Global pathways: new evidence on the international graduate school choice of Chinese outbound students

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Abstract

China serves as an indispensable recruitment market for higher education institutions across the globe. Using large-scale administrative and survey data from one of China's pipeline provinces for sending students abroad, we provide new evidence on the factors influencing Chinese students' graduate school choices internationally. We model international student mobility as a function of schooling-constrained, international migration, and consumption values. Descriptive results from nested logit model and multinomial logit model support the model predictions. We also construct counterfactual policy simulations by examining what would have happened under different potential scenarios in both China and destination countries. The simulation results show that the changes in Chinese college quality and family income are likely to affect the number of Chinese students studying abroad but not their distribution patterns among destination countries. In the meanwhile, factors including scholarship opportunities, work visa policies, and recruitment efforts in the destination countries would substantially shift Chinese students' choice of destination country and therefore the specific graduate school location.

Keywords Chinese outbound students · Graduate education · College choice · Counterfactual simulation

JEL Classification I20 · I23

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Introduction

The globalization of higher education has made graduate study opportunities in developed countries abundantly available to bachelor's degree recipients from other developing countries. Consequently, international graduate students have contributed positively to university finance and transformed the ways that highly sought-after global universities recruit and educate their international students. In the USA, Cantwell (2015) observed that US universities were able to generate positive revenue by simply enrolling additional international students. Bound et al. (2020) acknowledged that the revenue stream from international students would indeed help counteract the diminishing state support for public higher education.

Governments and higher education institutions are encouraged to specifically recruit and enroll students from outside their national borders (Altbach & Knight, 2007; Knight, 2008). While the USA remains the top destination country for international students, new international student enrollment in the USA has been declining since the fall of 2016 due to rising competition from other destination countries. Of course, the occurrence of the global COVID-19 pandemic has worsened the situation. As a result, proactive competition for international students becomes paramount, particularly in the post-pandemic world and with the restoration of political stability.

Over the past decades, Chinese students have been favored by nearly all developed countries at both the undergraduate and graduate levels, particularly in the USA and UK. According to data from the Higher Education Statistics Agency in the UK, Chinese students make up the largest cohort with 139,130 studying in the UK in 2019–2020 academic year. China is followed with a large gap by 52,545 students from India and 19,940 from the USA. Students from Italy and France are the two largest cohorts from the European Union, with 13,605 and 13,430 students, respectively, studying in the UK in the same academic year. In the USA, the situation is even more intensified because higher education institutions rely largely on full-paying international students, particularly Chinese students, to compensate for budget shortfalls caused by the decline in both domestic enrollment and state government funding (Curs & Jaquette, 2017; Krupnick, 2016; Li, 2017). In the 2019–2020 academic year alone, the number of international students studying in the USA from China totaled approximately 36% of all international students studying in the USA at all levels. Khanna et al. (2020) emphasized that the US higher education system had been transformed by the increasing number of international students since 2005, driven largely by Chinese students.

Beyond observational statistics, education policy researchers have closely examined international student mobility empirically (Barnett et al., 2016; Brooks & Waters, 2011; Kondakci et al., 2018; Levatino, 2017), especially that of Chinese students (Xiang & Shen, 2009; Cebolla-Boado et al., 2017; Lin, 2020; Yang, 2020). A growing body of literature has examined various determinants of international student mobility in the past decade. However, one obvious commonality and disadvantage of the published datasets is that they are country-level observations. Rosenzweig et al., 2006, 2008) demonstrated that variations in skill price and country-level GDP significantly impacted the number and quality of migrants to the USA. Using data from 13 OECD countries. Bird and Turner (2014) demonstrated statistically significant correlations between foreign undergraduate enrollment in the USA and a variety of (student-side) factors, including exchange rate fluctuations, home country income, and home county population of potential undergraduates, all of which were largely driven by China. Beine et al. (2014) analyzed the determinants of international students' college choices and concluded that international students were responsive to college-side factors, such as the wage and quality of higher education, cost of living in host countries, and tuition

expenses. Moreover, Stuen and Ramirez (2019) revealed a clear pattern of international student flow between pair countries (origin and host) and showed how factors such as earnings potential, educational opportunities, and cost affected the number of international students.

On the student supply side in China, existing studies have examined the overall trend and policy changes relevant to the rapid growth in the number of Chinese students who study abroad in a range of leading destination countries (Cheng & Miao, 2010; Wang, 2012). However, most of these studies remain descriptive and do not empirically examine students' decision-making rationales. With respect to supply–demand interactions, some studies focus on the push–pull factors behind students' decisions to study abroad (Bodycott, 2009; Li & Bray, 2007). Khanna et al. (2020) clarified that growth in housing and personal wealth was one of the key factors pushing Chinese students from families in the top tier of income distribution to study abroad. In contrast, the changing returns to education or information flows did not play a pivotal role as expected. Chen (2019) argued that US education at the undergraduate level did not necessarily boost job prospects for Chinese students returning to their home country. Furthermore, Chen et al. (2020) reported that one of the factors that forced Chinese students to return home after graduation was tightening work visa policies (H-1B program). As a result, the US education export service market is deteriorating, together with the worsened but recovering political situation.

In this paper, we examine the decisions of Chinese outbound graduate students at the individual level. Using a combination of large-scale administrative and survey data, we are among the first to provide empirical evidence on the graduate school choices of Chinese outbound students. In addition, by modeling students' choices of graduate studies on the framework of schooling-constrained, international migration, and consumption motive, we conduct policy simulations to investigate counterfactuals: *what would have happened if potential socioeconomic or policy changes were to take place in either China or destination countries under different scenarios*?

Our work extends the classic college choice theories originating from the seminal work of Manski and Wise (1983) that discussed students' preferences for different college attributes such as academic quality, job opportunities, and consumption amenities. In addition, migration has been recognized as the investment in human capital (Sjaastad, 1962). Therefore, we model international student mobility as a function of factors with respect to schooling-constrained, international migration, and consumption motive. To test the theoretical predictions, we use unique administrative and survey data on bachelor's degree recipients from Jiangsu Province, China. With the second largest provincial GDP in China, Jiangsu Province also has the third largest number of college graduates who pursue postgraduate studies abroad,[1] serving as one of the primary recruitment pipelines for US and UK universities and colleges, as well as supplying a considerable number of college graduates who pursue graduate schools in many other countries or regions.

We present several important empirical findings. We find that Chinese bachelor's degree recipients are incentivized to pursue graduate studies abroad when their perceived domestic education opportunities are limited (*schooling-constrained model*). Therefore, students with stronger preferences for better teaching and research environments are more likely to choose the USA. We also find that Chinese outbound graduate students are more likely to choose

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[1] According to the national administrative data on Chinese bachelor's degree recipients in 2011 provided by the Ministry of Education, there were 50,237 college graduates seeking graduate studies abroad throughout China, Jiangsu Province, accounting for 8.2%, which was just below that of Beijing (20.5%) and Shanghai (15.4%).

destination countries with promising job prospects, such as Australia and New Zealand, and/ or jobs providing competitive salaries, such as the USA (*international migration model*). Finally, we find that college graduates who are motivated to study abroad for reasons of cultural enrichment or other noneconomic motivations have diverse preferences for destinations such as Germany, France, and South Korea that have casual vocational lifestyles (*consumption motive model*). Our empirical findings are consistent with the theoretical predictions that are positioned to explain the rationales of graduate school choices of Chinese college graduates.

Using the estimated parameters from the choice models and following the standard approach of counterfactual policy simulations widely used in the economics of higher education (Arcidiacono et al., 2012; Bordón et al., 2020; DesJardins & McCall, 2010; DesJardins et al., 2002; Groen et al., 2008), we simulate counterfactuals of a set of policy shocks under different scenarios, i.e., to examine what would have happened if the policy become effect or not based on certain simulation assumptions. We focus on changes from both the student side (Chinese higher education quality and family income) and the college side in the destination countries (scholarship opportunities, work visa policies, and recruitment strategies). The results show that home country factors affect the number of Chinese bachelor's degree recipients pursuing graduate studies abroad but are unlikely to shift their distributions in destination countries. In contrast, the market factors in destination countries, including the availability of scholarship opportunities, work visa policies, and recruitment efforts, significantly affect Chinese students' choice of destination country.

We make three major contributions to the college choice literature as well as the practice of international graduate education. We start by providing a detailed, micro-level descriptive analysis of Chinese outbound graduates. The question of who among Chinese bachelor's degree recipients are pursuing graduate studies abroad is answered descriptively. Second, we extend the classic college choice model by further considering the values of international education and exploring underlying factors that impact the supply of Chinese outbound students. Third, we provide counterfactual simulations based on student preferences to promote the understanding of policy impact on Chinese outbound graduate students. The findings facilitate discussions on policies and practices pertinent to university finance and international student recruitment and enrollment in the destination countries. Identifying the key characteristics of Chinese outbound students and their motives is critical for higher education institutions in the USA, the UK, and other destination countries to continue benefiting from the enrollment of international students.

The rest of the study is organized as follows. The "Background" section introduces the background. The "Theoretical framework" section establishes the theoretical framework, and the "Survey and data" section describes the data. The "Examining the graduate school choices of Chinese bachelor's degree recipients" section presents the model and estimation results. The "Counterfactual policy simulations" section presents the counterfactual policy simulations. The "Conclusion" section concludes.

Background

This study focuses on international graduate students from China who would consider choosing to enroll at graduate schools overseas rather than in China. Empirical evidence on international graduate students is limited, although a large proportion of international students tend to enroll at advanced levels of tertiary institutions overseas. According to the Organization for Economic Co-operation and Development (OECD, 2019), while only 4% of the total university enrollment at the bachelor's level are international students, master's degree-seeking

students account for 13% of these students, while international doctoral students constitute 22% of the total. Several factors contribute to the enrollment pattern of international students, including capacity constraints in the origin countries and the monetary and cultural return to educational investments from studying abroad, particularly when studying at prestigious institutions or earning advanced professional degrees (OECD, 2017, 2019).

China has been the source of the largest number of international students studying in OECD countries since 2008 (OECD, 2010). Reportedly, Chinese students have accounted for approximately 22% of all international students enrolled in OECD countries since 2016; this share is the highest among all reporting countries. Among Chinese students enrolled in OECD areas, almost 40% are studying in the USA (OECD, 2018). Figure 1 illustrates the enrollment trend of postgraduate students from China in the USA, indicating a sharp increase from the 2006–2007 academic year. From 2006 to 2018, the total enrollment of Chinese postgraduate students in the USA grew significantly from 47,968 to 133,396.[2] In the past decade, Chinese students alone accounted for more than 30% of all international graduate students enrolled in the USA, peaking at 35.1% in 2013, followed by a two-year decline and then a rise to 35.3% in 2018. Other major countries hosting Chinese graduate students have experienced a similar growth trend. For instance, the number of Chinese postgraduate students has been rising in the UK for more than a decade to 69,305 in the 2018–2019 academic year, accounting for nearly 40% of non-UK domiciled graduate students.[3]

The increase in demand for graduate studies in China relates to its dramatic expansion in higher education access since 1998 (Ding et al., 2021). Figure 2 documents the increasing number of associate degree and bachelor's degree recipients in China since the expansion. This higher education expansion policy creates a uniquely large candidate pool of Chinese students who seek to pursue graduate studies somewhere, either domestically or abroad. Similarly, the number of master's degree graduates has also grown rapidly in China during the same period, as indicated in Appendix Figure A.2. However, opportunities for graduate education at the master's and doctoral levels in China are scarce relative to the number of bachelor's degree recipients. According to the *Report on National Postgraduate Enrollment Survey in China* (2020), approximately 805,000 students enrolled in postgraduate study in 2019, while the total number of students applying for the postgraduate entrance examination was nearly four times larger at approximately 2,900,000 applicants.[4] This indicates the extremely limited availability of graduate education in China and shows that only one in four applicants can earn the opportunity to pursue graduate studies.[5] Student demand itself creates a market for international graduate education.

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[2] On a similar scale, it is evident from Appendix Figure A.1 that the trend of both undergraduate and postgraduate students from China enrolled at the US higher education institutions also increased for about four times, from 57,956 in 2006 to 282,276 in 2018.

