Supplemental Appendix

University as a Melting Pot: Long-term Effects of Internationalization

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Online Appendix A: Tables

Table B1: The effect of exposure to international students on attitudes towards internationalization

	Coefficient	s.e.	Mean	N
Panel A: Selection into the NSS panel				
1. Is a program observed in the NSS panel? (0 - no, 1 - yes)	-0.007	(0.011)	0.911	381,671
2. How satisfied are you with the level of internationalization? (0 - not answered, 1 - answered)	0.000	(0.000)	0.354	347,615
3. How satisfied are you with the level of encouragement to learn about other cultures? (0 - not answered, 1 - answered)	0.000	(0.000)	0.354	347,615
Panel B: Linear regression with weights				
1. How satisfied are you with the level of internationalization? (1 - very dissatisfied, 5 - very satisfied)	0.060	(0.019)	3.524	123,038
2. How satisfied are you with the level of encouragement to learn about other cultures? (1 - very dissatisfied, 5 - very satisfied)	0.046	(0.017)	3.197	123,038
Panel C: Ordered probit regression				
1. How satisfied are you with the level of internationalization? (1 - very dissatisfied, 5 - very satisfied)	0.156	(0.011)	3.524	123,038
2. How satisfied are you with the level of encouragement to learn about other cultures? (1 - very dissatisfied, 5 - very satisfied)	0.068	(0.010)	3.197	123,038

Notes: A coefficient represents a 10 percentage point increase in the share of international students. In Panels A and B, all regressions include program and cohort fixed effects. In Panel C, all regressions include the share of international students after residualizing it for program and cohort fixed effects. In Panel B, I weigh observations by the ratio of students who answered the survey to the total number of students enrolled in the program. Standard errors, which are clustered at the program level, are reported in parentheses.

Table B2: The effect of exposure to international students on attitudes towards migration

	Coefficient	s.e.	Mean	N
Panel A: Selection into the LISS panel and answering a question				
1. Is a person observed in the LISS panel? (0 - no, 1 - yes)	0.000	(0.000)	0.001	1,037,347
2. Do you agree that people of foreign origin who legally reside in the Netherlands should be entitled to the same social security as Dutch citizens? (0 - not answered, 1 - answered)	-0.047	(0.036)	0.821	1,437
3. Do you agree that it does not help a neighborhood if many people of foreign origin or descent move in? (0 - not answered, 1 - answered)	-0.047	(0.036)	0.821	1,437
4. Where would you place yourself on a scale from 1 to 5, where 1 means that European unification has already gone too far and 5 means that it should go further? (0 - not answered, 1 - answered)	-0.045	(0.036)	0.811	1,437
Panel B: Linear regression with weights				
1. Do you agree that people of foreign origin who legally reside in the Netherlands should be entitled to the same social security as Dutch citizens? (1 - fully disagree, 5 - fully agree)	0.282	(0.128)	3.790	1,180
2. Do you agree that it does not help a neighborhood if many people of foreign origin or descent move in? (1 - fully disagree, 5 - fully agree)	-0.157	(0.062)	3.258	1,180
3. Where would you place yourself on a scale from 1 to 5, where 1 means that European unification has already gone too far and 5 means that it should go further?	0.162	(0.082)	2.148	1,166
Panel C: Ordered probit regression				
1. Do you agree that people of foreign origin who legally reside in the Netherlands should be entitled to the same social security as Dutch citizens? (1 - fully disagree, 5 - fully agree)	0.296	(0.104)	3.790	1,180
2. Do you agree that it does not help a neighborhood if many people of foreign origin or descent move in? (1 - fully disagree, 5 - fully agree)	-0.187	(0.102)	3.258	1,180
3. Where would you place yourself on a scale from 1 to 5, where 1 means that European unification has already gone too far and 5 means that it should go further?	0.253	(0.102)	2.148	1,166

Notes: A coefficient represents a 10 percentage point increase in the share of international students. In Panels A and B, all regressions include program and cohort fixed effects. In Panel C, all regressions include the share of international students after residualizing it for program and cohort fixed effects. In Panel B, I weigh observations by the number of students from the program. The scale of question 4 in Panel A, and question 3 in Panels B and C is reversed compared to the original. Standard errors, which are clustered at the program level, are reported in parentheses.

