

Sino-Globalization Network of Chinese Migrants, Students, and Travellers

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중국 이민자, 유학생, 여행자를 통해서 본 세계화 네트워크

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Abstract This study examined Sino-globalization through the network analysis of Chinese immigrants, international students, and travelers. The data were collected from the United Nations for immigrants, UNESCO for international students, and Ministry of Culture and Tourism of China for travelers. Consequently, Chinese immigrants and international students' favorite destinations were advanced Western countries, and Chinese travelers showed a high preference for Asian regions. Specifically, Thailand was the most popular destination for traveling, while the U.S. appeared to be the main destination for Chinese immigrants and students. The QAP analysis results showed a statistically significant correlation between the immigrant network and international student network. MR-QAP analysis found a causal relationship between the two networks. These findings may serve as empirical evidence for the Chinese government to review potential opportunities and problems related to Sino-globalization and provide the basis for preparing policy measures for other countries. Subsequent studies should compensate for research limitations by analyzing specific factors affecting national choice of Chinese immigrants, students, and travelers. The economic, social, and cultural impacts of China's globalization on other countries need to be discussed using qualitative research.

요약 이 연구는 중국인이 세계화로 편입되는 상황에서 나타나는 이민자, 유학생, 여행자의 네트워크 분석을 통해 중국 세계화 현황을 살펴보는 것을 목적으로 한다. 글로벌 네트워크에서 중국 이민자, 유학생, 여행자의 연관성을 제시하였다. 분석 방법은 UN의 이민자 데이터와 UNESCO의 유학생 데이터, 중국문화여행부의 여행자 데이터를 이용하여 중국 세계화의 관점에서 네트워크 및 QAP분석을 이용하였다. 분석결과 첫째, 이민이나 유학은 선진국으로 향하는 경향이 강했고, 여행은 아시아 지역에 대한 선호도가 높은 것으로 나타났다. 국가별로 태국은 여행자 네트워크에서, 미국은 이민자와 유학생 네트워크의 주요 목적지로 나타났다. 둘째, QAP 기반 통계적 상관관계 분석결과 중국 이민자들과 유학생들로 구성된 매트릭스 간 상관관계가 유의미한 것으로 나타났다. MR-QAP 분석을 통해 유학생과 이민자 네트워크가 높은 결정계수를 보여 두 변수 간 인과관계가 높은 것으로 나타났다. 이 분석을 통해 중국의 세계화에 따른 기회와 문제점을 검토하고 각국별 정책적 대책을 마련할 수 있는 실증적 근거를 제시하였다. 후속 연구에서는 중국 유학생과 중국 이민자의 국가 선택 요인, 중국의 세계화가 다른 나라들에 미치는 경제적, 사회적, 문화적 영향을 다각도로 분석하여 이 연구의 제한점을 보완할 것이다.

Keywords : China, Migrant, Traveller, Oversea Student, Sino-Globalization, Network Analysis

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1. Introduction

In December, 1978, Chinese government implemented China's reform and opening-up policy. It had gradually departed from the full planned economy and developed good ties with other countries based on the Five Principles of Peaceful Coexistence at the National Congress of the Communist Party of China that was held in 1987[1]. Since 1992, it had confirmed socialist market economy with the increasing private enterprises and globalization in various areas including business, culture, and tourism. Especially, as China joined World Trade Organization(WTO), a wide range of areas such as trade, economy, culture, tourism, scholarly research was developed worldwide between China and other countries[2]. In 2013, Chinese government proposed the Belt and Road Initiative(BRI) that means the Silk Road Economic Belt and 21st Century Maritime Silk Road. China's BRI aims at having effective platforms between China and collaborating countries to develop economic cooperation based on the concept of the Silk Road in the Han Dynasty of China, which is to establish the cross-continental community in diverse areas including politics, economy, culture[3,4]. Until January in 2020, China concluded cooperation with 138 countries including South Korea and 30 international organizations[5]. Europe is an important continent for the BRI, while Italy is the country that firstly joined the BRI among the EU countries[6]. China, in the forefront of trade and economy in the world, became an influencer that changed the worldwide economic situation and affected various fields such as politics, culture, and science and technology. Researchers insisted that the world structure will change having either one superpower, two superpowers, or multiple potential superpowers in ten years[7]. Particularly, the current globalization process is facing resistances against globalization, while