[3] Data are obtained from Higher Education Student Statistics: UK, 2018/19 statistical bulletin. https://www.hesa.ac.uk/data-and-analysis/students/where-from

[4] The graduate school admissions and enrollment policy further stipulates that those Chinese students applying to postgraduate entrance examination can only apply to one school and one major at a time for that academic year, according to the official website of the National Postgraduate Registration and Transfer in China. In case of failing in meeting the admission standards of the school applying for, students can only be considered to transfer his application to a different school (same major) if and when there are additional spaces become available with approval from university officials and that they meet the basic admission standard.

[5] Data are obtained from The Report on National Postgraduate Enrollment Survey in China (2020). https://www.eol.cn/e_ky/zt/report/2020/catalog.html

Fig. 1 Trends in the number and percentage of international postgraduates enrolled from China at US higher education institutions, 2000–2018. *Notes*: Data are obtained from *Open Doors*, Institute for International Education, various years. Enrollment in the figure includes international postgraduates from China, Mainland
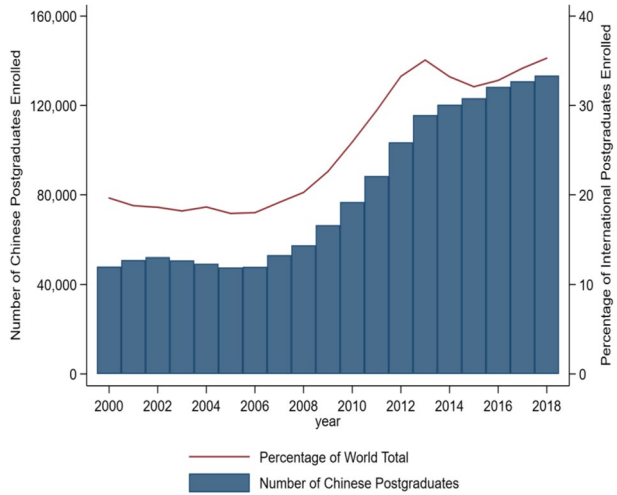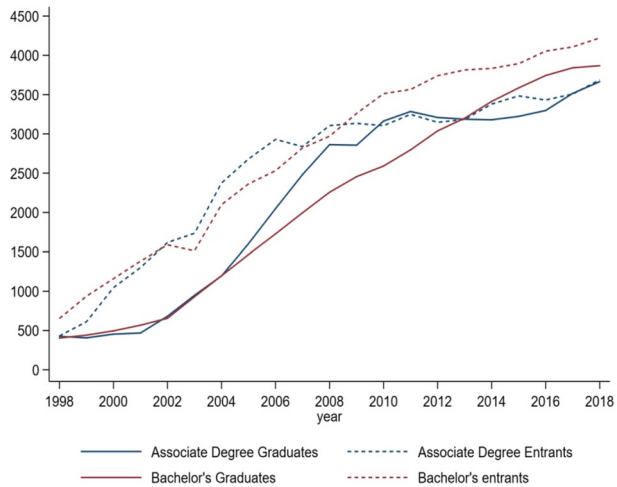
Fig. 2 Trends in the number of Chinese undergraduates, 1998–2018. *Notes*: Data are obtained from the Educational Statistics Yearbook of China, published by the Ministry of Education in China. Number of students is in thousands

Theoretical framework

Extension of college choice model

We build on and extend the classic college choice model originated from Manski and Wise (1983) to analyze the graduate school decision-making process of Chinese bachelor's degree recipients. Since the pioneering work of Manski and Wise (1983), this college choice model, with a focus on domestic undergraduate college choice, assumes that a student college choice is affected by academic quality, college price, distance from home, and education consumption values. For example, Long (2004) applied a conditional logistic model to analyze how high school graduates in the USA chose their colleges in 1972, 1982, and 1992. The research results indicated that college quality and price were key factors for college choices, particularly for low-income students. Skinner (2019) updated Long's

findings with a new cohort of students and showed that students in the 2000s remained sensitive to both cost and distance when deciding among colleges, particularly during the college application stage. Other scholars also have extended Perna's (2004, 2006) conceptual framework to domestic graduate school choice (Chen & Bahr, 2020; English & Umbach, 2016; Kallio, 1995; Zhang, 2005).

Extending from the college choice model, our study models international student mobility (graduate school choice) as a function of schooling-constrained, international migration, and consumption motive. Those three factors are not included in the previous literature on domestic college choice, which we use to capture different motivating factors that drive students' international graduate school decisions and thus can have different theoretical predictions from the previous studies. Our empirical descriptions, guided by this three-factor framework, aim to describe the diversification of student demand and to explore different policy counterfactuals, i.e., to examine what would have happened if the policy become effect or not based on certain simulation assumptions.

The first model, schooling-constrained model, explains the cost−benefit tradeoff for international students who choose to study abroad, mediated by the constrained domestic schooling model (Rosenzweig et al., 2006). This model indicates that international students typically come from countries with high rewards for skills but fewer opportunities to obtain advanced schooling. These students are most likely to be incentivized to study abroad with the goal of returning to their home country and reaping the rewards of the high return on educational investment.

In contrast, the second model of international migration model, explains that students may regard studying abroad as an initial springboard for establishing their lives in the host countries (Rosenzweig, 2008). The migration option values are particularly high when the domestic returns to education are low, for example, in the form of college graduates' earnings. In fact, Kennan and Walker (2011) emphasized the association between income and migration being driven by both geographic differences in mean wages and a tendency to move in search of a better locational match, especially when the income realization in the current location is unfavorable. Both abovementioned motivational factors supplement the international migration model framework in explaining the considerations involved in the decision-making of Chinese outbound graduate students.

Different from the previous two models that focus on labor market benefits, the third model, consumption motive model, explains the decision-making of graduate school choices differently by shifting focus on the nonmonetary rewards of studying abroad, such as access to the culture of host countries and cultural heritage. Student preferences in colleges, graduate programs, and destination countries are heterogeneous, given their individual characteristics and living circumstances. High-achieving students tend to be more willing to pay for high-quality academic programs/institutions, while some low-achieving students from wealthier families may be more inclined to pay for consumption goods such as location, school brand names, and campus amenities.

Model predictions

The schooling-constrained and international migration frameworks differ in model predictions, although they both explain the underlying cost−benefit mechanisms that guide the decision-making progress of prospective international students. Under the schooling-constrained model, increasing the quantity and quality of domestic education programs will reduce the probability of students seeking to study abroad. Bound et al. (2009) explored the enrollment trend of foreign doctoral students from different countries studying in the

USA and concluded that countries with fewer domestic high-quality doctoral program options, such as China, sent greater numbers of students to US doctoral programs. Bird and Turner (2014) showed that the college-aged population of the sending countries positively and significantly impacted graduate enrollment in the receiving countries, but this positive relationship grew weaker as the number of universities in the sending countries increased. *Consequently, our first testable hypothesis based on the schooling-constrained model is that Chinese students respond positively to education quality in the host countries but negatively to the lack of high-quality graduate education programs in China.*[6]

Under the international migration model, decreasing job opportunities and prospects in host countries would create an adverse effect, while increasing the quality and quantity of the home countries' graduate education programs may not stop students from going abroad. International students would find even the most advanced education opportunities less appealing if labor market conditions deteriorate and visa policies tighten. Kato and Sparber (2013) and Shih (2016) validated this model by demonstrating that, first, H-1B visa restrictions decreased the average quality of international applicants who were eventually enrolled in degree programs in the USA and second, education visa restrictions discouraged students from choosing to study abroad. Chen et al. (2020) stated that greater anticipation of student visa refusal in the USA would reduce the submission of SAT scores to and the subsequent enrollment at US universities. *Our second testable hypothesis based on the international migration model hypothesizes that, incentivized by the option value of working in the host countries, Chinese students would be discouraged from studying abroad or in specific countries if job opportunities decrease in the host countries.*[7]

To date, only a handful of studies have quantitatively explored the consumption motive aspects of college choice. Alter and Reback (2014) found that changes in both academic and quality-of-life features listed in two credible college guidebooks could affect the number of applications received by different colleges. Furthermore, Jacob et al. (2018) showed that most students appeared to value consumption elements such as high expenditure on student activities, sports, and dormitories, while the preferential taste for academic quality was confined only to high-achieving, academically driven students. A sizable portion of Chinese outbound graduate students do not reveal any rational and/or economic motivations behind their graduate school choice decision-making process. Instead, they exhibit more hedonistic incentives such as individual enjoyment, external amenities, and cultural enrichment. Their goals are to acquire foreign experience rather than to improve job competitiveness or enhance skills training. *As some students tend not to respond to factors such as the educational quality, opportunities, and labor market conditions of either the sending or destination country, our third testable hypothesis is that a potential decrease in family wealth might negatively affect the likelihood of students who choose to study abroad.*

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[6] The rationale is that, conditional on improvements in the quality of domestic graduate education, more Chinese bachelor's degree recipients would opt to stay in China and fewer would opt to pursue graduate education abroad. College quality is not necessarily unidimensional but may also involve some matching of students to institutions. It could be that the home country institutions are excellent but that studying abroad offers access to a wider variety of different models of education. This means that the push–pull factors for international graduate study choices are not always necessarily higher in quality per se, but host countries could provide different and, in some cases, potentially better matches for students' learning style, interests, and goals.

[7] For example, the political instability emerging in the USA under the current administration (events such as the visa tightening policy/visa administration check/suspension of the H-1B work visa program) greatly reduced Chinese graduate students' motivation to study abroad since 2017. The total number of international (Chinese) students studying in the USA decreased in three consecutive years (Open Door Report, 2019).

In the next sections, we will use those college choice model extensions to empirically investigate the factors impact the study abroad (graduate school) choice of Chinese bachelor's degree recipients and explore what could have happened using respective policy simulations. As students are probably motivated by various reasons to study abroad in different host countries and their motivations could change constantly based on personal and circumstantial contexts, the college choice theories are not mutually exclusive of each other. We will show that results are robust to whether we include the three factors—schooling-constrained, international migration, and consumption motive—separately or jointly (i.e., assuming a student has multiple motivations for studying abroad and those factors have interaction impacts on graduate school decisions).

Survey and data

Sampling and survey details

The *Survey on Bachelor's Degree Recipients* was conducted among four graduation cohorts from 2015 to 2018[8] and was designed and administered under the direction and management of the *College Enrollment and Employment Service Center* in Jiangsu Province, an official government organization and subsidiary of the Jiangsu Province Department of Education. The surveys were conducted to inform higher education policymaking in Jiangsu, including college curriculum innovation, teaching method improvement, and student affairs. The survey was designed by a group of accomplished academic scholars and public policy practitioners in Jiangsu Province, including one of our authors. Questions on international studies were particularly based on the theoretical framework presented in the "Theoretical framework" Sect. 3.[9] We replicated the same survey questions with four graduation cohorts to confirm the validity of the survey design.

We take advantage of this unique dataset because of its detailed responses from a sizable number of graduates and because Jiangsu Province is the third largest demographic region having the most college graduates who choose to study abroad. Specifically, the survey respondents were invited to participate six months after their graduation each year, just shortly after all the students had gone through the decision-making process of post-graduate planning.[10] As a result, we have confidence in the validity of the survey response. Six months was a reasonable amount of time in which students had not yet forgotten their graduate school decision-making process. In fact, given that they had graduated from college and had moved onto the next phase of life, they were reporting life events as facts instead of imaginary outcomes. Therefore, data validity is worth being examined. The specific survey items (motivational, planning, and execution types) also allowed us to conveniently group them under our analytical frameworks of schooling-constrained, international migration, and consumption motive. Thus, we could further examine the costs and benefits under each mechanism to explore the deterministic factors.

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[8] Because family background information for college graduates in 2018 is unavailable, we use only the 2018 data to conduct descriptive analysis.

[9] Due to confidentiality restrictions, we were not given access to the survey administration roster. We present the relevant survey items in the Online Appendix.