Table B3: Pre-emigration labor market outcomes of Dutch students

	Employed	Income percentile	Entrepreneur	% of foreign-born co-workers
Emigrated	-0.151	-0.110	-0.007	0.037
	(0.003)	(0.004)	(0.001)	(0.001)
Mean	0.933	0.614	0.032	0.118
N	2,496,650	2,496,650	2,496,650	1,767,597

Notes: All regressions include program and cohort fixed effects. This table reports coefficients from regressions of pre-emigration labor market outcomes on an indicator for whether the student subsequently emigrated 15 years after enrollment. Outcomes are measured in the year before the student's last observed year in the Netherlands. Mean refers to the sample mean of the dependent variable among non-emigrants. The sample contains outcomes for emigrants at the individual level measured once and for non-emigrants at the individual level measured annually. Standard errors, which are clustered at the program level, are reported in parentheses.

Table B4: Bounding analyses for labor market outcomes of Dutch students

Panel A: Lower bound	Employed	Income percentile	Entrepreneur	% of foreign-born co-workers
International share	-0.003	0.000	0.000	0.000
in 10%-points	(0.001)	(0.002)	(0.001)	(0.001)
Mean	0.882	0.688	0.067	0.114
N	617,094	617,094	617,094	458,709
Panel B: Upper bound				
International share	-0.001	0.001	0.002	0.002
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)
Mean	0.947	0.733	0.133	0.132
N	617,094	617,094	617,094	458,709
Panel C: Pre-emigration				
International share	-0.002	-0.001	0.000	0.001
in 10%-points	(0.001)	(0.002)	(0.001)	(0.001)
Mean	0.935	0.706	0.070	0.123
N	606,230	606,230	606,230	441,006

Notes: All regressions include program and cohort fixed effects. This table reports estimates of the effect of exposure to international students on natives' labor market outcomes, addressing missing outcomes for emigrants. Panel A presents lower bounds, imputing zeros for binary outcomes (employment and entrepreneurship) and values from the bottom 10% of peers in emigrants' programs for continuous outcomes (income percentile and the share of foreign-born co-workers). Panel B presents upper bounds, imputing ones for binary outcomes and values from the top 10% of peers for continuous outcomes. Panel C presents estimates imputing emigrants' outcomes from the year before their last observed year in the Netherlands. Outcomes are measured 15 years after enrollment. Mean refers to the sample mean of the dependent variable among non-emigrants. Standard errors, which are clustered at the program level, are reported in parentheses.

Table B5: Robustness to alternative models and samples

Panel A: Cohabited with a non-native	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
International share	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.008	0.006	0.007
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	605,367	605,367	605,367	605,367	605,367	605,367	605,367	637,725	615,410	650,182
Panel B: Married to a non-native										
International share	0.001	0.001	0.001	0.002	0.001	0.002	0.002	0.002	0.001	0.002
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	587,676	587,676	587,676	587,676	587,676	587,676	587,676	617,035	597,498	629,126
Panel C: Emigrated										
International share	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.005	0.002	0.004
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	617,094	617,094	617,094	617,094	617,094	617,094	617,094	651,650	627,143	664,272
Panel D: Employed										
International share	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	576,961	576,961	576,961	576,961	576,961	576,961	576,961	605,238	586,693	617,177
Panel E: Income percentile										
International share	0.001	0.001	0.001	0.000	0.002	0.001	0.001	0.000	0.001	0.000
in 10%-points	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	576,961	576,961	576,961	576,961	576,961	576,961	576,961	605,238	586,693	617,177
Panel F: Entrepreneur										
International share	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	576,961	576,961	576,961	576,961	576,961	576,961	576,961	605,238	586,693	617,177
Panel G: % of foreign-born co-workers										
International share	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	427,687	427,687	427,687	427,687	427,687	427,687	427,687	447,157	432,395	453,029
Controls										
Field specific linear time trend		✓					✓			
Field specific quadratic time trend			✓				✓			
Program size				✓			✓			
Individual characteristics					✓		✓			
Peer characteristics						✓	✓			
Sample										
First-generation immigrants								✓		✓
Students older than 30 at enrollment									✓	✓

Notes: All regressions include program and cohort fixed effects. A non-native is defined as a person without Dutch nationality. Individual characteristics include sex, age at enrollment, migration status, family size, pre-vocational diploma, gap year indicator. Peer characteristics include the share of females, average age at enrollment, the share of second generation migrants, average family size, the share with a pre-vocational diploma, the share with a gap year. Standard errors, which are clustered at the program level, are reported in parentheses.