U.S.-centric world system is unfavorable for cultural diversity and impartial trade. In this situation, countries such as Iran and Pakistan provide better symbiotic development platforms than China, expecting global cooperation in line with search for common features with China and complement of different features with it. Also, uncertainty in EU countries aligned with Brexit, the United Kingdom's withdrawal from the EU, influences the direction of the globalization. In particular, due to the increasing COVID-19 positive cases and deaths, the present world economy is unstable and under the process of potential revolution. Therefore, it is time to investigate China-centric globalization and global network. This research aims to examine the China-centric globalization process and features of its networks by analyzing immigrant network, international student network, and traveler network.

2. Research Method and Design

2.1 Data Collection and Format

The present research investigated the datasets of migrants, international students, and travelers. The data of migrants was obtained from United Nations[8], international student data from UNESCO Institute for Statistics[9], and traveler data from Ministry of Culture and Tourism of the People's Republic of China[10], respectively. The datasets of migrants, students and travelers were collected in February, 2020. As a matter of fact, all three datasets were not in network format. To make matters worse, both migration and student flow data were not composed in a networked way. Since automated parsing techniques can not be employed, it took a quite long time to manually configure the collected data for network analysis.

More specifically, the migrants data included 143 countries by the year of 2019. For the

international student data, the number of the Chinese students studying in 78 other countries in 2017 was retrieved from the UNESCO. Lastly, the travelers' data had 30 countries where people traveled between January and September in 2019 from China and the other rest of the World. The data was converted into a $n \times n$ matrix format for network analysis. During this period, standard matrix multiplication algorithm based on the sums of cross-products, embedded in the UCInet software, was employed after log transformation[11]. The values between specific countries (regarded as nodes in network analysis), indicated in a cell in $n \times n$ matrix, show the relationship between them in terms of the international flows from a perspective of China[12, 13].

2.2 Network Analysis

This paper uses a social network analysis that is an effective way to grasp relations between China and each country at a glance[14-16]. In addition, eigenvector centrality measures were used to examine the networked positions of

individual countries[17]. Network diagrams were created using the NodeXL.

Finally, the QAP (Quadratic Assignment Procedure) was conducted to compare the structural similarity among matrices. QAP is an algorithm that test the correlation between networks through two steps. In the first step, it measures Pearson's correlation coefficient between corresponding cells in matrices. In the second step, it randomly arranges rows and columns in a matrix and calculates correlation, which is followed by hundreds times of iteration to further measure the ratio of the cases that the correlation coefficient in the second step is larger than that in the first step. The significance below 0.05 indicates strong relationship between matrices[18]. The present research adopted the significance below 0.005 in order for conducting much stricter statistical analysis. Multiple regression quadratic assignment procedures (MR-QAP) embedded in the UCInet was also tested to examine the multiple linear regression between square matrices[19].