[10] According to the administrative data of college graduates from Jiangsu, China, from 2015 to 2018, approximately 88% of all bachelor's degree recipients had chosen to study abroad or domestically or enter the labor market when the surveys were conducted.

Table 1 Summary statistics on student characteristics based on overall bachelor's degree recipients studying abroad for graduate education

	2015		2016		2017		2018	
	Frequency	% within group	Frequency	% within group	Frequency	% within group	Frequency	% within group
College type								
Project-985 universities	1392	15.5	1363	13.2	1376	12.2	1284	10.0
Project-211 universities	2237	24.9	3100	30.1	3172	28.1	3923	30.7
Other universities	5343	59.6	5847	56.7	6741	59.7	7579	59.3
Total	8972	100	10,310	100	11,289	100	12,786	100
Majors								
Engineering	3211	35.8	3603	35.0	4093	36.3	4918	38.5
Science	839	9.4	900	8.7	1120	9.9	1216	9.5
Social science	3311	36.9	3957	38.4	4020	35.6	4371	34.2
Humanities	1366	15.2	1556	15.1	1744	15.5	1921	15.0
Agriculture	82	0.9	95	0.9	108	1.0	110	0.9
Medicine	163	1.8	199	1.9	204	1.8	250	2.0
Female	5157	57.5	6142	59.6	6691	59.3	7331	57.3
Male	3815	42.5	4168	40.4	4598	40.7	5455	42.7

This table is based on the Administrative Data of College Graduates from Jiangsu, China. Project 985 is a constructive project for funding world-class universities in the twenty-first century conducted by the government of China, which includes the 39 most selective universities. Project 211 is the Chinese government's new endeavor aimed at strengthening approximately 100 institutions of higher education and key disciplinary areas as a national priority for the twenty-first century. There are 112 universities in Project 211

Jiangsu, located in the eastern-central coastal area of China, is one of the most economically developed provinces. In 2018, Jiangsu had the second largest total GDP in China; the annual per capita disposable (after tax) income of urban residents was approximately $6,666, compared to a national average of $5,544, and the average for rural residents was $2,944, compared to a national average of $2,064.[11] Jiangsu also has one of the nation's most extensive higher education systems. In 2018, there were 271,607 graduates with bachelor's degrees from all 78 universities in Jiangsu (the national scale was 3,868,358). This included 48 public universities, four private universities, two Sino-foreign universities, and 24 independent colleges.[12] Since 2014, the gross enrollment rate for higher education in Jiangsu has exceeded 50%.[13]

The surveys covered 73 universities in Jiangsu Province.[14] Among them, only three nonelite universities did not take part in all four surveys (two participated only in 2018, and one missed the 2015 survey).[15] Thanks to the administrative efforts organized by the provincial education department and the collaboration of these universities,[16] completed questionnaires were collected from 59,065 graduates with bachelor's degrees in 2015, 58,055 graduates in 2016, 75,100 graduates in 2017, and 83,339 graduates in 2018.[17]

The overall response rate remained consistently stable over the four consecutive years when the surveys took place in Jiangsu Province. Detailed data were obtained from approximately 25% of all graduate cohorts annually and the subgroups who chose to pursue graduate studies abroad (see Table 1 and Table A.2 for detailed data). One important advantage of this dataset is that the survey data could be matched with the administrative data of the overall graduate population from the same year in Jiangsu Province. This feature allowed us to calculate the poststratification or nonresponse weight of the survey data due to the precise identification of who was in the survey cohort and who was not, hence facilitating weighted samples to reveal the study abroad trends of Chinese outbound graduate students. The weighted proportional distribution of the survey sample in Table A.3 and its spread is consistent with the population's proportional distribution in Table 1.

The collected survey results revealed comprehensive information on the college graduates, including but not limited to individual and parental characteristics and

[11] See "China Statistical Yearbook (2019), complied by National Bureau of Statistics of China, China Statistics Press, p188,196.".

[12] See "Jiangsusheng Putong Gaodeng Xuexiao Mingdan (List of the Regular Institutions of Higher Education in Jiangsu Province)". http://jyt.jiangsu.gov.cn/art/2020/4/21/art_58319_6929344.html

[13] See "2014 *Nian Jiangsusheng Guomin Jingji he Shehui Fazhan Tongji Gongbao* (Statistical Communiqué of Jiangsu Province on the 2014 National Economic and Social Development).". http://district.ce.cn/newarea/roll/201502/25/t20150225_46457212.shtml

[14] There were 78 undergraduate institutions in Jiangsu Province. Among them, four public nonelite and one Sino-foreign undergraduate institutions did not take part in the survey.

[15] As we focus on the group who choose to study abroad and as the probabilities of going abroad in these three nonelite undergraduate institutions were very low, the influence of missing data was negligible.

[16] The Ministry of Education of the People's Republic of China called on every university to release an annual report on the employment of their graduates, so most of these undergraduate institutions had strong motivations to collect a sample that was large enough for them to conduct analysis on their own.

[17] In addition to bachelor's degree recipients, we also collected data on graduates with associate, master's or doctoral degrees. As our primary concern is the supply of international graduates from China in this study, we consider only the bachelor's degree samples for analysis.

options after graduation (work, continue to study domestically, or study abroad). For bachelor's degree recipients who had commenced studies abroad, the survey responses also included information on their specific choices of destination countries, detailed reasoning for studying abroad, planning after graduate schools abroad, primary funding source, intended majors, and resource channels where college graduates obtained study abroad information. To the best of our knowledge, this is the only available student-level dataset that includes such comprehensive information. The rich nature of the dataset, both quantity and quality, makes our empirical analysis possible.

Summary statistics

Table A.1 describes the student characteristics of all college graduates (bachelor's degree recipients) in Jiangsu Province from 2015 to 2018. Among them, approximately 20% chose to pursue graduate studies each year, either domestically or abroad. The percentage of graduates who chose to study abroad for graduate schools was roughly one-fourth of the total graduates who chose to pursue graduate studies each year, with an upward increasing trend, ranging from 20.7% in 2015 to 23.7% in 2016, 22.9% in 2017, and 24.2% in 2018. The absolute change in the total number of students who chose to study abroad was not insignificant, and we observed an increase of nearly 4000 students over four years from one province in China.

It is worth exploring the types of institutions from which students who chose to study abroad graduated. In China, universities have been broadly classified with or without the labeling of *Project 985 University* and *Project 211 University* in recent decades,[18] which resembles the tier system of university rankings in the Western world in general. Note, however, that the *Project 985 University* and *Project 211 University* ranking systems no longer exist in China. They have been replaced by a new tertiary education development initiative called the *Double First Class*, a combination of *World First Class University* and *World First Class Academic Discipline Construction* movement in China. The new development initiative released university rankings in 2017, so the new list did not apply to our sample. We observed that college graduates who chose to study abroad were disproportionately from different types of higher education institutions, as indicated by the *Project 985 University* and *Project 211 University* rankings. Table 1 demonstrates that although nearly 60% of all bachelor's degree recipients who chose to study abroad came from nonelite universities in China, the relative ratio[19] of peers who came from elite Chinese universities (namely, institutions in the Project 985 and Project 211 categories) was much higher. For every

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[18] The Project 985 and Project 211 categorization can be interpreted as China's version of elite universities comparable with Ivy Leagues in the USA' Ivy League, albeit with a much smaller absolute number. In Jiangsu, only Nanjing University and Southeast University are Project 985 Universities. There are 9 other Project 211 Universities, which are China University of Mining and Technology, China Pharmaceutical University, Nanjing Agricultural University, Nanjing Normal University, Nanjing University of Science and Technology, Nanjing University of Aeronautics and Astronautics, Jiangnan University, Hohai University, and Soochow University. In this study, Project 211 universities strictly refer to these 9 universities.

[19] The relative ratio of college graduates who chose to study abroad in Project 985 universities equals the proportion of college graduates who chose to study abroad from Project 985 universities divided by the proportion of overall college graduates from Project 985 universities. The calculation of the relative ratio of Project 211 universities and nonelite universities are similar to this.

100 bachelor's degree recipients from the Project 985 universities in 2018, approximately 18 graduates chose to study abroad. This number was smaller among Project 211 universities (10) and even smaller in nonelite colleges (4).

Table 1 also shows that the college graduates who majored in engineering and social science constituted most of the group choosing to study abroad for graduate school, both accounting for more than one-third. The rest were students who majored in humanities (15%), science (approximately 10%), and other majors. The proportion of major occupancy was consistent across years on average. Most of the graduates with bachelor's degrees who chose to pursue graduate studies outside China were from higher-income families (see Table A.3). Their parents were college-educated professionals (close to three-quarters) who worked as public servants (more than one-third) or corporate employees (approximately one-third) or were self-employed (almost one quarter).

Table 2 describes the destinations of college graduates who chose to study abroad. The USA and UK were the top 2 destination countries, attracting nearly half of all college graduates from Jiangsu who chose to pursue graduate school abroad. Analyzing the reasons and motivations of students who chose to study abroad for graduate school, we observed that their responses corresponded to our proposed theoretical models: schooling-constrained model, international migration model, and consumption motive model.

We found that the primary reason for studying abroad was the preference for quality education and research opportunities. In each survey year, more than three-quarters of all degree-seeking students reported that they were studying abroad for a better teaching and research environment. The second most prevalent reason for studying abroad was to improve employability; on average each year, 60% of the survey respondents reported this reasoning. Other common rationales included enhancing foreign language capacity, obtaining development opportunities abroad, acquiring knowledge of different customs and cultures, and avoiding the intense competition of mainland China's postgraduate entrance examination. One interesting discovery was that graduates from different cohorts were very consistent in their reasoning regarding each question.

Additionally, Table 2 shows that Chinese students who chose to study abroad for graduate school were also diverse in their funding sources, major switching, information channels, and work plans after graduation. An overwhelming majority of international graduate students from Jiangsu were funded by their parents, relatives, friends, bank loans, and/or themselves. More than 86% of this group chose graduate majors that were consistent with or related to their undergraduate majors. To obtain information on studying abroad, students relied heavily on consulting agencies (from 56.8% in 2015 to 63.7% in 2018), the websites of prospective universities (from 51.8% in 2015 to 53.8% in 2018), recommendations from friends and other acquaintances (approximately one-third), and official university cross-border education partnerships (from 22.4% in 2015 to 15.8% in 2018). College graduates also differed in their postgraduate plans, with 46.7% preferring to look for a job in the destination countries or working temporarily in those countries before returning to China in 2015. However, the proportion decreased to 35.9% in 2018, implying that an increasing number of Chinese graduates preferred to return to China after completing their graduate studies (from 27.2% in 2015 to 35.6% in 2018).

