

Classifying the Endogeneity Observation and Estimation of the Potential for Mass Exodus of Chinese Students to ASEAN and European Schools based on Double Reduction Policy

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Abstract. The Chinese education system has been characterized by its competitiveness and thoroughness. The past decade witnessed an increase in students going from China to the United States, Australia, Europe, and ASEAN countries for education. A double reduction policy could increase the number of students moving abroad. Chinese parents have reasons such as global knowledge, English language, and future opportunities in the world to send their children out of China. So, this work will analyse the endogenous econometric based co variables such as economical status, language expectations and countries chosen for education and analyze the policies and future of China's concerning the double deduction policy. The proposed article also going to find out the countries chosen by chinese parents through their economical status and expectations. The policy may be suggested to revisit the double reduction policy through observed Endogeneity variables.

Keywords: Double Reduction Policy, Endogeneity variables, education anxiety

1 Introduction

The China's double reduction policy was designed to reduce excessive homework, and private tutoring for Chinese students enrolled in compulsory education programs. The Chinese education system is characterized by the competitiveness and thoroughness. Chinese students must demonstrate resilience and perseverance in a society that prioritizes academic excellence as an indicator of national pride (Davidson, 2021; Mikesell, 2021). Most Chinese students and their parents understand that to acquire meaningful employment in a very competitive jobs sector, students must attain high grades (Liu et al., 2022; Xue & Fang, 2018). Consequently, middle class and upper middle class parents are enrolling their children in private schools where, through private tutoring during school holidays, children can improve their academic performance. Over time, emphasis on off-campus tutoring has increased workload on Chinese

students (Li et al., 2021). Furthermore, an increased academic burden can adversely affect students' physical and mental health, as well as increase the financial cost of education for low-income families (Zhang & Xie, 2016). Consequently, the China decided and introduced the double reduction policy to enhance academic parity and protect students from the extra academic workload. The double reduction policy was mainly focused to a decrease in the quantity and duration of after-school tutoring and homework. The Double Reduction policy is to further regulate designed to enforce the Compulsory Education Law, and the Protection of Minors Law. However, banning private tutoring institutions has increased opportunities for one-to-one tutoring and initiated a new flow of wealthy background Chinese students to foreign countries. The foreign countries didn't banned the private tutoring. For instance, there was a new curve which shows the increase of the Chinese students moving to foreign countries behind the double reduction policy (Fig. 1).

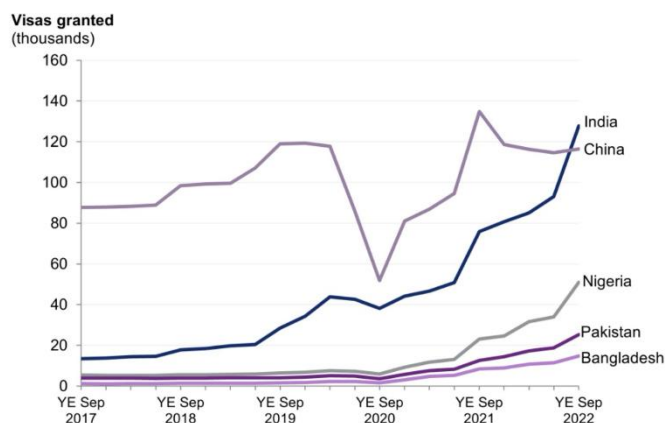


Fig 1. Student Visa Grants between 2010 and 2021

Fig.1 exhibits the insights of the sudden curve because the double-reduction policy on parents sending their children to ASEAN, Europe, Australia, and the United States.

Key Points of the Double Reduction Policy

The goals of the double reduction policy are different and ways to be achieved through different steps. By reducing the amount of homework and time spent completing homework for students across different grades. For instance, students in the first and second grades are not assigned any homework, while those in grades three to six are not to be given homework that takes more than one hour to complete (Zheng, 2022; Li et al., 2021). Secondly, schools must offer after-school care for their students to prevent the likelihood of enrolling in special classes during school holidays (Hatch, 2021). Additionally, the policy regulates private tutoring by banning tutoring during school breaks and weekends (Davidson, 2021). The preceding requirement further states that school teachers are outlawed from providing any private tutoring services other than what is covered during regular school hours.

