CEBI WORKING PAPER SERIES

LABOR MARKET INTEGRATION OF FOREIGN STUDENTS: THE ROLE OF NATIVE PEERS

Asbjørn Juul Petersen

Labor Market Integration of Foreign Students: The Role of Native Peers

Asbjørn Juul Petersen[*]

November 4, 2024

Abstract

I investigate what affects foreign students' decision to stay and work in the host country after completion of higher education. Specifically I ask whether the network of native peers at university affect the probability that foreign students in Denmark stay in the country and find employment after ended studies. To identify the causal effects, I exploit idiosyncratic variation in the share of Danish students who are admitted into each study program over adjacent cohorts. I find that an increase in the share of native peers of one standard deviation increases the probability that foreign students are employed in Denmark two years after ended studies by 4 pct. points. The effects are significant at least four years after ended studies. Improved professional network and knowledge of the Danish labor market seem to be an important mechanism.

1   Introduction

The number of individuals migrating to pursue a higher education degree in a foreign country has risen by 300 pct. during the last 25 years reaching more than 6 million people in 2020[1]. Despite the fact that foreign students are mobile, well-educated, and predominantly wish to stay and work in the host country after ended studies[2], only around 1 in 4 of the foreign students succeed in actually securing employment in the country.[3] This suggests that there exists some frictions preventing these high-ability foreigners from becoming a well-integrated part of the domestic labor market. Understanding and mitigating these frictions can have huge benefits in terms of better allocation of talent across borders, job match quality, and international knowledge sharing.

I investigate how the network of native peers affects the probability that foreign students find employment in the host country after ended studies. Previous studies have found that peers in college can affect early career outcomes including job search and even family formation (See e.g. Marmaros and Sacerdote (2002) and Kirkebøen et al. (2021)). I hypothesize and show that if foreign students are more exposed to native peers they get a network of individuals with knowledge about the domestic institutions, labor markets, and culture which can ease the transition from student to employee. To the best of my knowledge I am the first to document how networks affect labor market integration of foreign students.

I use high quality administrative data and construct a sample of all newly arrived foreign students who start a master degree in Denmark in the years 2008 to 2016. I observe the students after enrolling on their study programme and their educational and labor market outcomes for up to four years after ended studies. I define exposure to native peers as the share of Danish citizens who enroll at each of the different study programs.

To circumvent the issue of non-random selection of foreign students into specific programs I use an empirical strategy equivalent to the one pioneered by Hoxby (2000) and exploit

---

[1]Source: https://www.migrationdataportal.org/themes/international-students
[2]See e.g. QS (2021) and Danish Ministry of Education and Research and Danish Ministry of Immigration, Integration, and Housing (2015)
[3]Source: Table I.8 of https://doi.org/10.1787/migr_outlook-2010-en

within programme and institution variation in Danish peers from different cohorts to identify the causal effects. This type of strategy has been extensively used to estimate peer effects in education.[4] The identifying assumption is that when foreign students apply for admission to a Danish master degree they cannot perfectly predict how many native and foreign peers who will be admitted into the same study programme at the given educational institution that specific year. I test the validity of this assumption and find no signs of violation.

In the main analysis, I investigate whether the share of Danish peers on the educational programme affects the probability of employment in Denmark two years after ended studies for foreign students. I find that an increase in the share of Danish peers of one standard deviation (approximately 20 pct. points) increases the probability of subsequent employment in Denmark by around 4 pct. points. The effects are statistically significant and practically large and reveal that foreign students to a large extent are influenced by native peers. The results are robust to a range of different specifications. Further analyses show that the labor market effects are present and statistically significant at least 4 years after ended studies. This suggests that peer composition at university level has long term effects on the integration and retention of foreign talent.

I investigate heterogeneity in effect sizes based on citizenship country. The findings suggest that the effects of exposure to Danish peers are smallest for students from other Nordic countries (Norway, Sweden, Finland, and Iceland), second largest for other EU-students and largest for non-EU students. This is consistent with the idea that a given exposure to Danish peers transmit more knowledge about e.g. the Danish society and labor market to individuals who prior to coming to the country are further away from Denmark geographically and culturally.

I conclude the analysis by investigating three potential mechanisms as to why the network of Danish peers increases the probability of finding a job in Denmark after ended studies: i) Improved academic performance, ii) higher chances of finding a Danish partner,

---

[4]See e.g. Black et al. (2013), Carrell et al. (2018), Cattan et al. (2022), and Costas-Fernández et al. (2023).

and iii) improved professional networks and increased knowledge of the Danish labor market.

Although, I cannot definitively rule out channel ii) as a potential mechanism, the evidence speaks mostly in favor of channel iii) of an improved professional network and knowledge of the Danish labor market, and hence an easier transition to full-time employment after ended studies. This is evident as Danish peers seem to already have an effect on the probability of having a student job and in particular career relevant student jobs while studying. In Denmark, a student job has been documented to be an extensively used pathway to full-time employment upon completion of studies (See e.g. Baert et al. (2022), Danish Agency for Labour Market and Recruitment (2023), and Danish Association of Masters and PhD's (2023)). Furthermore exposure to Danish peers only seem to affect the probability of subsequent employment for foreign students with no prior attachment to the Danish labor market.

This paper contributes to three strands of literature. First it contributes to the literature which investigate the role of networks and peers in integrating foreign workers into domestic labor markets. A number of papers have investigated how the demographic composition of the neighborhood of immigrants (see e.g. Edin et al. (2003), Damm (2009), and Battisti et al. (2022)) affect the economic integration. They generally find that living in ethnic enclaves improves the labor market outcome for immigrants. I contribute to this literature by investigating the network effects of systematic and continuous exposure to native peers in the form of fellow students on the same study programme.[5] Further, the previous literature has mainly considered the integration of refugees. I expand this literature by focusing on a different group of immigrants with different characteristics.

Second it contributes to the rapidly expanding literature on peer effects in higher education. Cattan et al. (2022) investigate how elite peers at upper secondary education affects enroll-

---

[5]Hammar et al. (2022) has published a pre-analysis plan for an RCT in collaboration with an NGO where they arrange informal meetings between immigrants, primarily from low- and middle-income countries, and native Swedes to investigate the effects of such informal meetings on social and economic integration. The results, however, have not yet been published.

ment into elite study programs and labor market outcomes. They find that being exposed to elite peers positively affects the decision to study an elite degree and later life income. Marmaros and Sacerdote (2002) investigate how randomly assigned college roommates affect the probability that students find a high paying job after ended studies. They find positive results and conclude that students get help from their peers and their peers' parents in the process of finding a job after college. Costas-Fernández et al. (2023) investigate the effects of foreign students on native students' educational and career outcomes and find little to no effects on educational and labor market outcomes. To the best of my knowledge there exists no paper which examine how foreign students are affected by their native peers.

Finally I contribute to the literature on educational migration and foreign students. Specht (2022) investigate the effects of international students on bilateral trade, and find that international students increase the trade between host country and origin country, showcasing how international students can break down informal barriers. There exist relatively few papers which investigate what affects the decision of whether foreign students remain in the host country after ended studies. Kato and Sparber (2013) investigate the effects of restricting quotas for foreign workers in the US and find that it reduces the number and quality of foreign students. Khan and Lundberg (2023) investigate how the requirements for obtaining permanent residency for foreign foreign doctoral students affect the probability that they stay in Sweden after obtaining their degree. They find that easing the legal requirements increased the share of individuals who stayed in the country. Dustmann et al. (2011) build a dynamic Roy model of migration and learning and find that individuals might choose to remigrate back to their origin country if they have acquired some skills which there is a particularly high return to in the origin country. This paper expands this literature by focusing on the role of the foreign students' network in that decision. The results of this paper have important implications for the retainment and integration of foreign talent.

