BUREAU OF EDUCATIONAL AND CULTURAL AFFAIRS
MONITORING, EVALUATION, LEARNING, AND INNOVATION UNIT

INTERIM REPORT – QUANTITATIVE ANALYSIS INTERNATIONAL MOBILITY AND WORLD DEVELOPMENT: ESTIMATING THE SYSTEM-LEVEL IMPACT OF THE BUREAU OF EDUCATIONAL AND CULTURAL AFFAIRS (ECA) AND INTERNATIONAL EXCHANGES

JULY 2023

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REVISED JULY 10, 2023

BPA CONTRACT NUMBER: 19AQMM19A0019
PUBLIC DIPLOMACY RESEARCH AND EVALUATION SERVICES

TASK ORDER: 19AQMM21F7524

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ACRONYMS

ACES	Alumni Contact Engagement System
AF	Sub-Saharan Africa (the region, as defined by DOS)
DCG	District Communications Group
DOS	The United States Department of State
EAP	East Asia and Pacific (the region, as defined by DOS)
ECA	The Bureau of Educational and Cultural Affairs of DOS
EUR	Europe and Eurasia (the region, as defined by DOS)
GDP	Gross domestic product
NEA	Near East (the region, as defined by DOS)
PM	Professional mobility
SCA	South and Central Asia (the region, as defined by DOS)
SCS	Standardized cumulative stock
SM	Student mobility
SPSDs	Standardized Program Structure and Definitions
TM	Total mobility
TSM	Total student mobility
WHA	Western Hemisphere (the region, as defined by DOS)
YCM	Youth/cultural mobility

Summary of Findings

a. The Bureau of Educational and Cultural Affairs (ECA)-sponsored student mobility (SM) has a stronger link to opportunities for women, justice and freedoms, population health, and educational opportunities in the home country than other mobility types.
b. ECA-sponsored professional mobility (PM) has a stronger association with economic development than other mobility types.
c. ECA-sponsored youth/cultural mobility (YCM) does not have a robust association with the five areas of development examined in this study.
d. The link between total ECA-sponsored mobility and national development differs by region. Economic development was found to be most closely associated with ECA-sponsored mobility in Europe and Eurasia (EUR); opportunities for women in East Asia and Pacific (EAP); justice and freedoms in Western Hemisphere (WHA); population health in Sub-Saharan Africa (AF); and educational opportunity in EAP.
e. The proportion of students studying in the United States — both self-funded and scholarship-sponsored (ECA- and non-ECA-sponsored) degree exchanges — is associated with improved opportunities for women, justice and freedoms, population health, and educational opportunities. In contrast, having larger proportions of individuals pursuing higher education in China and Russia is linked with negative to no association with development of student home countries.

Introduction

The main objective of the research project *International Mobility and World Development: Estimating the System-Level Impact of ECA and International Exchanges* is to estimate system-level outcomes of exchange experiences in the United States, with a particular focus on understanding the contributions of ECA foreign exchange alumni to the development of their home countries. The project aims to investigate *quantitative* links between international mobility — which indicates participation in ECA-sponsored exchange programs throughout this report — and national development, as well as to provide a nuanced *qualitative* analysis of how international exchanges influence the (trans)formation of individuals globally, and how these individuals explain the connections between their international experiences and their societal contributions.

As a first step in the project, this interim report presents the quantitative links between international mobility and world development by analyzing a new cross-national time-series dataset, *Longitudinal Data on International Mobility and World Development* (referred to as Dataset 1 in the project's research plan). This is the first-of-its-kind dataset that brings together country-year-level measures of world development, international exchanges to the United States sponsored by ECA, and total student mobility to the United States, China, and Russia. ECA-sponsored mobility encompasses three distinct types of exchanges: student mobility (SM), professional mobility (PM), and youth/cultural mobility (YCM). Throughout this report, ***SM*** describes exchanges that enable students from other countries to travel to the United States to pursue a full degree or participate in a semester or year abroad, sponsored by ECA. ***PM*** refers

to the ECA-sponsored movement of individuals who possess professional qualifications to the United States for the purpose of enhancing their qualifications or changing their job role, industry, or geographic location. Finally, ***YCM*** indicates the U.S.-bound movement of individuals (including young people at secondary level) to participate in a range of exchanges, sponsored by ECA, in areas such as arts, culture, technology, and sports. ***Total student mobility (TSM)*** accounts for all degree-seeking, internationally mobile students either through self-funding or with the help of scholarships. The dataset was compiled by the Oxford team with the support of The District Communications Group (DCG) and ECA's Monitoring, Evaluation, Learning, and Innovation (MELI) unit. Full details of the data sources, measurement, analytical approach, list of countries included in the analyses and their statistics for international mobility, and full models of the regression analyses are provided in Appendices A, B, C, D, and E, respectively.

This report is organized as follows:

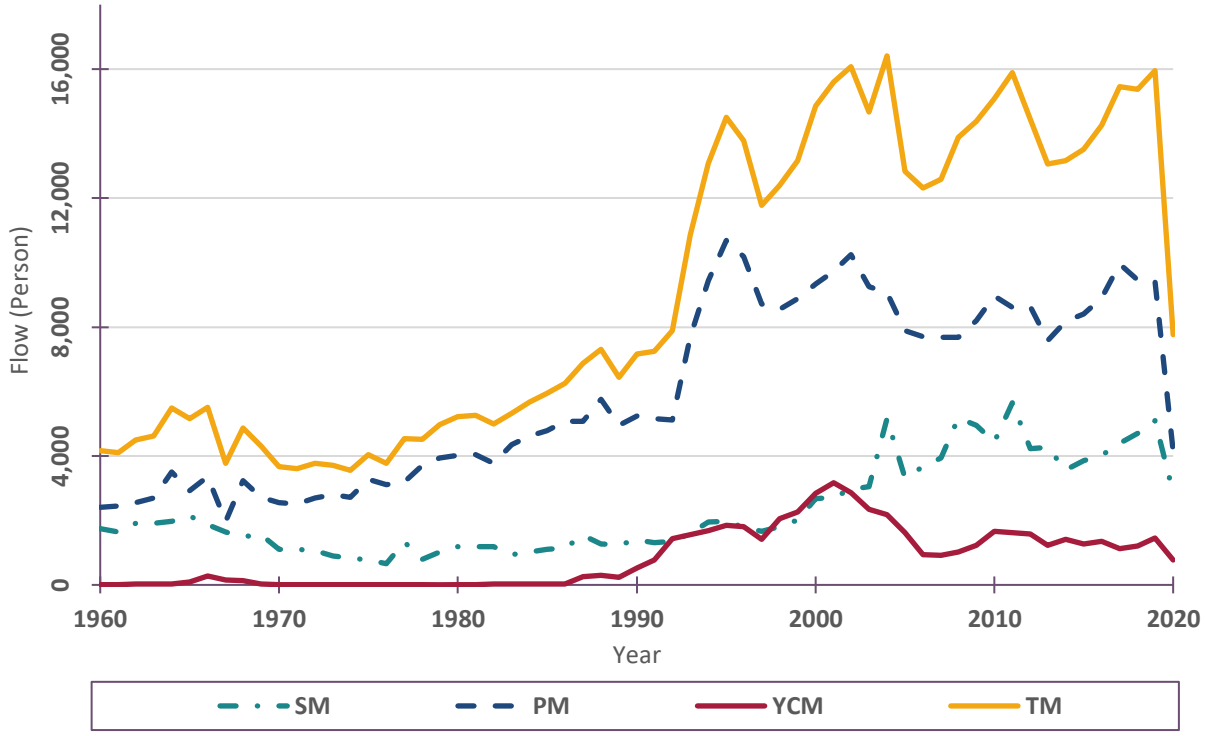
- Section I investigates the trends in ECA-sponsored SM, PM, and YCM. It also includes the trends in total ECA-sponsored mobility (TM) which is the sum of SM, PM, and YCM.
- Section II explores the global trends in five areas of development — economy, gender, justice and freedoms, health, and education.
- Section III examines the association between ECA-sponsored mobility and five areas of development in 133 countries from 1975 to 2020.
- Section IV compares the links of self-funded and scholarship-sponsored (ECA- and non-ECA-sponsored) TSM from 115 countries to the United States with TSM from those same countries to China and Russia and the effect on national development in those 115 countries from 2004 to 2018.

Section I. Trends in ECA-Sponsored Mobility to the United States

ECA has funded hundreds of thousands of individuals from different countries to pursue international exchange in the United States. Figure 1 presents the flows of exchange participants by year and by type of mobility (i.e., exchange) since 1960.[1] Although the mobility flows fluctuated by year and dropped in 2020 because of the COVID-19 pandemic, the overall trends show that the size of ECA exchanges increased from 1960 to 2020. PM was the largest mobility type over the entire period. The flow of PM participants was almost three times as large as the SM flow and almost seven times as large as the YCM flow. It is also notable that the PM flow skyrocketed after 1990 as PM from the post-Soviet countries, such as Russia, Ukraine, Belarus, Kazakhstan, and the Kyrgyz Republic, sharply increased.

[1] This analysis focuses on international mobility to the United States, so the U.S. citizens who participated in ECA exchanges are not part of the analysis. ECA "alumni" or "participants" in this report indicate foreign alumni or participants.

Figure 1. Flow of ECA Exchange Participants by Year and Type of Exchange (133 Countries, 1960-2020)

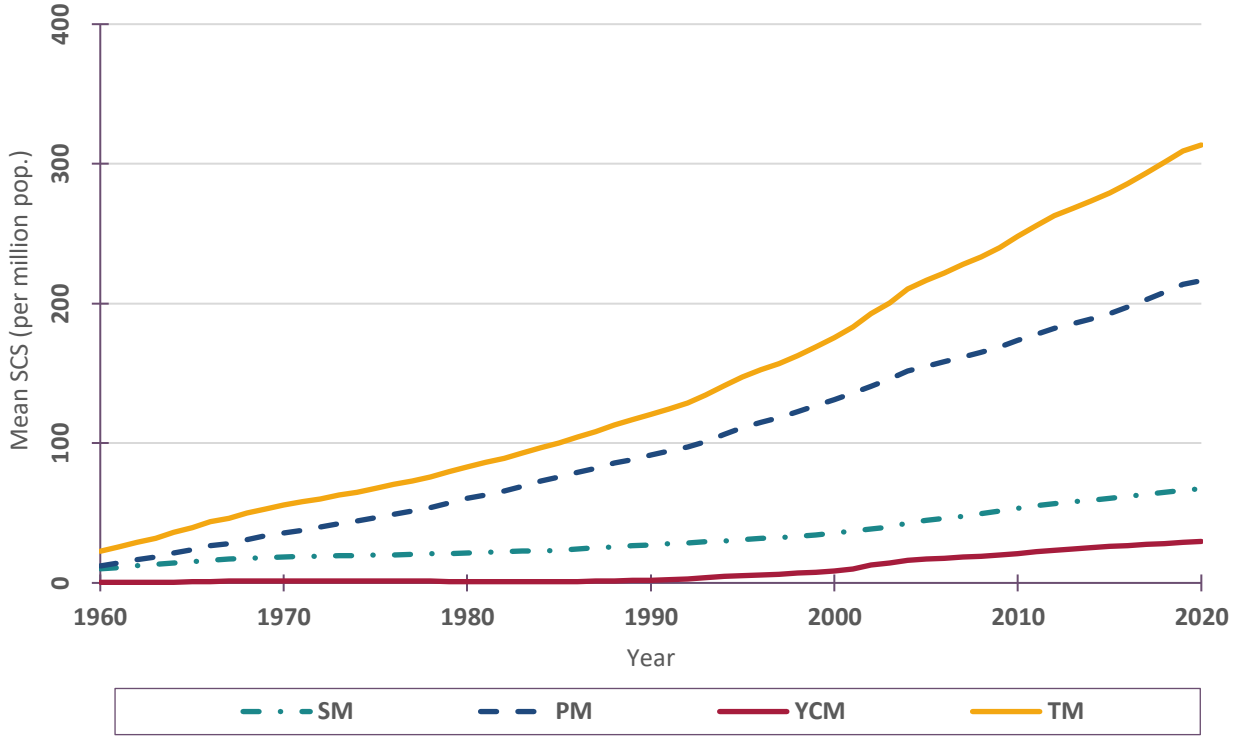


This study is interested in measuring the total number of ECA alumni at any given time in each country. The total number of ECA alumni indicates the pool of potential contributors to the country's development. The study refers to this measure as the standardized cumulative stock (SCS).[2] The SCS allows measuring the total number of ECA alumni per one million people in any given country, standardized by population numbers. The standardization makes the measure useful for cross-country comparison.

Figure 2 presents the global mean SCS of ECA alumni by type of ECA exchange. The largest SCS of ECA exchange is PM. The SCS of PM alumni has been increasing faster than SM and YCM in the same period. This analysis clearly shows that PM has produced the largest pool of potential contributors to the development of alumni home countries. The study uses the SCS measure in the subsequent regression analyses to estimate the link between ECA-sponsored mobility and national development.