The Main intention or the benefit of the double reduction policy is to share and promote the education equality among students from different socioeconomic classes. Previously, wealthy families spent a lot of money to help their children excel in the usually competitive senior high school and college entrance examinations through private tutoring (Sheng, 2021; Liu et al.,

2022). The policy eliminates the advantage wealthy children have by ensuring that all students only attend on-campus classes (Yan, 2021). It is vital to note that families from low-income households spend most of their income on private tutoring (Yifei, 2022). The double reduction policy allows families to redirect their household income to other projects. Also, the policy can potentially improve children's mental and physical health (Liu et al., 2022). A high academic workload takes up most of the free time students have for activities like physical exercises (Zheng, 2022). Similarly, a high academic workload can result in student burnout. This can have a detrimental impact on students' psychological and social outcomes. In this case, it is logical to assert that the double reduction policy will improve students' academic and health outcomes.

2 Literature Review

Around the world and China, the double reduction policy is a hotly observed, discussed and contested topic in the country based on media dissemination of information. According to Li et al. (2022), different stakeholders have contributed their opinions related to the policy on students' academic performance and parents decision for their wards. The authors noted that media outlets in China showed increased reporting on the double reduction policy in September and October 2021. Based on geographical searches on the term "double reduction," the authors reported that the policy was discussed across China since its introduction. The duration of increased public opinion is aligned with the beginning of school calendars, the introduction of related policies, and school holidays (Li et al., 2022). Thus, it is logical to conclude that based on the policy's importance on the country's future generations, the media and the public have given it adequate coverage. The outcome of such coverage includes enhanced policy awareness leading to the diffusion and fermentation of new policy changes.

Additionally, Yu et al. (2022) reported that student's situation and parents' understanding towards the double reduction policy influenced their perceptions concerning the government policy changes in the education sector. For example, education anxiety was a direct influence and significant interface between observing the policy and accepting the general opinion of education involution. Anxiety about admission to senior high school and college outperformed anxiety concerning learning institutions (Yu et al., 2022). Furthermore, an improved understanding of the policy enhanced parental perception of education equity in China. Most education anxieties were associated with "upper-class social envy" (Yu et al., 2022). The concept identified above originates from the association between education and its effects on helping families cross the social class lines from low class to upper class (Yu et al., 2022; Guo et al., 2020). As a result of status anxiety and education anxiety, parents from lower-class households dedicate most of their resources to off-campus training to close the social gap in society (Yuan, 2022). Hence, any instances of parental objections towards the double reduction policy are attributable to status and education anxiety.

The double reduction policy has resulted in a significant reduction in the number of off-campus training institutions. Wang et al. (2022) noted that there was at least an 87% decline in the number of off-campus training institutions by the end of 2021. The authors further stated that due to the policy changes introduced, the average fee for private tutoring dropped by at least 40%, with at least 25 publicly traded companies issuing statements that they had ceased providing subject training in compulsory education. The changes reflected above were further highlighted by Guo (2021), noting that multiple training institutions had enacted redundancy measures, with tens of thousands of teachers and trainers facing unemployment. Changes in the

education sector were also observed in publicly traded companies losing \$100 billion in market value (Guo et al., 2020). Thus, the policy has resulted in negative outcomes such as loss of jobs and foreign investment.

Some researchers believe that the policy can lead to increased inequality. Guo (2021) and Pan (2022) noted that a similar approach was used in South Korea, leading to minimal changes in society's academic and social structures. Also, banning private institutions can increase demand for the more expensive one-on-one tutoring (Guo, 2021). This can lock out poor students from competing with wealthy students, further widening the social status gap (Pan, 2022). Moreover, Jin and Sun (2021) opined that the double reduction policy could lead to a mass exodus of wealthy students to countries that allow private tutoring. Such students will have better job opportunities compared to their counterparts from low-income families. The U.S. has at least one million international students, with China accounting for 34% and India representing 18% (Zhe et al., 2022; Table 1).

Table 1: International Students In-take of Universities in the United States of America-2021

PLACES OF ORIGIN OF INTERNATIONAL STUDENTS			
	2019/20	2020/21	% of total
WORLD TOTAL	1,075,496	914,095	100.0
China	372,532	317,299	34.7
India	193,124	167,582	18.3
South Korea	49,809	39,491	4.3
Canada	25,992	25,143	2.8
Saudi Arabia	30,957	21,933	2.4
Vietnam	23,777	21,631	2.4
Taiwan	23,724	19,673	2.2
Brazil	16,671	14,000	1.5
Mexico	14,348	12,986	1.4
Nigeria	13,762	12,860	1.4
Japan	17,554	11,785	1.3
Nepal	12,730	11,172	1.2
Iran	11,451	9,614	1.1
Bangladesh	8,838	8,598	0.9
Turkey	9,481	8,109	0.9
United Kingdom	10,756	8,028	0.9
Indonesia	8,300	7,489	0.8
Pakistan	7,939	7,475	0.8
Colombia	7,787	7,107	0.8
Kuwait	8,375	6,846	0.7
Venezuela	6,855	6,122	0.7
Hong Kong	6,778	5,878	0.6
Spain	7,954	5,781	0.6
France	8,471	5,643	0.6
Germany	9,242	5,364	0.6
Other Places of Origin	168,289	146,486	16.1

Also, Hughes (Statista) noted that 164000 Chinese students enrolled to study in Australia in 2021 for studies (Fig. 2).