The rest of the paper is organized as follows: In section 2 I describe the institutional setting. In section 3 I present the data and descriptive statistics. I outline the empirical strategy in section 4. In section 5 I present the results. I investigate potential mechanisms

in section 6. Section 7 concludes.

2 Institutional Setting

In the following section, I outline the Danish tertiary education system, the admission process for foreign students, and the rules for entering the labor market for foreign citizens.[6]

2.1 The Danish Tertiary Education System

The Danish tertiary education system consists of different types of degrees offered at different institutions. Almost all educations are offered at public institutions. At the lower level there are three different types of tertiary degrees: short tertiary education, professional bachelor degree, and academic bachelor degree. The final level of tertiary education is a master's degree. In this paper, I focus exclusively on foreign students at master's degrees. I do this for two reasons. First, it is the type of degree which by far has the most foreign students. There are approximately as many foreign students enrolled at master's degrees as in all the other three type of degrees combined.[7]. The second reason is that a master's degree is typically the last level of education which is undertaken before entering the labor market.[8] Therefore it is likely that the network on the master's degree has an impact on the transition to employment.

A master's degree typically takes two years to complete.[9] Master's degrees are undertaken primarily at academic universities as well as other higher education institutions in Denmark (Royal Danish Academy of art, Officer's education etc.) Examples of master's degrees are MSc. in Economics, MSc. in Law, MSc. in Chemistry, MSc. in History etc. The teaching form on the master's education is typically a combination of lectures, teaching in smaller classes, writing of assignments (mandatory assignments, written exams, theses etc.) either individually or in teams, and supervision.

---

[6] The institutional settings in this section is based on the following sources: Danish Ministry of Higher Education and Science (2024), Danish Ministry of Children and Education (2024), SIRI (2024d), Your Europe (2023), SIRI (2024a), SIRI (2024b), SIRI (2024c), and SIRI (2024c).

[7] https://ufm.dk/publikationer/2018/filer/pjece-justering-af-engelsksprogede-uddannelser.pdf

[8] Although it is possible to gain admission to a PhD upon completion of a master's degree, a PhD is also classified as a job in Denmark with an employment contract and salary of approximately 30.000 DKK (4.500 USD) per month.

[9] A few master's degree (medicine and dual degrees) take three years to complete.

2.2   Admission to Danish master's degrees

Admission to a master's degree requires completion of a relevant bachelor degree either from Denmark or from a foreign university. The main deadline is the 1st of March with start 1st of September.[10] Most of the master's degrees have a capacity limit, which are set by the educational institution and in some instances in collaboration with the Danish Ministry of Higher Education and Research.[11] Students who apply for a master's degree in direct continuation of a recently completed bachelor degree at the same educational institution (e.g. BSc. in Economics at Univeristy of Copenhagen and MSc. in Economics at University of Copenhagen) have priority in the admission process and are guaranteed a spot. If there are more applicants than slots for a given degree at a given educational institution, applicants are assessed by the admission officers at the relevant education institution based on the relevance and the grades obtained on their bachelor's degree.

The rules for application and admission to a Danish master's degree for foreign students are similar to the process of application and admission for Danish citizens. They have to document completion (or expected completion) of a relevant bachelor's degree, and that they live up to the specific requirements for admission to that specific master's degree. Further they have to document fulfillment of linguistic requirements. If the primarily education language on that specific degree is Danish, they have to document fulfillment of both Danish and English. If the education is taught in English, the foreign students only have to document fulfillment of English language requiements.[12]

Although the rules for admission are generally similar for citizens from EU/EEA countries and citizens from non-EU/EEA countries, there are some differences. Non-EU/EEA

---

[10]Some university programmes also have deadline the 15th of October with start 1st of February the following year.

[11]See   e.g.   https://ufm.dk/uddannelse/institutioner-og-drift/styring-af-uddannelsesudbud/dimensionering/ledighedsbaseret-dimensionering

[12]Documentation of fulfillment of language requirements can either be by completed previous education in that specific language or by a language test.

citizens have to apply for a student residency permit. It is however as a general rule granted provided they are admitted to a education programme. Further, non-EU/EEA citizens have to pay for their educational degree in Denmark whereas education is free for Danish citizens and EU/EEA citizens. The cost of a full master's degree is typically between 15.000-30.000 EUR.

2.3 The Labor Market for Foreign Citizens

Both EU/EEA and non-EU/EEA students are allowed to work alongside their studies. Although non-EU/EEA students are only allowed to work for a maximum of 90 hours per month (they can work full-time in the months June, July, and August). From 2013 following an EU-court ruling, EU/EEA students can get access to student aid of approximately 900 EUR per month provided they work for at least 10-12 hours per week alongside their studies.[13].

Upon ended studies, the rules for obtaining a working permit in Denmark for foreign students are different for students from EU/EEA- and non-EU/EEA countries:

EU/EEA citizens: Upon completion of studies, EU/EEA citizens can apply for a job for up to 6 months without needing any additional documentation. After the six months, the job seeker can apply for an extension of the job search period provided that the individual can document that she is i) actively searching for a job, and ii) has a reasonable chance of getting a job. Upon getting a job EU/EEA citizens are covered by the rules of free mobility of labor within the European Union and has the right to live and work in Denmark provided they work for at least 10-12 hours per week. The jobs they are offered do not need to fulfill any additional requirements other than being a real job, at least 10-12 hours per week and typically of a duration of at least 10-12 weeks.

Non-EU/EEA citizens: Upon completion of studies, non-EU/EEA citizens can apply for a job in Denmark for a period of up to six months, similar to EU/EEA students. However, there are certain requirements for the jobs they are offered in order to get a working per-

---

[13]See Danish Ministry of Science, Innovation, and Higher Education (2013)

mit in Denmark. Either the wage is above 64.900 DKK per year (2024 level), the job they are offered is a PhD, or the job-type they are offered is on a so called positive list, which consists of occupation in which there is a shortage of labor supply. There are currently 141 type of jobs on this so called positive list.

3   Data

3.1   Data Source and Sample Selection

I use rich administrative data from Statistics Denmark. I combine multiple registries, which contain information about students' citizenship country, age, gender, when they arrived to Denmark, their study programme and the educational institution. Further, the registries contain information about individuals' labor market outcomes during and after ended studies.

The analysis sample consists of foreign students who enroll in a Danish master's degree in the years 2008 to 2016.[14]. I define foreign students as non-Danish citizens, who did not live or work in Denmark the year prior to enrollment into a master's degree. The reason, for defining foreign students this way, is that I wish to investigate foreign students without any prior attachment to Denmark who migrated to Denmark with the main purpose of studying. I exclude individuals where I do not have information about their citizenship status. Finally, I only include individuals who study at a programme with at least 5 students.[15] The final sample consists of 21520 foreign students.

3.2   Definition of Key Variables

Treatment Variable The treatment variable is defined as the share of Danish citizens within student i's study program, educational institution and cohort of enrollment (e.g. master's

---

[14]The reason for not going further back is the financial crisis in 2007 and the admission of Romania and Bulgaria into the EU

[15]In section 5.4, and A.2 I conduct a series of robustness tests with varying samples including not excluding individuals who lived/worked in Denmark prior to enrollment, including individuals with unknown citizenship country, only including study programmes with at least 10 students, and using different cohorts.

in Physics at University in Copenhagen in 2011). It is defined the following way:

$$S_{-ijkt} = \frac{\text{Danish citizens at study programme } j \text{ at institution } k \text{ in cohort } t}{\text{Total students at study programme } j \text{ at institution } k \text{ in cohort } t \text{ excl. individual } i}$$

I focus on the peers at their study program, although peers other places could also matter (e.g. at dorms, sports clubs, colleagues etc.). I do this for two reasons. First, the educational institution is where foreign most frequently interact with Danish students (see DAMVAD (2013)). Second, variation in peer composition at admission to study programs is arguably more likely to be exogenous compared to e.g. peer compositions at student housing such as dorms.