Table B6: Robustness to alternative models and samples

Panel A: Satisfaction with the level of internationalization	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
International share	0.053	0.053	0.053	0.053	0.053	0.052	0.052	0.053	0.054	0.053
in 10%-points	(0.019)	(0.019)	(0.019)	(0.020)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
N	123,038	123,038	123,038	123,038	123,038	123,038	123,038	129,064	123,918	130,256
Panel B: Satisfaction with the level of encouragement to learn about other cultures										
International share	0.038	0.038	0.038	0.037	0.038	0.043	0.042	0.038	0.037	0.037
in 10%-points	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.020)	(0.020)	(0.019)	(0.019)	(0.019)
N	123,038	123,038	123,038	123,038	123,038	123,038	123,038	129,064	123,918	130,256
Panel C: Social security rights for foreigners										
International share	0.238	0.238	0.238	0.256	0.226	0.260	0.262	0.230	0.238	0.230
in 10%-points	(0.095)	(0.095)	(0.097)	(0.106)	(0.093)	(0.081)	(0.098)	(0.091)	(0.095)	(0.091)
N	1,180	1,180	1,180	1,180	1,180	1,180	1,180	1,251	1,193	1,267
Panel D: Foreigners in neighborhoods										
International share	-0.138	-0.138	-0.138	-0.153	-0.112	-0.126	-0.123	-0.118	-0.138	-0.117
in 10%-points	(0.062)	(0.062)	(0.063)	(0.066)	(0.060)	(0.063)	(0.069)	(0.062)	(0.062)	(0.062)
N	1,180	1,180	1,180	1,180	1,180	1,180	1,180	1,251	1,193	1,267
Panel E: European unification										
International share	0.239	0.239	0.239	0.234	0.248	0.197	0.185	0.206	0.239	0.206
in 10%-points	(0.068)	(0.068)	(0.069)	(0.065)	(0.069)	(0.079)	(0.085)	(0.068)	(0.068)	(0.068)
N	1,166	1,166	1,166	1,166	1,166	1,166	1,166	1,235	1,179	1,250
Controls										
Field specific linear time trend		✓					✓			
Field specific quadratic time trend			✓				✓			
Program size				✓			✓			
Individual characteristics					✓		✓			
Peer characteristics						✓	✓			
Sample										
First-generation immigrants								✓		✓
Students older than 30 at enrollment									✓	✓

Notes: All regressions include program and cohort fixed effects. Individual characteristics include sex, age at enrollment, migration status, family size, pre-vocational diploma, gap year indicator. Peer characteristics include the share of females, average age at enrollment, the share of second generation migrants, average family size, the share with a pre-vocational diploma, the share with a gap year. Standard errors, which are clustered at the program level, are reported in parentheses.

Table B7: Sensitivity to alternative definitions of international students

Panel A: Cohabited with a non-native	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
International share	0.006	0.006	0.005	0.006	0.005	0.005	0.008	0.002
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.006)
N	605,367	605,367	605,367	605,357	605,367	605,367	605,367	605,367
Panel B: Married to a non-native								
International share	0.001	0.002	0.001	0.000	0.001	0.002	0.001	0.003
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)
N	587,676	587,676	587,676	587,666	587,676	587,676	587,676	587,676
Panel C: Emigrated								
International share	0.003	0.003	0.003	0.003	0.003	0.002	0.004	-0.001
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)
N	617,094	617,094	617,094	617,084	617,094	617,094	617,094	617,094
Panel D: Employed								
International share	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	0.000
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)
N	576,961	576,961	576,961	576,951	576,961	576,961	576,961	576,961
Panel E: Income percentile								
International share	0.001	0.000	-0.001	0.000	-0.001	-0.003	0.000	0.005
in 10%-points	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.006)
N	576,961	576,961	576,961	576,951	576,961	576,961	576,961	576,961
Panel F: Entrepreneur								
International share	0.000	0.000	0.001	0.001	0.001	0.002	0.000	0.003
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)
N	576,961	576,961	576,961	576,951	576,961	576,961	576,961	576,961
Panel G: % of foreign-born co-workers								
International share	0.001	0.001	0.001	0.001	0.001	0.002	0.001	-0.004
in 10%-points	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)
N	427,687	427,687	427,687	427,687	427,687	427,687	427,687	427,687
Definition of international students is based on								
Nationality and high school completion	✓							
Nationality		✓						
High school completion			✓					
Residency before enrollment				✓				
Country of birth					✓			
Parent's country of birth						✓		
EEA+ nationality							✓	
Non-EEA+ nationality								✓

Notes: All regressions include program and cohort fixed effects. A non-native is defined as a person without Dutch nationality. EEA+ nationality refers to individuals from the European Economic Area (the EU, Iceland, Liechtenstein, and Norway) plus Switzerland. Standard errors, which are clustered at the program level, are reported in parentheses.