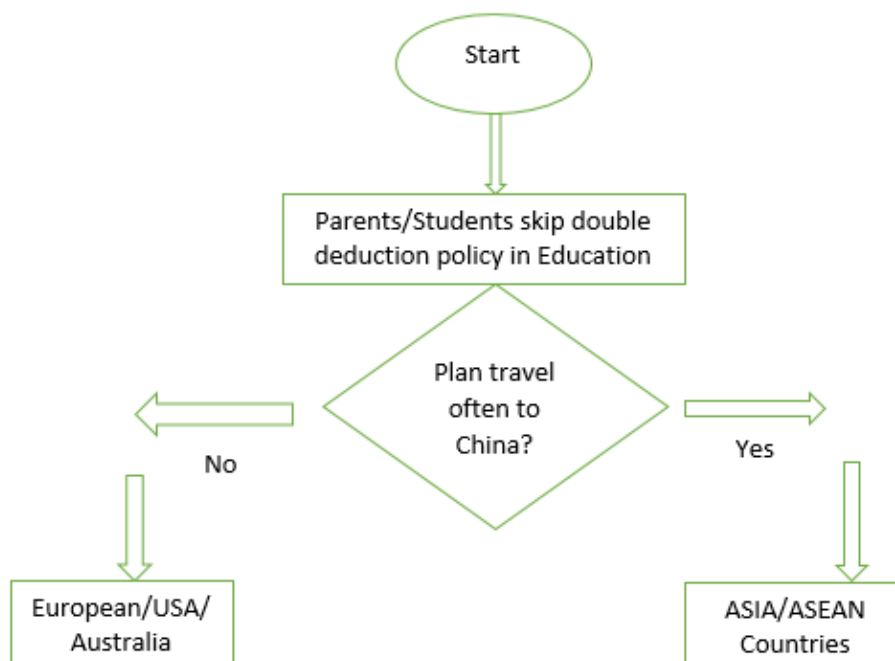


Fig. 2: Flow Chart of the Parents and Children Decision Process

The number of foreign student’s admissions is expected to keep rising.

3 Methodology

A. Data

The data used to predict future outcomes and the impact of the double reduction policy was retrieved from secondary sources. Xue and Fang (2018) showed that Shanghai and Beijing Provinces had some of the highest participation in private tutoring, while provinces like Jiangxi and Guangdong were in the last quartile. Table 2 summarizes students’ participation in private tutoring in 2016 by province.

Table 2: Participation in Supplementary Tutoring by Provinces in 2016

Quartile	Provinces
Top Quartile	Beijing, Heilongjiang, Jiangsu, Liaoning, Zhejiang Province, Tianjin, Shanghai, and Anhui
Second Quartile	Shanxi, Jilin, Henan, Hunan, Shandong, and Shaanxi
Third Quartile	Hubei, Chongqing, Hebei, Sichuan, and Fujian.

Fourth Quartile Guizhou, Gansu, Yunnan, Guangxi, Jiangxi, and Guangdong

On the other hand, Table 3 shows differences in spending across the different Chinese provinces in 2016. Based on the data, provinces like Gansu and Shanghai had the highest expenditure, while Yunnan and Hubei provinces had the lowest expenditure in 2016.

Table 3: Household Spending in Supplementary Tutoring by Provinces in 2016

Quartile	Provinces
Top Quartile	Shanghai, Hunan, Liaoning, Zhejiang, Chongqing, Jiangsu, and Gansu
Second Quartile	Heilongjiang, Sichuan, Shaanxi, Guangdong, and Anhui
Third Quartile	Beijing, Tianjin, Hebei, Fujian, Guangxi, Guizhou, Shandong, and Jilin
Fourth Quartile	Hubei, Shanxi, Henan, Jiangxi, and Yunnan

B.Choosing the Endogeneity for the Observation and Estimation

In Econometrics, Endogenous growth theory consist of observations and Endogenous covariables. They show the significant relationship between the observed variables to the growth in economy based growth. So the proposed work exhibit the reality by using the observed variables in Endogenous bivariable model towards the Chinese parent's socioeconomic level, expectations and countries choice for education. The link function is actually exhibiting the China's double deduction policy results or observed outcomes.