Table 2 Descriptive analysis of the bachelor's degree recipients studying abroad for graduate education (weighted)

	2015	2016	2017	2018
Destination countries/regions				
UK	24.6	29.5	30.8	32.1
USA	22.1	17.1	18.3	16.6
Australia and New Zealand	17.9	17.9	18.4	15.3
Korea, Japan, and Singapore	10.3	12.6	11.7	11.9
Germany and France	8.6	7.5	6.4	6.5
EU countries	4.1	3.1	3.5	3.1
Canada	2.3	2.0	2.9	2.0
Others	10.3	10.2	8.0	12.6
Reasons for studying abroad				
Pursuing better teaching and research environment	75.1	77.9	81.0	82.1
Improving employability	60.2	54.7	57.6	59.6
Enhancing foreign language capacity	40.5	38.4	40.2	41.4
Obtaining development opportunity abroad	39.6	34.1	31.1	32.1
Getting knowledge of different customs and culture	28.0	29.1	29.9	26.7
Keeping away from intense competition in mainland's graduate entrance examination	7.3	8.2	10.4	11.2
Accepting the arrangement of family members and relatives	3.8	3.9	3.1	2.7
Following the craze in studying abroad	1.3	1.3	1.3	1.0
Plans after graduation				
Getting back after working in the destination county	35.6	31.5	31.3	30.5
Working in the destination county	11.1	7.0	5.4	5.4
Getting back to the origin country	27.2	31.6	37.0	35.6
Uncertain	26.0	29.9	26.2	28.6
Main funding sources				
Funded by parents, relatives, and friends	91.4	92.7	93.5	93.7
Funded by higher education institution applied to	5.1	4.6	3.7	3.6
Funded by domestic government or universities	1.2	0.9	0.9	1.0
Income from working abroad	1.5	0.8	1.1	0.8
Bank loans	0.5	0.4	0.2	0.2
Others	0.4	0.5	0.5	0.7
Major Switching				
Attending a major related to the BA major	49.5	46.0	49.3	50.2
Attending the same BA major	38.5	40.2	38.5	37.5
Attending a major unrelated to the BA major	12.0	13.8	12.2	12.3
Information channels for studying abroad				
Studying abroad consulting agencies	56.8	57.4	59.8	63.7
websites of target universities	51.8	49.8	54.0	53.8
Recommendations from other people	32.8	33.7	34.5	37.0
University cross-border education partnerships	22.4	18.2	18.8	15.8
Field trip abroad	6.4	9.2	10.8	11.0

Percent share within each question is reported. This table is based on the Survey on Bachelor's Degree Recipients data from Jiangsu, China, weighted by the overall population from the administrative data

Examining the graduate school choices of Chinese bachelor's degree recipients

Discrete choice model

We adopt the discrete choice model to examine the graduate school choices of Chinese outbound college graduates. According to the data structure in the survey in which students reported their postgraduate status, they selected among three different options: pursuing graduate degrees in China, pursuing graduate degrees abroad, and entering the labor market directly. For those students who chose to study abroad, they further selected among a list of host countries. The ideal approach is to model after a three-step nested decision-making structure in which in the first stage a student decides between working and graduate schools, in the second stage between Chinese and foreign graduate schools, and in the third stage between different host counties. However, we cannot combine these three stages together, as we do not observe host country preference data of students who did not study abroad by the time of the survey. This limitation is unlikely to alter our main conclusions, as most Chinese students decide whether to study abroad much earlier than contemplating destination countries. Therefore, we adopt a two-level nested logit model to explore students' choices between pursuing graduate studies abroad and domestically, and then a multinomial logit model to analyze their decisions on host countries.

The two-stage nested logit model assumes that students choose between working and graduate studies first and then make choices between Chinese and foreign graduate schools.

The graduate education choice could be represented by a random utility model introduced by McFadden (1973), which assumes that one student selects an option from among all the alternatives to maximize their expected utility (perceived level of satisfaction measure either monetarily or spiritually). In this study, students' postgraduate choices are modeled in Eq. (1.1):

$$U_{ijb} = x'_{ijb}\beta_{jb} + z'_{ib}\gamma_b + w'_{jb}\delta + \varepsilon_{ijb}(i = 1, \dots, n; j = 1, 2, 3; b = 1, 2) \tag{1.1}$$

U_{ijb} is a random utility if individual i chooses alternative j from the three choices (employment, domestic graduate studies, or study abroad) which can be grouped into branch b (working or graduate studies), and ε_{ijb} is the error term.[20] All the explanatory variables x_{ijb} are case specific or alternative invariant. The coefficient β_{jb} identifies the impact of x_{ijb} on U_{ijb} depending on alternative j and branch b. The coefficient γ_b represents the effect of the branch-level variable z_{ib} on U_{ijb}, while the coefficient δ indicates the influence of the alternative-level variable w_{jb} on U_{ijb}. Obviously, individual i will choose alternative j only if its expected utility is larger than any of the other alternatives. The probability of individual i choosing alternative j from branch b can be written as Eq. (1.2):

$$P_{ijb} = P_{ij|b}P_b = \frac{\exp(x'_{ij|b}\beta_{jb} + w'_{jb}\delta)}{\sum_{j=1}^{J_b}\exp(x'_{ij|b}\beta_{jb} + w'_{jb}\delta)} \times \frac{\exp[\tau_b(z'_{ib}\gamma_b + IV_{ib})]}{\sum_{b=1}^{B}\exp[\tau_b(z'_{ib}\gamma_b + IV_{ib})]} \tag{1.2}$$

Define the inclusion value for branch b as:

$$IV_{ib} = \ln(\sum_{j=1}^{J_b}\exp(x'_{ij|b}\beta_{jb} + w'_{jb}\delta)) \tag{1.3}$$

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[20] This basic model setup has been widely used in the college choice literature (e.g., Jacob et al., 2018; Long, 2004).

The new parameter $\tau_b = \sqrt{1 - Corr(\varepsilon_{ijb}, \varepsilon_{ikb})}$ must equal 1 to satisfy the independence from irrelevant alternatives (IIA) to produce the multinomial logit model. As the IIA assumption may not be satisfied in post-graduation decision making, we adopt the above nested logit model where the IIA restriction continues to hold within each branch. The more efficient way to estimate the parameters of the nested logit model is full information maximum likelihood approach.

When studying host country choices among students who have already studied abroad, we use a multinomial logit model as Eq. (1.4):

$$U_{ij} = x_i' \beta_j + \varepsilon_{ij} (i = 1, \ldots, n; j = 1, \ldots, 6) \tag{1.4}$$

U_{ij} is a random utility if individual i chooses alternative j from one of the host country options, and ε_{ij} is the error term. All the explanatory variables x_i are case specific or alternative invariant. The coefficients β_j identify the impacts of x_i on U_{ij} depending on alternative j. Obviously, individual i will choose alternative j only if its expected utility is larger than any of the other alternatives. As a result, the probability of individual i choosing alternative j can be written as Eq. (1.5):

$$\begin{aligned} P(y_i = j | x_i) &= P(U_{ij} \geq U_{ik}, \forall k \neq j) \\ &= P(\varepsilon_{ik} - \varepsilon_{ij} \leq x_i' \beta_j - x_i' \beta_k, \forall k \neq j) \end{aligned} \tag{1.5}$$

Assuming that ε_{ij} satisfies the IIA assumption, the probability of individual i choosing alternative j can be written as Eq. (1.6):

$$P(y_i = j x_i) = \begin{cases} \frac{1}{1 + \sum_{k=2}^{J} \exp(x_i' \beta_k)} (j = 1) \\ \frac{\exp(x_i' \beta_j)}{1 + \sum_{k=2}^{J} \exp(x_i' \beta_k)} (j = 2, \ldots, J) \end{cases} \tag{1.6}$$

Given the data on realized choices for host countries, the logarithmic form of the likelihood function for an individual i is given by the following (the base category is $j = 1$):

$$lnL_i(\beta_1, \ldots, \beta_J) = \sum_{j=1}^{J} I(y_i = j) lnP(y_i = j x_i) \tag{1.7}$$

In this equation, I() is an indicator function. If $y_i = j$, I()=1; otherwise, I() = 0. Eventually, we obtain the estimated coefficients $\widehat{\beta_1}, \ldots, \widehat{\beta_J}$ by maximizing the sum of the total samples' logarithmic likelihood functions.

In both the nested logit model and multinomial logit model, the primary explanatory variables x_i are based on our theoretical framework. We examine the correlations between individual preferences and students' respective study abroad decisions. In the empirical models, we control student characteristics, including demographics, family background, college and major information, and peer effects in college. Importantly, when studying host country choices among students who have already studied abroad, x_i include a rich set of subjective measures of graduate school preferences, including reasons and motivations, graduation plans, funding sources, information channels, and major preferences. These measures are likely to sufficiently capture individual preferences in their study-abroad decisions. Although the results could not help us identify a causal relationship between the proposed deterministic factors and final graduate school choice due to potential omitted variable bias, the results are informative enough to suggest clear associations between

influencing factors and school choices. Our argument is that we have controlled for most, if not all, confounding factors in the model. It is expected that the model minimizes the potential bias from omitted variables and can be used for further counterfactual simulations.

A remaining limitation, however, is that we do not observe the branch-level variables z_{ib} and the alternative-level variables w_{jb} in the two-stage nested logit model. This limitation is unlikely to alter our main conclusions, as the features of the above specific alternation and branch are difficult to accurately measure. Future work can track students' preferences and decision-making over time and deepen this line of inquiry.

The choice between pursuing graduate studies abroad and domestically

To predict the association of each covariate on the probability of one specific choice (international graduate studies, domestic graduate studies, or domestic employment), we construct the two-level nested logit model in two different ways, as shown in Table 3. One approach is to group Chinese and foreign graduate schools into one category of graduate study and working into another one, while the other approach is to partition pursuing graduate studies in China and seeking domestic employment into one category of staying in China and pursuing foreign graduate schools into a separate category. The IIA assumption tests are rejected in the above two models, which supports that the nested logit model is much more appropriate than the multinomial logit model, while the coefficients of each covariate in different models in Table 3 are very similar. As there is no well-defined testing procedure for discriminating among tree structures (Greene, 2020) , we explain the results according to the first structure.[21]

Table 3 indicates that students with different characteristics have varied postgraduation plans.[22] All else being equal, male graduates are less likely to pursue international graduate studies than female graduates. Males, however, are more likely to enter the labor market immediately after college. Compared with nonelite university graduates, Chinese college graduates from Project 211 universities have a higher probability of choosing graduate studies abroad, while the corresponding figure for students from Project 985 universities is insignificant. Similarly, compared with Chinese college graduates who major in social sciences, those majoring in science and medicine are less likely to pursue graduate studies abroad. Last, compared with students whose parents are less educated and unemployed, those from culturally and economically advantaged families are more likely to study abroad.

Consistent with the domestic schooling-constrained model, the empirical results also state that the more satisfied Chinese students are with the universities they graduated from, the lower their probability of wanting to pursue graduate studies abroad. We also study peer effects to understand how peers perform on domestic graduate studies and how progress toward the study abroad option affects recent outbound college graduates' decision-making. Peer effects indicate the "average condition" in the same college and graduation cohort. Ceteris paribus, college graduates are less likely to pursue graduate studies abroad if their peers secure more domestic graduate study opportunities. In contrast, students are more likely to study abroad if they observe that it is relatively easy for their peers to do the same.

Our findings contributed to the classic college choice model in two major ways. First, by exploring how underlying factors such as domestic higher education quality and

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[21] The values of dissimilarity parameters equal to 0 implies that the alternatives in the relative nest are perfectly correlated, whereas 1 implies independence.

[22] Our main results are from the surveys in 2015–2017, as parental information was missing in 2018. The results are similar when including the 2018 cohort or omitting parental information in the model.