Notice, that I do not include native students directly in the analysis sample but only through the treatment variable. In this study, I focus on what Manski (1993) calls contextual or exogenous effects as opposed to the endogenous effects. I.e. I focus on how foreign students are affected by pre-determined characteristic (being a Danish citizen) of their peer group. I follow the related literature (e.g. Carrell et al. (2018), Costas-Fernández et al. (2023), and Eriksen and Dougherty (2024)) and only include foreign students in the sample and investigate how their outcomes are affected by exposure to native students.

Primary Outcome The main outcome variable is a dummy variable indicating whether individual i is in employment in Denmark two years after ended studies. I define both wage earners and self-employed individuals as employed.[16]. Note that I do not distinguish between leaving Denmark after ended studies and staying in Denmark and not working. The dummy variable is equal to one if the individual is in employment and zero otherwise.

Background Characteristics At the study programme level, I observe the subject, the educational institution, and the total number of students enrolled. At the individual student level, I observe age, gender, and citizenship country for each of the individuals in the sample.

---

[16] I use the registry AKM and define individuals as in employment if they are registered in the AKM registry and has occupation code (BESKST13) either 01, 02, 03, or 04.

3.3 Descriptive Statistics

In figure 1 below, I show the development in the number of foreign students who start a master's degree in Denmark each cohort from 2008-2016.

Figure 1: Development in Enrollment of Foreign Master's Students
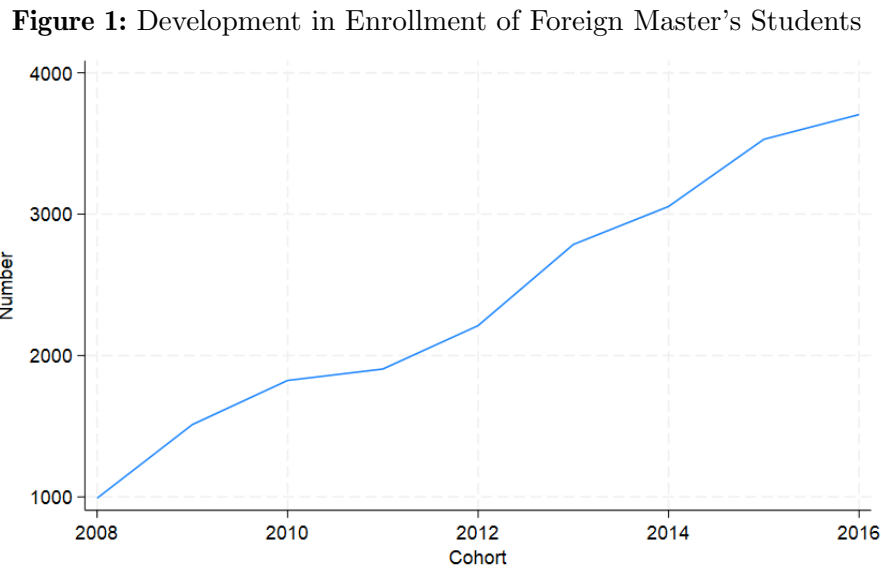
Source: Statistics Denmark and own calculations

From figure 1 it is evident that the number of foreign master's students enrolling at Danish universities has increased dramatically from the years 2008-2016. In 2008 around 1000 foreign students enrolled into a Danish master's degree compared to almost 4000 in 2016. It is also evident that the increase over the years appears somewhat linear.

In table 1 I present descriptive statistics of my analysis sample.

Table 1: Descriptive Statistics

	(1)	(2)	(3)
	Mean	Standard deviation	N
Female	.501	.500	21520
Age when enrolling	24.86	3.14	21520
Nordic Citizen	.194	.395	21520
EU/EEA Citizen	.817	.387	21520
Lives in Denmark 2 years after ended studies	.463	.499	21520
Work in Denmark 2 years after ended studies	.288	.453	21520
Graduates	.899	.302	21520
Study time (in days)	805.1	269.2	21520
Cohabits with a Danish partner one year prior to ended studies	.042	.201	21520
Cohabits with a Danish partner the year of ended studies	.052	.221	21520
Cohabits with a Danish partner the year after ended studies	.063	.242	21520
Cohabits with a Danish partner two years after ended studies	.065	.247	21520

Source: Statistics Denmark and own calculations.

Note: Female, Nordic Citizen, EU/EEA Citizen, Lives in Denmark 2 years after ended studies, Work in Denmark 2 years after ended studies, Graduates, and cohabitation with a Danish partner are dummy variables where the mean is the share of individuals in the sample where the dummy variable is equal to one.

From table 1, we see that around 50 pct. of the foreign students are female. Around 20 pct. are from other Nordic countries (Sweden, Norway, Finland, and Iceland) and more than 80 pct. of the foreign students are EU/EEA-citizens. The students are on average 24.9 years old when they start their master's degree which is a bit younger than Danish students.[17] Around 29 pct. of the foreign students work in Denmark two years after ended studies. A relatively small share of foreign students cohabit with Danish partners as less than 7 pct. cohabit with Danish partners even two years after ended studies.

4   Empirical Strategy

In an ideal experiment foreign students would be randomly allocated into different study programmes. Then the causal effect could be estimated simply by running a regression of the probability of finding work in Denmark after ended studies on the share of Danish peers. In reality, however, foreign students self-select into different study programmes, and we might be worried that foreign students with certain unobserved characteristics select into certain programs. If for example foreign students who already prior to studying in

---

[17]See e.g. https://ufm.dk/aktuelt/pressemeddelelser/arkiv/2009/ugens-tal-dtu-har-landets-yngste-kandidater/studerendes-alder-som-faerdige-kandidater.

Denmark know they want to work in Denmark after ended studies, select into study programmes that generally have many Danish peers then this will bias the estimates.

Instead I use the approach first proposed by Hoxby (2000) utilizing year to year changes in the composition of admitted students with a specific characteristic (Danish citizenship status) within each study programme and institution for the different cohorts.[18]. For example: Msc. in Biology at University of Aarhus might one year have 77 pct. Danish students who are admitted and might another year have 64 pct. It is this variation, I utilize. This strategy allows foreign students to select into certain study programs based on the composition of peers, it does however require that there is some idiosyncratic variation from year to year in the share of native peers at a given study programme at a given institution. The identifying assumption is that foreign students cannot perfectly predict how many of their fellow students who will be Danish citizens as opposed to non-Danish citizens in a given year. I estimate the following model:

$$Y_{ikjt} = \alpha + \delta S_{-ikjt} + \mu_{kj} + \gamma_{jt} + t \cdot D_{ikj} + X'_{ikjt}\beta + \varepsilon_{ikjt} \qquad (4.1)$$

Y_{ikjt} is the outcome of interest. S_{-ikjt} is the share of Danish peers at study programme k at institution j at cohort t, (excluding individual i). μ_{kj} is institution-programme fixed effects. γ_{jt} is institution specific time fixed effects. I include these, as the number of foreign students are generally increasing, and there might be specific patterns in this development which are specific to each educational institution.[19] $t \cdot D_{ikj}$ is institution-programme specific linear trends. I include these to control for the fact that the share of Danish students at each institution-programme might change systematically over time, making foreign students able to predict the share of Danish students. Controlling for specific linear trends is typically used in the literature to alleviate that concern.[20] In section 5.4, I test the sensitivity of the results by including a quadratic institution-programme year trend. X_{ikjt} is a

---

[18]Example of papers which investigate peer effects in education by utilizing changes from cohort to cohort include Black et al. (2013), Carrell et al. (2018), Eriksen and Dougherty (2024), Costas-Fernández et al. (2023), Cattan et al. (2022)

[19]I start by adding general year fixed effects, and then include year fixed effects interacted with institution fixed effects.