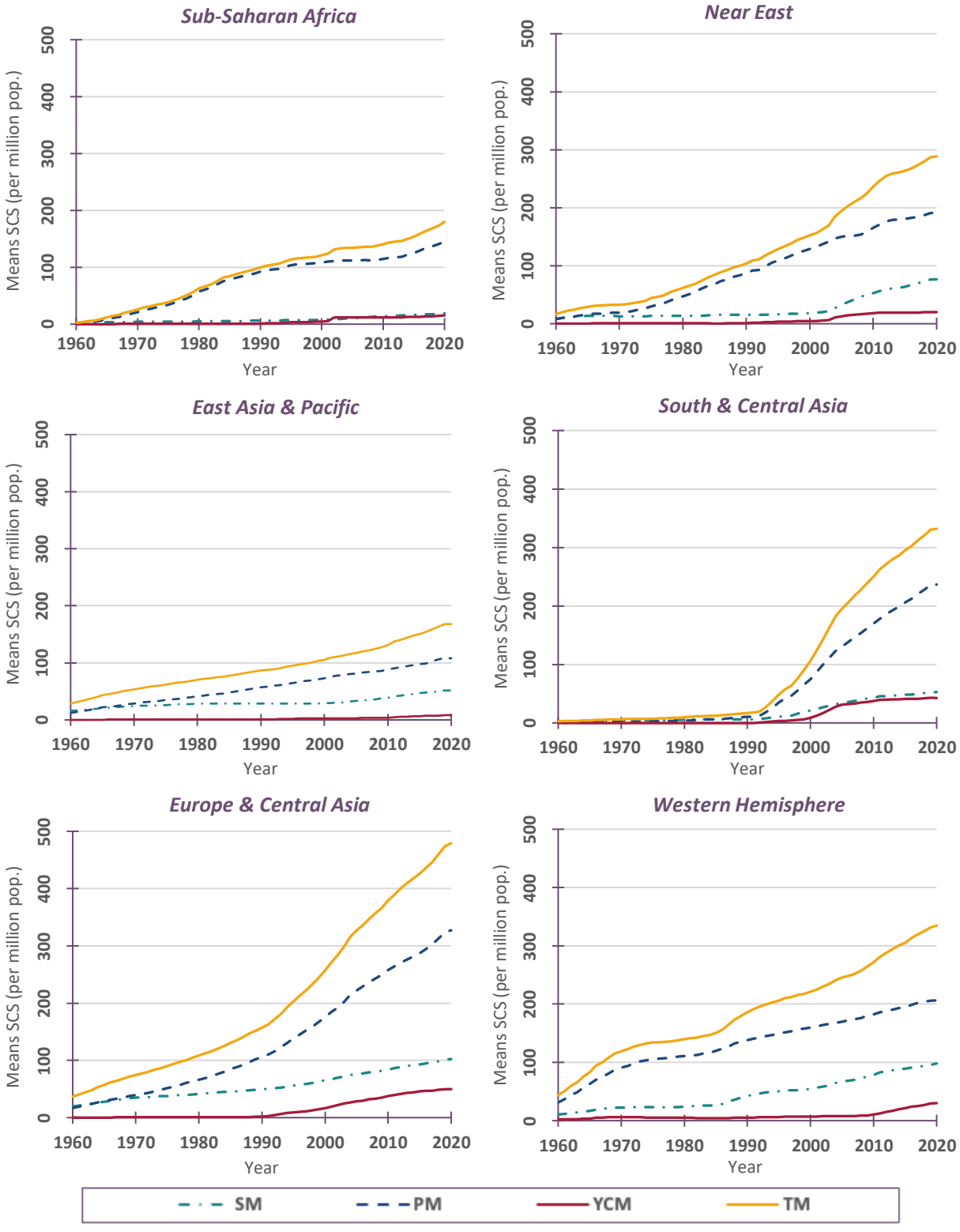
[2] A *stock* represents the number of all alumni at a point in time, whereas a *flow* refers to the number of alumni who began their ECA exchanges per year. The research team uses the term stock to distinguish it from the flow.

Figure 2. Global Mean of Standardized Cumulative Stock of ECA Exchange Alumni by Year and Type of Exchange (133 Countries, 1960-2020)



The average SCS of ECA alumni differ by region. Figure 3 presents the mean SCS of ECA exchange alumni by region, year, and type of ECA exchange. Consistent with the global trends in Figure 2, PM alumni represent the largest stock of alumni in all six regions, followed by SM and then YCM alumni. EUR had the largest pool of ECA alumni in 2020, whereas EAP had the smallest pool.

Figure 3. Standardized Cumulative Stock by Region and Type of Exchange (133 Countries, 1960-2020)



As seen in Figure 3, each region has distinctive trends in terms of the relative distributions of PM, SM, and YCM:

In **Sub-Saharan Africa (AF)**, most ECA alumni are alumni of PM. The regional mean SCS of SM and YCM are very low.

In the **Near East (NEA)**, most ECA alumni are alumni of PM. However, SM has also grown rapidly since the early 2000s.

In **East Asia and Pacific (EAP)**, the SCS of alumni in each mobility type has been the lowest among the six regions, although the unstandardized cumulative stock — which is not normalized by population of the country — of EAP was larger than that of AF, NEA, and SCA in 2020.

In **South and Central Asia (SCA)**, ECA-sponsored mobility skyrocketed after 1990. This sharp increase is largely driven by the four Central Asian countries (Kazakhstan, Kyrgyz Republic, Tajikistan, and Uzbekistan) which became independent in 1991 following the collapse of the USSR. A decade later, as the United States' public diplomacy spending in the Muslim world increased significantly (Congressional Research Service, 2006; U.S. General Accounting Office, 2003, 2006), exchanges from India, Pakistan, and Afghanistan picked up from the mid-2000s. SM and YCM had much lower SCS levels of alumni than PM, and SM and YCM had similar SCS levels over the entire period.

Europe and Eurasia (EUR) is the region with the largest SCS of SM, PM, and YCM alumni in 2020. The graph also shows that the SCS of all types of exchanges rose after 1990 because the post-Soviet countries (Belarus, Estonia, Georgia, Latvia, Lithuania, Russia, and Ukraine) and other countries in Eastern Europe (Bulgaria, Czech Republic, Hungary, Poland, Romania, and Slovak Republic) became active participants in ECA exchanges following the dissolution of the USSR.

Western Hemisphere (WHA) is the region with the largest SCS of ECA alumni from 1960 to 2000. Since 2000, ECA mobility in WHA has increased at a slower pace than that in EUR.

Section II. Trends in Development Areas

Development is a multidimensional concept that indicates economic, social, and political advancement. This study conceptualizes world development as covering five areas consistently central to world development discourses since the 1960s, as demonstrated by the published output of major authoritative global organizations working in the field (UN, 2000, 2015; UNDP, 1990; World Bank, 2003). The five areas of development identified by this study are:

- **Economy**: promoting growth; combating poverty, including combating climate change and its impacts; and delivering humanitarian assistance
- **Gender**: attaining gender equality and empowering women

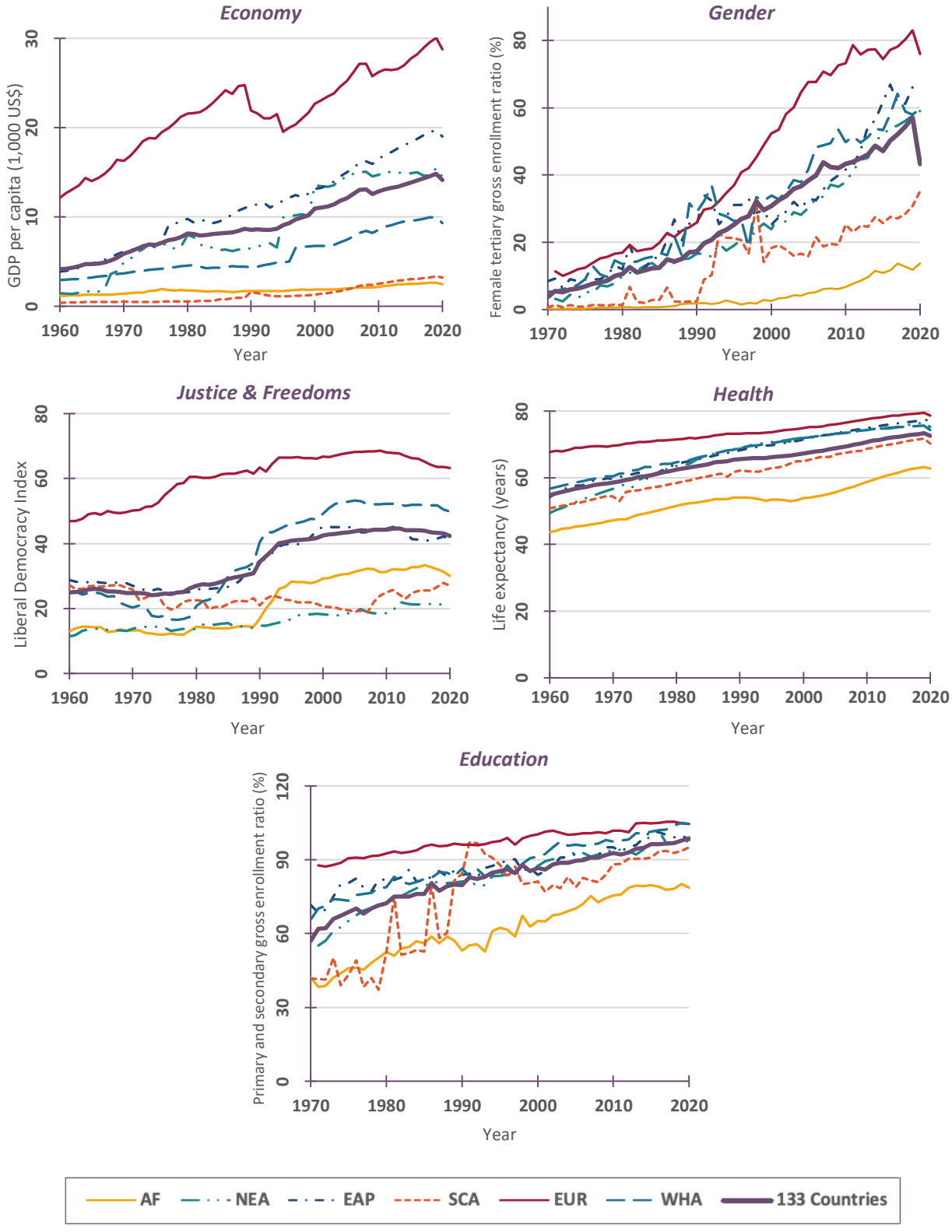
- **Justice and freedoms**: promoting peaceful, secure, and inclusive societies for sustainable development; providing access to justice for all and building effective, accountable, and inclusive institutions at all levels; and promoting human freedom, including free elections, multiparty political systems, uncensored press, adherence to the rule of law, and guarantees of free speech
- **Health**: promoting health and well-being
- **Education**: improving access to good quality education – primary, secondary, and tertiary

These five areas are aligned with global goals as well as American foreign policy goals. Global goals include United Nations goals and strategic documents, in particular the Sustainable Development Goals (UN, 2015), the Millennium Development Goals (UN, 2000), the UNDP's flagship Human Development Report (UNDP, 1990), and the World Bank's World Development Reports. There is significant overlap between the five areas of development identified by this study and the broadly agreed definitions for U.S. foreign assistance programs detailed in the Standardized Program Structure and Definitions (SPSD) (U.S. Department of State, 2009).

For the purposes of the quantitative analyses reported here, one representative indicator of development was used for each area. To facilitate reliable analysis of the long-term association between international exchanges and world development, the research team selected the indicator for each area using the following criteria of data availability, as a minimum: (a) temporal coverage from 1975 to 2020; and (b) cross-national coverage of more than half of the sample countries at each time point ($67 \approx 133 / 2$).[3] Figure 4 presents the global and regional means of the selected indicators between 1960 and 2020.

[3] According to these two minimum requirements, some indicators originally proposed in the project's research plan had to be dropped, including poverty (data available for only two countries in 1975, via World Bank) and the female labor force participation rate (available from 1990 onward, via World Bank).

Figure 4. Trends in Development Indicators (133 Countries, 1960-2020)



Economy: This study measures economic development by GDP per capita (constant 1,000 U.S. dollars in 2015), which indicates a country's level of affluence. The mean GDP per capita for 133 countries included in the analysis has increased since 1960. The regional mean was the highest in EUR and the lowest in AF and SCA.

Gender: This study measures opportunities for women by the female ***tertiary*** gross enrollment ratio.[4] This is the percentage of female students enrolled in tertiary education, regardless of age, in the population age group entitled to tertiary education. This measure is conceptually limited to gender development in education, but it is also indicative of a wider societal shift towards gender equality such as the changes in gender-role attitudes and the decline in gender disparity in the labor market (Buchmann et al., 2008).[5] Opportunities for women to access tertiary education have improved since the 1970s. Female tertiary enrollment was the highest in EUR and the lowest in AF. The mean female tertiary enrollment for the countries included in the analysis dropped around 2020. There are many fluctuations in regional trends caused by missing data.

Justice and freedoms: This study measures development in justice and freedoms by the liberal democracy index. The liberal democracy index captures both the existence of electoral democracy and the extent to which liberal democracy emphasizes the protection of individuals' and minorities' rights against the state and majority (Lührmann et al., 2019). The mean of the liberal democracy index for the countries included in the analysis sharply increased between the late 1980s and early 1990s, but it has remained stable since then. EUR was the region with the highest liberal democracy levels, and NEA consistently had the lowest levels.

Health: This study measures development in health by life expectancy, which refers to the number of years a newborn infant would live. Life expectancy has increased in all regions. On average, people in EUR have had the longest life expectancy, whereas people in AF have had the shortest life expectancy.

Education: This study measures development in education by the ***primary*** and ***secondary*** gross enrollment ratio, which indicates the percentage of students enrolled in primary and secondary education, regardless of age, in the population age group entitled to primary and secondary

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[4] Female tertiary gross enrollment ratio is the best available proxy for opportunities for women for the purpose of this study. It is the only indicator related to opportunities for women that meets the criteria of the temporal coverage from 1975 to 2020 and cross-national coverage of more than half of the sample countries at each time point (67 ≈ 133 / 2). Meeting these criteria was crucial for reliable analysis of the long-term association between international exchanges and opportunities for women. Another possible indicator, the female labor force participation rate, is only available from 1990 onward. The research team also considered the comprehensive Historical Gender Equality Index (Dilli et al., 2019) to measure opportunities for women, but this dataset is unavailable from 2004 onward.

[5] A separate analysis of a restricted sample of 105 countries from 1975 to 2003 also revealed a strong correlation between the Historical Gender Equality Index and this ratio (r = .624), indicating that female tertiary gross enrollment is closely aligned with comprehensive gender equality and women's empowerment.

education. This measure represents the quality of mass schooling for literacy, numeracy, and basic education for individual development. Education enrollments have improved across all regions since the 1960s. The global mean of the primary and secondary gross enrollment ratio for the countries included in the analysis reached 100 percent in 2020. AF consistently had the lowest levels of school enrollment, and EUR had the highest levels of school enrollment. The trends in some regions, especially SCA, should be interpreted with caution because the fluctuations of the trends were driven by missing data.

Section III. The Link Between ECA-Sponsored Mobility and Development of Home Country

This section examines the links between ECA mobility and world development. This study uses multilevel random slope models to analyze unbalanced panel data for country-years nested within 133 countries in the sample. The model uses five-year lagged values (t-5) of the SCS of SM, PM, YCM, and TM. The choice of the five-year lag is based on the assumption that it takes at least five years for ECA alumni to be incorporated into the pool of potential contributors to their home countries' development following the ECA exchange.[6] The model also incorporates control variables that account for plausible alternative explanations for development, such as quality of domestic higher education, level of economic development, amount of international trade, time, and geographic region.[7] The details regarding the measurements and analytical approach are provided in Appendices B and C.

Table 1 presents the results of the multilevel random slope models for the link between ECA mobility and the five development areas examined in this study, utilizing the same representative indicator for each area as described in Section II (full model parameters are presented in Appendix E).

[6] International undergraduate students need four years to achieve their tertiary degree in the United States, and the other ECA exchanges for non-degree SM, PM, and YCM usually provide grantees with a shorter period for their stay in the United States. For example, the five-year lag indicates that the alumni from the 1970 exchanges are incorporated into the "pool" of potential contributors after 1975. The models were also tested using the four- and six-year lagged values and the results were similar to those in Table 1 of the report.