Table 3 Multiple choice model results: postgraduation plans of bachelor's degree recipients

Domestic graduate studies	Nested logit model				Multinomial logit model	
	Branches: working vs. graduate studies		Branches: study abroad vs. staying in China			
	International graduate studies	Domestic employment	International graduate studies	Domestic employment	International graduate studies	Domestic employment
	[base outcome]		[base outcome]		[base outcome]	
Male	−0.022* (0.010)	0.189*** (0.012)	−0.166*** (0.032)	0.077*** (0.019)	−0.091** (0.031)	0.182*** (0.012)
Reference: other universities						
Project-211 universities	0.082*** (0.017)	0.067*** (0.016)	0.342*** (0.038)	0.027** (0.010)	0.349*** (0.039)	0.071*** (0.017)
Project-985 universities	−0.012 (0.025)	0.302*** (0.040)	0.025 (0.078)	0.099*** (0.031)	0.179* (0.078)	0.268*** (0.042)
Reference: Social science						
Engineering	−0.024 (0.013)	−0.174*** (0.015)	−0.049 (0.041)	−0.082*** (0.020)	−0.153*** (0.038)	−0.192*** (0.016)
Science	−0.059** (0.021)	−0.103*** (0.021)	−0.188** (0.060)	−0.051*** (0.015)	−0.251*** (0.060)	−0.119*** (0.022)
Humanities	0.019 (0.014)	−0.022 (0.019)	0.098* (0.039)	−0.005 (0.009)	0.088* (0.041)	−0.010 (0.020)
Agriculture	−0.033 (0.038)	−0.058 (0.041)	−0.188 (0.121)	−0.034 (0.019)	−0.225 (0.123)	−0.078 (0.042)
Medicine	−0.167*** (0.036)	−0.029 (0.026)	−0.568*** (0.091)	−0.022 (0.012)	−0.618*** (0.092)	−0.052 (0.027)
Parents: college education	0.379*** (0.049)	−0.386*** (0.017)	1.375*** (0.043)	−0.111*** (0.027)	1.262*** (0.040)	−0.261*** (0.017)
Reference: Parental job: unemployed						
Parent's job: farmer	−0.246*** (0.051)	−0.085*** (0.023)	−0.811*** (0.132)	−0.037** (0.013)	−0.851*** (0.133)	−0.089*** (0.024)
Parent's job: self-employment	0.168*** (0.033)	0.023 (0.022)	0.524*** (0.083)	0.016 (0.010)	0.547*** (0.084)	0.038 (0.022)
Parent's job: public servant	0.136*** (0.032)	−0.141*** (0.025)	0.538*** (0.084)	−0.056*** (0.017)	0.491*** (0.086)	−0.132*** (0.026)
Parent's job: corporate employee	0.212*** (0.037)	0.023 (0.023)	0.700*** (0.083)	0.024* (0.011)	0.731*** (0.084)	0.059* (0.023)

Table 3 (continued)

	Nested logit model				Multinomial logit model	
	Branches: working vs. graduate studies		Branches: study abroad vs. staying in China			
	International graduate studies	Domestic employment	International graduate studies	Domestic employment	International graduate studies	Domestic employment
Reference: Family economic conditions: lowest						
Family's economic conditions: low	0.186*** (0.030)	0.273*** (0.015)	0.517*** (0.064)	0.120*** (0.029)	0.636*** (0.061)	0.286*** (0.015)
Family's economic conditions: middle	0.480*** (0.064)	0.318*** (0.027)	1.387*** (0.075)	0.206*** (0.050)	1.588*** (0.070)	0.487*** (0.028)
Family's economic conditions: high	0.611*** (0.082)	0.205*** (0.053)	1.792*** (0.096)	0.206*** (0.054)	1.998*** (0.098)	0.490*** (0.059)
Family's economic conditions: highest	0.583*** (0.085)	0.337*** (0.077)	1.640*** (0.133)	0.241*** (0.067)	1.878*** (0.142)	0.563*** (0.089)
Reference: Very dissatisfied						
Dissatisfied with the university graduated from	−0.019 (0.068)	−0.182 (0.105)	0.023 (0.188)	−0.092 (0.054)	−0.073 (0.206)	−0.219 (0.116)
Satisfied with the university graduated from	−0.187** (0.068)	−0.189 (0.100)	−0.485** (0.177)	−0.119* (0.055)	−0.617*** (0.194)	−0.284* (0.111)
Very Satisfied with the university graduated from	−0.256*** (0.072)	−0.173 (0.100)	−0.716*** (0.179)	−0.120* (0.055)	−0.851*** (0.196)	−0.287** (0.111)
Monthly income of peers (1000 yuan)	0.005 (0.007)	−0.032*** (0.010)	0.032 (0.020)	−0.015** (0.005)	0.013 (0.021)	−0.035*** (0.010)
The peers' domestic employment possibility (%)	0.002 (0.001)	0.023*** (0.001)	−0.009** (0.003)	0.010*** (0.002)	0.003 (0.003)	0.024*** (0.001)
The peers' international	0.038***	−0.025**	0.104**	−0.002	0.102***	−0.0

Table 3 (continued)

	Nested logit model				Multinomial logit model	
	Branches: working vs. graduate studies		Branches: study abroad vs. staying in China			
	International graduate studies	Domestic employment	International graduate studies	Domestic employment	International graduate studies	Domestic employment
graduate studies possibility (%)	(0.005)	* (0.002)	* (0.004)	(0.001)	(0.004)	06** (0.002)
The peers' domestic graduate studies possibility (%)	−0.011*** (0.002)	−0.038*** (0.001)	−0.022*** (0.004)	−0.016*** (0.004)	−0.034*** (0.003)	−0.039*** (0.001)
Year 2016 dummy	0.041** (0.014)	0.025 (0.015)	0.152*** (0.039)	0.016* (0.007)	0.172*** (0.040)	0.037* (0.015)
Year 2017 dummy	0.034* (0.014)	0.007 (0.015)	0.128*** (0.038)	0.007 (0.007)	0.141*** (0.039)	0.016 (0.015)
Constant	−1.003*** (0.166)	0.740*** (0.150)	−3.746*** (0.342)	0.340** (0.105)	−3.427*** (0.431)	1.069*** (0.183)
Number of observations	741,933			741,933		
Number of cases	247,311		247,311		247,311	
Pseudo R^2 0.177						
Wald chi2	34,428.79 Prob > chi2 = 0.000		10,857.08 Prob > chi2 = 0.000			
LR test for IIA	chi2 = 248.25 Prob > chi2 = 0.000		chi2 = 32.68 Prob > chi2 = 0.000			
Dissimilarity Parameters	Graduate_study_tau = 0.296 Employment_tau = 1		Staying_in_China_tau = 0.419 Study_abroad_tau = 1			

This table is based on the Survey on Bachelor's Degree Recipients data from Jiangsu, China. Raw coefficients of the nested logit model are reported. Standard errors in parentheses. Some observations have missing data on university satisfaction, monthly income of peers, parent education level and job. The model therefore also includes dummy variables for missing data on these variables. "Peers" means graduates from the same university, education level and major to samples. The peers' monthly income variable is deflated by the consumer price index for all urban consumers and is in 2015 RMB. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

opportunities would impact the decision-making process of graduate school choice for the Chinese bachelor's degree recipients, we extended the classic college choice model that focused on domestic college choice only to include the consideration of the value of international education, which could be explained from the perspective of domestic schooling-constrained. Second, by using a combination of detailed, micro-level and large-scale administrative and survey data, we were able to examine the question of who chose to study abroad empirically.

The choice between studying in the USA, the UK, and other countries

To clearly interpret the multinomial logit model results, following Nguyen and Taylor (2003), we predict the marginal effect of each covariate on the probability of one specific choice. Assuming that destination country decisions are independent of studying abroad, we adopt model 1.4 using the subsample that includes graduates who have already studied abroad. Therefore, for Chinese outbound graduate students who pursue graduate studies from J total countries, the expected utility U_{ij} for individual i from studying in country j is a function of individual-level variables. Alongside the variables included in the previous estimation, we include explanatory variables such as goals and reasons for studying abroad, whether to pursue rigorous academic training, enhancing employability, enjoying cultural enrichment, or seeking job opportunities in host countries. We also include variables that identify the channels from which students obtain their study-abroad information, funding sources, and other relevant miscellaneous factors.[23]

Marginal effects are estimated on each covariate to explore the association between the covariate and the corresponding probability of pursuing graduate studies in one specific destination country. Table 4 shows that students' preferences are substantially and significantly heterogeneous regarding choosing the destination country of study.[24] Our observations lead to four main findings. First, students choose destination countries for a variety of reasons. Students who emphasize the teaching and research environment and/or the opportunity to improve foreign language proficiency are more likely (by 3.6 and 2.1 percentage points, respectively) to study in the USA. In contrast, students whose goals of pursuing graduate studies abroad are to obtain career advancement opportunities abroad and/or strengthen cultural awareness are less likely (by 4.1 and 4.8 percentage points, respectively) to choose the USA.

Second, the funding sources to support Chinese outbound graduate students are found to be associated with choosing a host country in which to study. Students who mainly use personal funds are 10.1 percentage points less likely to choose the USA, ceteris paribus. Instead, they seem to favor the UK by 8.6 percentage points and Australia and New Zealand by 12.9 percentage points.

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[23] Note that we constructed an additional multinomial logit model to include the interaction terms of factors (motivations and information channels) that would impact study abroad, as these are not mutually exclusive. The results of marginal effects and raw coefficients are presented in Table A.5 and Table A.6, respectively. The simulation results in Table A.7 are similar to those in Table 6 without interaction terms. To clearly explain the estimation results, we present the results without interactions in the main text. There are data limitations to be considered in future studies, such as that the students' motivations may change over time, different students can be motivated by different reasons at various degrees, and the content of information obtained from different channels are dissimilar.

[24] The raw coefficients of the multinomial logit model are presented in Table 5.

Third, we find that students' plans after graduate schools overseas are strong predictors of their choices of host countries. Students who want to seek job opportunities in the destination countries temporarily or permanently are 9.7 and 8.3 percentage points more likely to choose the USA, respectively. Students are 17.7 and 28.1 percentage points less likely to choose the UK if their goal is to settle down either temporarily or permanently, respectively.

Finally, we discover that channels to obtain information about pursuing graduate studies abroad are also important predictors of destination country choices. Students who use publicly available websites to guide them in where to attend graduate school are 3.2 percentage points more likely to be enrolled at schools in the USA and UK. In contrast, students who depend on university cross-border education partnerships to obtain information for studying abroad are 3.6 percentage points less likely to choose to study in the USA. Unsurprisingly, with the assistance of study-abroad consulting agencies incentivized by institutional enrollment commissions, destinations such as the UK, Australia, and New Zealand are prioritized in educational marketing campaigns. It is important to keep in mind that the abovementioned channels can at the best inform us where students would acquire information to guide them for study abroad decision makings, but they will not ensure the accuracy of the information obtained. Information validity from various channels is worth being examined further as they could easily be biased or simply inaccurate. One data caveat is that we also do not have the specific information students obtained. As a result, the limitation of our prediction based on information channels can be informative but would not lead to anything precise or directional.

Therefore, our findings made additional contributions to the classic college choice model by first exploring the underlying factors such as why study abroad, the specific plans after postgraduation, funding sources, and information channels that would impact the Chinese bachelor's degree recipients. The additional discussion towards the value of international graduate schools now can be explained from the perspective of international migration model and consumption motive model. Secondly, the nature of our datasets proved to be extremely valuable for us to examine graduate school choice empirically, once again.

Counterfactual policy simulations

Simulation algorithm

Using the parameter estimates of the nested logit model (see Table 3) and multinomial logit model (see Table 5), we simulate how potential policy variations in China (origin country) and in destination countries might impact the study-abroad decision-making of Chinese outbound graduate students. The series of "what if" questions in different contexts enables us to understand the magnitudes of such potential changes and to further explore strategies that can help both the supply and demand parties to maximize their benefits. For example, how can higher education institutions in the destination countries advance their recruitment and enrollment agenda by exploiting and understanding Chinese outbound graduate students' specific needs for improving job market skills, seeking advanced educational opportunities or job/immigration opportunities, or even simply satisfying their hunger for foreign cultural appreciations and exposures? The highlights of the various policy differences inevitably facilitate the positioning strategy of different institutions in the USA, the UK, Canada, or elsewhere.