[20]See e.g. Hoxby (2000), Cattan et al. (2022), and Eriksen and Dougherty (2024)

vector of individual controls including age, gender, citizenship country as well as a control for the total number of students at institution-programme kj at cohort t. Standard errors are clustered at the institution-programme level.

4.1 Addressing Concerns with the Empirical Strategy

There are two primary concerns with the empirical strategy. The first is that there is not enough variation in the share of native students to precisely estimate the peer effects, once I include the above mentioned fixed effects and controls. The second concern is that foreign students with certain (unobserved) characteristics affecting their probability of staying and working in Denmark after ended studies, select into certain programs with certain student compositions, conditional on the included fixed effects. If that is the case, the causal effect is not identified. In order to address these concerns I follow Bifulco et al. (2011). To address the issue of variation in the treatment variable, I investigate how much variation which is left in the treatment variable after I include the various fixed effects outlined in equation 4.1. The results are reported in table 2 below

Table 2: Variation in Native Share after Removing Various Fixed Effects

	(1)	(2)
	Mean	Standard deviation
Native share	0.592	0.199
(N=21520)		
Residuals after removing:	Mean	Standard deviation
Institution-Programme FE & Number of Students	0.000	0.075
& Year FE	0.000	0.074
& Institution × Year FE	0.000	0.065
& Institution-Programme trends	0.000	0.049
& Individual Controls	0.000	0.049

Source: Statistics Denmark and own calculations.
Note: The table displays first the mean and standard deviation of the treatment variable "Native Share". Second, it shows descriptive statistics of residuals from a regression of Native share on the various fixed effects and controls. In each regression, I include the described fixed effects and the previously included fixed effects. This means that the last row shows descriptive statistics of the residuals from a regression of native share on all the fixed effects and control variables from equation 4.1.

Table 2 shows the distribution of the treatment variable, amongst the individuals in the sample. We see that the mean share of native students which the foreign students in the sample is exposed to is 0.59. The standard deviation is 0.199. The table further shows how much variation which is left in the treatment variable after removing the fixed effects described in equation 4.1. From the last row, we observe, that after removing all the fixed effects and control variables the standard deviation is reduced by around 75 pct. to 0.049. While this seems like a large reduction, the amount of variation left in the treatment is comparable to other related studies (see e.g. Bifulco et al. (2011) and Humlum and Thorsager (2021)). Further, as the results in section 5 show, the residual variance in the treatment variable is enough to estimate the parameters of interest relatively precisely.

To investigate the issue of endogenous selection into certain study programs, I run a series of placebo tests. Conditional on the fixed effects specified in regression equation 4.1, a regression of predetermined characteristics should not depend on S_{-ikjt}. In order to test this, I estimate equation 4.1 using age, gender, and citizenship country group (Nordic citizen, EU-/EEA citizen non-EU/EEA citizen) as the outcome variables.[21] If there is no self-selection of foreign students conditional on the included fixed effects, the coefficients to S_{-ikjt} should

---

[21]In these regression equations I do not include the control variables other than the number of total students at the institution-programme at the given cohort.

be insignificant in the regressions for all of the predetermined background characteristics. The results are reported in table 3 below:

Table 3: Balancing Tests of Background Characteristics

	(1)	(2)	(3)	(4)
	Age	Female	EU/EEA Citizen	Nordic Citizen
Native share (std.)	0.0950	-0.00136	-0.00232	0.00681
	(0.0931)	(0.0115)	(0.0158)	(0.00796)
Constant	25.07***	0.491***	0.800***	0.343***
	(0.369)	(0.0359)	(0.0469)	(0.0767)
Total Number of Students	✓	✓	✓	✓
Institution-Programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution × Year FE	✓	✓	✓	✓
Institution-Programme Trends	✓	✓	✓	✓
Individual Controls				
N	21462	21462	21462	21462
R^2	0.110	0.148	0.193	0.346

Source: Statistics Denmark and own calculations.
Note: Standard errors are clustered at the study programme level and are in parantheses. $^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results show that neither of the background characteristics vary significantly with the share of Danish peers. The results do not show signs of violation of the identifying assumption.

5 Results

5.1 Main Results

I estimate the effect of native share on the probability of subsequent employment in Denmark for foreign students. The estimation results for equation 4.1 are reported in table 4 below. The outcome is a dummy variable for whether the individual is employed in Denmark two years after ended studies. In each of the five specifications reported below, I add sequentially more and more of the fixed effects described in section 5: In column 1 I report the results of the regression including only institution-programme fixed effects. In column 2 I add year fixed effects. In column 3 I add year fixed effects by educational institutions, in column 4, I add study programme specific year trends, and in column 5 I add individual

control variables. The results in column 5 are the results of the full regression equation 4.1,
and hence the preferred specification.

Table 4: Main Results

	(1)	(2)	(3)	(4)	(5)
	Work	Work	Work	Work	Work
Native share (std.)	0.0232*	0.0247*	0.0292**	0.0419***	0.0426***
	(0.00927)	(0.00953)	(0.0104)	(0.0122)	(0.0126)
Constant	0.240***	0.239***	0.240***	0.149**	0.189***
	(0.00468)	(0.00974)	(0.0222)	(0.0509)	(0.0509)
Total Number of Students	✓	✓	✓	✓	✓
Institution-Programme FE	✓	✓	✓	✓	✓
Year FE		✓	✓	✓	✓
Institution × Year FE			✓	✓	✓
Institution-Programme Trends				✓	✓
Individual Controls					✓
N	21483	21483	21462	21462	21441
R^2	0.089	0.090	0.098	0.114	0.147

Source: Statistics Denmark and own calculations.
Note: Standard errors are clustered at the study programme level and are in parantheses. [+] $p < 0.10$, *
$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results from table 4 demonstrate that the coefficients to native share are statistically
significant, economically large, and relatively stable over the different specifications. In the
preferred specification in column 5 with all fixed effects and control variables included,
the estimated effect of Danish peers is 0.043 meaning that a one standard deviation (20
pct. points) increase in the share of Danish peers increases the probability of employment
in Denmark two years after ended studies by 4.3 pct. points. As around 28.8 pct. of the
foreign students work in Denmark two years after ended studies the estimated effect size
corresponds to a 15 pct. increase from the baseline mean. Excluding the control variables,
the institution-programme trends, as well as the various fixed effects seem only to have a
limited influence on the estimated effects. In all specifications the estimated effect sizes are
between 2.3-4.3 pct.