[7] One potential confounding variable — which affects both ECA-sponsored international exchanges and the development of home country — could be U.S. foreign aid. Tests of bivariate correlations between the U.S. aid measured by the GreenBook and five development indicators, as well as four mobility measures, showed very weak correlations ranging from -.069 to .018; this indicates that U.S. aid is not a confounding factor. This issue is discussed in further detail in Appendix C.

Table 1. Multilevel Random Slope Models of ECA-Sponsored Mobility on Five Development Areas (133 Countries, 1975-2020)

	Economy	Gender	Justice and Freedoms	Health	Education
Student Mobility$_{t-5}$	.003 (.003)	.050 *** (.015)	.062 *** (.015)	.009 ** (.003)	.033 ** (.010)
Professional Mobility$_{t-5}$	.011 *** (.002)	.026 *** (.006)	.002 (.006)	.003 ** (.001)	.007 (.004)
Youth/cultural mobility$_{t-5}$	.005 * (.003)	.011 (.013)	-.016 (.012)	.000 (.003)	.013 (.009)
Total Mobility$_{t-5}$	.005 *** (.001)	.016 *** (.004)	.003 (.004)	.002 * (.001)	.008 * (.000)
N (country-year)	4046	2996	4022	4046	3337

Note: Unstandardized coefficients (standard errors in parentheses). Each model includes one mobility covariate (SM, PM, YCM, and TM) at a time. Controls for the following variables are included in all models except the models with economic development but not shown here: gross tertiary enrollment ratio$_{t-5}$, GDP per capita$_t$, international trade$_t$, year$_t$, year squared$_t$, and dummy variables for regions. The models with economic development include the same controls except GDP per capita$_t$. Full model parameters are presented in Appendix E.

*—p <.05; **—p <.01; ***—p < .001 (two-tailed tests).

The models presented in Table 1 show the following in relation to each development area:

Economy: PM is positively linked to economic development as measured by GDP per capita. Every additional alum in PM per 1 million population in the country is associated with an additional $11 (USD) in GDP per capita.[8] YCM and TM are also positively associated with economic development, but the effects are not as strong as PM.[9] This model does not show that any changes in SM have a substantial impact on economic development.

Gender: SM, PM, and TM are associated with more opportunities for women, as measured by the female tertiary enrollment ratio. It is notable that the effect of SM (.050) is almost double that of PM (.026). The results show that every additional ECA-sponsored SM alum per 1 million population is associated with an additional .050 percentage points in the female tertiary gross

[8] For example, in India the SCS of PM increased by .913, and GDP per capita increased $525 from 2011 to 2020. This model shows that PM alumni are likely to contribute $10.05 (= .913 × $11) in GDP per capita in the same period, and it accounts for 1.914% (= $10.05 / $525 * 100) of the GDP per capita increase. This example suggests that PM alumni might be associated with 1.914% of economic growth in India from 2011 to 2020, which is not a small contribution.

[9] When using a slightly longer six-year lag, accounting for the fact that youth mobility participants are likely to be the youngest of all ECA participants, the statistical significance of the association between youth mobility and economic development disappears.

enrollment ratio, and an additional ECA-sponsored PM alum is associated with an additional .026 percentage points in the female tertiary gross enrollment ratio. However, YCM does not have the same positive connection with opportunities for women.

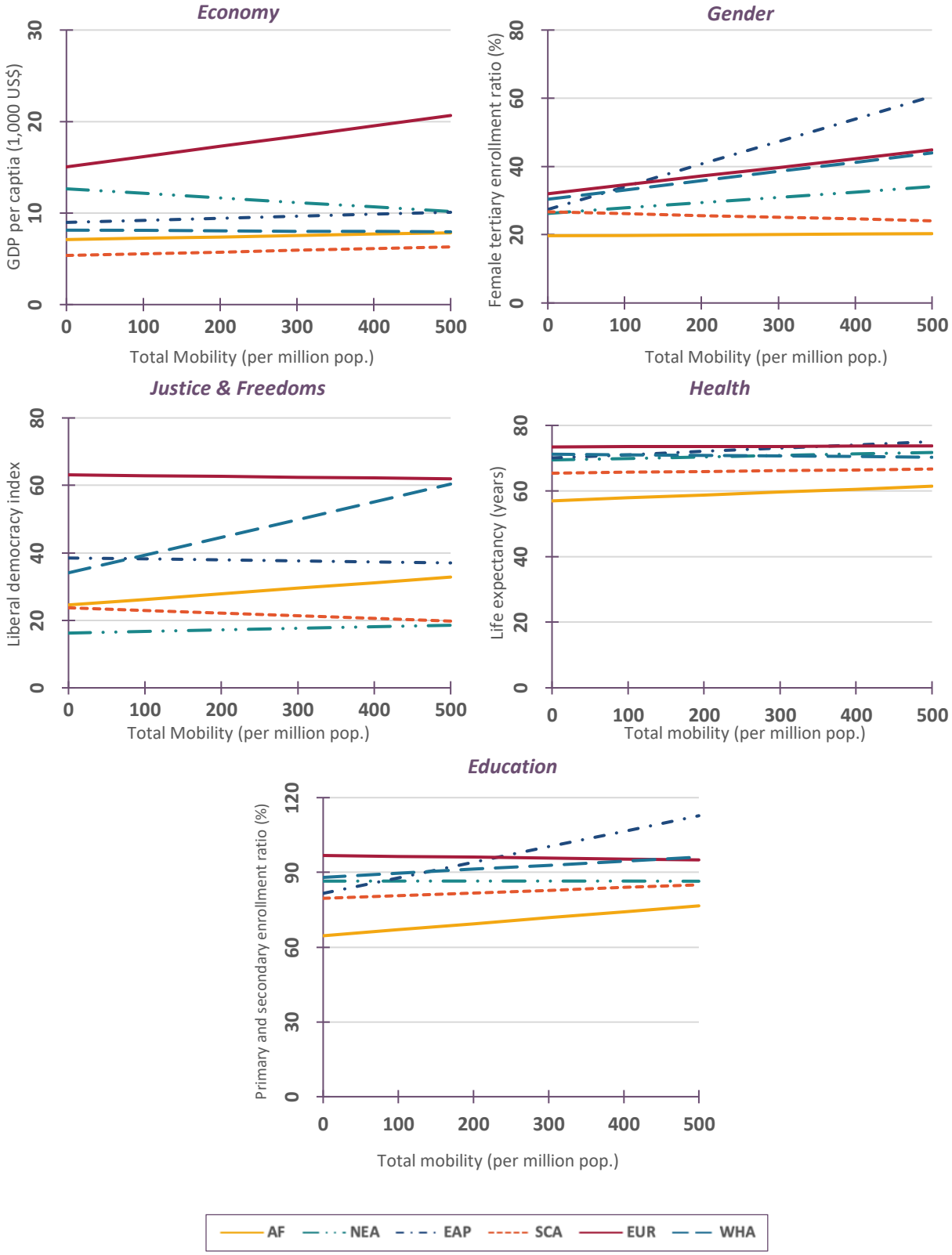
Justice and freedoms: SM is the only type of ECA-sponsored mobility that has a strong, positive connection to justice and freedoms as represented by the liberal democracy index. This index theoretically ranges from 0 to 100, and every additional ECA-sponsored SM alum per 1 million population is associated with an additional .062 points in the liberal democracy index. Notably, this connection does not hold true for TM. This could be due to the fact that SM makes up a relatively small portion of total ECA-sponsored mobility, as seen in Figure 1.

Health: SM, PM, and TM are all linked to the overall health improvement of a population, as measured by life expectancy. The association of SM is the strongest, and the result shows that every additional ECA-sponsored SM alum per 1 million population is associated with an additional 0.009 years (or 3.3 days) of life expectancy.

Education: SM and TM are linked to expanded educational opportunities, as measured by the primary and secondary gross enrollment ratio. Every additional ECA-sponsored SM alum per 1 million population is associated with an additional .033 percentage points in the primary and secondary gross enrollment ratio.

These results show the links between ECA-sponsored mobility and world development for 133 countries in the sample. Figure 5 presents the results of interaction effects to demonstrate the different connections between total ECA-sponsored mobility and each development area by region (Appendix E presents the full models for the interaction analyses).

Figure 5. The Associations Between Total ECA-Sponsored Mobility and Development Areas by Region



The results of these interactions are as follows.[10]

Economy: The relationship between TM and economic development in EUR is strong. However, a negative correlation is observed in NEA, but it is not strong enough to be considered reliable. No other region shows a strong connection between the two.

Gender: The connection between TM and opportunities for women is especially strong in EAP, EUR, and WHA. Out of these regions, the connection is strongest in EAP. No other region displays such a clear connection between TM and opportunities for women.

Justice and freedoms: In WHA, there is a strong, positive link between TM and justice and freedoms. EUR has the highest level of liberal democracy, but there is not a direct connection between these values and TM. The connection between the two is not evident in other parts of the world.

Health: TM is associated with better population health in AF, although life expectancy in AF is lower than in other regions. No other region shows such a clear correlation between the two.

Education: TM is connected to better educational opportunity in AF, EAP, SCA, and WHA. The strongest connection between the two is observed in EAP. The link in NEA and EUR is not as strong.

Section IV. Comparative Analysis of International Student Mobility to the United States, China, and Russia

This section examines the relationship between TSM and national development. TSM refers to the movement of degree-seeking students who go abroad for study, either through self-funding or scholarships. Specifically, this section will focus on three destination countries for international higher education — the United States, China, and Russia — and how TSM to each of these countries affects national development.[11] The analysis is limited to the period from 1999 to 2018 and 115 countries due to the limited coverage of data (see Appendix C for the country selection and Appendix D for the list of countries).

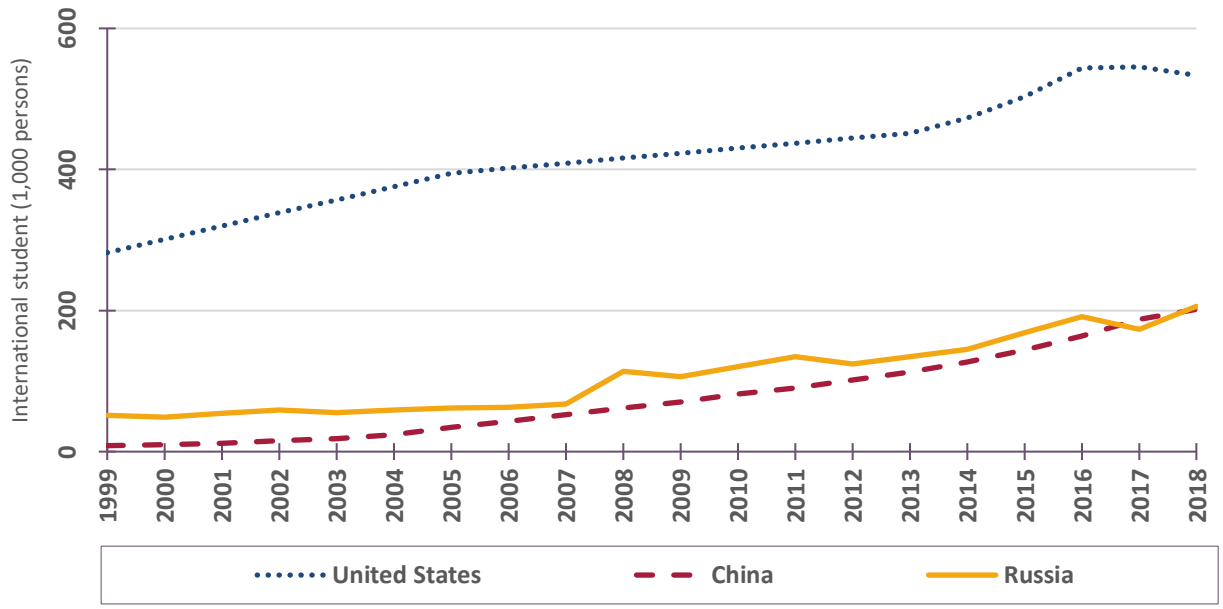
The United States has the largest number of international students, followed by China and Russia (Figure 6). In 1999, there were 282,053 degree-seeking international students in the United States from 115 countries; 51,741 in Russia; and 8,420 in China. The number of international students increased between 1999 and 2018 in all three destination countries. In

[10] The interaction analysis presented in Figure 5 includes interaction terms between TM and five binary regional indicators (AF, NEA, EAP, SCA, and WHA) with the reference category of EUR. Therefore, the significance tests of the interaction terms in Appendix E, Table AE5 indicate whether the coefficients of TM for the region and EUR are statistically different. Also, see Table AE6 in Appendix E for the marginal effect of TM by region.

[11] Data are unavailable for professional and youth/cultural exchanges, so this section only focuses on student exchanges.

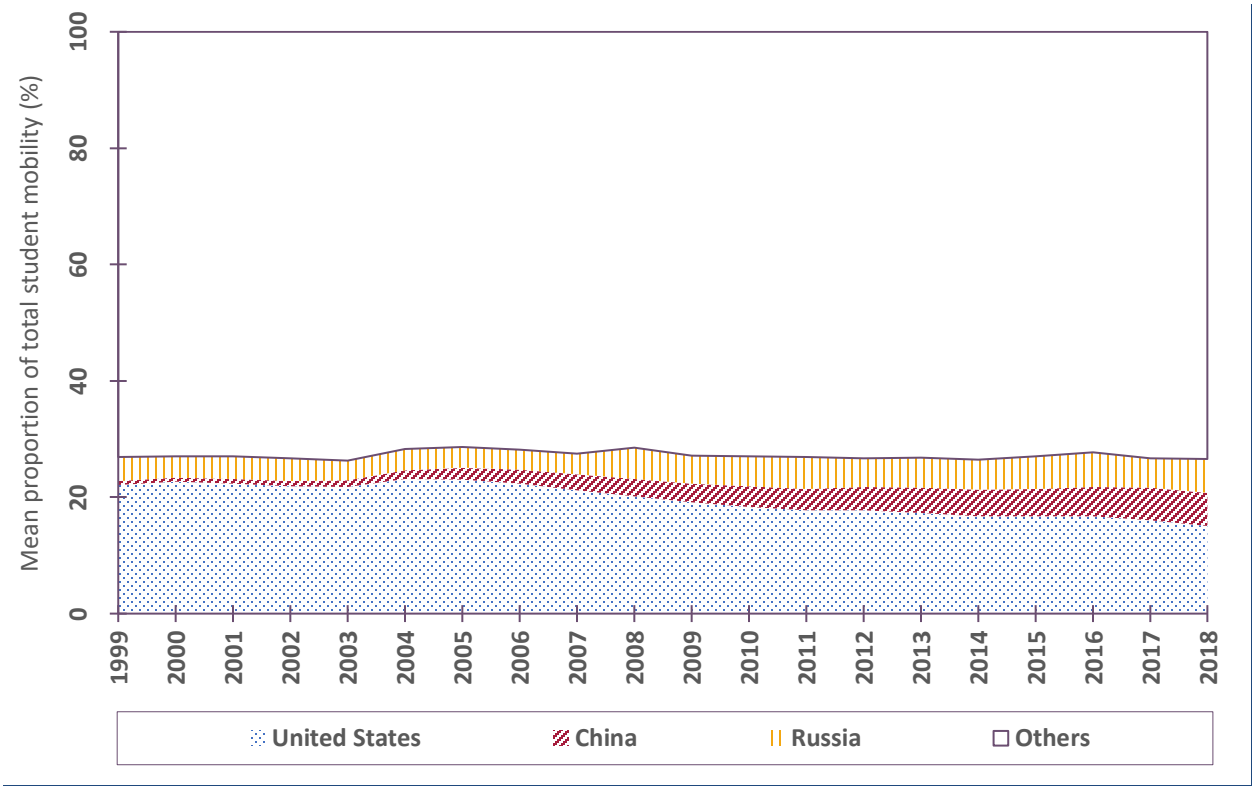
2018, the number of international students reached 533,083 in the United States; 205,937 in Russia; and 201,639 in China. The growth rate of international student numbers from 1999 to 2018 was the highest for China, which witnessed a 24-fold growth in international students in this period.

