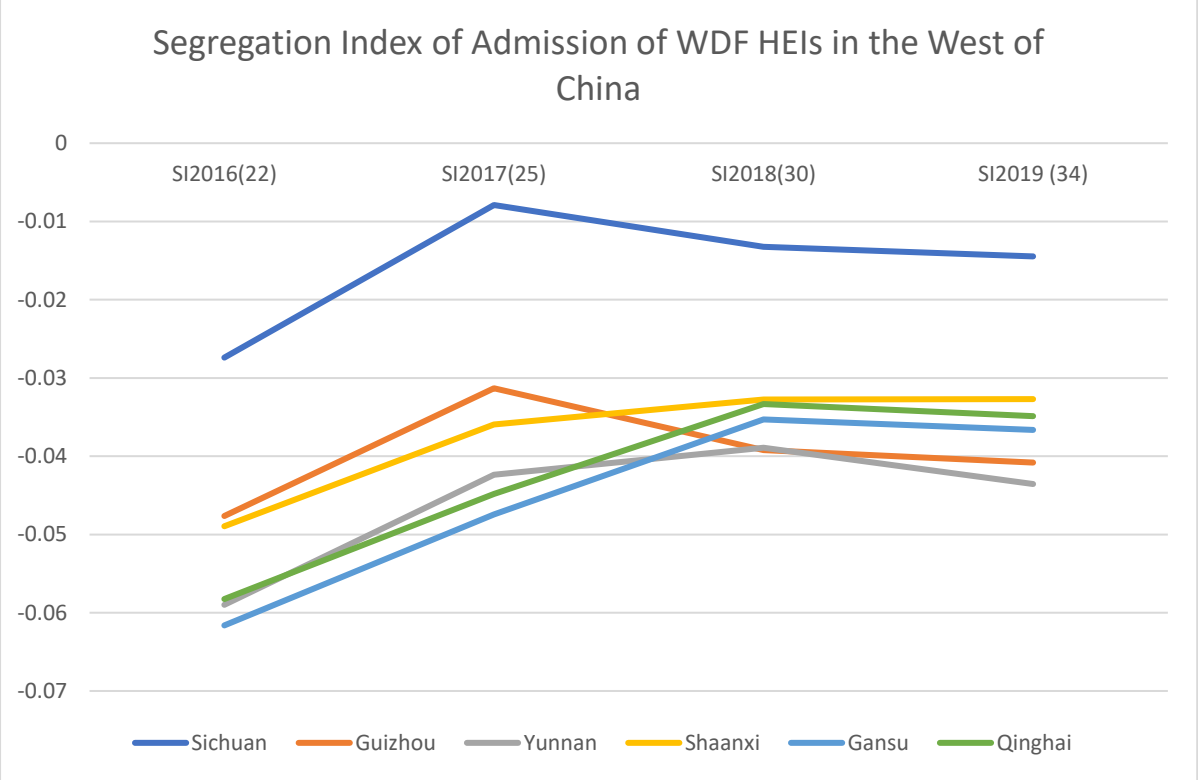

Figure 16

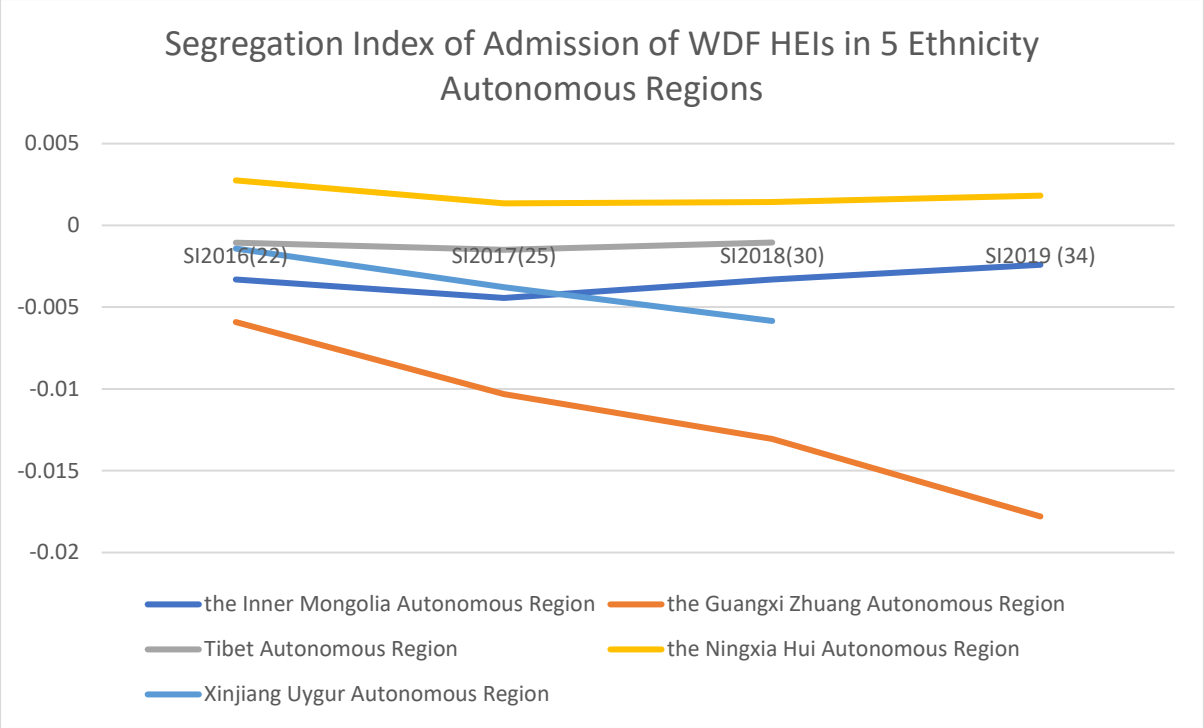

Figure 17

Admission Opportunity Index

Because of the potential biases of calculations that exclude early school leavers in the last two sections, this section introduces AOI to remedy this shortcoming. AOI intends to infer how likely a person in a particular province is to complete the educational journey from primary school to HE, instead of only focusing on how likely a person already in the semi-finals is to win the final game. After all, selective meritocracy, partly reflected as test-orientation, begins at the end of middle schools or even earlier, rather than at NCEE.

According to Figures 18 to 20, Beijing, Tianjin and Liaoning were notable winners. Most of the AOI displayed in these three areas were over 40%, specifically 46.79%, 47.21% and 31.32% in Beijing in 2017, 2018 and 2019 respectively; 48.71% and 49.83% in Tianjin in 2018 and 2019 respectively; and 45.25% in Liaoning in 2018. The second most advantaged group includes Shanghai, Jiangsu, Zhejiang, Fujian and Heilongjiang, with AOI higher than 30%.

All provinces above in the privileged groups are in the east of China, areas rich in not only economic capitals but cultural capitals. Students from these provinces might be more likely to be born in an affluent family, to receive higher-quality compulsory education and to win a place in HE.

On the contrary, however, many provinces in the middle and west of China suffer from much lower AOI throughout these three years. For example, Ningxia (13.4% in 2018), Yunnan (12.08 in 2018), Guangxi (15.48% in 2017, 14.87% in 2018), Sichuan (15.63% in 2018, 13.25% in 2019) and Gansu (15.53% in 2018, 19.49% in 2019) all belong to the west of China. Similar disadvantages could be seen in the middle of China including Anhui, Jiangxi, Henan, Shanxi and Hunan. Students in these under-developed provinces have to cope with a more competitive selective meritocracy. Less of them could successfully pass the preliminary contest compared to their counterparts in the east.

Moreover, there is a notable exception: Guangdong, one of the most economically-developed provinces in the east of China, also displayed a lag-behind AOI with 15.74% in 2017, 16.23% in 2018 and 17.2% in 2019. The reason might be the large numbers of migrant children. These migrant children came to Guangdong with their working parents and received compulsory education there. But they have to go back to their Hukou locality to receive high school education, otherwise they would not be qualified to take the NCEE. This might generate a sharp decrease in high school intakes in Guangdong and then a further decrease in HE AOI.