5.2   Long Run Effects

Next I investigate the long run effects of exposure to Danish peers. Investigating whether the effects are temporary or persist have important implications for the interpretation of the results, and the policy implications. If the effects are truly driven by a change in the network of foreign students, the effects should be present for a number of years after ended studies. Further, a more permanent effect indicates that native students transmit knowledge and share information which can aid foreign students in the long run. In order to investigate this, I estimate equation 4.1 using employment in Denmark for the different years 1-4 after ended studies as the dependent variable. The results are reported in table 5 below:

Table 5: Long Run Effects

	(1)	(2)	(3)	(4)
	Work (Year 1)	Work (Year 2)	Work (Year 3)	Work (Year 4)
Native share (std.)	0.0277*	0.0426***	0.0284*	0.0221*
	(0.0117)	(0.0126)	(0.0117)	(0.0108)
Constant	0.282***	0.189***	0.170***	0.163***
	(0.0556)	(0.0509)	(0.0458)	(0.0484)
Total Number of Students	✓	✓	✓	✓
Institution-Programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution × Year FE	✓	✓	✓	✓
Institution-Programme Trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓
N	21441	21441	21360	20776
R^2	0.144	0.147	0.146	0.138

Source: Statistics Denmark and own calculations.
Note: Standard errors are clustered at the study programme level and are in parantheses. $^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5 shows that the estimated effects of the share of Danish peers are positive and significant at least 4 years after ended studies. The results show that the effects are significant and of an order of magnitude of around 2.2-4.3 pct. points for all the first four years after ended studies. Although the effect sizes seem to decline in the third and fourth year after ended studies, it is still remarkable that the composition of peers at the master's programme significantly impact the career decisions of foreign students four years after ended studies. This indicates a relatively high degree of persistence in location choices and that a network

of native peers have lasting effects on the labor supply and human capital accumulation of foreign students in Denmark.

5.3 Heterogeneity

In this section, I investigate potential heterogeneity in effect sizes. In particular, I focus on heterogeneous effects by origin country. If the results are truly driven by transmission of information about the Danish society, labor market, and culture etc., we would expect the effects to be numerically larger for students who come from countries who are further away from Denmark geographically, institutionally, and culturally.

I divide my sample into three groups based on citizenship country: Nordic students, other EU/EEA students, and non-EU/EEA citizens. The other Nordic countries are very similar to Denmark in terms of culture, institutions, labor market structure etc. compared to other countries, and other EU/EEA countries are generally more similar to Denmark than non-EU/EEA countries. Further, the rules and legislation for obtaining working permits in Denmark for non-EU/EEA citizens are more difficult to navigate than the rules applying to EU/EEA- and Nordic citizens. This should further increase the value of a network of Danish peers for non-EU/EEA citizens. I estimate equation 4.1 for each of the three groups. The results are reported in table 6 below.

Table 6: Heterogenous Effects by Citizenship

	Nordic Citizens	Other EU/EEA Citizens	Non-EU/EEA Citizens
	(1)	(2)	(3)
	Work	Work	Work
Native share (std.)	0.0319	0.0363*	0.0742*
	(0.0521)	(0.0169)	(0.0346)
Constant	-0.0597	0.251**	0.281***
	(0.141)	(0.0808)	(0.0768)
Total Number of Students	✓	✓	✓
Institution-Programme FE	✓	✓	✓
Year FE	✓	✓	✓
Institution × Year FE	✓	✓	✓
Institution-Programme Trends	✓	✓	✓
Individual Controls	✓	✓	✓
N	4063	13370	3853
R^2	0.196	0.149	0.238

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level and are in parantheses. $^+ p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results show that the estimated peer effects are positive for all three groups of students and numerically largest for non-EU/EEA citizens, second largest for non-Nordic EU/EEA students and smallest for Nordic students. This is consistent with the notion that native students share information with foreign students and that a given exposure to Danish peers on average transmit more information to individuals who come from countries who are further away from Denmark. In appendix table 15 I run the regression with an interaction of Danish share and a non-EU/EEA- Citizenship dummy and find a positive and significant coefficient to the interaction.

I further investigate potential heterogeneity in effect sizes by gender and age. These results are reported in table 7 below.

Table 7: Heterogenous Effects by Gender and Age

	Male	Female	≤ 24 y/o	>24 y/o
	(1)	(2)	(3)	(4)
	Work	Work	Work	Work
Native share (std.)	0.0400*	0.0376*	0.0274	0.0552**
	(0.0182)	(0.0173)	(0.0169)	(0.0170)
Constant	0.273***	0.155*	0.0312	0.202**
	(0.0735)	(0.0601)	(0.125)	(0.0736)
Institution-Programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution × Year FE	✓	✓	✓	✓
Institution-Programme Trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓
N	10651	10686	12495	8850
R^2	0.177	0.173	0.161	0.200

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level and are in parantheses. $^+ p < 0.10$, $^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

While I find no difference for female and male students, the effects appear to be larger for students who are more than 24 years old when they enroll. A potential reason could be that students younger than 24 are somewhat younger than their Danish peers at their study programme which might result in less interactions with Danish peers.

5.4   Robustness and Specification Checks

I conduct various robustness and specification checks to assess the sensitivity of the main results. In this section, I present the primary robustness tests. Additional robustness tests are reported in appendix section A.2. Generally the results are both qualitatively and quantitatively robust to the various specifications.

Excluding small and large study programs

One might worry that the results are either driven by very large study programs or very small study programs. Large- and small study programs can drive the results in different ways: Large study programs has a large influence as there are a lot of individuals in the sample in that study program. So peer effects on one or two large study programs might drive the results. Small study programs might drive the results as even small numerical changes in the number of native students from year to year will cause large fluctuations in

the share of native peers. To mitigate this concern I conduct two robustness tests: First, I remove i) study programs with less than 10 students and ii) study programs with more than 250 students. Second, I include all the study programs but weight the observations by i) the total number of students at each study programme and ii) by the inverse of total number of students at each study program. I estimate equation 4.1 with these adjustments. The results are reported in table 8.

Table 8: Sensitivity to Size and Weight of Study programme Size

	Study programs w. >10 students	Study programs w. <250 students	Weighted by programme size	Weighted by inv. programme size
	(1)	(2)	(3)	(4)
	Work	Work	Work	Work
Native share (std.)	0.0414***	0.0329*	0.0347**	0.0446**
	(0.0123)	(0.0127)	(0.0125)	(0.0149)
Constant	0.242***	0.366***	-0.172	0.423***
	(0.0532)	(0.0431)	(0.137)	(0.0538)
Institution-Programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution × Year FE	✓	✓	✓	✓
Institution-Programme Trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓
N	21149	14557	21441	21441
R^2	0.146	0.167	0.106	0.199

Source: Statistics Denmark and own calculations.
Note: Standard errors are clustered at the study programme level and are in parantheses. $^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

From table 8 we see that the effects are both qualitatively and quantitatively robust to excluding both the small and large study programs and also to reweighing each student based on the size of their study program. In all of the regressions the point estimates are statistically significant and between 0.033-0.045.

Sensitivity to changing the included cohorts

Another worry is that the results are driven by the specific cohorts I have included in the analysis sample. In particular, the results might be a specific feature of the international labor market conditions, macroeconomic trends or specific legislation, which was introduced in this specific period. In order to mitigate this concern I estimate equation 4.1 on four different samples using the student cohorts: i) 2011-2016, ii) 2008-2013, iii) 2005-2016, iv) 2005-2013, and v) 2003-2011. The results are reported in table 9 below:

Table 9: Sensitivity to Selected Cohorts

	2011-2016	2008-2013	2005-2016	2005-2013	2003-2011
	(1)	(2)	(3)	(4)	(5)
	Work	Work	Work	Work	Work
Native share (std.)	0.0295+	0.0570**	0.0324**	0.0431**	0.0352*
	(0.0154)	(0.0183)	(0.00998)	(0.0133)	(0.0146)
Constant	0.206*	0.352***	0.254***	0.402***	0.455***
	(0.0808)	(0.0842)	(0.0512)	(0.0575)	(0.0698)
Institution-Programme FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Institution × Year FE	✓	✓	✓	✓	✓
Institution-Programme Trends	✓	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓	✓
N	17117	11154	23831	13545	10405
R^2	0.150	0.179	0.145	0.173	0.165

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level and are in parantheses. $^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

From table 9 we see that the effects of native share is significant at a five pct. level for all the different samples except from the sample including the 2011-2016 cohorts in column (1). Using this sample, the effect is borderline significant (p-value of 0.056). For all of the different samples the estimated effect size is between 0.030-0.057. Generally the results are relatively robust to changing the selected cohorts in the sample.