Table B8: Sensitivity to alternative definitions of international students

Panel A: Satisfaction with the level of internationalization	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
International share	0.053	0.056	0.052	0.054	0.051	0.046	0.061	0.101
in 10%-points	(0.019)	(0.019)	(0.018)	(0.021)	(0.019)	(0.020)	(0.021)	(0.071)
N	123,038	123,038	123,038	123,038	123,038	123,038	123,038	123,038
Panel B: Satisfaction with the level of encouragement to learn about other cultures								
International share	0.038	0.042	0.028	0.030	0.038	0.047	0.033	0.140
in 10%-points	(0.019)	(0.019)	(0.019)	(0.021)	(0.019)	(0.020)	(0.022)	(0.065)
N	123,038	123,038	123,038	123,038	123,038	123,038	123,038	123,038
Panel C: Social security rights for foreigners								
International share	0.238	0.230	0.204	0.222	0.235	0.218	0.202	0.768
in 10%-points	(0.095)	(0.095)	(0.094)	(0.093)	(0.095)	(0.082)	(0.097)	(0.553)
N	1,180	1,180	1,180	1,180	1,180	1,180	1,180	1,180
Panel D: Foreigners in neighborhoods								
International share	-0.138	-0.137	-0.125	-0.128	-0.140	-0.137	-0.121	-0.592
in 10%-points	(0.062)	(0.061)	(0.059)	(0.064)	(0.066)	(0.068)	(0.054)	(0.415)
N	1,180	1,180	1,180	1,180	1,180	1,180	1,180	1,180
Panel E: European unification								
International share	0.239	0.237	0.216	0.229	0.244	0.232	0.245	0.597
in 10%-points	(0.068)	(0.066)	(0.067)	(0.066)	(0.066)	(0.073)	(0.059)	(0.366)
N	1,166	1,166	1,166	1,166	1,166	1,166	1,166	1,166
Definition of international students is based on								
Nationality and high school completion	✓							
Nationality		✓						
High school completion			✓					
Residency before enrollment				✓				
Country of birth					✓			
Parent's country of birth						✓		
EEA+ nationality							✓	
Non-EEA+ nationality								✓

Notes: All regressions include program and cohort fixed effects. EEA+ nationality refers to individuals from the European Economic Area (the EU, Iceland, Liechtenstein, and Norway) plus Switzerland. Standard errors, which are clustered at the program level, are reported in parentheses.

Table B9: Overview of estimates on the impact of international students in higher education

Paper	Country	Data	Sample	Measure	Relevant outcomes	Results
Chevalier et al. (2020)	UK	Administrative data from one university and a survey of graduates	4,032 1,581	9%-points (SD)	Failed a course Abroad 6 months post-graduation	0.029 (0.058) 0.015 (0.032)
Costas-Fernández et al. (2023)	UK	Administrative data and a survey of graduates	509,870 315,215 124,305	18.5%-points (SD)	Graduated from a university Employed 6 months post-graduation Log yearly earnings 6 months post-graduation	0.001 (0.006) 0.001 (0.009) 0.033 (0.015)
Anelli et al. (2023)	US	Administrative data from one university	16,828	4.4%-points (SD)	Time to final major declaration Expected earnings 11-15 years post-graduation	0.100 (0.120) 0.031 (0.086)
Rakesh (2023)	US	Administrative data from one university	29,246	10%-points	Graduated from a university	-0.011 (0.006)

Notes: Measure denotes the unit used to quantify the share of international students. "SD" signifies that a paper quantified this measure in terms of standard deviations, while the term "%-points" indicates the magnitude of these standard deviations. Relevant outcomes are those findings from the literature that can be directly compared to the outcomes of this study.