Figure 6. International Students in the United States, China, and Russia (115 Countries, 1999-2018)



To view international SM to these three countries in the global context, Figure 7 presents the mean proportion of TSM to the United States, China, and Russia in the total number of students studying abroad from 115 countries in the sample. In 1999-2018, approximately 30 percent of students who studied abroad selected the United States, China, or Russia as their destination countries. The mean proportion of TSM to the United States declined from 22.2 percent to 15.1 percent between 1999 and 2018. In contrast, the mean proportions of TSM to China and Russia increased from 4.1 percent to 5.8 percent for Russia and 0.7 percent to 5.7 percent for China in the same period. These trends show that the share of the United States as a destination country in the international higher education market has declined since 1999.

Figure 7. Total Student Mobility to the United States, China, and Russia as Shares of Total Student Mobility (115 Countries, 1999-2018)



The proportion of TSM to the United States, China, and Russia differs by student home country. To provide insights into the countries of origin of the students studying in the United States, China, and Russia, Table 2 displays the lists of 10 countries with the highest proportion of TSM to the United States, China, and Russia.

The country with the highest proportion of TSM to the United States is Canada (59.1 percent), followed by Jamaica (58.4 percent) and Saudi Arabia (51.5 percent). Among the top-10 countries, eight countries are in WHA (Saudi Arabia and India are the non-WHA countries).

Laos (24.3 percent), Mongolia (20.2 percent), and Pakistan (13.1 percent) have the highest proportion of TSM to China. The top-10 countries include five in EAP, three in AF, and two in SCA.

Finally, Kazakhstan (66.2 percent) has the largest proportion of TSM to Russia, followed by Belarus (63.4 percent) and Armenia (53.1 percent). All countries on the list are post-Soviet countries.

Table 2. Top-10 Countries with Mean Percentage of Total Student Mobility to the United States, China, and Russia for 1999-2018

Top	UNITED STATES		CHINA		RUSSIA	
	Country	Percentage of TSM (Mean for 1999-2018)	Country	Percentage of TSM (Mean for 1999-2018)	Country	Percentage of TSM (Mean for 1999-2018)
1	Canada[f]	59.1	Laos[c]	24.3	Kazakhstan[d]	66.2
2	Jamaica[f]	58.4	Mongolia[c]	20.2	Belarus[e]	63.4
3	Saudi Arabia[b]	51.5	Pakistan[d]	13.1	Armenia[d]	53.1
4	Mexico[f]	50.1	Korea (South)[c]	12.1	Tajikistan[d]	44.2
5	Honduras[f]	48.7	Tanzania[a]	11.2	Azerbaijan[d]	40.8
6	India[d]	48.6	Burundi[a]	10.4	Uzbekistan[d]	33.4
7	Panama[f]	47.2	Nepal[d]	9.6	Kyrgyz Republic[d]	30.5
8	Costa Rica[f]	43.9	Cambodia[c]	9.4	Ukraine[e]	29.1
9	Dominican Republic[f]	42.9	Thailand[c]	9.1	Georgia[e]	23.0
10	Guatemala[f]	41.9	Ghana	8.0	Estonia[e]	22.7

Note: The mean percentage of TSM indicates an average of the proportion of total student mobility to the United States, China, or Russia in the total number of outbound students from 1999 to 2018. An average of the total number of TSM per one thousand population in this period for each country is provided in Appendix D. a = Sub-Saharan Africa; b = Near East; c = East Asia & Pacific; d = South & Central Asia; e = Europe & Eurasia; f = Western Hemisphere

These lists of countries — where the largest proportions of internationally mobile students choose the United States, China, or Russia as their destinations — suggest that students normally choose geographically closer locations for educational mobility.[12]

Table 3 presents the results of the multilevel random slope models for the comparative analyses of links between TSM to the three countries and the five areas of development examined in this study. The models include the five-year lagged values of total TSM rate (the total number of students studying abroad per one thousand population) and three measures of percentage of TSM to the United States, China, and Russia at a time to compare the effects of

[12] The following statistical models do not control for general migration trends because long-term annual data for migration are unavailable. However, the UN migration data for 2010 shows that among the top-10 countries with the highest proportion of migration to the United States in the total number of emigrants, nine countries are in WHA (Puerto Rico, Mexico, El Salvador, Guatemala, Belize, Bahamas, Honduras, Cuba, and Panama). It suggests that general migration might be associated with student mobility patterns.

the proportions of internationally mobile students by destination country (see Appendix C for the description of the analytical approach and Appendix E for the full model parameters).

Table 3. Multilevel Random Slope Models of Total Student Mobility on Five Development Areas (115 Countries, 2004-2018)

	Economy	Gender	Justice and Freedoms	Health	Education
Total student mobility rate$_{t-5}$	.183 ** (.059)	1.705 ** (.518)	.510 (.349)	.222 *** (.049)	.583 (.320)
Percentage of TSM to the United States$_{t-5}$	-.004 (.008)	.190 ** (.067)	.173 *** (.047)	.026 *** (.007)	.081 * (.040)
Percentage of TSM to China$_{t-5}$	.022 (.019)	-.310 (.174)	-.029 (.115)	-.021 (.016)	-.192 (.103)
Percentage of TSM to Russia$_{t-5}$	-.006 (.007)	.091 (.061)	-.038 (.044)	-.012 * (.006)	.026 (.040)
N (country-year)	1254	1086	1254	1254	1053

Note: Unstandardized coefficients (standard errors in parentheses). Controls for the following variables are included in all models except the models with economic development but not shown here: gross tertiary enrollment ratiot-5, GDP per capita$_t$, international trade$_t$, year$_t$, and binary regional indicators. The model with economic development include the same controls except GDP per capita$_t$. Full model parameters are presented in Appendix E.

*—p <.05; **—p <.01; ***—p < .001 (two-tailed tests).

The models in Table 3 show the following in relation to each development area.

Economy: TSM rate is strongly linked to economic development in the student's home country. Results indicate that every additional TSM per one million population is associated with an additional $.183 (USD) of GDP per capita. In contrast, the relationship between the proportions of U.S.-bound, China-bound, and Russia-bound mobility and economic development at the student's home country is not as clear.

Gender: TSM rate has a clear association with enhanced opportunities for women. The analysis also uncovered that a one percent increase in the proportion of U.S.-bound TSM is associated with an additional .190 percentage points in the female tertiary gross enrollment ratio. This result suggests that studying in the United States has a more pronounced link to the promotion of opportunities for women than studying in China or Russia.

Justice and freedoms: The proportion of U.S.-bound TSM has a strong association with the liberal democracy index, where every 1 percent increase in the share of the U.S.-bound TSM is associated with an additional .173 points in the liberal democracy index. In contrast, the proportions of TSM to China and Russia do not show such a strong association with the liberal democracy index. These findings confirm earlier research (Chankseliani, 2018; Spilimbergo,

2009) that higher education in a democratic context could be related to the progress of democratic political culture in the home country.

Health: TSM rate has a strong connection to life expectancy. In particular, the proportion of U.S.-bound TSM is associated with longer life expectancy in the home country. Conversely, the proportion of Russia-bound TSM is associated with shorter life expectancy. These results suggest that the large pool of people who have pursued higher education abroad, especially in the United States, may be linked to increasing life expectancy in their home country.

Education: The proportion of U.S.-bound TSM has a clear association with better educational opportunities. However, the relationship between the proportions of China-bound and Russia-bound TSM and educational expansion in the student's home country is not as apparent.

Limitations and Future Research

This interim report presents the findings from the first phase of a large, mixed-methods research project *International Mobility and World Development: Estimating the System-Level Impact of ECA and International Exchanges*. This phase was focused on numeric data analysis. The next phase involves collecting interview data. We hope that the narrative evidence will allow us to contextualize and interpret the statistical trends reported here. The findings presented in this interim report need to be interpreted considering the following limitations that the research team hopes to address:

a. The findings presented in this interim report assume that ECA alumni normally return and stay in their home country. This assumption might overestimate mobile individuals' contributions to the development of their home countries. No data is available on the post-exchange migration journey of ECA exchange alumni. The research team has recently obtained a data source for the return rates of foreign students from the Home Office in the United Kingdom. The dataset is called the *Migrant Journey*. This dataset includes information about the annual return rates of self-funded and scholarship-recipient students for each cohort from 2006 to 2021 by home country. Future research with this dataset would provide a foundation to better investigate the impact of return rates on the link between international mobility and development.
b. The findings presented in this interim report pertain to the longitudinal association between ECA-sponsored mobility and development over a period of more than four decades. These include consistent analyses for five areas of development. To undertake these analyses, the sample was restricted to 133 countries that had all development indicators available for at least three years during the entire period of analysis, and the regression models included the same set of control variables. It is important to note, however, that there are trade-offs associated with these analyses. They limit the ability to select other useful development indicators for a more in-depth investigation, to estimate a fully specified model for each development indicator with other shorter-term covariates and possible confounders, and to achieve fuller representation of countries in the world. Given these challenges, the findings provide evidence consistent with a relationship between ECA-sponsored mobility and world development, though they do

not definitely demonstrate its causal relationship. Future research should examine the development indicators separately with flexible temporal coverage and a customized list of covariates for each development indicator (i.e., history of democracy for justice and freedoms; government expenditure on primary and secondary schools for education) to gain a better understanding of the relationships between international mobility and the development of the home countries.

c. The findings presented in this interim report demonstrate the presence or lack of links between different types of international exchanges and development, but there is a dearth of theoretical and qualitative research on the mechanisms underlying these links. An important assumption of this analysis is that pursuing exchange experiences abroad is a (trans)formative experience for mobile individuals, and those who return to their home countries can contribute to the development of those countries in ways that differ from those who do not have international mobility experiences. How does SM, PM, and YCM contribute to individual (trans)formation? What are the relational and structural/institutional conditions in which individuals are effective in advancing systemic changes, as opposed to conditions in which individuals are trapped into replication? How do actors link their individual (trans)formation during international mobility with their contributions to systemic changes in their home countries? The next phase of the project will provide a nuanced qualitative analysis of how international exchanges influence the (trans)formation of individuals globally, and how these individuals explain the connections between their international experiences and their societal contributions.

Acknowledgements

This interim report has greatly benefited from the insights and comments of MELI, DCG, and Oxford team members. The authors greatly appreciate the data search and digitization efforts of Kim Van Wyngaardt, Zane Harrod, Natalya Hanley, and Zhe Wang.

Appendix A: Data Biographies

"Longitudinal Data on International Mobility and World Development" (referred to as Dataset 1 in the project's research plan) was constructed to examine the long-term associations of international exchanges and national development by appending development indicators; the measures of total student mobility to the United States, China, and Russia; and control variables to the Alumni Contact Engagement System (ACES) dataset. The following data biography provides information about the data sources for the variables.

Title	Dataset/ Report	Publisher/ Distributor	Owner	Publication Date	Last Updated Date	Date Accessed	Country & Territory Coverage	Year Coverage	Who	When	How	URL
Alumni Contact Engagement System	Dataset	Monitoring, Evaluation, Learning and Innovation Unit (MELI)	Monitoring, Evaluation, Learning and Innovation Unit (MELI)	N/A	N/A	N/A	223	1940-2024	Monitoring, Evaluation, Learning and Innovation Unit (MELI)	N/A	The dataset is generated from ECA's Alumni Contact Engagement System.	N/A
Annual Report (Titles of the reports vary by year)	Report	The Bureau of Educational and Cultural Affairs of the U.S. Department of State	The Bureau of Educational and Cultural Affairs of the U.S. Department of State	1968-1974	N/A	N/A	Vary by year	1967-1972	The Bureau of Educational and Cultural Affairs of the U.S. Department of State	1968-1974	The data are obtained each year from the statistics of the grantees for the Department's exchange programs.	N/A
Annual Report (Titles of the reports vary by year)	Report	Board of Foreign Scholarships (J. William Fulbright Foreign Scholarship Board)	Board of Foreign Scholarships (J. William Fulbright Foreign Scholarship Board)	1966, 1974-2006	N/A	N/A	Vary by year	1966, 1973-2005	Board of Foreign Scholarships (J. William Fulbright Foreign Scholarship Board)	1966, 1974-2006	The data are obtained each year from the statistics of the grantees for the Fulbright educational exchange programs.	N/A
Brief Statistics on International Students Studying in China	Report	International Cooperation and Exchange Department of Ministry of Education of the People's Republic of China	International Cooperation and Exchange Department of Ministry of Education of the People's Republic of China	N/A	N/A	N/A	220	1999-2018	Institutions of higher education confirmed by the education department of each province, autonomous region, and municipality directly under the Central Government	N/A	The data are compiled on the basis of statistical data submitted by the institutions of higher education.	N/A