Sensitivity to non-linearities

It is plausible, that there are non-linearities, which I have not accounted for in the model. For instance, the time-trends in the development of the share of native peers at some study programs. If that is the case, the variation in peer composition from cohort to cohort is not idiosyncratic but rather systematic. This can introduce bias in the estimates, as the applicants might be able to plan their peer composition and self-select into cohorts with relatively many/few Danish peers. In order to mitigate this concern, I add quadratic institution-programme specific time-trends to the baseline specification in equation 4.1. Additionally, I check for non-linear peer effects by including native share squared in the model. The results are reported in table 10 in column 1 and 2 respectively.

Table 10: Sensitivity to non-linearities

	Programme specific quadratic year-trends	Quadratic peer effects
	(1)	(2)
	Work	Work
Native share (std.)	0.0403***	0.0482*
	(0.0120)	(0.0214)
Native share (std.) squared		0.00244
		(0.00551)
Constant	0.242***	0.243***
	(0.0520)	(0.0514)
Institution-Programme FE	✓	✓
Year FE	✓	✓
Institution × Year FE	✓	✓
Institution-Programme Trends	✓	✓
Individual Controls	✓	✓
Study Programme × 2nd degree Year-trends	✓	
N	21441	21441
R^2	0.147	0.147

Source: Statistics Denmark and own calculations.
Note: Standard errors are clustered at the study programme level and are in parantheses. $^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

From table 10 column (1) I see that including quadratic study programme specific effects has no impact on the estimated effects. The effect is 0.040 and is still significant at a five pct. level. In column (2), I add native share squared to the regression. I see that the effect of native share is 0.048 and statisically significant, whereas the coefficient to native share squared is statistically insignificant and numerically close to zero. These results indicate, that the results found in this paper are not driven by the specific choice of the functional form of the regression equation 4.1.

6   Mechanisms

In this section, I investigate potential mechanisms through which the peer effects might operate. Although there are infinitely many potential mechanisms through which the peers effects can operate, I investigate three mechanisms, which arguably seem plausible:

1. Improved Academic Environment

2. Increased probability of finding a Danish Partner

3. Improved Professional Network and Labor Market Knowledge

6.1 Improved Academic Environment

It is possible that the share of Danish peers might affect the academic environment at the study program, which will in turn impact the probability of finding employment in Denmark after ended studies. One might for example imagine that Danish students have a higher academic level than their foreign peers due to e.g. better linguistic skills, more topic specific knowledge as Danish students typically have completed their bachelor degree at Danish universities which rank relatively highly.[22] Further, Danish pupils at elementary school level have above average PISA scores (Christensen, Vibeke T. and Beuchert, Louise (2023)). It is thus plausible that a higher share of Danish peers implies a higher academic level in the study program. Costas-Fernández et al. (2023) argue that the composition of native v. foreign students might affect the (perceived) ability level at study programs, and these findings are backed by Anelli et al. (2017) and Tonello (2016). Numerous studies have documented that the academic level of peers positively affects the educational outcomes of the individual students (see e.g. Zimmerman (2003), Lavy et al. (2012), and Humlum and Thorsager (2021)). Higher ability peers can e.g. share information about the curriculum, or study techniques either directly or indirectly. Therefore it is plausible that a higher academic level of peers might positively affects the probability that foreign students graduate, complete the studies within the assigned time, and achieve higher grades. This in turn can potentially affect the probability that foreign students find a job in Denmark upon ended studies. This is first and foremost the case because many jobs either formally or informally require completion of a relevant master's degree. Further, higher university grades improves the labor market outcomes in the beginning of the career (Hansen et al. (2024)) Finally, for non-EU students, a relevant master's degree is typically a formal requirement for obtaining a job which grants residency permit.[23]. On the other hand, completion of a master's degree and higher grades also improves job prospects in other countries than Denmark.

In order to test whether improved academic environment is a relevant channel for explaining peer effects, I test whether the share of native peers affects the academic outcomes of foreign students including probability of graduation, time of completion and grades re-

---

[22]https://www.timeshighereducation.com/world-university-rankings/2024/world-ranking
[23]See SIRI (2024c)

ceived on the master's thesis. The results for the regressions are reported in table 11 below.

Table 11: Effect of Danish peers on Academic Outcomes

	(1) Graduates	(2) Study time (days)	(3) Grades (std.)
Native share (std.)	0.000269	-2.342	-0.0143
	(0.00986)	(6.729)	(0.0466)
Constant	1.130***	646.8***	0.131
	(0.0471)	(36.63)	(0.203)
Total Number of Students	✓	✓	✓
Institution-Programme FE	✓	✓	✓
Year FE	✓	✓	✓
Institution × Year FE	✓	✓	✓
Institution-Programme Trends	✓	✓	✓
Individual Controls	✓	✓	✓
N	21441	19263	12849
R^2	0.122	0.308	0.183

Source: Statistics Denmark and own calculations.
Note: Standard errors are clustered at the study programme level and are in parantheses. [+] $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

From table 11 I see that the native share does not affect any academic outcomes for foreign students. All coefficients to native share are insignificant, and the confidence intervals are relatively narrow, so I can rule out even moderate effects of Danish peers on the various academic outcomes. Thus, I find no evidence that the peer effects operate through an improved academic environment and spillovers on the academic performance of foreign students.

6.2   Increased probability of finding a Danish Partner

Another channel through which peer effects might operate is through an increased probability of finding a Danish partner. Kirkebøen et al. (2021) find that colleges and even specific study programs often act as local marriage markets, and that individuals are significantly more likely to marry someone who has enrolled in the same study programs as themselves. It is therefore possible that a higher share of native peers affect the probability that foreign students find a Danish partner. Danish Ministry of Education and Research and Danish Ministry of Immigration, Integration, and Housing (2015) find that having a Danish partner is strongly associated with staying in Denmark after ended studies. A Danish partner

can e.g. help foreign students learn the language, share information about the Danish institutions and society. Finally, and perhaps most importantly, having a Danish partner can increase the inherent motivation for continuing to live and work in Denmark after ended studies.

In order to investigate this mechanism I test how the share of Danish peers affect the probability that foreign students enter into a relationship with a Dane. There are several challenges to this analysis: The first is data availability: I do not have access to information about whether foreign students enter into a romantic relationship with a Dane. I can, however observe once they enter into a *cohabiting* relationship with a Dane of the opposite gender.[24]

The other challenge is more conceptual. It is difficult to distinguish between whether entering into a romantic relationship with a Dane is a mechanism for choosing to stay and work in Denmark or whether it is a consequence of having chosen to stay for unrelated reasons. In order to circumvent this issue to some extent, I investigate whether the share of Danish peers affects the probability of living in a cohabiting couple with a Dane prior to when my main outcome variable of working in Denmark is measured. That is, I investigate how the share of native students affects the probability of cohabitation with a Danish partner in each each of the years from one year prior to ended studies until two years after ended studies. The results for the regressions are reported in table 12 below:

---

[24]Due to the definition of Statistics Denmark, homosexual couples are only registered as such once they marry.