Online Appendix B: Figures

Figure B1: Histogram of the share of international students by program × year of enrollment using the NSS sample
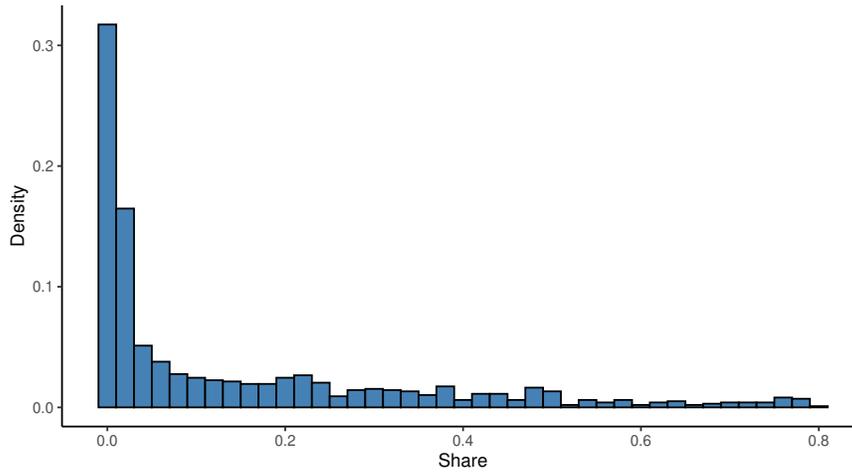
Notes: This histogram shows the plot of the share of international students calculated by program × year of enrollment. For display clarity, the top 1% of the data is winsorized.

Figure B2: Histogram of the residualized share of international students by program × year of enrollment using the NSS sample
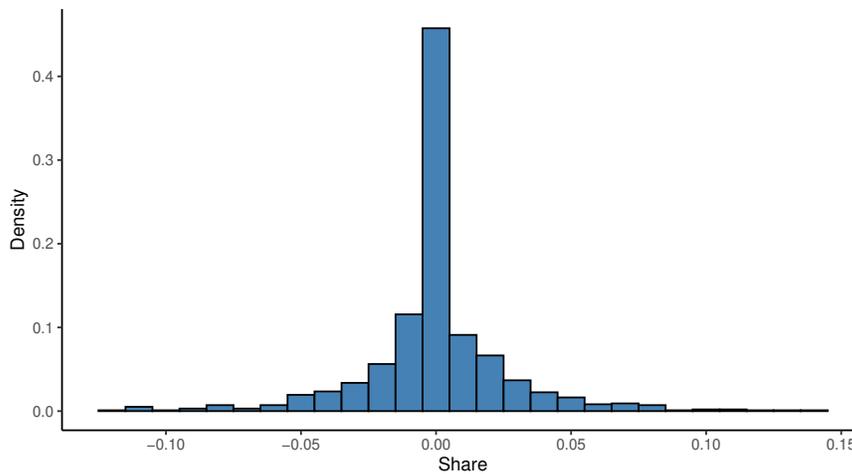
Notes: This histogram shows the plot of residuals of the share of international students calculated by program × year of enrollment after partialing out for program and cohort fixed effects. For display clarity, the top and bottom 1% of the data are winsorized.

Figure B3: Scatter plots
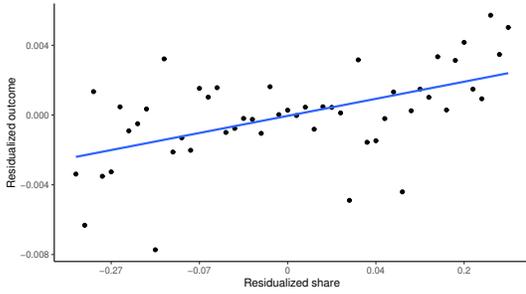
(a) Cohabitation with a non-native
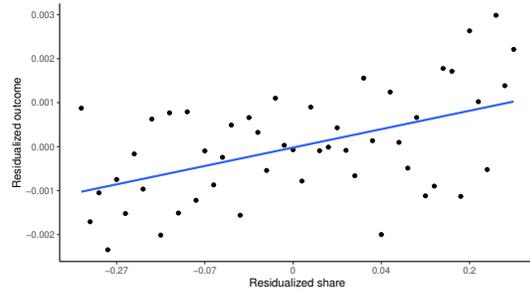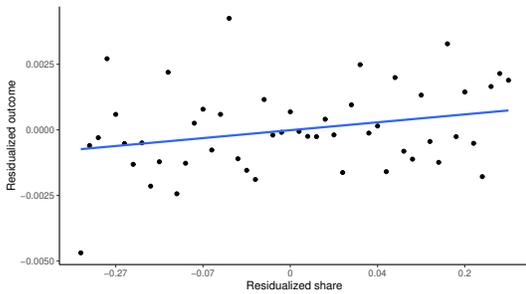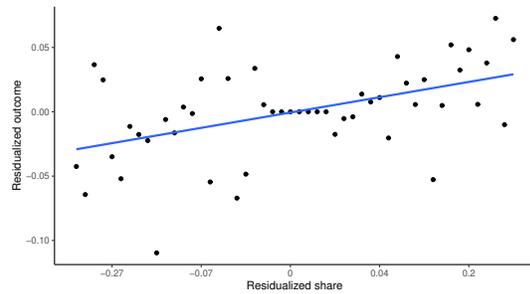
(b) Marriage to a non-native