Educational and Cultural Diplomacy	Report	The U.S. Department of State	The U.S. Department of State	1961-1966	N/A	N/A	Vary by year	1949-1965	The U.S. Department of State	1961-1966	The data are obtained each year from the statistics of the grantees for the Department's exchange programs.	N/A
UN World Population Prospects - 2022 revision	Dataset	Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat	Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat	Jul-11-2022	Jul-11-2022	Dec-02-2022	237	1950-2100	Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat	N/A	The data are obtained from the results of 1,758 national population censuses conducted between 1950 and 2022, as well as information from vital registration systems and from 2,890 nationally representative sample surveys.	https://population.un.org/wpp
UNESCO Institute for Statistics (UIS)	Dataset	UNESCO	UNESCO	Sep-2022	Sep-2022	Dec-06-2022	Vary by variable	Vary by variable	UNESCO Institute for Statistics (UIS)	N/A	The data are collected from a variety of sources to produce internationally comparable education indicators, including administrative data, household surveys, learning assessments, financial and expenditure data, and population data. The data for the variables in the analysis are obtained from education statistics in aggregate form from official administrative sources at the national level, using the annual UIS Survey of Formal Education (UIS/ED/C) for UNESCO countries.	http://data.uis.unesco.org
Variety of Democracy (V-Dem) - version 12	Dataset	V-Dem Institute at the University of Gothenburg	V-Dem Institute at the University of Gothenburg	Mar-2022	Mar-2022	Dec-13-2022	202	1789-2021	V-Dem Institute at the University of Gothenburg	N/A	The data are collected from five experts per country-year observation, using a pool of over 3,700 country experts who provide judgment on different concepts and cases.	https://v-dem.net/data/the-v-dem-dataset
World Bank Open Data	Dataset	The World Bank	The World Bank	N/A	N/A	Jan-06-2023	Vary by variable	1960-2021	The World Bank	N/A	The data are collected from World Bank national accounts data and OECD National Accounts data.	https://data.worldbank.org

Appendix B: Variables and Description

Variable	Description	Source	URL
Development Indicators			
Economy	*GDP per capita*: Gross domestic product divided by mid-year population (thousands of 2015 US$)	WB	https://data.worldbank.org/indicator/NY.GDP.PCAP.KD
Gender	*Female gross tertiary enrollment ratio*: the percent of female students enrolled in tertiary education, regardless of age, in the population of the age group entitled to tertiary education	UIS	https://data.worldbank.org/indicator/SE.TER.ENRR.FE
Justice and freedoms	*Liberal democracy index*: the existence of electoral democracy and the extent to which liberal democracy emphasizes the protection of individuals' and minorities' rights against the state and majority	V-Dem	https://v-dem.net/data/the-v-dem-dataset/
Health	*Life expectancy at birth*: the number of years a newborn infant would live	UN WPP	https://population.un.org/wpp
Education	*Gross primary and secondary enrollment ratio*: the percent of students enrolled in primary and secondary education, regardless of age, in the population of the age group entitled to primary and secondary education	UIS	
ECA-sponsored mobility			
Student mobility	The number of ECA alumni who have participated in student exchange programs per 1 million population	ACES, Fulbright	N/A
Professional mobility	The number of ECA alumni who have participated in professional exchange programs per 1 million population	ACES	N/A
Youth/Cultural mobility	The number of ECA alumni who have participated in youth/cultural exchange programs per 1 million population	ACES	N/A
Total mobility	The number of ECA alumni who have participated in student, professional, or youth/cultural exchange programs per 1 million population	ACES, Fulbright	N/A
Total Student Mobility			
Total student mobility rate	The number of total degree-seeking self-funded and scholarship-sponsored internationally mobile students studying abroad per million population	UIS, COSM	http://data.uis.unesco.org/
% Total student mobility to the United States	Degree-seeking total student mobility to the U.S. as a percent of the total number of outbound internationally mobile students studying abroad	UIS	https://opendoorsdata.org/data/international-students/all-places-of-origin/
% Total student mobility to China	Degree-seeking total student mobility to China as a percent of the total number of outbound internationally mobile students studying abroad	COSM	N/A
% Total student mobility to Russia	Degree-seeking total student mobility to Russia as a percent of the total number of outbound internationally mobile students studying abroad	UIS	N/A
Control Variables			
Gross tertiary enrollment ratio	The percent of students enrolled in tertiary education, regardless of age, in the population of the age group that corresponds to tertiary education.	UIS	https://data.worldbank.org/indicator/SE.TER.ENRR
International trade (% of GDP)	The sum of exports and imports of goods and services as a percent of GDP	WB	https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS
Time	Year	ACES	N/A
Time^2	Year squared	ACES	N/A
Region			
Sub-Saharan Africa	1 = Sub-Saharan Africa, 0 = else	ACES	N/A
Near East	1 = Near East, 0 = else	ACES	N/A
East Asia and Pacific	1 = East Asia and Pacific, 0 = else	ACES	N/A
South and Central Asia	1 = South and Central Asia, 0 = else	ACES	N/A
Europe and Eurasia	1 = Europe and Eurasia, 0 = else	ACES	N/A
Western Hemisphere	1 = Western Hemisphere, 0 = else	ACES	N/A

Note: ACES = Alumni Contact Engagement System; COSM = Brief Statistics on International Students Studying in China; Fulbright = Annual Reports of the U.S. Department of State and the Board of Foreign Scholarships (J. William Fulbright Foreign Scholarship Board); UIS = UNESCO Institute for Statistics; UN WPP = United Nations World Population Prospects; WB = World Bank Open Data.

Appendix C: Analytical Approach

Data and Sample

Building Dataset

Longitudinal Data on International Mobility and World Development (referred to as Dataset 1 in the project's research plan) was constructed using the Alumni Contact Engagement System (ACES) database of ECA international exchange alumni and a variety of public sources, such as the UN World Population Prospects, the UNESCO Institute for Statistics, and the World Bank. First, the master dataset was derived from the ACES database, which includes the anonymous list of 721,017 alumni of the 289 ECA-sponsored student mobility (SM), professional mobility (PM), and youth/cultural mobility (YCM) programs from 1940 to 2024, along with information about their gender and home country. The preparation of the master dataset involved the following steps:

a. The U.S. citizens were dropped. After deleting these cases, the ACES dataset had 706,423 alumni of 279 ECA exchanges.
b. Then, the number of alumni was categorized by year, home country, and mobility type (SM, PM, and YCM).
c. The data were converted to a long format where each row represents one year per home country, and the numbers of alumni for SM, PM, and YCM are in separate columns.

Next, development indicators, measures of the proportions of total student mobility (TSM) (self-funded and scholarship-sponsored student exchange) to the United States, China, and Russia, and control variables — which were derived from other public sources — were appended to the master dataset.

Sample Selection

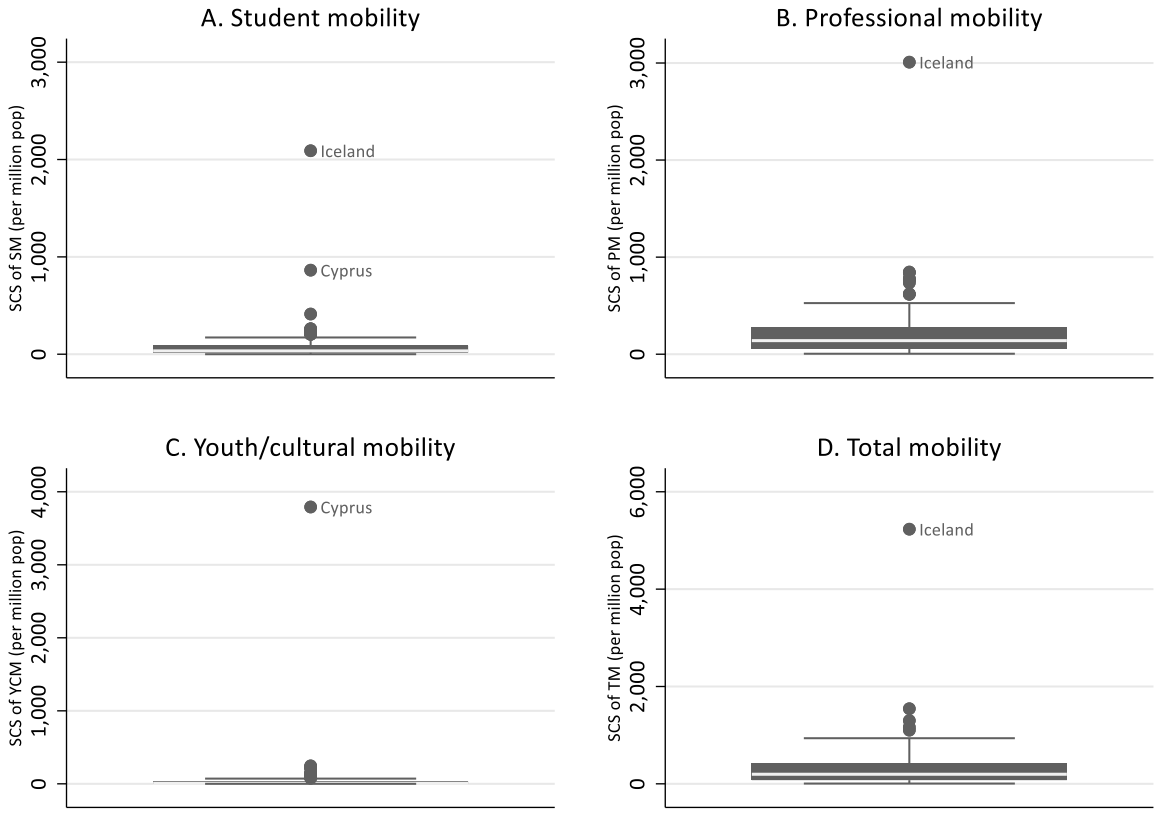
The countries and years were selected to facilitate reliable analyses of the long-term associations between international exchanges and national development. Dataset 1 contained the number of ECA alumni in 221 countries from 1940 to 2024. The sample selection procedure was as follows:

1-a. The five development indicators used in this study cover at least the period from 1970 to 2020. The analyses use five-year lagged values of the ECA mobility and gross tertiary enrollment ratio as explanatory variables. The tertiary enrollment variable ranges from 1970 to 2020, so the five-year lag of the variable restricted the temporal coverage of the analyses to the years from 1975 to 2020.
1-b. The countries that had data available for all dependent variables were selected. This ensured the reliability of analyses for five development indicators with the same set of countries.

1-c. Subsequently, the countries that had fewer than three time points in the time period were dropped because the multilevel random slope model needs at least three observations within country to estimate a precise slope of each country (Curran et al., 2010).

1-d. Finally, outliers were examined for the standardized cumulative stock (SCS) of ECA mobility. Figure AC-1 shows the box plots of the four ECA mobility measures in 2015, which is the last time point for these mobility measures in the model due to the five-year lag used for the mobility measures. The box plots indicate that Iceland and Cyprus lie outside of the regular distribution of the mobility measures. Therefore, Iceland and Cyprus were dropped from the analyses to prevent the two small countries from significantly distorting regression analyses.

Figure AC-1. Outliers of ECA Mobility Measures in 2015



The sample countries for the comparative analyses of the impact of TSM to the United States, China, and Russia on national development were selected from the countries used in the analyses of ECA mobility. Other countries have not been added to it to ensure consistency in the set of home countries throughout this report. The sample selection procedures were as follows:

2-a. The overlapping period for the three measures for the TSM to the United States, China, and Russia ranges from 1999 to 2018.[13] The analyses use the five-year lagged values of the TSM, so the sample was restricted to the years from 2004 to 2018.

2-b. Only the countries that had all five development indicators available for this period were included.

2-c. Subsequently, to conduct a comparative analysis across the three countries, only the countries that had TSM data for all three destination countries were included. At this stage, China and Russia were dropped because students who study in their country cannot be categorized to TSM. Hong Kong was also dropped because the data source for the TSM to China does not include statistics of Hong Kong.

Table AC-1 presents the step-by-step changes in the sample of countries following the above-described procedure. As a result, the final country-level sample size for the analyses of the ECA mobility is 133 countries from 1975 to 2020; for the analyses of the TSM, it is 115 countries from 2004 to 2018.

Table AC-1. Country-Level Sample Size

	Analysis of ECA mobility				Analysis of TSM		
	1-a	**1-b**	**1-c**	**1-d**	**2-a**	**2-b**	**2-c**
N (country level)	221	147	135	133	133	118	115

Variables

Dependent Variables

One development indicator was used as a dependent variable for each development area (economy, gender, justice and freedoms, health, and education). To facilitate reliable analysis of the long-term association between international exchanges and world development, the research team selected the variables using the following minimum criteria: a) the temporal coverage from 1975 to 2020, and b) cross-national coverage of more than half of the sample countries at each time point (67 ≈ 133 / 2).

Development in ***economy*** is measured by real GDP per capita (constant 1,000 U.S. dollars in 2015), which taps prosperity of a country in terms of its economic growth. Development in ***gender*** is measured by the female tertiary gross enrollment ratio, which refers to the percentage of female students enrolled in tertiary education regardless of age in the population

[13] Total student mobility to China covers the years from 1999 to 2018. However, the UNESCO Institute for Statistics (UIS) data for U.S.- and Russia-bound student mobility have missing data for some years in this period. Each country's missing data were imputed by the linear interpolation, which estimates the missing value by the mean of the observed values before and after the missing point.

age group entitled to tertiary education. This measure is conceptually limited to gender development in education, but it is also indicative of a wider societal shift towards gender equality, such as such as the changes in gender-role attitudes and the decline in gender disparity in the labor market (Buchmann et al., 2008). Additionally, a strong correlation with Historical Gender Equality Index reveals its strong alignment with comprehensive gender equity and women's empowerment (r = .624, 105 countries from 1975 to 2003). The research team measures development in ***justice and freedoms*** using the liberal democracy index from the Variety of Democracy dataset. The liberal democracy index captures both the existence of electoral democracy and the extent to which liberal democracy emphasizes the protection of individuals' and minorities' rights against the state and majority (Lührmann et al., 2019). ***Health*** in development is measured by life expectancy at birth, which indicates the number of years a newborn infant would live. Finally, ***education*** in development is measured by the primary and secondary gross enrollment ratio, which refers to the percentage of students enrolled in primary and secondary education, regardless of age, in the population age group entitled to primary and secondary education. This variable represents the quality of mass schooling for literacy, numeracy, and basic education for individual development.

Key Independent Variables

The key independent variable for the analysis of ECA-sponsored mobility is the ***standardized cumulative stock*** *(SCS)* of SM, PM, YCM, and total mobility (TM), which is the sum of SM, PM, and YCM. This measure indicates the pool of potential contributors to the country's development. This measure was derived from the ACES database which provides lists of alumni for each mobility type by country of origin and year of arrival. To calculate the SCS, the annual flow of ECA-sponsored mobility in a country was first estimated by aggregating individual data to a country-year level. The flow was then transformed into the cumulative stock by adding the annual flow up to the given year. Finally, the cumulative stock was standardized by the population size of the home country to facilitate cross-country comparison. The formula for the SCS of each ECS-sponsored mobility for a country is as follows:

$$SCS_t = \sum_{t=1940}^{t} f_t \Big/ \frac{pop_t}{1{,}000{,}000}, \qquad (1)$$

where SCS_t is standardized cumulative stock at year t; f_t is flow of ECA alumni at year t; and pop_t is population at year t.