We employ Using a Bayesian model selection technique, the impact of prohibited subjects on Chinese study abroad choices is taken into account when comparing latent and observable endogeneity models. Consider a bivariate model with recursive endogeneity in this work, where the terms "observed data" and "latent data" respectively refer to and. The two distinct modeling approaches, latent and observable, are displayed as follows:Observed Endogeneity

$$\begin{aligned} y_{i1}^* &= x_{i1}'\beta_1 + \varepsilon_{i1} \\ y_{i2}^* &= x_{i2}'\beta_2 + 1\{y_{i1} = 2\}\gamma_{22} + 1\{y_{i1} = 3\}\gamma_{23} + \dots + 1\{y_{i1} = J\}\gamma_{2J} + \varepsilon_{i2} \quad (1) \end{aligned}$$

The latent data are related to the observed outcomes by a link function depending on the values can take, for equations. The model is characterized by two dependent variables, where

$y_i^* \equiv (y_{i1}^*, y_{i2}^*)'$ are the continuous latent data and $y_i \equiv (y_{i1}, y_{i2})'$ are the corresponding discrete

observed data. For simplicity, assuming $\varepsilon_i \equiv (\varepsilon_{i1}, \varepsilon_{i2})' \sim N_2(0, \Omega)$ and $\Omega = \begin{pmatrix} \omega_{11} & \omega_{12} \\ \omega_{21} & \omega_{22} \end{pmatrix}$ is in

correlation form. The link function for ordered data is $y_{ik} = \sum_{j=1}^J 1\{y_{ik}^* > \alpha_{k,j-1}\}$ for J ordered

alternatives, where α_{kj} is a cut-point between the categories. In this study, The cut points are reduction policy and Economic status of the Parents. This work define four categories of main

focused forbidden subjects and study abroad choices related to economic status of the Chinese parents. The equation (1) is re-written as:

$$y_{i1}^* = x_{i1}'\beta_1 + \varepsilon_{i1}$$

$$y_{i2}^* = x_{i2}'\beta_2 + 1\{y_{i1} = 2\}\gamma_{22} + 1\{y_{i1} = 3\}\gamma_{23} + 1\{y_{i1} = 4\}\gamma_{24} + \varepsilon_{i2} \quad (2)$$

Where

$$y_{i1} = \begin{cases} 1 \text{ English language} \\ 2 \text{ Tutoring (Private)} \\ 3 \text{ Art Culture (Science)} \\ 4 \text{ Social Status} \end{cases}$$

$$y_{i2} = \begin{cases} 1 \text{ Lower Middle Class} \\ 2 \text{ Middle Class} \\ 3 \text{ Upper Middle Class} \\ 4 \text{ Economically high} \\ 5 \text{ Elite Class} \end{cases}$$

C. Associating Double deduction policy, Foreign Education and Socio Economic Growth

The authors would like to emphasize once more that the Chinese parents expect their children to study more material and put in more effort at a young age from the suggested way. Chinese parents view China's population and level of competition as a significant impediment. Parents think that children who put in more academic effort, homework, or additional tutoring will fare better in life. Homework and additional tutoring are not permitted under this double reduction policy. Not only are schools affected by these chain reactions, but a few universities are still operating as well. Thus, the level of rivalry for admission to universities with a global reputation is higher than anticipated. Therefore, the parents made the decision to accompany their children to schools and universities abroad. Chinese students are among the most numerous, according to statistics on demographic migration and university admissions.

The student period began with language study, followed by training in a variety of pursuits and global connections that ultimately led them to become migrants once more on foreign territory. According to data from the United Nations on migration, students who studied abroad often end up becoming migrants because they want to experience other countries' arts and cultures, take part in international competitions, and strengthen their connections to the rest of the world for a better future outside of China. The Double Deduction policy specifically prohibits providing the kids with any kind of academic or cultural training through tutoring. The goal of China's program is to increase socioeconomic stability in the nation while also enhancing the mental health of its pupils. China cannot prevent its nationals from receiving an education abroad. At the same time, they are also improving the financial status of the local Chinese teachers.

4 Results

Students from high-income provinces like Shanghai are more likely to participate in private tutoring compared to students from low-income provinces, as demonstrated by the classification of Gansu Province in the last quartile in relation to student participation in private tutoring. However, there is a negative correlation between household spending on private tutoring and

household income. For example, Beijing is ranked in the first quartile in private tutoring participation and the third quartile in spending per household, Gansu Province, has the lowest GDP, but the highest household spending on off-campus training.