(c) Emigration

(d) Satisfaction with internationalization

Notes: The plots show the residualized outcome against the residualized share of international students after partialling out program and cohort fixed effects. The residualized share is divided into 50 equally sized bins. For each bin the average residualized outcome is shown against the average residualized share.

Figure B4: Scatter plots
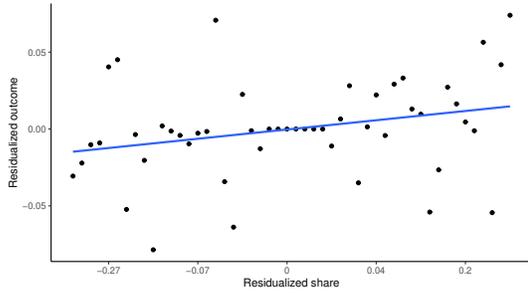
(a) Satisfaction with encouragement to learn about other cultures
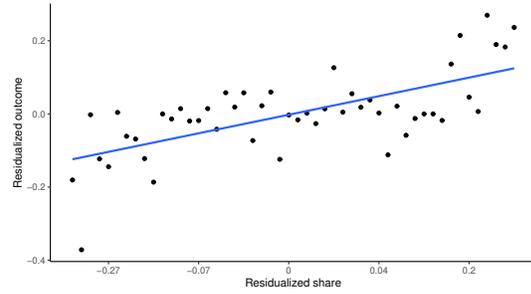
(b) Same social security rights for foreigners

(c) Foreigners in neighborhoods
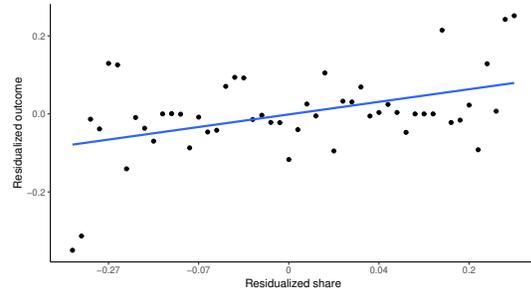
(d) European unification

Notes: The plots show the residualized outcome against the residualized share of international students after partialling out program and cohort fixed effects. The residualized share is divided into 50 equally sized bins. For each bin the average residualized outcome is shown against the average residualized share.

Figure B5: Marginal effects of the share of international students
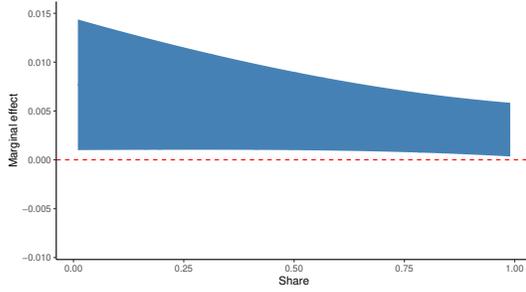
(a) Cohabitation with a non-native
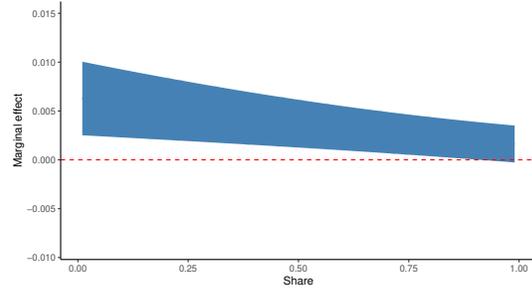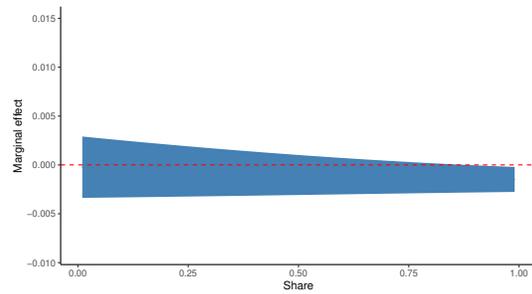
(b) Marriage to a non-native

(c) Emigration

(d) Share of foreign-born co-workers

Notes: The plots display marginal effects based on estimates from a cubic specification that includes program and cohort fixed effects in Model 4. Marginal effects are computed as the derivative of the fitted outcome with respect to the share of international students, and standard errors are obtained via the delta method. Shaded areas represent 95% confidence intervals.