Next, the key independent variable for the comparative analysis of degree-seeking (TSM) (self-funded and scholarship-sponsored mobility) to the United States, China, and Russia is the ***proportion of*** **TSM** to each of these host countries in a given home country. The measures for U.S.- and Russia-bound TSM were derived from the UNESCO Institute of Statistics (UIS), while the measure for China-bound TSM was sourced from the Brief Statistics on International Students Studying in China. The proportion of TSM was estimated by dividing the TSM to each of the three countries by the total number of students who study abroad.

Control Variables

Several control variables were included in the analysis to account for plausible alternative explanations for development. Many variables with limited temporal and cross-national coverage – such as Official Development Assistance (ODA), poverty, income inequality, and unemployment rate – could not be used as controls because this analysis focuses on the long-term association between development and international exchanges from 1975 to 2020 in more than 130 countries. This study should also use the same minimum set of control variables for each of five dependent variables to present the results of the consistent models.

The research team incorporates three measures to account for the influence of domestic higher education, level of economic globalization, and economic prosperity on each of the development indicators. The ***gross tertiary enrollment ratio*** is the percentage of students enrolled in tertiary education, regardless of age, in the population of the age group that corresponds to tertiary education. This measure was included in the model to control for the contribution of college-educated people from domestic higher education on development of the home country. ***International trade*** indicates the sum of exports and imports of goods and services as a percentage of GDP. This international trade measure was used a proxy for a level of economic globalization that might be associated with development. To control for the affluence of a country based on economic growth that could be a strong driver of development, ***GDP per capita*** (constant 1,000 U.S. dollars in 2015) was included in the model.

Historical and regional variations in development indicators were controlled in the model to estimate an accurate association between international exchanges and development of the home country. ***Time*** and ***time-squared*** variables account for the linear and quadratic historical trends of the development indicators. The time variable was scaled from 0 to 45 for each year of the analysis of ECA-sponsored mobility from 1975 to 2020 and scaled from 0 to 14 for each year of the comparative analysis of TSM from 2004 to 2018. Six regional indicators were measured as binary variables for ***Sub-Saharan Africa (AF)*** (1 = Sub-Saharan Africa, 0 = else); ***Near East (NEA)*** (1 = Near East, 0 = else); ***East Asia and Pacific (EAP)*** (1 = East Asia and Pacific, 0 = else); ***South and Central Asia*** *(SCA)* (1 = South and Central Asia, 0 = else); ***Europe and Eurasia (EUR)*** (1 = Europe and Eurasia, 0 = else); and ***Western Hemisphere (WHA)*** (1 = Western Hemisphere, 0 = else). In the model, the regional indicators were used to control for the variations in development indicators across regions, as well as to examine whether regional discrepancies in development indicators existed.

Analytical Methods

A multilevel random slope model was used to examine the association between ECA mobility and development of the home country for 133 countries from 1975 to 2020. The unit of analysis of the cross-sectional time-series dataset is country-years clustered within countries. This clustered data structure violates the assumption of independent errors of ordinary least squares (OLS) models, leading to underestimations of standard errors. Therefore, a ***multilevel*** model was used to obtain more precise parameters and standard errors by treating country-level variances independently (Snijders & Bosker, 2011).

In this study, the multilevel ***random slope*** model was used to control for the heterogeneous time trends of the development indicators across countries. This model allows the slope of time to vary across countries, leading to a precise estimation of the association between the ECA mobility and development indicators after accounting for long-term trends in development. Additionally, because of missing data at some time points, the dataset is an unbalanced panel dataset where cases are unevenly distributed across countries. The multilevel random slope model is appropriate for fitting models to unbalanced data (Singer & Willett, 2003).

The multilevel random slope model can be represented by the following equation:

$$D_{it} = \beta_0 + \beta_1 M_{i(t-5)} + \beta_2 TE_{i(t-5)} + \beta_3 Trade_{it} + \beta_4 GDPC_{it} + \beta_5 T_{it} + \beta_6 T_{it}^2 +$$
$$\beta_7 Region_i + u_{0i} + u_{1i} T_{1i} + u_{2i} T_{2j}^2 + e_{it}, \quad (2)$$

where D_{it} is one of the development indicators (economic development, gender development, justice and freedoms, health improvement, and educational expansion) for country *i* at year *t*; $M_{i(t-5)}$ is the five-year lag of one of the ECA-sponsored mobility measures (SM, PM, YCM, and TM) for country *i* at year *t*; TE_{it} is the five-year lag of the gross tertiary enrollment ratio for country *i* at year *t*; $Trade_{it}$ is the sum of exports and imports of goods and services measured as a percentage of GDP for country *i* at year *t*; $GDPC_{it}$ is GDP per capita for country *i* at year *t*; T_{it} is time variable (t − 1975, so year of 1975 = 0) for country *i*; T_{it}^2 is the time-squared variable for origin country *i*; $Region_i$ is binary regional variables (AF, NEA, EAP, SCA, and WHA with EUR as reference); u_{0j} is the random effect of origin country *i* on the development indicator; u_{1j} and u_{2j} are the random effects of country *i* on the effect of the time and time-squared variables on the development indicator; and e_{it} is the country-year-level error.

As discussed in the Limitations and Future Research section, the results of the analysis should be interpreted cautiously because the same minimum set of control variables was used for all dependent variables to present the results of the consistent models. To conduct an in-depth analysis of the impact of international exchanges, future research should perform separate analyses for each development indicator with different sets of theory-driven control variables.

Next, this study examined the associations between the degree-seeking self-funded and scholarship-sponsored TSM to the United States, China, and Russia and the development indicators for 115 countries from 2004 to 2018. The multilevel random slope model was estimated as performed in the analysis of ECA-sponsored mobility.

Our multilevel random slope model for this analysis can be represented by the equation:

$$D_{it} = \beta_0 + \beta_1 TSM_{i(t-5)} + \beta_2 PTSMUS_{i(t-5)} + \beta_3 PTSMCH_{i(t-5)} + \beta_4 PTSMRU_{i(t-5)} +$$
$$\beta_5 TE_{i(t-5)} + \beta_6 Trade_{it} + \beta_7 GDPC_{it} + \beta_8 T_{it} + \beta_9 Region_i + u_{0i} + u_{1i} T_{1i} + e_{it}, \quad (3)$$

where $TSM_{i(t-5)}$ is the five-year lag of the total number of internationally mobile self-funded and scholarship-sponsored students per one thousand population for origin country *i* at year *t*;

$PTSMUS_{i(t-5)}$ is the five-year lag of the percentage of TSM to the United States in the number of TSM for country *i* at year *t*; $PTSMCH_{i(t-5)}$ is the five-year lag of the percentage of TSM to China in the number of TSM for country *i* at year *t*; $PTSMRU_{i(t-5)}$ is the five-year lag of the percentage of TSM to Russia in the number of TSM for country *i* at year *t*; and T_{it} is time variable (t − 2004, so year of 2004 = 0) for country *i*.

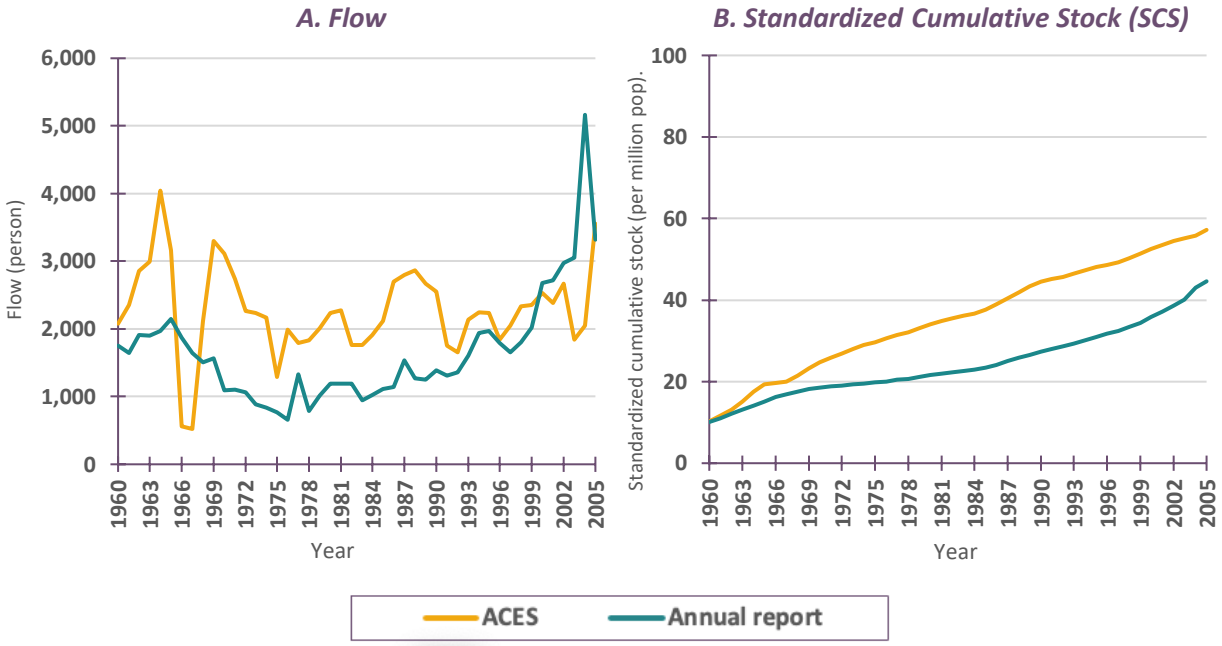
This model incorporated the three measures of the percentage of TSM to the United States, China, and Russia at a given time point to compare the effects of the proportions of each country among the total number of students abroad. It also controlled for only the linear time trends of the development indicators to minimize the risk of overfitting a model with a shorter time period. To access the results, two-tailed tests with significance levels of $p < .05$ were used.

Robustness Checks

Fulbright Foreign Student Exchange in the ACES and Annual Report

The SM data for the Fulbright exchange were also sourced from annual reports of the U.S. DOS and the Board of Foreign Scholarships (J. William Fulbright Foreign Scholarship Board). The annual reports overlap with the ACES over the period of 1960-2005. Panel A of Figure AC-2 presents the trends of the two flows of SM of the Fulbright foreign student exchange in the annual reports and in the ACES dataset between 1960 and 2005. These two sources use slightly different time units – the calendar year for ACES and the fiscal or academic year for the annual report. The number of participants in the Fulbright exchange during this period is quite different in these two sources. The flow derived from the ACES is generally higher than the flow from the annual reports.

Figure AC-2. Flow and SCS of SM from the ACES and the Annual Report



The data from the Fulbright annual report were chosen for the analyses for this period as the published data from the funding agency were considered to be relatively more trustworthy. Therefore, the SM data from the Fulbright annual reports were used to substitute the Fulbright foreign student exchange in ACES from 1960 to 2005.

Panel B of Figure AC-2 shows that the global means of the two versions of the standardized cumulative stock (SCS) measures of SM have similar trends with a strong correlation (r = .966). The same regression models were run with the original version of the ACES SM measure, and the results were similar to those presented in the report.

Confounders

Several confounding factors of a country may have an impact on both international exchanges and development of the home country, including U.S. international aid, international trade with the United States, and foreign direct investment (FDI) from the United States. Of these possible confounders, U.S. aid is the most promising factor in our analysis. The aid from the United States depends on diplomatic relations between the United States and other countries, and can thus affect ECA-sponsored exchanges. Additionally, international aid is targeted to promote the development of the recipient countries, which could lead to development. To test if the flow of U.S. international aid, measured with the GreenBook, plays a role as a confounding factor, we conducted bivariate correlations between U.S. international aid and each of the five development indicators, as well as between U.S. international aid and four ECA-sponsored mobility variables. Our analysis showed that the correlations between U.S. international aid and the development indicators ranged from -.069 to -.002 and those between U.S. international aid and ECA-sponsored mobility variables ranged from -.025 to .018. Furthermore, the results of the regression analysis that took the U.S. international aid variable into account were similar to those in Table 1 of our report. This exercise demonstrates that U.S. international aid is not a confounding factor in this analysis.

Unfortunately, the limited temporal and cross-national coverage of the other potential confounders prevent us from testing them. Given the challenge of unobserved confounding factors, our findings provide evidence consistent with the relationship between international exchanges and development, but do not definitively demonstrate a causal relationship.