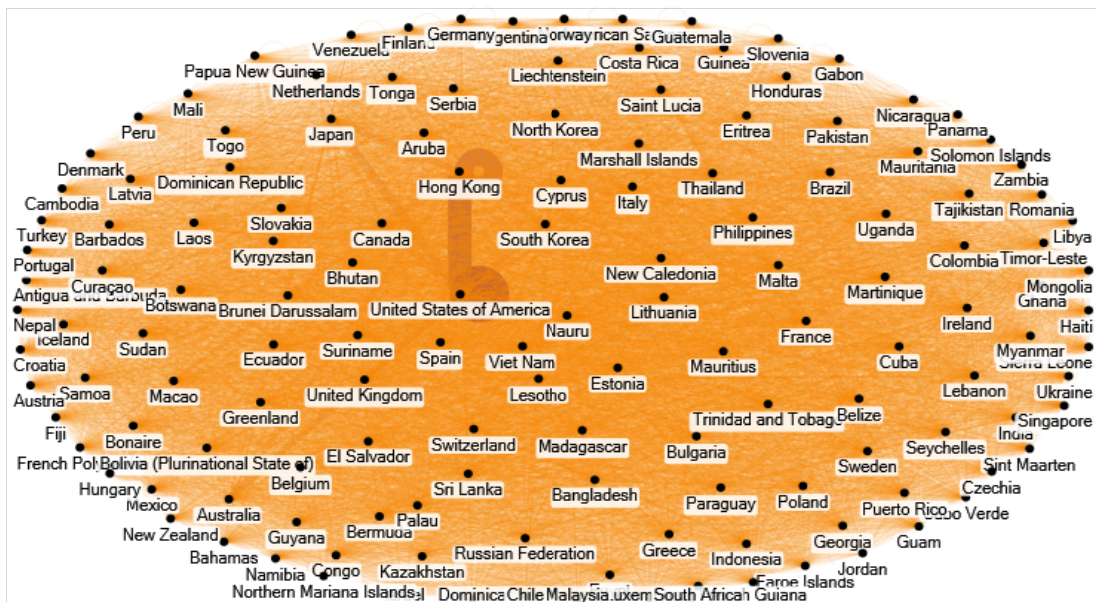


Fig. 1. International network of immigrants

3. Results

3.1 Sino-Globalization network of Chinese Migrants

Chinese emigrated to 143 countries. As shown in Table 1, the top countries that had over 0.5 million Chinese immigrants included United States of America (2899267 immigrants), Hong Kong (2272293), Japan (784763), Canada (691489), Australia (641624), and South Korea (620295). European countries such as Italy (228231), United Kingdom (225385), Spain (164695), France (121172), or Germany (119093) also received immigrants from China. It illustrates that America, Asia, Oceania, and Europe were the popular continents where Chinese emigrated; on the other hand, Africa was not popular destination of their emigration.

Table 1. Top 50 countries in terms of number of Chinese immigrant

Rank	Country/Region	Value	Eigen vector	Rank	Country/Region	Value	Eigen vector
1	USA	2899267	1.000	26	Brazil	26078	0.009
2	Hong Kong	2272293	0.784	27	Switzerland	25313	0.009
3	Japan	784763	0.271	28	Jordan	21669	0.007
4	Canada	691489	0.239	29	Belgium	21031	0.007
5	Australia	641624	0.221	30	Austria	20910	0.007
6	South Korea	620295	0.214	31	Peru	20390	0.007
7	Singapore	380145	0.131	32	Panama	19876	0.007
8	Macao	297643	0.103	33	Nepal	19558	0.007
9	Italy	228231	0.079	34	Hungary	17389	0.006
10	UK	225385	0.078	35	Denmark	14880	0.005
11	Bangladesh	164917	0.057	36	Argentina	14649	0.005
12	Spain	164695	0.057	37	Laos	14205	0.005
13	France	121172	0.042	38	Finland	14040	0.005
14	Germany	119093	0.041	39	Ireland	13924	0.005
15	India	108286	0.037	40	Venezuela	13581	0.005
16	New Zealand	95185	0.033	41	Norway	12448	0.004
17	Thailand	77581	0.027	42	Malaysia	11864	0.004
18	Indonesia	75511	0.026	43	Mongolia	11271	0.004
19	Netherlands	70830	0.024	44	Portugal	10638	0.004
20	Russian	56157	0.019	45	Chile	10540	0.004
21	South Africa	41004	0.014	46	Mexico	9258	0.003
22	Philippines	37083	0.013	47	Ukraine	6625	0.002
23	Myanmar	34893	0.012	48	Romania	5557	0.002
24	Sweden	34476	0.012	49	Czechia	5404	0.002
25	North Korea	29145	0.010	50	Suriname	5260	0.002

Table 1 shows that the U.S. held the higher values in eigenvector centrality indicator than other countries, followed by Hong Kong, Japan, South Korea, Canada, and Australia. Overall, the top 10 countries are developed economically and located in North America, Asia, and Oceania. The countries ranked below 10 include developing countries. Fig. 1 shows that central nodes such as the U.S. and Hong Kong were located in the center of network diagram as the thickness of lines between them indicate the strength of their relations. The network was visualized using Harel-Koren Fast Multiscale algorithm available in the NodeXL.

3.2 Sino-Globalization network of Chinese international students

It was found that students from China studied in 78 oversea countries. United States of America was the primary country where Chinese students studied the most, the total of which was more than the sum of the students studying in Australia and United Kingdom. The top 50 countries that received Chinese students are displayed in Table 2. As indicated, Chinese students studied mostly in America, Asia, Oceania, and Europe were the major continents than Africa, which is the similar phenomena found in migrants data.