Figure B6: Marginal effects of the share of international students
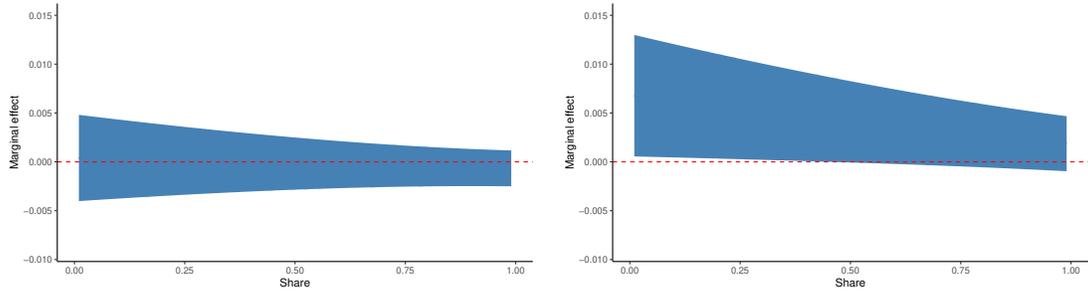
(a) Employment

(b) Income percentile
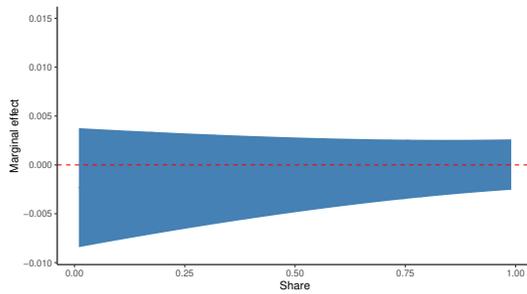
(c) Entrepreneur

Notes: The plots display marginal effects based on estimates from a cubic specification that includes program and cohort fixed effects in Model 4. Marginal effects are computed as the derivative of the fitted outcome with respect to the share of international students, and standard errors are obtained via the delta method. Shaded areas represent 95% confidence intervals.

Figure B7: Counterfactual treatment effects
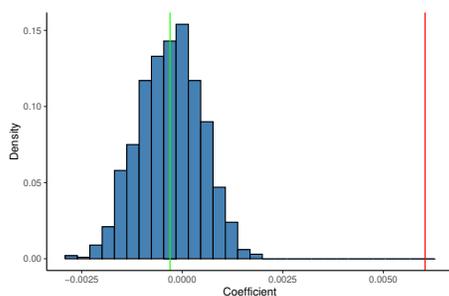
(a) Cohabitation with a non-native
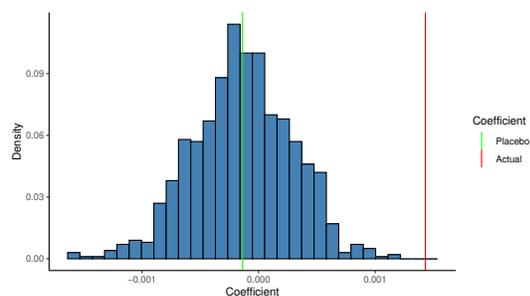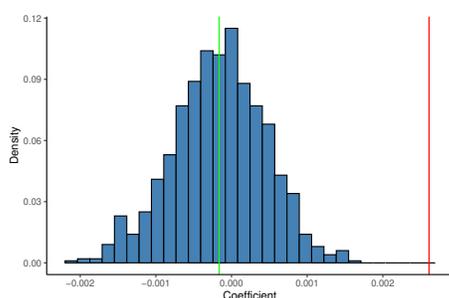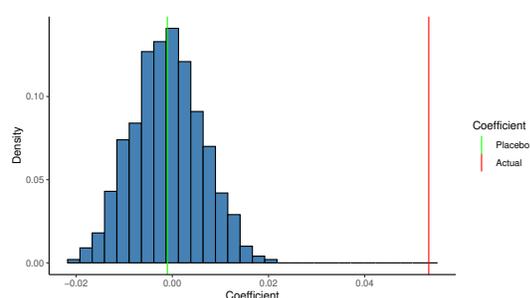
(b) Marriage to a non-native

(c) Emigration

(d) Satisfaction with internationalization

Notes: The plots display estimates from 1,000 simulated datasets where instead of using the actual share of international students that native students are exposed to, I assign them a share of international students from the same program and year but a different university. They also show the mean estimated coefficients of the randomly assigned shares (green), and the actual estimated coefficient (red). All regressions include program and cohort fixed effects.