Appendix D: Standardized Cumulative Stock of ECA-Sponsored Mobility and Total Student Mobility in 133 Countries

Country	Standardized Cumulative Stock of ECA Mobility in 2020				Total Student Mobility (Mean for 1999 – 2018)			
	SM	PM	YCM	TM	TSM Rate (per 1000 persons)	Percentage of TSM to USA	Percentage of TSM to China	Percentage of TSM to Russia
Sub-Saharan Africa (35)								
Benin	10.04	61.30	7.04	78.38	.61	3.84	2.54	1.60
Botswana	50.66	366.40	22.78	439.84	3.18	7.43	3.22	.70
Burkina Faso	7.57	41.72	3.21	52.50	.24	9.38	.39	.52
Burundi	4.75	30.44	1.15	36.33	.25	4.98	10.41	3.31
Cabo Verde	3.43	314.09	200.81	518.33	7.28	8.75	2.80	1.06
Cameroon	11.85	65.91	3.51	81.27	1.05	4.83	1.79	1.14
Central African Republic*	2.62	67.19	.94	70.75	-	-	-	-
Chad	5.77	34.19	3.12	43.08	.39	1.62	1.54	2.89
Congo, Democratic Republic of	1.60	17.72	.59	19.91	.10	7.24	3.79	1.35
Cote d'Ivoire	11.67	67.32	4.07	83.06	.47	8.36	1.05	1.49
Eritrea*	10.12	61.87	.00	71.99	-	-	-	-
Eswatini*	116.04	503.11	42.35	661.50	-	-	-	-
Gabon*	9.16	175.35	4.80	189.31	-	-	-	-
Ghana	25.54	71.29	6.93	103.76	.46	26.74	8.01	2.56
Guinea	7.57	53.31	2.12	63.01	.59	3.36	1.96	1.81
Kenya	15.89	53.25	6.42	75.56	.36	34.97	3.50	1.75
Lesotho*	35.49	221.37	7.54	264.41	-	-	-	-
Madagascar	5.53	27.39	.81	33.73	.21	2.97	4.75	1.30
Mali	14.42	54.61	6.60	75.62	.39	5.74	2.60	1.83
Mauritania	28.90	96.03	14.89	139.82	1.01	2.04	1.58	1.04
Mauritius	94.77	554.00	26.97	675.74	6.50	2.63	5.55	1.02
Mozambique	8.21	25.66	1.76	35.63	.11	4.01	5.16	1.77
Namibia	57.85	254.31	43.39	355.55	3.38	1.11	3.48	2.65
Niger	6.25	32.92	3.41	42.57	.25	4.99	3.24	.31
Nigeria	4.08	25.85	1.94	31.88	.32	14.46	1.52	1.47
Republic of the Congo	16.13	104.52	6.14	126.79	2.19	1.41	3.79	3.00
Rwanda	11.56	66.56	6.09	84.21	.50	8.00	7.20	.51
Senegal	18.19	133.24	12.05	163.48	.93	6.03	1.42	.29
Seychelles	.00	1080.26	37.90	1118.17	5.52	2.45	7.51	.47
South Africa	20.39	83.60	31.80	136.66	.15	24.49	4.34	.24
Sudan	3.04	27.74	1.64	32.43	-	-	-	-
Tanzania	9.80	31.60	4.33	45.73	.15	18.63	11.19	3.45
Togo	17.06	132.07	3.79	152.92	.84	6.24	2.12	.22

Uganda	8.47	40.67	3.72	52.85	.14	16.48	5.13	1.03
Zimbabwe*	14.04	115.70	11.74	141.48	-	-	-	-
Near-East (15)								
Algeria	7.76	41.15	13.56	62.46	.63	.78	1.04	.49
Bahrain	296.45	570.57	69.71	936.74	3.65	11.82	3.55	.24
Egypt	25.47	55.83	3.82	85.12	.19	14.76	1.21	.83
Iran	2.18	15.99	.53	18.70	.48	14.08	.82	.63
Iraq	29.07	62.97	5.01	97.05	.42	4.45	1.24	2.79
Israel	132.91	478.90	54.24	666.06	1.96	20.41	.26	2.37
Jordan	105.14	273.96	36.60	415.69	2.34	12.68	1.30	2.38
Kuwait	53.21	134.62	5.73	193.56	3.70	38.71	.14	.20
Morocco	39.96	98.78	7.55	146.28	1.39	3.27	.40	1.99
Oman	52.82	187.74	5.50	246.07	3.72	8.64	.19	.18
Palestine	241.86	448.86	68.33	759.05	4.28	1.74	.81	1.82
Qatar*	14.49	147.81	9.78	172.08	-	-	-	-
Saudi Arabia	8.42	59.62	1.89	69.92	1.40	51.54	.81	.04
Syria	14.88	61.14	2.36	78.37	1.26	2.77	.56	4.65
East Asia & Pacific (13)								
Australia*	49.36	130.70	3.23	183.29	-	-	-	-
Cambodia	33.91	50.74	7.75	92.40	.31	8.98	9.35	3.40
China*	.46	5.68	.68	6.82	-	-	-	-
Hong Kong*	17.73	129.98	3.47	151.18	-	-	-	-
Indonesia	21.21	18.36	3.76	43.32	.19	19.58	6.42	.10
Japan*	36.12	63.60	4.27	103.99	-	-	-	-
Korea (South)	33.56	90.50	11.46	135.52	3.09	37.56	12.10	.31
Laos	44.54	90.58	17.49	152.61	1.04	2.05	24.28	1.67
Malaysia	40.21	83.10	5.51	128.83	2.13	13.14	3.51	3.56
Mongolia	119.60	263.79	36.12	419.51	4.21	9.65	20.24	15.45
New Zealand	222.08	400.90	6.32	629.31	1.37	20.14	2.13	.05
Philippines	24.49	32.01	5.68	62.18	.11	35.88	2.88	.11
Thailand	24.83	44.74	4.13	73.70	.56	25.86	9.12	.19
South & Central Asia (12)								
Armenia	255.92	994.79	240.95	1491.66	1.75	7.75	1.04	53.12
Azerbaijan	58.43	256.49	51.73	366.65	1.79	3.00	.49	40.84
Bangladesh	5.52	13.59	.70	19.82	.19	18.46	3.19	.91
Bhutan	78.96	296.44	7.77	383.17	3.25	5.02	.26	.08
India	3.11	7.42	.35	10.87	.16	48.64	3.13	2.14
Kazakhstan	37.30	260.34	48.84	346.48	3.00	2.27	4.07	66.23
Kyrgyz Republic	71.60	553.94	105.37	730.91	1.32	3.38	5.77	30.55
Nepal	18.84	63.38	5.32	87.53	1.04	31.02	9.59	.63
Pakistan	31.01	27.91	2.13	61.05	.21	17.80	13.10	.27
Sri Lanka	25.56	78.61	5.39	109.56	.72	18.02	4.53	3.78
Tajikistan	27.98	206.64	29.13	263.75	1.13	3.53	2.64	44.19
Uzbekistan	18.79	80.44	13.21	112.45	.88	2.01	1.74	33.37

Europe & Eurasia (38)								
Albania	132.55	345.33	67.32	545.20	5.75	5.22	.21	.33
Austria	233.17	266.62	5.61	505.40	1.86	5.99	.26	.07
Belarus	36.64	268.64	100.58	405.87	2.23	2.34	.36	63.36
Belgium	125.85	203.60	7.01	336.46	1.16	6.85	.35	.11
Bulgaria	56.17	306.77	40.69	403.63	2.76	11.97	.29	1.15
Croatia	42.96	325.61	23.19	391.76	2.01	7.13	.25	.12
Czech Republic	25.35	186.97	9.97	222.30	.86	11.02	.28	.34
Denmark	270.53	359.45	7.90	637.87	1.13	16.70	1.44	.05
Estonia	94.78	798.83	78.98	972.59	2.85	6.16	.18	22.66
Finland	265.13	535.86	10.85	811.83	1.66	7.63	.36	.59
France	87.73	120.61	2.30	210.64	1.12	10.59	.99	.12
Georgia	185.35	941.34	244.03	1370.72	1.94	5.33	.21	23.00
Germany	253.81	167.04	52.23	473.08	1.15	10.41	.49	.22
Greece	184.36	186.83	14.08	385.17	3.59	5.72	.08	.45
Hungary	44.31	309.32	46.15	399.77	.83	11.31	.57	.37
Ireland	117.87	289.52	144.56	551.95	4.08	5.88	.17	.02
Italy	54.74	126.35	2.64	183.73	.82	8.13	.78	.16
Latvia	82.76	461.24	105.95	649.96	2.15	7.91	.45	21.17
Lithuania	53.90	325.50	58.51	437.90	2.57	6.46	.17	14.73
Luxembourg*	109.45	331.54	20.62	461.61	-	-	-	-
Malta	21.34	768.40	36.87	826.61	2.34	4.07	.06	.11
Montenegro*	124.00	1019.00	262.30	1405.30	-	-	-	-
Netherlands	100.89	186.18	3.90	290.97	.83	13.38	.56	.05
Norway	422.13	434.59	6.51	863.22	3.16	12.45	.27	.13
Poland	24.44	118.12	12.36	154.91	.60	9.52	.44	.29
Portugal	103.42	154.88	14.18	272.48	1.15	7.37	.70	.06
Republic of North Macedonia	142.11	492.17	92.84	727.12	2.42	5.81	.25	.49
Romania	26.49	166.44	16.41	209.34	1.21	10.51	.22	.11
Russia*	25.51	261.48	53.58	340.56	-	-	-	-
Serbia*	25.96	359.47	145.96	531.39	-	-	-	-
Slovak Republic	22.17	206.54	30.24	258.95	4.32	2.94	.08	.09
Slovenia	51.94	448.61	34.94	535.50	1.34	9.60	.20	.13
Spain	57.60	155.29	1.67	214.55	.69	14.49	.42	.10
Sweden	89.30	195.97	2.99	288.26	1.73	23.49	.50	.11
Switzerland	28.59	63.90	4.75	97.24	1.50	12.87	.46	.06
Turkey	39.10	55.96	5.99	101.04	.56	27.55	.84	.86
Ukraine	55.73	298.95	109.09	463.75	.87	5.26	.61	29.05
United Kingdom	70.52	187.04	14.49	272.06	.49	29.43	1.02	.10
Western Hemisphere (20)								
Argentina	54.22	129.81	10.48	194.51	.21	31.09	.70	.07
Brazil	12.75	42.36	4.85	59.95	.18	29.77	.44	.48
Canada	12.72	64.80	5.15	82.66	1.37	59.08	1.53	.03
Chile	162.69	143.88	16.06	322.64	.62	26.56	.34	.09

Colombia	80.11	69.17	9.05	158.33	.64	25.79	.35	.56
Costa Rica	213.93	327.93	61.29	602.37	.51	43.87	1.53	.62
Cuba	3.27	12.39	.44	16.11	.19	6.78	2.90	.81
Dominican Republic	79.09	137.10	15.36	231.55	.31	42.92	.43	.36
Ecuador	90.68	181.03	28.60	300.31	.72	25.82	.59	2.00
El Salvador	134.12	305.75	36.87	476.74	.51	36.03	.10	.05
Guatemala	48.03	140.13	12.21	200.37	.19	41.89	.16	.47
Guyana*	106.62	403.91	96.59	607.12	-	-	-	-
Honduras	82.00	150.76	17.09	249.86	.35	48.74	.13	.11
Jamaica	120.90	392.14	60.27	573.32	2.09	58.44	1.45	.33
Mexico	36.51	52.11	9.98	98.60	.24	50.11	.39	.17
Nicaragua*	120.34	190.80	77.12	388.25	-	-	-	-
Panama	272.68	343.24	41.22	657.14	.76	47.18	1.60	1.47
Paraguay	86.27	176.02	26.89	289.18	1.22	8.03	.10	.04
Peru	46.81	89.99	11.65	147.28	.70	17.39	.31	1.14
Uruguay	200.34	776.01	60.95	1037.30	1.02	14.52	.23	.06

*—the countries dropped in the analysis of the outbound student mobility to the U.S., China, and Russia.

Appendix E: Full Models for International Exchange

Table AE1. Full Multilevel Random Slope Model of ECA Student Mobility on Five Development Indicators (133 Countries, 1975-2020)

	Economy	Gender	Justice and Freedoms	Health	Education
Student Mobility$_{t-5}$	.003 (.003)	.050 *** (.015)	.062 *** (.015)	.009 ** (.003)	.033 ** (.010)
Gross tertiary enrollment ratio$_{t-5}$	.034 *** (.004)	.327 *** (.022)	-.052 ** (.019)	.009 * (.003)	-.008 *** (.014)
International trade$_t$	.012 *** (.002)	.004 (.009)	.028 ** (.008)	-.001 (.002)	.003 (.006)
GDP per capita $_{t-5}$		.444 *** (.059)	.049 (.065)	.055 *** (.014)	.068 (.044)
Time	.005 * (.003)	.011 (.013)	-.016 (.012)	.000 (.003)	.013 (.009)
Time^2	.005 *** (.001)	.016 *** (.004)	.003 (.004)	.002 * (.001)	.008 * (.000)
Region (ref. = Europe & Eurasia)					
Sub-Saharan Africa	-5.247 ** (1.723)	13.131 *** (2.612)	-33.812 *** (4.606)	-14.801 *** (.991)	-25.782 *** (2.915)
Near East	0.377 (2.248)	-5.867 (3.111)	-43.601 *** (5.738)	-3.041 * (1.195)	-8.089 * (3.462)
East Asia & Pacific	-3.621 (2.274)	-1.429 (3.113)	-23.025 *** (5.982)	-1.916 (1.247)	-4.452 (3.578)
South & Central Asia	-7.408 ** (2.441)	-6.049 (3.549)	-37.053 *** (6.305)	-7.332 *** (1.323)	-12.399 ** (3.820)
Western Hemisphere	-4.256 * (1.989)	.468 (2.924)	-17.804 *** (5.217)	-3.046 ** (1.095)	-3.281 (3.186)
Constant	7.918 ***	-8.144	41.408 ***	65.283 ***	76.126 ***
Variance Components					
Country Level					
Slope (Time)	.271	9.679	4.516	.183	1.551
Slope (Time2	.000	.002	.001	.000	.000
Intercept	61.042	1613.635	1083.276	59.915	648.256
Country-Year Level					
Intercept	1.244	32.743	31.102	1.533	15.024
Model Fit Statistics					
AIC	14373.6	20280.8	26870.4	14866.0	20029.5
BIC	14487.1	20394.9	26990.1	14985.8	20133.4
-2log likelihood	7168.8	10121.4	13416.2	7414.0	9997.8
N (country-year)	4046	2996	4022	4046	3337

Note: Unstandardized coefficients (standard errors in parentheses).
*—p < .05; **—p < .01; ***—p < .001 (two-tailed tests)

Table AE2. Full Multilevel Random Slope Models of ECA Professional Mobility on Five Development Indicators (133 Countries, 1975-2020)

	Economy	Gender	Justice and Freedoms	Health	Education
Professional Mobility$_{t-5}$	.011 *** (.002)	.026 *** (.006)	.002 (.006)	.003 ** (.001)	.007 (.004)
Gross tertiary enrollment ratio$_{t-5}$	.031 *** (.004)	.325 *** (.022)	-.047 * (.019)	.009 * (.004)	-.085 *** (.014)
International trade$_t$	.012 *** (.002)	.008 (.009)	.028 *** (.008)	-.002 (.002)	.001 (.006)
GDP per capita $_{t-5}$		.454 *** (.058)	.057 (.066)	.057 *** (.014)	.083 (.044)
Time	.133 ** (.046)	1.138 *** (.290)	1.203 *** (.197)	.289 *** (.041)	.828 *** (.123)
Time^2	.000 (.001)	-.006 (.005)	-.016 *** (.003)	-.001 (.001)	-.003 (.002)
Region (ref. = Europe & Eurasia)					
Sub-Saharan Africa	-7.117 *** (1.651)	-15.477 *** (2.653)	-36.627 *** (4.771)	-14.986 *** (.973)	-26.675 *** (2.885)
Near East	-.952 (2.143)	-7.328 * (3.159)	-45.613 *** (5.990)	-2.935 * (1.181)	-8.441 * (3.446)
East Asia & Pacific	-5.342 * (2.171)	-1.366 (3.196)	-24.449 *** (6.273)	-1.722 (1.240)	-4.550 (3.595)
South & Central Asia	-7.273 ** (2.318)	-6.533 (3.614)	-39.578 *** (6.586)	-7.379 *** (1.306)	-12.815 *** (3.801)
Western Hemisphere	-6.726 *** (1.912)	-.927 (3.004)	-17.980 *** (5.462)	-2.788 ** (1.082)	-2.739 (3.175)
Constant	9.079 *** (1.189)	-6.174 (4.181)	43.685 *** (4.264)	65.389 *** (.940)	76.820 *** (2.970)
Variance Components					
Country Level					
Slope (Time)	.256	9.604	4.385	.187	1.548
Slope (Time2	.000	.003	.001	.000	.000
Intercept	55.773	1605.211	1110.616	61.035	649.677
Country-Year Level					
Intercept	1.230	32.545	31.174	1.534	15.063
Model Fit Statistics					
AIC	14322.3	20273.5	26886.8	14866.6	20036.3
BIC	14435.8	20387.6	27006.5	14986.4	20140.2
-2log likelihood	14286.3	20235.5	26848.8	14828.6	20002.3
N (country-year)	4046	2996	4022	4046	3337