Table 12: Effect of Native Peers on Probability of Cohabiting with a Danish Partner

	(1) Danish partner (Year -1)	(2) Danish partner (Year 0)	(3) Danish partner (Year 1)	(4) Danish partner (Year 2)
Native share (std.)	0.000309	0.00877	0.000999	0.00192
	(0.00523)	(0.00599)	(0.00577)	(0.00741)
Constant	-0.0150	-0.0652**	-0.0572+	-0.0461
	(0.0221)	(0.0219)	(0.0315)	(0.0327)
Total Number of Students	✓	✓	✓	✓
Institution-Programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution × Year FE	✓	✓	✓	✓
Institution-Programme Trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓
N	21441	21441	21441	21441
R^2	0.081	0.092	0.076	0.076

Source: Statistics Denmark and own calculations.
Note: Standard errors are clustered at the study programme level and are in parantheses. $^+ p < 0.10$, $^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

From table 12 I see that, rather surprisingly, exposure to native peers does not have a statistically significant effect on the probability of cohabiting with a Danish partner in each of the years up to two years after ended studies. I cannot, however, rule out that social relationships with Danes is still a relevant mechanism as native peers can still affect social relationships both in the form of friendships and non-cohabiting romantic relationships. I just cannot observe it in the data.

6.3 Improved Professional Network and Labor Market Knowledge

The final mechanism I investigate is whether exposure to Danish peers improve the professional network and labor market knowledge, which can increase the probability of finding a job in Denmark after ended studies. According to Danish Ministry of Education and Research and Danish Ministry of Immigration, Integration, and Housing (2015) around two thirds of foreign students plan to apply for a job in Denmark after ended studies. Those who don't, point to linguistic barriers and a lack of network as the main reasons for not applying. Previous studies have documented that peers at college affect the job search process and the likelihood of finding (a well paid) job (See e.g. Marmaros and Sacerdote (2002) and Ilyés and Sebők (2023)). College peers can e.g. help each other through formal or informal referrals, help and guidance in the application process, and knowledge sharing about cultural and institutional settings on the labor market. It is therefore likely that exposure to native peers can aid the job search process of foreign students.

In order to investigate this channel, I test whether the share of Danish peers affects the probability that foreign students have a student job the year prior to ended studies. In Denmark it is quite common for master's students to have (career relevant) part-time jobs alongside their studies to gain labor market experience and increase their professional network. According to a survey of graduates conducted by Danish Association of Masters and PhD's (2023) a student job at a relevant employer is one of the most common ways to find employment after ended studies. Danish Ministry of Education and Research and Danish Ministry of Immigration, Integration, and Housing (2015) find that foreign students who had a student job are significantly more likely to stay and work in Denmark after ended studies. If improved professional relationships and labor market knowledge is a relevant mechanism it is likely that Danish peers affect the possibility of getting a student job, and in particular a student job which is relevant for their future careers.

It is of course difficult to distinguish whether a given student job is career relevant. It is however reasonable to assume that many of students which have a student job in certain sectors such as hospitality, restaurants, or in the retail industry are employed in more manual jobs, which are not directly relevant for their career after completion of a master's degree. To distinguish between the relevance of different kinds of student jobs, I investigate the effect of native peers on the probability of i) having a student, ii) having a student job *which is not* in hospitality or restaurant, and iii) having a student job *which is not* in hospitality, restaurant or in the retail sector. The results for each of the three regressions are reported in table 13 below:

Table 13: Effect of Native peers on Having a Student Job

	(1) Student Job	(2) Student Job (Excl. Hospitality & Restaurants)	(3) Student Job (Excl. Hospitality, Restaurants & Retail etc.)
Native share (std.)	0.0284+	0.0303*	0.0401**
	(0.0145)	(0.0145)	(0.0148)
Constant	0.442***	0.350***	0.352***
	(0.0474)	(0.0469)	(0.0443)
Total Number of Students	✓	✓	✓
Institution-Programme FE	✓	✓	✓
Year FE	✓	✓	✓
Institution × Year FE	✓	✓	✓
Institution-Programme Trends	✓	✓	✓
Individual Controls	✓	✓	✓
N	21441	21441	21441
R^2	0.162	0.132	0.121

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level and are in parantheses. $^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

From table 13 I see that the share of native students positively affects the probability of having a student job. The effect is significant at a 10 pct. level. When restricting the impact of native peers to more career relevant student jobs in column (2) and (3) the effect becomes larger and significant at a 5 pct. and 1 pct. level respectively. This suggests that native peers have a positive effect on the probability of getting a student job, and in particular when we consider student jobs, which are more career relevant. This can further increase the professional network of the foreign students and increase their prospects of getting a full-time job after ended studies.

In order to further investigate whether professional network and gaining knowledge about the Danish labor market from Danish peers is a relevant mechanism, I conduct a placebo test, where I investigate whether exposure to Danish peers affect the probability of working in Denmark two years after ended studies for foreign students who already worked in Denmark before enrolling into the master's degree. As this group of students already had knowledge about the Danish labor market, a professional network etc., the effect size of exposure to Danish peers on the study programme should be smaller (and potentially non-existing) for this group of foreign students if gaining knowledge about the labor market and a professional network is a relevant mechanism for the estimated peer effects in table 4. I estimate equation 4.1 only for the group of foreign students who were on the Danish labor market one year prior to enrollment. The results are reported in table 14 below.

Table 14: Placebo test for foreign student w. prior attachment to Danish labor market

	(1) Work
Native share (std.)	0.00698
	(0.0175)
Constant	0.498***
	(0.0463)
Total Number of Students	✓
Institution-Programme FE	✓
Year FE	✓
Institution × Year FE	✓
Institution-Programme Trends	✓
Individual Controls	✓
N	16518
R^2	0.153

Source: Statistics Denmark and own calculations.
Note: Standard errors are clustered at the study programme level and are in parantheses. $^+ p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

From table 14 I see that the effects for this group of students are both numerically smaller, and statistically insignificant, which is in line with what we would expect. It does seem plausible that network and knowledge about the Danish labor market might be a relevant mechanism through which the peer effects operate.

The results in this section speaks mostly in favor of an improved professional network and labor market knowledge as an important mechanism through which the peer effects operate. This is evident as native peers has a positive effect on the probability of finding (a career relevant) student job. Further, native peers does not affect the probability of employment in Denmark after ended studies for foreign students who were already living and working in Denmark prior to admission into a study program, and hence did already have a network and Danish labor market knowledge. While I cannot rule out that the probability of finding a Danish partner is also a relevant mechanism, I do not observe any effects in the data. This might, however, be due to the fact that I do not have data on non-cohabiting relationships and the fact that cohabiting with a Danish partner up to two years after ended studies is a low-frequency outcome for foreign students, as only around 6.5 pct. of foreign students cohabit with a Danish partner two years after ended studies. I can however rule out that an improved academic environment is a relevant mechanism as the estimated

effects of native peers on academic outcomes is insignificant, close to zero, and estimated with a relatively high degree of precision.

7 Conclusion

I have investigated how native peers on the study programme affect the probability that foreign students stay and work in the host country after ended studies. By using detailed administrative data from Denmark on foreign students in combination with within institution and study programme variation in adjacent cohorts, I have identified the causal effects of exposure to Danish peers. The results show that an increase of the share of Danish peers of one standard deviation increases the probability for a foreign student to work in the host country two years after ended studies by 4 pct. points. The results are significant and robust across a wide range of different specifications. The effects persist at least four years after ended studies, which indicates that the composition of university peers have long lasting effects on foreign students' careers. I find that the effects are stronger for students from countries that are geographically and culturally further away from Denmark. This is consistent with the notion that learning about the Danish labor market, culture etc. from native peers is more pronounced for individuals who are initially far away. I investigate potential mechanisms and find suggestive evidence that improved professional network and learning about the Danish labor market seem to be the main mechanism through which the peer effects operate.