Figure B8: Counterfactual treatment effects
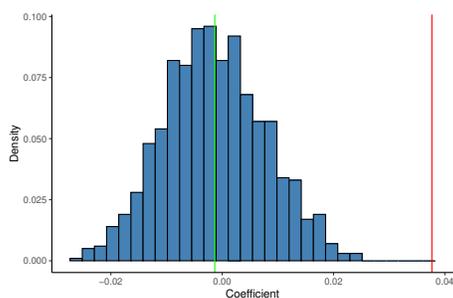
(a) Satisfaction with encouragement to learn about other cultures
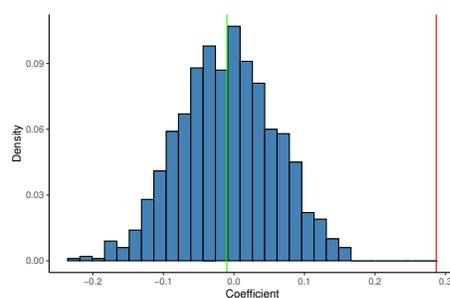
(b) Same social security rights for foreigners
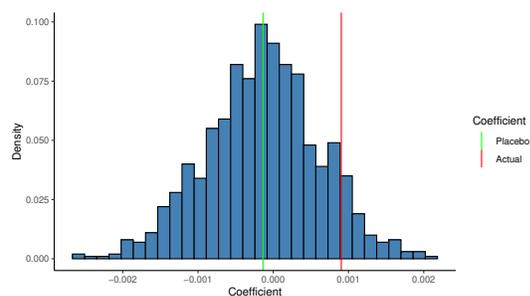
(c) Foreigners in neighborhoods

(d) European unification

Notes: The plots display estimates from 1,000 simulated datasets where instead of using the actual share of international students that native students are exposed to, I assign them a share of international students from the same program and year but a different university. They also show the mean estimated coefficients of the randomly assigned shares (green), and the actual estimated coefficient (red). All regressions include program and cohort fixed effects.
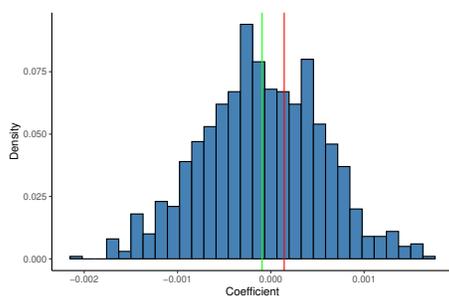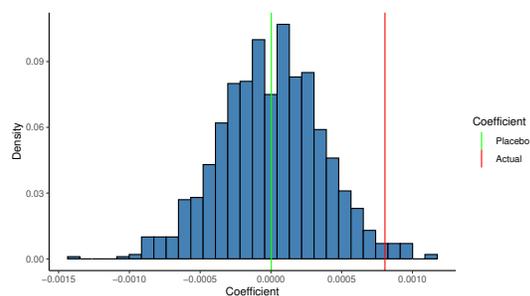
Figure B9: Counterfactual treatment effects
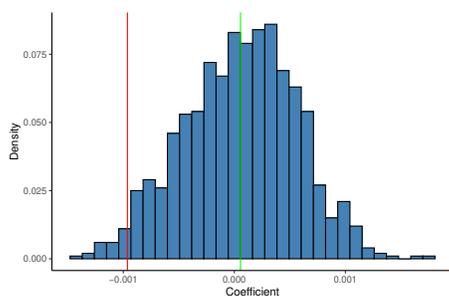
(a) Employment

(b) Income percentile

(c) Entrepreneur

(d) Share of foreign-born co-workers

Notes: The plots display estimates from 1,000 simulated datasets where instead of using the actual share of international students that native students are exposed to, I assign them a share of international students from the same program and year but a different university. They also show the mean estimated coefficients of the randomly assigned shares (green), and the actual estimated coefficient (red). All regressions include program and cohort fixed effects.