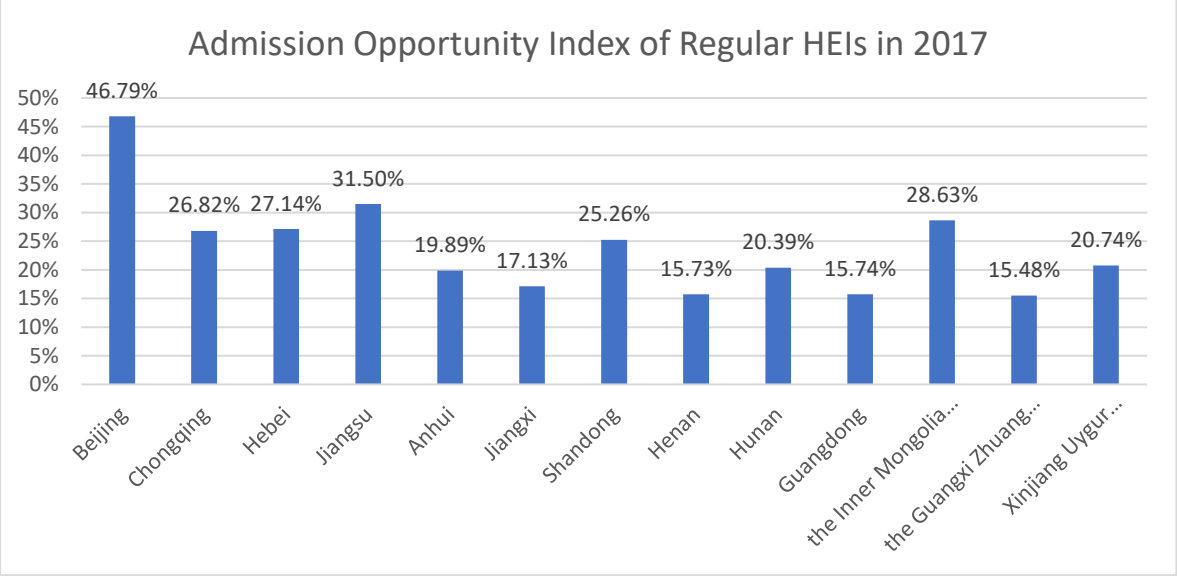

Figure 18

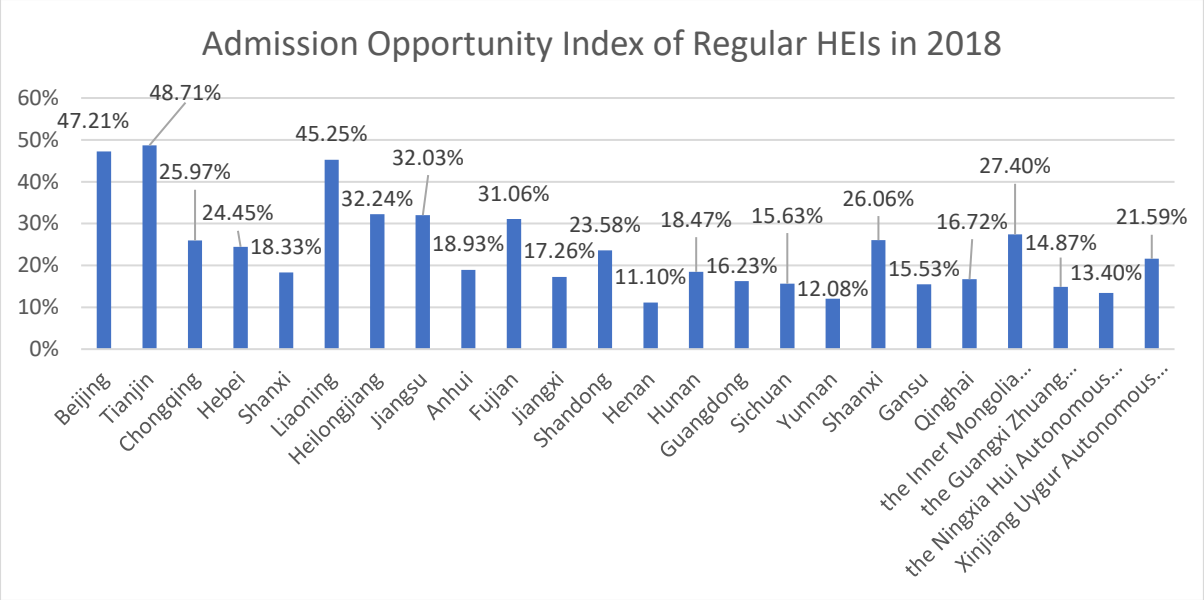

Figure 19

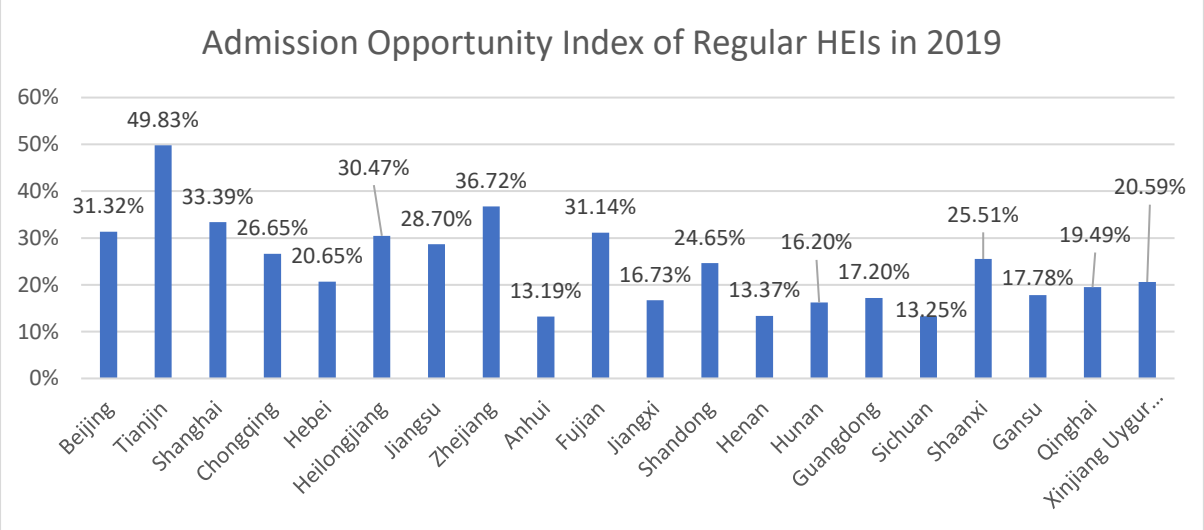

Figure 20

Conclusion

In conclusion, despite the intention to improve HE geographical equity, PQP does show some biases in its implementation. First, according to the widely-used ARI, Beijing, Tianjin, Shanghai, Hainan, Fujian and Liaoning were advantaged in both regular HEI and WDF HEI enrolment. Jiangsu and Jilin showed high admission rates in regular HEI enrolment and WDF HEI enrolment respectively. Conversely, provinces in the middle of China, such as Jiangxi, and those in the west of China, such as Guizhou, were always in a disadvantaged position.

Second, using the GS Index, a more accurate index, the results remained analogous. Students from four municipalities and provinces in the east of China often displayed an over-representation, while those from provinces in the middle of China, such as Henan and Jiangxi, and in the west of China, including Sichuan and the Ethnic Minority Autonomous Regions, were more likely to be under-represented in both regular HEIs and prestigious HEIs. Third, taking selective processes earlier in the educational journey into consideration, when AOI was used, municipalities and eastern provinces belonged to the advantaged group while provinces in the middle and west lagged behind in HE admission.

Therefore, in order to improve HE equity, it is of importance for government to deal with these geographical disparities. Adjustments to the quota allocation might be required at first. In addition, more educational funding and resources should be invested in remote areas to help them improve the quality of education.

There are some limitations to this study. First, the collected admission quota of WDF HEIs is just a plan. Although Chinese HEIs are highly political and administrated by government, it is still not tenable to assume that there is no difference in student intakes between plan and reality. Unfortunately, it is hard to obtain the real data. If a more open and transparent HE admission dataset could be established, future studies might benefit significantly. Second, this study only focuses on the enrollees of HE, which might create a unilateral picture. It is necessary to take their counterparts who miss HE into account to gain a more complete view. Furthermore, this study only evaluates whether PQP ameliorates geographical disparity in HE enrolment, without discussing whether the indicator for disadvantage used in PQP is valid. In fact, viewing living provinces as indicators risks falling into an ecological fallacy. These points will be discussed in detail in the author's thesis and more accurate, reliable and accessible individual-level indicators for disadvantage will be explored.