Note: Unstandardized coefficients (standard errors in parentheses).
*—p < .05; **—p < .01; ***—p < .001 (two-tailed tests)

Table AE3. Full Multilevel Random Slope Models of ECA Youth/Cultural Mobility on Five Development Indicators (133 Countries, 1975-2020)

	Economy	Gender	Justice and Freedoms	Health	Education
Youth/Cultural Mobility$_{t-5}$	.005 * (.003)	.011 (.013)	-.016 (.012)	.000 (.003)	.013 (.009)
Gross tertiary enrollment ratio$_{t-5}$	.034 ** (.004)	.328 *** (.022)	-.045 * (.019)	.010 * (.004)	-.084 *** (.014)
International trade$_t$	.013 *** (.002)	.013 (.009)	.028 *** (.008)	-.001 (.002)	.003 (.006)
GDP per capita $_{t-5}$		.507 *** (.057)	.059 (.066)	.058 *** (.014)	.090 * (.044)
Time	.172 *** (.047)	1.203 *** (294)	1.214 *** (.196)	.301 *** (.040)	.847 *** (.122)
Time^2	.000 (.001)	-.006 (.005)	-.016 *** (.003)	-.001 (.001)	-.003 (.002)
Region (ref. = Europe & Eurasia)					
Sub-Saharan Africa	-5.373 ** (1.719)	-14.957 *** (2.676)	-36.650 *** (4.777)	-15.186 *** (.989)	-26.934 *** (2.906)
Near East	.247 (2.241)	-7.560 * (3.194)	-45.640 *** (5.997)	-3.154 ** (1.205)	-8.574 * (3.489)
East Asia & Pacific	-3.813 (2.267)	-2.351 (3.225)	-24.703 *** (6.268)	-2.140 (1.256)	-5.169 (3.602)
South & Central Asia	-7.522 ** (2.427)	-7.765 * (3.641)	-39.580 *** (6.587)	-7.432 *** (1.332)	-13.086 *** (3.846)
Western Hemisphere	-4.525 * (1.985)	.343 (3.022)	-17.886 ** (5.468)	-2.949 ** (1.106)	-2.663 (3.222)
Constant	8.124 *** (1.241)	-6.393 (4.282)	43.576 *** (4.261)	65.538 *** (.944)	77.060 *** (2.969)
Variance Components					
Country Level					
Slope (Time)	.271	9.946	4.373	.182	1.524
Slope (Time2	.000	.003	.001	.000	.000
Intercept	61.135	1702.199	1105.618	60.760	644.292
Country-Year Level					
Intercept	1.244	32.699	31.156	1.538	15.070
Model Fit Statistics					
AIC	14370.1	20291.9	26885.2	14873.2	20041.1
BIC	14483.6	20406.0	27004.9	14993.0	20157.2
-2log likelihood	14334.1	20253.9	26847.2	14835.2	20003.1
N (country-year)	4046	2996	4022	4046	3337

Note: Unstandardized coefficients (standard errors in parentheses).
*—p < .05; **—p < .01; ***—p < .001 (two-tailed tests)

Table AE4. Full Multilevel Random Slope Models of ECA Total Mobility on Five Development Indicators in 133 Countries (1975-2020)

	Economy	Gender	Justice and Freedoms	Health	Education
Total Mobility$_{t-5}$	.005 *** (.001)	.016 *** (.004)	.003 (.004)	.002 * (.001)	.008 ** (.003)
Gross tertiary enrollment ratio$_{t-5}$	.032 *** (.004)	.326 *** (.022)	-.048 * (.019)	.009 * (.004)	-.087 *** (.014)
International trade$_t$	.012 *** (.002)	.010 (.009)	.028 *** (.008)	-.002 (.002)	.002 (.006)
GDP per capita $_{t-5}$		.448 *** (.057)	.055 (.066)	.057 *** (.014)	.081 (.044)
Time	.153 ** (.047)	1.169 *** (.290)	1.198 *** (.197)	.292 *** (.041)	.824 *** (.123)
Time^2	.000 (.001)	-.007 (.005)	-.016 *** (.003)	-.001 (.001)	-.003 (.002)
Region (ref. = Europe & Eurasia)					
Sub-Saharan Africa	-6.384 *** (1.659)	-15.249 *** (2.630)	-36.450 *** (4.757)	-14.904 *** (.980)	-26.268 *** (2.883)
Near East	-.446 (2.158)	-7.060 * (3.132)	-45.487 *** (5.967)	-2.938 * (1.185)	-8.140 * (3.431)
East Asia & Pacific	-4.863 * (2.187)	-1.633 (3.166)	-24.248 *** (6.244)	-1.747 (1.243)	-4.101 (3.577)
South & Central Asia	-7.293 ** (2.337)	-6.858 (3.585)	-39.380 *** (6.558)	-7.361 *** (1.310)	-12.633 *** (3.784)
Western Hemisphere	-5.728 ** (1.918)	-.690 (2.971)	-18.025 *** (5.438)	-2.813 ** (1.085)	-2.649 (3.160)
Constant	8.619 *** (1.195)	-6.398 (4.198)	43.570 *** (4.258)	65.365 *** (.941)	76.585 *** (2.969)
Variance Components					
Country Level					
Slope (Time)	.264	9.647	4.399	.185	1.538
Slope (Time2	.000	.002	.001	.000	.000
Intercept	56.637	1627.558	1110.431	60.938	650.061
Country-Year Level					
Intercept	1.237	32.615	31.176	1.534	15.031
Model Fit Statistics					
AIC	14343.9	20276.0	26886.2	14867.3	20037.0
BIC	14457.4	20390.1	27005.9	14987.1	20153.1
-2log likelihood	14307.9	20238.0	26848.2	14829.3	19999.0
N (country-year)	4046	2996	4022	4046	3337

Note: Unstandardized coefficients (standard errors in parentheses).
*—p < .05; **—p < .01; ***—p < .001 (two-tailed tests)

Table AE5. Full Interaction Effects Models Between ECA Total Mobility and Region on Five Development Indicators (133 Countries, 1975-2020)

	Economy	Gender	Justice and Freedoms	Health	Education
Total Mobility$_{t-5}$	.011 ***	.026 ***	-.002	.001	-.004
	(.001)	(.005)	(.005)	(.001)	(.004)
Gross tertiary enrollment ratio$_{t-5}$	.031 ***	.324 ***	-.041 *	.009 *	-.085 ***
	(.004)	(.022)	(.019)	(.004)	(.014)
International trade$_t$	.012 ***	.010	.026 ***	-.001	.002
	(.002)	(.009)	(.008)	(.002)	(.006)
GDP per capita $_{t-5}$		.406 ***	.069	.059 ***	.082
		(.059)	(.066)	(.014)	(.043)
Time	.150 **	1.186 ***	1.181 ***	.287 ***	.823 ***
	(.047)	(.284)	(.196)	(.041)	(.124)
Time^2	.000	-.007	-.016 ***	-.001	-.003
	(.001)	(.005)	(.003)	(.001)	(.002)
Region (ref. = Europe & Eurasia)					
Sub-Saharan Africa (AF)	-7.943 ***	-12.292 ***	-38.558 ***	-16.436 ***	-32.214 ***
	(1.616)	(2.824)	(4.990)	(1.056)	(3.239)
Near East (NEA)	-2.398	-5.765	-46.911 ***	-3.947 **	-10.296 *
	(2.105)	(3.384)	(6.353)	(1.335)	(4.117)
East Asia & Pacific (EAP)	-6.066 **	-4.597	-24.658 ***	-3.330 *	-15.192 ***
	(2.133)	(3.561)	(6.855)	(1.441)	(4.266)
South & Central Asia (SCA)	-9.676 ***	-5.287	-39.413 ***	-7.996 ***	-17.186 ***
	(2.313)	(3.558)	(6.616)	(1.359)	(4.075)
Western Hemisphere (WHA)	-6.915 ***	-1.606	-29.040 ***	-2.202	-8.790 *
	(1.866)	(3.744)	(6.023)	(1.289)	(3.933)
Interaction Effects					
TM$_{t-5}$ × AF	-.010 **	-.025	.019	.008 **	.028 **
	(.003)	(.013)	(.013)	(.003)	(.009)
TM$_{t-5}$ × NEA	-.016 ***	-.010	.007	.004	.003
	(.004)	(.013)	(.014)	(.003)	(.010)
TM$_{t-5}$ × EAP	-.009	.041	-.001	.009	.066 ***
	(.009)	(.019)	(.027)	(.006)	(.017)
TM$_{t-5}$ × SCA	-.009 ***	-.031 ***	-.006	.002	.014 *
	(.002)	(.009)	(.009)	(.002)	(.007)
TM$_{t-5}$ × WHA	-.012 ***	.001	.055 ***	-.003	.020
	(.003)	(.014)	(.013)	(.003)	(.009)
Constant	9.966 ***	-7.478	44.910 ***	65.934 ***	80.162 ***
	(1.167)	(4.099)	(4.283)	(.963)	(3.101)
Variance Components					
Country Level					
Slope (Time)	.267	9.253	4.356	.191	1.582
Slope (Time2	.000	.002	.001	.000	.000
Intercept	51.874	1521.482	1087.055	59.841	659.824
Country-Year Level					
Intercept	1.226	32.518	31.009	1.533	14.972
Model Fit Statistics					
AIC	14316.4	20264.9	26874.3	14863.5	20021.5
BIC	14461.5	20409.0	27025.5	15014.8	20168.3
-2log likelihood	14270.4	20216.9	26826.3	14815.5	19973.5
N (country-year)	4046	2996	4022	4046	3337

Note: Unstandardized coefficients (standard errors in parentheses).
*—p < .05; **—p < .01; ***—p < .001 (two-tailed tests)

Table AE6. Average Marginal Effects of ECA Total Mobility on Five Development Indicators by Region (Estimated from Models in Table AE5)

	Economy	Gender	Justice and Freedoms	Health	Education
AF	.001 [-.005, .008]	.001 [-.022, 0.24]	.016 [-.007, .040]	.009 [.004, .014]	.024 [.009, .039]
NEA	-.005 [-.012, .002]	.016 [-.008, .040]	.005 [-.021, .030]	.005 [-.001, .010]	.000 [-.017, .017]
EAP	.002 [-.015, .020]	.066 [.029, .103]	-.003 [-.055, .050]	.010 [-.001, .021]	.062 [.030, .094]
SCA	.002 [-.001, .005]	-.005 [-.020, .009]	-.008 [-.021, .006]	.003 [-.001, .006]	.011 [.000, .021]
EUR	.011 [.009, .014]	.026 [.015, .036]	-.002 [-.013, .008]	.001 [-.002, .003]	-.004 [-.012, .005]
WHA	.000 [-.006, .006]	.027 [.002, .052]	.053 [.029, .076]	-.002 [-.007, .003]	.016 [.001, .032]

Note: Average marginal effects (95% confidence intervals in brackets).

Table AE7. Full Multilevel Random Slope Models of Total Student Mobility on Five Development Indicators (115 Countries, 2004-2018)

	Economy	Gender	Justice and Freedoms	Health	Education
Total student mobility rate$_{t-5}$	.183 ** (.059)	1.705 ** (.518)	.510 (.349)	.222 *** (.049)	.583 † (.320)
% outbound student mobility to the U.S.$_{t-5}$	-.004 (.008)	.190 ** (.067)	.173 *** (.047)	.026 *** (.007)	.081 * (.040)
% outbound student mobility to China$_{t-5}$	.022 (.019)	-.310 † (.174)	-.029 (.115)	-.021 (.016)	-.192 † (.103)
% outbound student mobility to Russia$_{t-5}$	-.006 (.007)	.091 (.061)	-.038 (.044)	-.012 * (.006)	.026 (.040)
Gross tertiary enrollment ratio$_{t-5}$	-.003 (.003)	.041 (.033)	-.017 (.022)	.008 ** (.003)	-.038 * (.019)
International trade$_{t}$	.000 (.002)	.006 (.017)	.010 (.012)	.003 * (.002)	-.025 * (.011)
GDP per capita $_{t-5}$		.393 ** (.123)	.273 ** (.105)	.020 (.019)	.208 ** (.079)
Time	.201 *** (.049)	.913 *** (.154)	.048 (.110)	.297 *** (.022)	.630 *** (.097)
Region (ref. = Europe & Eurasia)					
Sub-Saharan Africa	-20.474 *** (3.094)	-55.099 *** (5.509)	-30.726 *** (5.309)	-18.704 *** (1.141)	-26.128 *** (3.602)
Near East	-10.773 ** (3.839)	-33.788 *** (5.962)	-50.192 *** (6.030)	-2.946 * (1.341)	-6.240 (3.981)
East Asia & Pacific	-14.264 ** (4.540)	-26.269 *** (7.187)	-27.212 *** (7.228)	-6.097 *** (1.599)	-5.592 (4.795)
South & Central Asia	-19.980 *** (4.065)	-42.976 *** (6.668)	-42.542 *** (6.652)	-8.534 *** (1.457)	-13.899 *** (4.506)
Western Hemisphere	-14.048 *** (3.530)	-22.741 *** (5.957)	-17.932 ** (5.770)	-2.548 * (1.257)	-2.908 (3.884)
Constant	22.214 *** (2.102)	53.075 *** (4.810)	61.787 *** (4.329)	74.531 *** (.865)	96.661 *** (3.100)
Variance Components					
Country Level					
Slope (Time)	.257	1.575	.929	.043	.665

Intercept	145.229	288.000	326.701	16.974	134.241
Country-Year Level					
Intercept	.264	25.452	11.949	.198	7.944
Model Fit Statistics					
AIC	3445.2	7371.2	7622.1	2715.7	6009.8
BIC	3527.4	7456.0	7709.4	2803.0	6094.1
-2log likelihood	3413.2	7337.2	7588.1	2681.7	5975.8
N (country-year)	1254	1086	1254	1254	1053

Note: Unstandardized coefficients (standard errors in parentheses).
*—p < .05; **—p < .01; ***—p < .001; †—p < .10 (two-tailed tests)

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