Table 2 shows that the U.S. had the higher values in eigenvector centrality indicators than other countries, followed by Australia, United Kingdom, Japan, Canada, and South Korea. Overall, the top 10 countries are developed economically and located in North America, Asia, and Oceania. The countries ranked below 10 include developing countries. In general, the top 20 countries were developed countries located in North America, Asia, Australia, and Europe. And Fig. 2 is an international network of overseas students.

Table 2. Top 50 countries in terms of number of Chinese students

Rank	Country/Region	Value	Eigen vector	Rank	Country/Region	Value	Eigen vector
1	USA	321624.8	1.000	26	Denmark	1107	0.003
2	Australia	128498	0.400	27	Mongolia	969	0.003
3	UK	96543	0.300	28	Poland	937	0.003
4	Japan	79375	0.247	29	Saudi Arabia	862	0.003
5	Canada	66161	0.206	30	Indonesia	630	0.002
6	South Korea	44163	0.137	31	Belgium	607	0.002
7	Hong Kong	28736.77	0.089	32	Austria	576.5	0.002
8	Germany	27765	0.086	33	Argentina	566	0.002
9	France	24788	0.077	34	Portugal	488	0.002
10	New Zealand	17645.97	0.055	35	Norway	468	0.001
11	Italy	14531	0.045	36	USA	424	0.001
12	Macao	14013	0.044	37	Jordan	355	0.001
13	Russian	11950	0.037	38	Brazil	319	0.001
14	Malaysia	10880	0.034	39	Kyrgyzstan	270	0.001
15	Netherlands	4929	0.015	40	Czechia	251	0.001
16	Sweden	2396	0.007	41	South Africa	192	0.001
17	Spain	2211	0.007	42	India	177	0.001
18	Ireland	2012	0.006	43	Laos	125	0.000
19	Finland	1738	0.005	44	Estonia	109	0.000
20	Switzerland	1678	0.005	45	Luxembourg	84	0.000
21	Hungary	1574	0.005	46	Azerbaijan	76	0.000
22	Turkey	1517	0.005	47	Sri Lanka	73	0.000
23	Belarus	1507	0.005	48	Morocco	57	0.000
24	Kazakhstan	1377	0.004	49	Lithuania	45	0.000
25	Ukraine	1252	0.004	50	Greece	43	0.000

3.3 Sino-Globalization Network of Chinese travelers

Table 3 shows top 30 countries that Chinese travel. They often travel Asian countries including Thailand, Japan, Taiwan, Viet Nam, Hong Kong, Macao, Singapore, Malaysia, Indonesia, South Korea, and Philippines. Many of them also travel European countries such as Russian Federation and Italy and United States of America.

Fig. 3 is an international network of overseas travellers. It uncovered that the traveler network was different from the immigrant and international student networks. The traveler network found Thailand had higher values in eigenvector centrality indicators than other countries, followed by Japan, Taiwan, Vietnam, and Hong Kong. Most of the top 10 countries on the list were Asian countries, and countries in Europe, North America, and Australia appeared afterward. This finding means that the centrality indicators in the traveler network centralized to Asia, unlike the migrant and international student networks.