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Appendix 1

2016	2017	2018	2019
Xiamen Uni	Xiamen Uni	Xiamen Uni	Xiamen Uni
Zhongnan Uni	Zhongnan Uni	Zhongnan Uni	Zhongnan Uni
Zhongshan Uni	Zhongshan Uni	Zhongshan Uni	Zhongshan Uni
Wuhan Uni	Wuhan Uni	Wuhan Uni	Wuhan Uni
Southeast Uni	Southeast Uni	Southeast Uni	Southeast Uni
Tongji Uni	Tongji Uni	Tongji Uni	Tongji Uni
Shandong Uni	Shandong Uni	Shandong Uni	Shandong Uni
Shanghai Jiaotong Uni	Shanghai Jiaotong Uni	Shanghai Jiaotong Uni	Shanghai Jiaotong Uni
South China Uni of Technology	South China Uni of Technology	South China Uni of Technology	South China Uni of Technology
Jilin Uni	Jilin Uni	Jilin Uni	Jilin Uni
East China Normal Uni	East China Normal Uni	East China Normal Uni	East China Normal Uni
Hunan Uni	Hunan Uni	Hunan Uni	Hunan Uni
Uni of Science and Technology of China	Uni of Science and Technology of China	Uni of Science and Technology of China	Uni of Science and Technology of China
Ocean Uni of China	Ocean Uni of China	Ocean Uni of China	Ocean Uni of China
Beijing Normal Uni	Beijing Normal Uni	Beijing Normal Uni	Beijing Normal Uni
Northeastern Uni	Northeastern Uni	Northeastern Uni	Northeastern Uni
Beijing Institution of Technology	Beijing Institution of Technology	Beijing Institution of Technology	Beijing Institution of Technology
Northwest A & F Uni	Northwest A & F Uni	Northwest A & F Uni	Northwest A & F Uni
Zhengzhou Uni	Zhengzhou Uni	Zhengzhou Uni	Zhengzhou Uni
Dalian Uni of Technology		Dalian Uni of Technology	Dalian Uni of Technology

2016	2017	2018	2019
Northwestern polytechnical Uni			Northwestern polytechnical Uni
Peking Uni			
	Fudan Uni	Fudan Uni	Fudan Uni
	Sichuan Uni	Sichuan Uni	Sichuan Uni
	Nankai Uni	Nankai Uni	Nankai Uni
	Chongqing Uni	Chongqing Uni	Chongqing Uni
	Xi'an Jiaotong Uni	Xi'an Jiaotong Uni	Xi'an Jiaotong Uni
	Harbin Institution of Technology	Harbin Institution of Technology	Harbin Institution of Technology
		Huazhong Uni of Science and Technology	Huazhong Uni of Science and Technology
		Nanjing Uni	
		Lanzhou Uni	Lanzhou Uni
		China Agriculture Uni	China Agriculture Uni
		Yunnan Uni	Yunnan Uni
			Renmin Uni
			Beihang Uni
			Minzu Uni of China

Appendix 2

2016	2017	2018	2019
Beijing	Beijing	Beijing	Beijing
Chongqing	Chongqing	Chongqing	Chongqing
Zhejiang			Zhejiang
Anhui	Anhui	Anhui	Anhui
Fujian		Fujian	Fujian
Jiangxi	Jiangxi	Jiangxi	Jiangxi
Shandong	Shandong	Shandong	Shandong
Henan	Henan	Henan	Henan
Hubei			
Hunan	Hunan	Hunan	Hunan
Guangdong	Guangdong	Guangdong	Guangdong
Hainan			
Gansu		Gansu	Gansu
Qinghai		Qinghai	
Inner Mongolia Autonomous Region	Inner Mongolia Autonomous Region	Inner Mongolia Autonomous Region	Inner Mongolia Autonomous Region
Guangxi Zhuang Autonomous Region	Guangxi Zhuang Autonomous Region	Guangxi Zhuang Autonomous Region	
Xinjiang Uygur Autonomous Region	Xinjiang Uygur Autonomous Region	Xinjiang Uygur Autonomous Region	Xinjiang Uygur Autonomous Region
	Hebei	Hebei	Hebei
	Jiangsu	Jiangsu	Jiangsu
		Tianjin	Tianjin
		Shanxi	
		Liaoning	
		Heilongjiang	Heilongjiang

2016	2017	2018	2019
		Sichuan	Sichuan
		Yunnan	
		Shaanxi	Shaanxi
		Ningxia Hui Autonomous Region	
			Shanghai