Table 4 Marginal effects of multinomial logit model: destination country choices of Chinese outbound graduate students

	USA	UK	Australia and New Zealand	Germany and France	Korea, Japan, and Singapore	Others
Reasons for studying abroad						
Pursuing better teaching and research environment	0.036**	0.019	0.01	−0.005	−0.025**	−0.036***
Improving employability	0.013	0.025*	−0.015	0.014*	−0.023**	−0.012
Obtaining development opportunity abroad	−0.041***	0.015	0.057***	0.017*	0.001	−0.048***
Enhancing foreign language capacity	0.021*	−0.061***	0.036***	0.014	0.020*	−0.030**
Getting knowledge of different customs and culture	−0.048***	0.015	−0.015	0.036***	0.033***	−0.021*
Mainly funded by personal sources	−0.101***	0.086**	0.129***	0.019	−0.025	−0.109***
Plans after graduation						
Working in the destination county	0.083***	−0.281***	0.080***	−0.017	0.079***	0.056***
Getting back after working in the destination county	0.097***	−0.177***	0.066***	0.019*	0.043***	−0.048***
Uncertain	0.062***	−0.146***	0.081***	−0.002	0.026*	−0.021
Information channels for studying abroad						
Studying abroad consulting agencies	0.018	0.088***	0.080***	−0.050***	−0.059***	−0.077***
Websites of target universities	0.032***	0.032**	−0.031***	0.004	−0.038***	0.001
Recommendations from other people	0.011	−0.030**	0.013	0.001	−0.027**	0.032***
Field trip abroad	0.024	0.003	−0.030	−0.036**	0.004	0.034*
University cross-border education partnerships	−0.036**	−0.014	−0.008	0.060***	−0.002	0.000
Other control variables	*Omitted (see full results in Table 5)*					

This table is based on the Survey on Bachelor's Degree Recipients data from Jiangsu, China. The sample includes 2015–2017 cohorts. Some marginal effect results of the multinomial logit model are reported in this table and the raw coefficients are reported in Table 5. Some observations have missing data on university satisfaction, monthly income of peers, parent education level and job, and plans after graduation. The multinomial logit model therefore also includes dummy variables for missing data on these variables. "Peers" means graduates from the same university, education level and major to samples. The peers' monthly income variable is deflated by the consumer price index for all urban consumers and is in 2015 RMB. Taking sample size into account, we merge HMT regions of China, EU countries, Canada, and Others into one group as "others" in the dependent variable of this multinomial logit model. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5 Multinomial logit model results: destination country choices of Chinese outbound graduate students

	UK	Australia and New Zealand	Germany and France	Korea, Japan, and Singapore	Others
USA	(base outcome)				
Male	−0.425*** (0.089)	−0.162 (0.094)	−0.093 (0.116)	0.029 (0.100)	−0.281** (0.093)
Reference: other universities					
Project-211 universities	0.067 (0.109)	−0.183 (0.118)	0.564*** (0.150)	0.076 (0.126)	0.314** (0.115)
Project-985 universities	−0.851*** (0.187)	−0.877*** (0.206)	1.100*** (0.247)	0.184 (0.204)	0.055 (0.187)
Reference: Social science					
Engineering	0.062 (0.110)	−0.026 (0.116)	1.028*** (0.157)	0.190 (0.132)	0.189 (0.118)
Science	−0.080 (0.166)	−0.609** (0.195)	0.194 (0.245)	−0.042 (0.192)	−0.461* (0.182)
Humanities	0.176 (0.131)	−0.117 (0.143)	1.089*** (0.178)	1.441*** (0.141)	0.859*** (0.134)
Agriculture	−0.530 (0.411)	−0.224 (0.392)	−0.693 (0.656)	0.431 (0.396)	0.459 (0.342)
Medicine	−0.435 (0.274)	−0.292 (0.277)	−0.854 (0.505)	−0.393 (0.333)	−0.430 (0.281)
Reference: Very dissatisfied					
Dissatisfied with the university graduated from	−0.123 (0.610)	−0.878 (0.556)	−1.819** (0.620)	−0.805 (0.584)	0.023 (0.635)
Satisfied with the university graduated from	−0.017 (0.582)	−0.648 (0.521)	−1.362* (0.558)	−0.530 (0.549)	0.305 (0.607)
Very Satisfied with the university graduated from	−0.057 (0.586)	−0.688 (0.527)	−1.492** (0.566)	−0.895 (0.555)	0.238 (0.611)
Monthly income of peers (1000 yuan)	−0.257*** (0.054)	−0.226*** (0.059)	−0.554*** (0.076)	−0.231*** (0.061)	−0.229*** (0.055)
The peers' domestic employment possibility (%)	−0.007 (0.009)	−0.016 (0.010)	0.012 (0.013)	−0.018 (0.010)	−0.005 (0.009)
The peers' international graduate studies possibility (%)	0.011 (0.009)	−0.004 (0.010)	−0.010 (0.014)	−0.026* (0.011)	−0.011 (0.010)
The peers' domestic graduate studies possibility (%)	−0.026** (0.009)	−0.032** (0.010)	0.000 (0.013)	−0.029** (0.010)	−0.015 (0.010)
Parents: college education	−0.306* (0.127)	−0.122 (0.137)	−0.363* (0.160)	−0.910*** (0.133)	−0.368** (0.129)
Reference: Family economic conditions: lowest					
Family's economic conditions: low	0.241 (0.211)	−0.238 (0.208)	−0.166 (0.241)	0.168 (0.210)	−0.018 (0.194)
Family's economic conditions: middle	0.452* (0.224)	−0.106 (0.223)	0.094 (0.262)	−0.007 (0.230)	−0.015 (0.210)
Family's economic conditions: high	0.344 (0.264)	−0.327 (0.272)	−0.513 (0.358)	−0.680 (0.306) *	−0.259 (0.262)

Table 5 (continued)

	UK	Australia and New Zealand	Germany and France	Korea, Japan, and Singapore	Others
Family's economic conditions: highest	0.189 (0.357)	−0.459 (0.371)	−0.474 (0.473)	−0.359 (0.386)	−0.849* (0.394)
Reference: Parental job: unemployed					
Parent's job: farmer	−0.152 (0.504)	−0.711 (0.613)	0.417 (0.547)	0.078 (0.448)	−0.334 (0.427)
Parent's job: self-employment	0.309 (0.298)	0.142 (0.314)	0.334 (0.370)	0.026 (0.295)	−0.342 (0.268)
Parent's job: public servant	0.307 (0.295)	0.079 (0.311)	0.166 (0.370)	−0.040 (0.296)	−0.481 (0.267)
Parent's job: corporate employee	0.089 (0.293)	0.059 (0.308)	0.098 (0.367)	−0.132 (0.292)	−0.622* (0.264)
Reasons for studying abroad					
Pursuing better teaching and research environment	−0.136 (0.108)	−0.148 (0.114)	−0.309* (0.134)	−0.439*** (0.114)	−0.447*** (0.108)
Improving employability	0.036 (0.086)	−0.171 (0.092)	0.091 (0.114)	−0.259** (0.096)	−0.148 (0.089)
Obtaining development opportunity abroad	−0.422*** (0.099)	0.088 (0.101)	0.051 (0.126)	0.023 (0.104)	−0.310** (0.099)
Enhancing foreign language capacity	0.349*** (0.089)	0.643*** (0.095)	0.461*** (0.117)	0.258* (0.100)	−0.028 (0.094)
Getting knowledge of different customs and culture	0.372*** (0.096)	0.209* (0.105)	0.794*** (0.122)	0.577*** (0.105)	0.197* (0.100)
Mainly funded by personal sources	1.094*** (0.211)	1.529*** (0.286)	0.840*** (0.226)	0.408* (0.175)	−0.020 (0.148)
Plans after graduation					
Working in the destination county	−1.877*** (0.202)	−0.098 (0.182)	−0.716** (0.248)	0.094 (0.180)	−0.220 (0.164)
Getting back after working in the destination county	−1.470*** (0.110)	−0.235 (0.123)	−0.359* (0.144)	−0.294* (0.128)	−0.910*** (0.117)
Uncertain	−1.090*** (0.113)	0.092 (0.126)	−0.432** (0.154)	−0.209 (0.133)	−0.536*** (0.120)
Information channels for studying abroad					
Studying abroad consulting agencies	0.338*** (0.093)	0.467*** (0.102)	−0.816*** (0.120)	−0.618*** (0.102)	−0.592*** (0.094)
Websites of target universities	−0.059 (0.087)	−0.391*** (0.092)	−0.154 (0.117)	−0.497*** (0.099)	−0.200* (0.091)
Recommendations from other people	−0.216* (0.087)	−0.003 (0.092)	−0.071 (0.114)	−0.274* (0.098)	0.105 (0.089)
Field trip abroad	−0.141 (0.132)	−0.344* (0.147)	−0.607** (0.187)	−0.123 (0.140)	0.047 (0.130)

Table 5 (continued)

	UK	Australia and New Zealand	Germany and France	Korea, Japan, and Singapore	Others
University cross-border education partnerships	0.154 (0.130)	0.163 (0.140)	1.013*** (0.147)	0.236 (0.136)	0.238 (0.129)
Year 2016 dummy	0.297* (0.123)	0.155 (0.130)	0.241 (0.157)	0.308* (0.136)	0.148 (0.126)
Year 2017 dummy	0.255* (0.118)	0.185 (0.126)	0.323* (0.155)	0.349** (0.132)	0.223 (0.121)
Constant	1.456 (1.794)	0.274 (2.077)	−0.529 (2.112)	1.516 (1.975)	3.219 (2.022)
N	6983				
Pseudo R^2	0.121				

This table is based on the Survey on Bachelor's Degree Recipients data from Jiangsu, China. The raw coefficients of the multinomial logit model are reported. Standard errors in parentheses. Some observations have missing data on university satisfaction, monthly income of peers, parent education level and job, and plans after graduation. The model therefore also includes dummy variables for missing data on these variables. "Peers" means graduates from the same university, education level, and major to samples. The peers' monthly income variable is deflated by the consumer price index for all urban consumers and is in 2015 RMB. Taking sample size into account, we merge HMT regions of China, EU countries, Canada, and Others into one group as "others" in the dependent variable of this multinomial logit model. * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Krupnick ([2016](#)) stated that the decline in economic growth in China, domestic and foreign competition for international students, and rising scrutiny of nonimmigrant student visas all contribute to the challenging circumstances faced by US higher education institutions regarding recruiting Chinese students for master's programs. Additionally, other China-related factors, such as improved education quality and increased education opportunities with affordable tuition, stronger job prospects, safe environments, and political stability, all make the USA a less preferable and less attractive destination to study abroad. In contrast, this loss of the USA is a gain for other popular countries, such as the UK and Canada.[25]

Based on the theoretical decision-making framework of Chinese outbound graduate students, as well as the available parameters of interest from the empirical models in the previous section, we conduct seven pairs of counterfactual simulations that are policy relevant. Specifically, we set out to examine the impact of the change in student satisfaction with Chinese higher education and the impact of financial stocks that are closely associated with college affordability in the USA, the UK, and other countries on the student demand side (*schooling-constrained model*). On the college supply side, the simulations examine the impact of financial aid policy change in destination countries and the impact of work visa policy change (*international migration model*). For example, the USA is the best-known and most reputable country that uses its generous, merit-based, and need-based financial aid policies to compete for the best minds in the world. The H-1B work program, although controversial, is regarded as a direct and convenient path to permanent residency in the USA. Our final three pairs of simulations examine specific recruitment efforts that are rooted in and can explain the *consumption motive model*. The scenarios include recruitment collaborations and partnerships with consulting agencies in China, the building and maintenance of user-friendly recruitment/college websites, and the establishment of bilateral partnerships with Chinese universities and colleges.

The standard counterfactual simulation approach considers different scenarios and compares the outcomes between an actual scenario and the counterfactual scenario. For simplicity, our assumption is that policy changes are exogenous and that there are no confounding general equilibrium effects that would reverse the results, at least in a short period. This approach has been widely adopted to simulate counterfactual changes in the effects of financial aid on student departure from college (DesJardins & McCall, [2010](#); DesJardins et al., [2002](#)), the effects of graduate program quality on student attrition (Groen et al., [2008](#)), the effects of expected earnings on college major choice (Arcidiacono et al., [2012](#)), and the effects of preferences on the gender gap in college major choice (Bordón et al., [2020](#)).

The algorithmic construction of the counterfactual policy simulations is presented in Algorithm 1 in the Appendix. We consider both the choice of whether to study abroad and the choice of which country to study in, resulting in the nested logit model and multinomial logit model as reported in the previous sections.

Counterfactual scenario #1: changes in higher education satisfaction in China

The first counterfactual simulation examines the impact of hypothetical changes in higher education satisfaction on Chinese outbound graduate students' decision-making. The schooling-constrained model predicts that there exists a substitutional effect between

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[25] https://www.bangkokpost.com/world/1953984/chinese-students-turn-away-from-us-universities

studying abroad and staying to attend graduate studies or work locally. China has invested significant efforts to build world-class universities (Song, 2018), and we have witnessed the rapid development of growing US university enterprises such as the New York University Shanghai campus and the Duke Kunshan campus. Even so, development efforts will take a considerable amount of time, and access to high-quality higher education opportunities in China is ultra-selective. The concerns that higher education quality in China is generally low will not disappear overnight (Loyalka et al., 2019). In this simulation, we assume that Chinese outbound graduate students' choices are only affected by the change in higher education quality to ensure the exogeneity of the policy variation. To measure and account for university quality, we use students' satisfaction (subjective evaluation) as a proxy. The probabilities of choosing to study abroad in the baseline model are compared with two scenarios that include Chinese outbound graduate students who reported increased or decreased satisfaction with the domestic institution for one unit level.