Forecast Analysis

According to Swaminathan (WHO), “herd immunity” to the Covid-19 Pandemic will take longer to be effective. Also, the pandemic will likely remain out of control until 2021. The market size of China’s post-study services will, therefore, according to the forward-looking prediction, be close to the full-year market size of 2019 in 2024. Moreover, Countries such as ASEAN, Australia, and the U.S. are ready to take the students with the vaccination certificate but returning to China remains a serious challenge. Hence the double reduction policy has resulted in instances where students can easily leave China but not return. This will likely increase the student exodus out of China, at least until 2021.

The claims above can be Bayes’ Theorem to predict future trends in Chinese students’ decision to become international students in European, North American, and ASEAN universities. When Event B is specified, the Bayes Theorem operates on the conditional probability of Event A, which is equal to the likelihood of Events A and B occurring simultaneously and is then divided by the probability of Event B. In this case, the adoption of a double reduction policy is Event B, while the rise in Chinese international students studying abroad is Event A. For this discussion, we will only use figures from Appendix B representing Chinese students in the U.S.A.

Thus: $P(B/A) = \frac{P(A)B}{P(A)}$

P(A)

Alternatively: $P(A/B) = \frac{P(A)B}{P(B)}$

P(B)

The Bayes’ Theorem is also expressed as:

$$P(B|A) = \frac{P(B \cap A)}{P(A)} = \frac{P(B \cap A)}{P(B \cap A) + P(B^c \cap A)}$$

We will, however, use the first example highlighted in the preceding formulae. Event A in this instance, represents changes in students’ enrollment in foreign universities after Event B, the introduction of the double reduction policy. Past data (Appendix A) shows a 46% rise in sponsored study visa grants between September 2020 and September 2021. Assuming constant change going forward, $P(A) = 0.46$. However, Appendix B shows that 35% of international students from 2020 to 2021 in the U.S. were Chinese. Meaning $P(B) = 0.35$. Thus, B/A is the probability of an increased exodus of Chinese students to the U.S., given that the double reduction policy has caused a 46% increase in student visa applications.

Hence: $P(A|B) = (0.46 * 0.46)/0.35 = 0.604$

In other words, if the double reduction policy’s implementation continues as planned and the previous trends in student visa application continue following past years’ trends, the number of Chinese students travelling to the U.S. will increase by 60%.

Heterogeneous Analysis

Heterogeneous data sets have high degrees of variability in formats and data types. Moreover, heterogeneous data are extremely vague and possess low quality because of missing values or high cases of data redundancy. The process described above is achieved by assessing heterogeneity in each group of data sets. By examining comparative data on participation rates across multiple Chinese provinces and contrasting it against the provincial GDP values, there is evidence that students in high-income provinces have high participation rates in private tutoring. In contrast, however, students from lesser economically productive provinces have a higher percentage of household spending on private tutoring compared to their counterparts from regions like Beijing. The findings are aligned with the current literature discussed in this paper. Families from poorer provinces may be more willing to spend a significant fraction of their income to enlist their children in private tutoring to close the social status gap. Conversely, parents from high-income regions like Beijing do not experience “upper-class social envy”. Also, wealthy provinces are more likely to have better public education resources than poor ones. This results in families from high-income regions spending smaller amounts of their income on private tutoring.

Insights from Analysis of Endogeneity Observation from Students in ASEAN

The senior high school entrance exam diversion policy is as simple as allowing half of the candidates to attend high school and the other half to attend secondary vocational, vocational, or technical schools.

It is important to demonstrate how the double reduction strategy and the high school entrance examination diversion policy have made it difficult for many middle-class kids to enroll in reputable high schools, which will increase the number of Chinese students enrolling in K10-universities abroad.

5 Conclusion

According to recent studies, the double-reduction policy's implementation attempts to improve student welfare and do away with disparities in the Chinese educational system. In China, a family's ability to raise its social standing is always linked to education. Students may transfer to other countries if private coaching is prohibited. Most importantly, endogenous growth economists maintain that faster innovation and more expenditures in human capital can both directly lead to higher productivity. They focus on the outcomes of enhanced research and development, training initiatives, and innovative production methods. Consequently, rather than outlawing tutoring, China's double reduction policy should invest in endogenous inputs and priorities for Chinese students, such as human capital, research, and cutting-edge technology. This is also resulted in more inequalities in Chinese social classes, because it increases “upper-class social envy” and the students who got education in abroad are converted into immigrants to settle down in countries like UK, United States of America and Australia. The students who got education in ASEAN are returning time to time to live and creating business links between China and ASEAN.

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