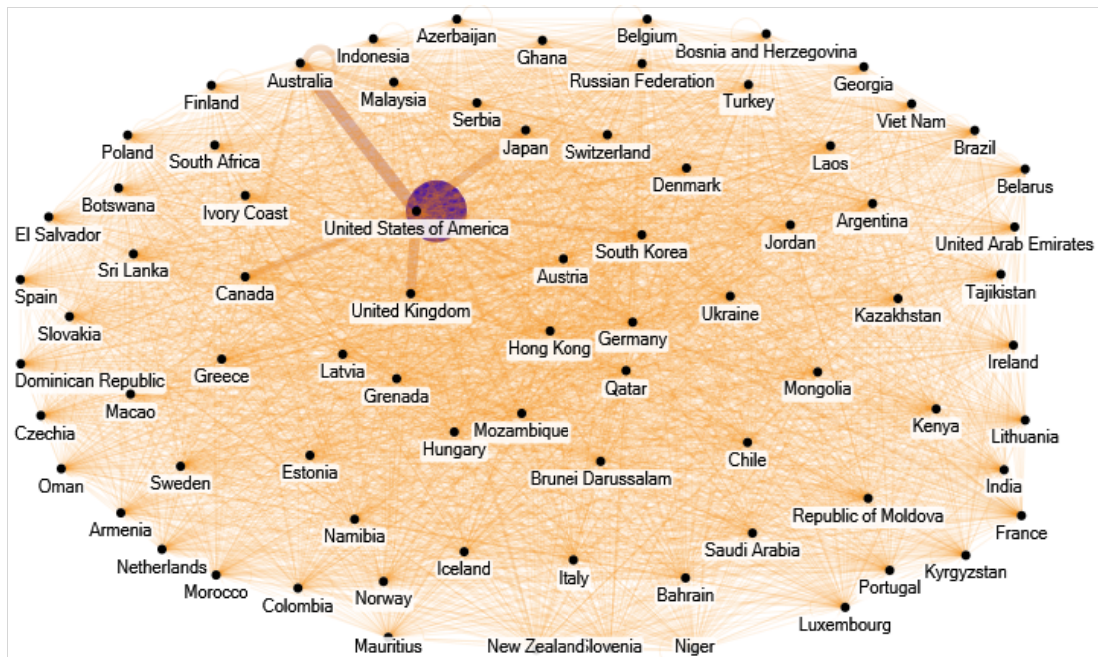


Fig. 2. International network of overseas students

Table 3. Top 30 countries in terms of number of travelers (N=30)

Rank	Country/Regions	Value	Eigen vector	Rank	Country/Regions	Value	Eigen vector
1	Thailand	8022963	1.000	16	Australia	688594	0.086
2	Japan	5738773	0.715	17	Germany	671099	0.084
3	Taiwan	4201576	0.524	18	Switzerland	617524	0.077
4	Viet Nam	4147629	0.517	19	myanmar	518635	0.065
5	Hong Kong	3713569	0.463	20	UK	507016	0.063
6	Macao	2515149	0.313	21	New Zealand	424198	0.053
7	Singapore	2068741	0.258	22	Spain	199118	0.025
8	Malaysia	2015404	0.251	23	India	189140	0.024
9	Indonesia	1414261	0.176	24	Egypt	170008	0.021
10	Russian	1365890	0.170	25	Sweden	161658	0.020
11	South Korea	1199568	0.150	26	Netherlands	142202	0.018
12	Philippines	988613	0.123	27	Denmark	127629	0.016
13	France	795017	0.099	28	South Africa	92706	0.012
14	USA	785601	0.098	29	Mongolia	45536	0.006
15	Italy	704282	0.088	30	Kenya	30400	0.004
16	Sweden	2396	0.007	41	South Africa	192	0.001
17	Spain	2211	0.007	42	India	177	0.001
18	Ireland	2012	0.006	43	Laos	125	0.000
19	Finland	1738	0.005	44	Estonia	109	0.000
20	Switzerland	1678	0.005	45	Luxembourg	84	0.000
21	Hungary	1574	0.005	46	Azerbaijan	76	0.000
22	Turkey	1517	0.005	47	Sri Lanka	73	0.000
23	Belarus	1507	0.005	48	Morocco	57	0.000
24	Kazakhstan	1377	0.004	49	Lithuania	45	0.000
25	Ukraine	1252	0.004	50	Greece	43	0.000

3.2 Comparing Sino-Globalization network

Table 4. QAP correlations (N=16)

	Student	Traveler
Immigrant	0.7356* (p=0.0018)	0.04046 (p=0.4349)
Student		0.1340 (p=0.3201)

*Significant at p<0.005

Table 5. MR-QAP Results (N=16)

	Dependent variable	Independent variable	R-Square	Adj R-Sqr	P-value
Model 1	Immigrant	Student	0.5411	0.5392	0.0025

The present study conducted QAP analysis to test statistical relationships between Chinese immigrant, international student, and traveler networks. Table 4 shows the correlations between the networks. As a result, immigrant network and international student network had the strongest relationship ($r=0.7356$, $n=16$, $p<0.005$). This example showed statistically