Based on the simulation results of the nested logit model, Fig. 3 depicts the predicted study abroad probability of Chinese bachelor's degree recipients, in which the probability is higher if there are more values farther to the right, while the probability becomes lower if there are more values farther to the left. Noticeable changes in the probability of studying abroad can be seen when Chinese bachelor's degree recipients experienced the change in graduates' level of satisfaction with domestic university education.[26] Note that the scale of probability changes when higher education satisfaction increased/decreased is not symmetric. The implication is that additional factors exist that impact the decision-making of Chinese bachelor's degree recipients.

This result is consistent with the predictions of schooling-constrained model and nested logit model estimation: dissatisfaction with domestic higher education (particularly due to a lower level of higher education quality) would increase the probability of studying abroad for Chinese bachelor's degree recipients. In contrast, the probability of studying abroad would decrease if student satisfaction with domestic higher education became greater (particularly due to increasing higher education quality).

We also discover that among students who have already chosen to study abroad, the impact of a change in higher education satisfaction on their selection of destination countries is relatively small (see Figure A.3 for details). Table 6 reports the percentage of all students by destination country under each policy scenario. Under the scenario of lower domestic institutional satisfaction, the probabilities of choosing to study in the USA and UK are 19.2% and 26.3% (8% and 3% increase from the status quo estimates from the model), respectively. The corresponding predicted probabilities under higher domestic institutional satisfaction are 18.5% and 26.0% (4% and 2% increases from the status quo estimates) for the USA and UK, respectively.

The implication that comes out of this policy simulation is that although skills training and access to quality education are core elements under the schooling-constrained model, many other influencing factors equally impact where Chinese outbound graduate students choose to study abroad. Although lower satisfaction with domestic higher education incentivizes Chinese bachelor's degree recipients to study abroad, a more important message for US institutions is that the quality of higher education of US universities is seen as a given for Chinese outbound graduate students. Therefore, US higher education institutions should focus on

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[26] The simulation results based on the nested logit model and multinomial logit model presented in Table A.4 are very close.

emerging factors under the international migration model framework and consumption motive model framework, such as relaxed work visa policies and additional cultural enrichment programs, which we will discuss in the following simulations, to compete with other countries, such as the UK, for the best graduate students from China. The predictions of the probabilities imply that the UK is a competitive destination for Chinese outbound graduate students.

Counterfactual scenario #2: changes in financial affordability of Chinese students

In 2019, approximately 400,000 Chinese students enrolled at US colleges and universities, contributing approximately $15 billion in tuition and fees to the US economy.[27] In US graduate schools, particularly at the master's level (our focus of the survey study), most programs are tuition driven, and international graduate students pay out of their own pocket. Other countries, such as the UK, Canada, and especially Australia, are similar in this regard. As a result, international graduate students from China, who have the financial capacity to pay independently, are particularly welcomed in the global education market.

The second counterfactual simulation examines what would happen to the probability of enrollment in graduate schools abroad if there were positive or negative changes in Chinese students' financial situations. Unlike in the USA or other industrialized countries such as the UK and Canada, many students are financially dependent on their parents in China regarding educational investment. Chinese parents are also more than willing to spend money on education, which they regard as a path to a better life. The schooling-constrained model predicts that the impact of financial stocks is closely associated with college affordability in the USA, the UK, and other countries. Our assumption is that financial capacity is a standalone, exogenous factor. Consequently, provided that China's economy has entered a "new normal" in which China's economic growth has shifted significantly from high speed to medium to high speed since 2014, the individual wealth level of Chinese families will be negatively impacted, and their willingness to pay to study abroad will also decrease significantly in the coming years.

Figure 4 presents evidence that family income is an indispensable factor that influences the probability of studying abroad for Chinese bachelor's degree recipients, in which the probability is higher if there are more values farther to the right, while the probability becomes lower if there are more values farther to the left. When families could not pay more, there would be a lower probability of choosing (and lower affordability) to study abroad.[28] Table 6 presents detailed results of the second policy simulation. Whether students choose to study in the USA does not seem to be very affected by changes in family financial circumstances. This result could arise because an absolute change of one unit of family income is not financially significant enough or because the USA is a solid choice for Chinese outbound graduate students despite their financial situations. Nevertheless, the UK might be most negatively affected by the decreasing affordability of Chinese students for an overseas education. The alternative destination country options include Australia, New Zealand, Germany, and France. When family income in China increased, students would be redirected from Asia and Europe to pursue graduate studies in the USA and UK.

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[27] https://theconversation.com/5-reasons-chinese-students-may-stop-studying-in-the-us-141966

[28] The simulation results based on the nested logit model and multinomial logit model presented in Table A.4 are very close.

Overall, our finding demonstrates that family income plays an indispensable role in influencing the probability of studying abroad for Chinese bachelor's degree recipients. The finding is consistent with the predictions of schooling-constrained model and nested logit model estimation: higher family income would increase the probability of studying abroad while the probability of studying abroad would decrease if the family income became lower. However, family income has mixed effects on students' host country choices. The implication is that although financial affordability is important under the schooling-constrained model, many other influencing factors equally and concurrently impact where Chinese outbound graduate students choose to study abroad.

Counterfactual scenario #3: changes in scholarship policies in host countries

While most Chinese students who study abroad pay for their own education, there are a reasonable number of students who rely primarily on merit-based scholarships, particularly at the doctorate level. The third counterfactual simulation examines the impact of financial aid policy change in destination countries. The international migration model predicts that the impact of financial aid policy change in destination countries is closely related to destination choice of Chinese bachelor's degree recipients.

The results from panel C in Table 6 suggest that the USA would experience a loss of a small number of Chinese outbound graduate students if all destination countries would not provide scholarships. In contrast, almost all Chinese outbound graduate students would choose to study in the USA if scholarships were available. Statistically, the probability of Chinese students going to the USA for graduate studies would rise dramatically by 54%. Under the same scenario, the probability of Chinese outbound graduate students going to the UK, Australia, New Zealand, Germany, and France would suffer a large decrease.

The finding is consistent with predictions from the international migration model and multinomial logit model estimation that said providing financial aid in one country (leading to lower cost for international student mobility) would increase the probability of being selected as destination for international graduate study while the probability of being selected as destination for studying abroad would decrease if the country could not provide financial aid (leading to higher cost for international student mobility on the contrary).

Another important discovery is that result from the impact of merit-based scholarship on the enrollment of Chinese outbound graduate students contradicts findings from the domestic context in the USA. For example, Fitzpatrick and Jones (2016) documented a moderate to no impact of merit-based scholarships on college enrollment and degree completion and an unknown impact on economic prosperity when combining datasets from across multiple states. We cautiously note, however, that our target student population is different. Moreover, our simulation incorporated a sample of students who had already started to study abroad, and we focused on the distributional changes (intensive margin). We are unable to answer the question regarding potentially new entrants to the international graduate education market (extensive margin) due to data limitations. Nonetheless, the extensive margin effect would be minimal in the short term, as we have shown that students make the two-step decisions sequentially and separately.

Counterfactual scenario #4: changes in work visa policy in host countries

Given that job prospects after graduation are obviously critical considerations for students deciding to study abroad, it is anticipated that tightening or loosening the work

Fig. 3 Changes in university satisfaction and predicted study abroad probability of Chinese bachelor's degree recipients. *Notes*: The sample mean of predicated study abroad probability is 2.8%. If the university satisfaction of Chinese bachelor's degree recipients had increased for one level, the predicted probability would be 2.6%, while the predicted probability would be 3.7% if their university satisfaction had decreased for one level
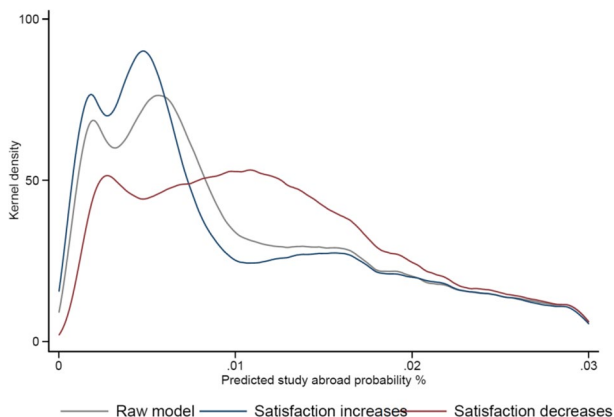
visa approval rate will affect international students' choices of host countries (Chen et al., 2020). The fourth counterfactual simulation examines the impact of work visa policy change in destination countries. The international migration model predicts that the impact of work visa policy change in destination countries is closely related to destination choice of Chinese bachelor's degree recipients.

Figure 5 virtualizes the changes in working opportunities and predicts the enrollment probabilities of going to the USA and UK, while the probability is higher if there are more values farther to the right and the probability becomes lower if there are more values farther to the left. The USA and UK are the two largest destination countries and competitors that recruit Chinese outbound graduate students. In both countries, changes in work visa policies would greatly impact the graduate school enrollment decisions of Chinese students.[29]

Panel D in Table 6 presents the detailed findings. If none of the destination countries provided work permits for international graduate students, the probability of Chinese students choosing to study in the USA would decrease rapidly by 32%. Meanwhile, students would be more likely to choose the UK alternatively (the probability increases by 49.4%). Under the same scenario, Chinese students would also become less likely to study in Australia, New Zealand, Germany, France, and other Asian countries.

In contrast, the probability of Chinese students choosing to pursue graduate studies in the USA as a destination country would be obviously higher than the baseline probability of 9.6% when host countries could provide work permits for international students. It is surprising that the probability of Chinese outbound graduate students choosing the UK as the destination would decrease by 56.9% in this scenario. A direct implication is that the UK is not a priority place to work if students are given options. Note that the probabilities of studying in other countries indicated in the survey also increase under this scenario, except for France and Germany.

The findings are consistent with the predictions from the international migration model and multinomial logit model estimation that loosening work visa policy in one country (mainly leading to more working opportunities for international students) would increase

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[29] The simulation results based on the multinomial logit model with interaction terms presented in Table A.7 are very similar to those without interaction terms.

Table 6 Simulation of destination country choices: adjusted probability of assuming all Chinese outbound graduate students had…

	Baseline model estimates	Decrease/no in factors of panels A–G			Increase/yes in factors of panels A–G		
		Adjusted probabilities	Differences in adjusted probabilities	Percent change in adjusted probabilities	Adjusted probabilities	Differences in adjusted probabilities	Percent change in adjusted probabilities
Panel A: satisfaction on university graduated from							
USA	0.178	0.192	0.014	7.87%	0.185	0.007	3.93%
UK	0.255	0.263	0.008	3.14%	0.260	0.005	1.96%
Australia and New Zealand	0.164	0.159	−0.005	−3.05%	0.167	0.003	1.83%
Germany and France	0.083	0.074	−0.009	−10.84%	0.082	−0.001	−1.20%
Korea, Japan, and Singapore	0.140	0.142	0.002	1.43%	0.123	−0.017	−12.14%
Others	0.180	0.171	−0.009	−5.00%	0.184	0.004	2.22%
Panel B: family income							
USA	0.178	0.180	0.002	1.12%	0.182	0.004	2.25%
UK	0.255	0.230	−0.025	−9.80%	0.276	0.021	8.24%
Australia and New Zealand	0.164	0.180	0.016	9.76%	0.166	0.002	1.22%
Germany and France	0.083	0.085	0.002	2.41%	0.081	−0.002	−2.41%
Korea, Japan, and Singapore	0.140	0.139	−0.001	−0.71%	0.120	−0.02	−14.29%
Others	0.180	0.186	0.006	3.33%	0.176	−0.004	−2.22%
Panel C: scholarship for studying abroad							
USA	0.178	0.173	−0.005	−2.81%	0.274	0.096	53.93%
UK	0.255	0.260	0.005	1.96%	0.162	−0.093	−36.47%
Australia and New Zealand	0.164	0.168	0.004	2.44%	0.066	−0.098	−59.76%
Germany and France	0.083	0.086	0.003	3.61%	0.060	−0.023	−27.71%

Table 6 (continued)

	Baseline model estimates	Decrease/no in factors of panels A–G			Increase/yes in factors of panels A–G		
		Adjusted probabilities	Differences in adjusted probabilities	Percent change in adjusted probabilities	Adjusted probabilities	Differences in adjusted probabilities	Percent change in adjusted probabilities
Korea, Japan, and Singapore	0.140	0.140	0.000	0.00%	0.151	0.011	7.86%
Others	0.180	0.174	− 0.006	− 3.33%	0.287	0.107	59.44%
Panel D: working permit in destination country							
USA	0.178	0.121	− 0.057	− 32.02%	0.195	0.017	9.55%
UK	0.255	0.381	0.126	49.41%	0.110	− 0.145	− 56.86%
Australia and New Zealand	0.164	0.115	− 0.049	− 29.88%	0.187	0.023	14.02%
Germany and France	0.083	0.077	− 0.006	− 7.23%	0.060	− 0.023	− 27.71%
Korea, Japan, and Singapore	0.140	0.111	− 0.029	− 20.71%	0.194	0.054	38.57%
Others	0.180	0.195	0.015	8.33%	0.254	0.074	41.11%
Panel E: consulting agencies for studying abroad							
USA	0.178	0.190	0.012	6.74%	0.195	0.017	9.55%
UK	0.255	0.293	0.038	14.90%	0.110	− 0.145	− 56.86%
Australia and New Zealand	0.164	0.197	0.033	20.12%	0.187	0.023	14.02%
Germany and France	0.083	0.060	− 0.023	− 27.71%	0.060	− 0.023	− 27.71%
Korea, Japan, and Singapore	0.140	0.114	− 0.026	− 18.57%	0.194	0.054	38.57%
Others	0.180	0.146	− 0.034	− 18.89%	0.254	0.074	41.11%
Panel F: websites of target universities							
USA	0.178	0.192	0.014	7.87%	0.195	0.017	9.55%
UK	0.255	0.271	0.016	6.27%	0.110	− 0.145	− 56.86%

Table 6 (continued)

	Baseline model estimates	Decrease/no in factors of panels A–G			Increase/yes in factors of panels A–G		
		Adjusted probabilities	Differences in adjusted probabilities	Percent change in adjusted probabilities	Adjusted probabilities	Differences in adjusted probabilities	Percent change in adjusted probabilities
Australia and New Zealand	0.164	0.149	−0.015	−9.15%	0.187	0.023	14.02%
Germany and France	0.083	0.086	0.003	3.61%	0.060	−0.023	−27.71%
Korea, Japan, and Singapore	0.140	0.122	−0.018	−12.86%	0.194	0.054	38.57%
Others	0.180	0.180	0.000	0.00%	0.254	0.074	41.11%
Panel G: university cross-border education partnerships							
USA	0.178	0.147	−0.031	−17.42%	0.195	0.017	9.55%
UK	0.255	0.241	−0.014	−5.49%	0.110	−0.145	−56.86%
Australia and New Zealand	0.164	0.155	−0.009	−5.49%	0.187	0.023	14.02%
Germany and France	0.083	0.140	0.057	68.67%	0.060	−0.023	−27.71%
Korea, Japan, and Singapore	0.140	0.138	−0.002	−1.43%	0.194	0.054	38.57%
Others	0.180	0.179	−0.001	−0.56%	0.254	0.074	41.11%

This table is based on simulation results of the multinomial logit model which explores Chinese students' destination country choices for international graduate studies, using the Survey on Bachelor's Degree Recipients data from Jiangsu, China. The sample includes 2015–2017 cohorts. *Baseline* displays the predicted international study probabilities of the sample. *Adjusted probabilities* simulate how the predicted international study probabilities of Chinese students would change if their university satisfaction or families' economic affordability decreased or increased, whether scholarships or working opportunities were provided by their destination countries or not, and whether studying abroad consulting agencies, friendly websites, or partner universities were used to attract Chinese students with bachelor's degrees by their target universities or no
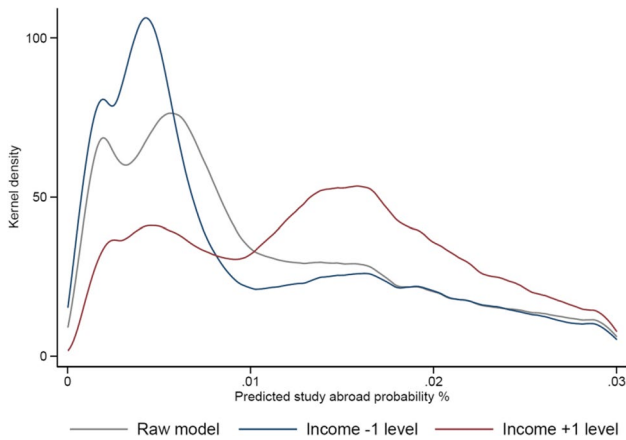
Fig. 4 Changes in family income and predicted study abroad probabilities of Chinese bachelor's degree recipients. *Notes*: The sample mean of predicated study abroad probability is 2.8%. If the family income of Chinese bachelor's degree recipients had increased for one level, the predicted probability would be 4.3%, while the predicted probability would be 2.2% if their family income had decreased for one level

the probability of being selected as destination for international graduate study while the probability of being selected as destination for studying abroad would decrease if the country tightened work visa policy (mainly leading to fewer working opportunities for international students).

Counterfactual scenario #5: changes in recruitment strategies

The final set of simulations examines changing recruitment approaches (see panel E, panel F, and panel G in Table 6). Established recruitment measures include setting up study-abroad consulting agencies in China, designing user-friendly college websites, and developing cross-border education partnerships with Chinese higher education institutions. The consumption motive model predicts that recruitment strategies of destination countries are closely related to destination choice of Chinese bachelor's degree recipients.

Under the scenario in which all destination countries adopted the abovementioned recruitment strategies, the probability of Chinese students pursuing graduate studies in the USA would increase by 9.6%, while the corresponding probability of choosing the UK would decline significantly by 56.9%. Under the scenario in which none of the destination countries would set up study-abroad consulting agencies in China or design user-friendly college websites, the probabilities of Chinese students going to the USA would appear to increase by 6.7% and 7.9%, respectively, and the probabilities would increase by 14.9% and 6.3%, respectively, for the UK. Similarly, if no host countries developed cross-border education partnerships with Chinese higher education institutions, the probabilities of Chinese students choosing to study in the USA and UK would decrease by 17.4% and 5.5%, respectively. Therefore, the efforts invested in building cross-border higher education partnerships make strategic sense.

We find that both active and passive recruitment strategies have mixed effects on students' host country choices. The implication is that although recruitment strategies play an important role under the consumption motive model, many other influencing factors impact where Chinese outbound graduate students choose to study abroad equally and concurrently.

Conclusion

Using a uniquely large-scale administrative and survey dataset from Jiangsu Province, China, we study the decision-making of Chinese outbound graduate students from the region. Our findings provide novel evidence on the characteristics of Chinese outbound graduate students. From a descriptive perspective, we present and discuss the characteristics and patterns of Chinese outbound graduate students. Taking advantage of the estimation results from the nested logit model and multinomial logit model, we conduct a series of counterfactual policy simulations to examine how different policy change scenarios would impact the decision-making of Chinese outbound graduate students, such as where they would choose to attend a graduate program. To the best of our knowledge, our paper is one of the first studies to provide such comprehensive simulations of Chinese outbound graduate students' destination country choice.

Our findings have important implications at both the state (government policymaking) and institutional levels (universities and colleges) of the destination countries, given the diplomatic and financial interests of participating stakeholders. In terms of policy implications for individual institutions in the USA or elsewhere, we believe that the framework that we propose and empirically examine in this paper will help institutions better understand how Chinese students make their international graduation education choices. Particularly, students have diverse preferences for international studies that lead to varying responses to different potential scenarios. Our simulations are at the extensive margin for between-country comparisons that can provide alerts for the overall flows of Chinese students. One of our simulations also target institutional policies (recruitment strategies), which can be informative institutions about how Chinese students respond to different recruitment efforts. With more detailed data among a specific institution's recruiting pool, our framework and simulation methodology (as we provide open-source algorithms and codes) can be readily applied to institution's own analysis.

Our findings can help universities adapt to the academic, cultural, and professional needs of prospective Chinese outbound graduate students by designing a graduate curriculum that addresses the driving factors discussed in the schooling-constrained, international migration, and consumption motive frameworks. The ultimate educational goal is to equip graduates with adequate market competencies to satisfy career requirements as well as connecting students with personal development opportunities such as internships. We observe that some US universities that emphasize the career training aspect of graduate education, which falls under the international migration option framework, achieve great success in international graduate student recruitment. By doing so, US universities occupy the pivotal position in leading in the global graduate education market and remain ultracompetitive in terms of academic training, research development, institutional strategy, the maintenance of US job market prosperity, and global talent attraction.

Finally, our research contributes to the growing college choice literature by presenting solid empirical evidence and we have associated our findings with an integrated framework that incorporates the schooling-constrained model, international migration model, and consumption motive model with a focus on international graduate education. We uncover the underlying mechanisms that shed light on why Chinese college graduates would choose to study abroad, supporting the schooling-constrained model and international migration model with empirical results. We demonstrate that increasing the satisfaction of Chinese higher education will reduce the probability of Chinese bachelor's degree recipients seeking to study abroad for graduate education,
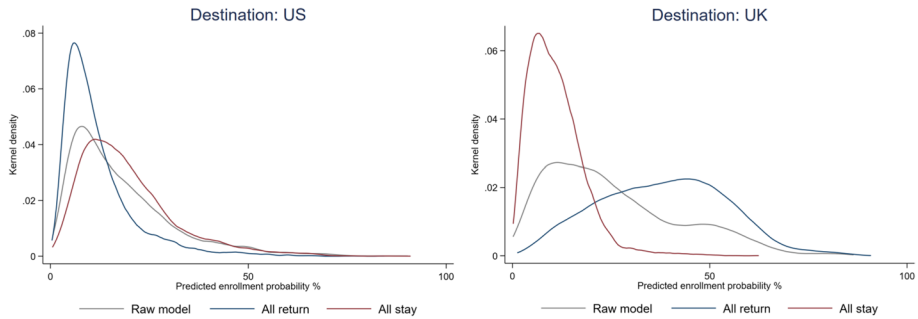
Fig. 5 Changes in working opportunities and predicted enrollment probability of Chinese outbound graduate students. *Notes*: The figures are based on the simulation results of the multinomial logit model which explores Chinese students' destination country choices for graduate studies abroad. The raw model displays the predicted enrollment probability of the sample; *All Stay* and *All Return* simulate how the predicted enrollment probability of Chinese students would change if their destination countries had provided enough or no working opportunities, respectively

and we show that decreasing job opportunities in destination countries such as the USA will lower the appeal for Chinese students to study there. Consistent with the consumption motive model, our findings also emphasize the importance of incorporating cultural enrichment and other nonmonetary efforts into formal graduate school education to attract international graduate students in sustainable ways. However, we would like to acknowledge that characteristics (quality factors for example) of the destination institution should be included for future research analysis. The specific measures of institution quality, for example, would add value to the discussion of students' decision-making process for study abroad, as the quality factor makes more sense for high caliber students, rather than the destination country factor alone. This would be something to be hopeful for in the coming years as we are currently making efforts on it.

We conclude by pointing out that although our descriptive findings are very consistent with theoretical models, the results in this paper are still limited and not able to examine long-run general equilibrium effects. Future work can provide quasi-experimental and experimental evidence to demonstrate factors that would causally impact Chinese outbound graduate students' decision-making, particularly their informational and behavioral barriers (Ye, 2021). Consequently, the work can also be helpful for evaluating relevant and critical higher education policy changes in the context of China, the USA, the UK, and other interested destination countries.

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