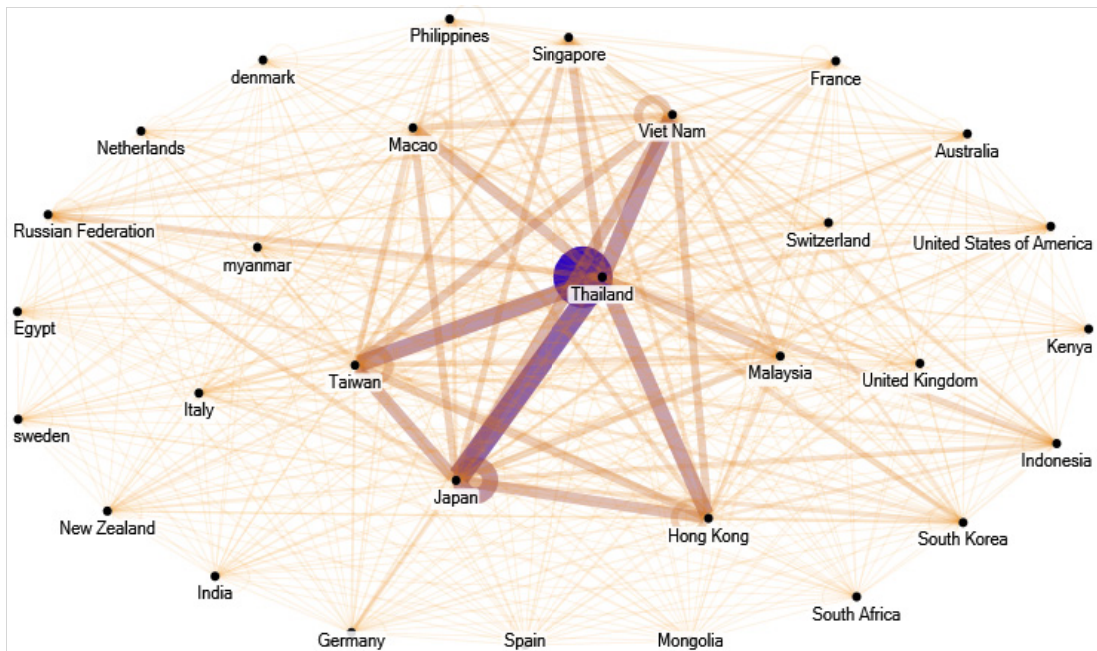


Fig. 3. International network of overseas travelers

meaningful relationships between the networks with p values less than 0.005, while the other network relationships had p values over 0.005.

In order to further test if there is causal relationship between the immigrant and international student networks, MR-QAP was conducted. The result shows that in Model 1, international student network predicted 54.11% of the variance in immigrant network, with the p values less than 0.005, respectively (see Table 5).

4. Conclusion

This study used a social network method to analyze the globalization of China from three aspects: immigration, overseas student flows, and international tourism. As results, Chinese people emigrated to some 143 countries. The U.S. was the most popular nation-state for Chinese immigrants. On the other hand, Africa was not popular destination. The U.S. held the highest value in eigenvector centrality indicator than other countries, followed by Hong Kong, Japan, South Korea, Canada, and Australia. In a similar vein, Chinese students studied mostly in America, Asia, Oceania, and Europe than Africa. However, the structure of traveler network was different from immigrant and international student networks. In traveler network, Thailand had the highest value in centralities than other countries, followed by Japan, Taiwan, Vietnam, and Hong Kong. The top ten countries on the traveller's list were mostly Asian countries. Europe, North America, and Australia appeared afterward. The reason why tourism is concentrated in Asia probably because the Asian culture and geographical location are closer to China, especially the film and television works shot in Thailand, Japan and other Asian countries make many audiences have the idea of destination tourism[20]. The present study conducted a QAP technique to test statistical relationships between

Chinese immigrant, international student, and traveler networks. Immigrant network and international student network had the strongest relationship. International student network predicted 54.11% of the variance in immigrant network, with the p value less than 0.005.

Through the results of this study, Chinese government can further develop a policy program to take advantage of some opportunities in terms of Sino-globalization, by addressing some possible problems and issue in China's 'One Belt, One Road' initiative. For example, a public diplomacy program may help some relevant countries expand the enrollment of Chinese oversea students to attract talented Chinese immigrants. In addition, we plan to make an in-depth study of the specific factors of Chinese students studying abroad and Chinese immigrants in the future, as well as the impact of Sino-globalization on other countries in terms of economy, policies, culture and life. The present study has its limitation in the fact that international students information of some countries including Singapore is not shared in the international students data of UNESCO[21].

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