The results found in this paper suggest that the decision of whether foreign students stay in the host country or move away after ended studies is in no way something that is fixed in advance but a choice which to a high degree is influenced by educational structures such as the composition of university peers. In particular, the results suggest that a network of native students can be a key element in retaining and integrating foreign talent into domestic labor markets.

8   Literature

Anelli, M., K. Shih, and K. Williams (2017). Foreign peer effects and stem major choice.

Baert, S., B. Neyt, E. Omey, and D. Verhaest (2022). Student work, educational achievement, and later employment: A dynamic approach. *IZA Discussion Paper* (11127).

Battisti, M., G. Peri, and A. Romiti (2022). Dynamic effects of co-ethnic networks on immigrants' economic success. *The Economic Journal 132*(641), 58–88.

Bifulco, R., J. M. Fletcher, and S. L. Ross (2011). The effect of classmate characteristics on post-secondary outcomes: Evidence from the add health. *American Economic Journal: Economic Policy 3*(1), 25–53.

Black, S. E., P. J. Devereux, and K. G. Salvanes (2013). Under pressure? the effect of peers on outcomes of young adults. *Journal of Labor Economics 31*(1), 119–153.

Carrell, S. E., M. Hoekstra, and E. Kuka (2018). The long-run effects of disruptive peers. *American Economic Review 108*(11), 3377–3415.

Cattan, S., K. G. Salvanes, and E. Tominey (2022). First generation elite: the role of school networks.

Christensen, Vibeke T. and Beuchert, Louise (2023). PISA 2022 - Sammenfatning. https://www.vive.dk/media/pure/5xp670pz/24426569. Accessed 24 July 2024.

Costas-Fernández, J., G. Morando, and A. Holford (2023). The effect of foreign students in higher education on native students' outcomes. *European Economic Review 160*, 104595.

Damm, A. P. (2009). Ethnic enclaves and immigrant labor market outcomes: Quasi-experimental evidence. *Journal of Labor Economics 27*(2), 281–314.

DAMVAD (2013). Internationale studerende i danmark. https://www.rm.dk/api/NewESDHBlock/DownloadFile?agendaPath=%5C%5CRMAPPS0221.onerm.dk%5CCMS01-EXT%5CESDH%20Data%5CRM_Internet%5CDagsordener%5CVaekstforum%202013%5C20-02-2013%5CAaben_dagsorden&appendixId=40257. Accessed 24 July 2024.

Danish Agency for Labour Market and Recruitment (2023). Dimittender med studiejob kommer hurtigere i beskæftigelse. Report. Downoaded from: `https://jobindsats.dk/media/gechfyt5/dimittender-med-studiejob-kommer-hurtigere-i-besk%C3%A6ftigelse.pdf`. Accessed: 08.01.2023.

Danish Association of Masters and PhD's (2023). Analyse: Sådan kommer dimittender i job. `https://dm.dk/media/28739/201904-saadan-kommer-dimittender-i-job.pdf`. Accessed: 31.10.2024.

Danish Ministry of Children and Education (2024). Det ordinære uddannelsessystem. `https://www.uvm.dk/uddannelsessystemet/overblik-over-det-danske-uddannelsessystem/det-ordinaere-uddannelsessystem`. Accessed 12 August 2024.

Danish Ministry of Education and Research and Danish Ministry of Immigration, Integration, and Housing (2015). Internationale studerende i danmark - hvad har betydning for om internationale studerende bliver i danmark efter endt studie? `https://uim.dk/media/9309/internationale-studerende-i-danmark.pdf`. Accessed 24 July 2024.

Danish Ministry of Higher Education and Science (2024). Optagelse på videregående uddannelse på grundlag af en udenlandsk eksamen. `https://ufm.dk/uddannelse/anerkendelse-og-dokumentation/guide-til-anerkendelse/uddannelsesindehaver/optagelse-vg`. Accessed 12 August 2024.

Danish Ministry of Science, Innovation, and Higher Education (2013). Eu-domstolens dom i sag c-46/12, l.n. `https://www.ft.dk/samling/20121/almdel/euu/spm/42/svar/1041130/1232301.pdf`. Accessed 12 August 2024.

Dustmann, C., I. Fadlon, and Y. Weiss (2011). Return migration, human capital accumulation and the brain drain. *Journal of Development Economics 95*(1), 58–67.

Edin, P.-A., P. Fredriksson, and O. Åslund (2003). Ethnic enclaves and the economic success of immigrants—evidence from a natural experiment. *The quarterly journal of economics 118*(1), 329–357.

Eriksen, J. and S. M. Dougherty (2024). Peer effects in vocational education and training.

Hammar, O., M. Karadja, and A. Khan (2022). Social networks and immigrant integration: Experimental evidence from sweden. *Journal of Development Economics*.

Hansen, A. T., U. Hvidman, and H. H. Sievertsen (2024). Grades and employer learning. *Journal of Labor Economics 42*(3), 000–000.

Hoxby, C. M. (2000). Peer effects in the classroom: Learning from gender and race variation.

Humlum, M. K. and M. Thorsager (2021). The importance of peer quality for completion of higher education. *Economics of Education Review 83*, 102120.

Ilyés, V. and A. Sebők (2023). University peers and career prospects: The impact of university ties on early labor market outcomes. *Economics of Education Review 96*, 102456.

Kato, T. and C. Sparber (2013). Quotas and quality: The effect of h-1b visa restrictions on the pool of prospective undergraduate students from abroad. *Review of Economics and Statistics 95*(1), 109–126.

Khan, A. and E. Lundberg (2023). Permanent residency policy and skilled immigration: Evidence from a swedish reform. *Available at SSRN 4594690*.

Kirkebøen, L., E. Leuven, and M. Mogstad (2021). College as a marriage market. Technical report, National Bureau of Economic Research.

Lavy, V., M. D. Paserman, and A. Schlosser (2012). Inside the black box of ability peer effects: Evidence from variation in the proportion of low achievers in the classroom. *The Economic Journal 122*(559), 208–237.

Manski, C. F. (1993). Identification of endogenous social effects: The reflection problem. *The review of economic studies 60*(3), 531–542.

Marmaros, D. and B. Sacerdote (2002). Peer and social networks in job search. *European economic review 46*(4-5), 870–879.

QS (2021). Us international student survey 2021. https://www.qs.com/reports-whitepapers/international-student-survey-2021-us-edition/. Accessed 1 October 2024.

SIRI (2024a). Eu-ophold som arbejdstager. `https://www.nyidanmark.dk/da/Du-vil-ans%C3%B8ge/Ophold-som-nordisk,-EU,-E%C3%98S-eller-schweizisk-statsborger/EU-arbejdstager`. Accessed 12 August 2024.

SIRI (2024b). Jobsøgningsophold på 6 måneder efter afsluttet uddannelse. `https://nyidanmark.dk/da/Applying/Study/Jobseeking%20study`. Accessed 12 August 2024.

SIRI (2024c). Positivlisten for personer med en videregående uddannelse. `https://www.nyidanmark.dk/da/Du-vil-ans%C3%B8ge/Arbejde/Positivlisten-videreg%C3%A5ende-uddannelse`. Accessed 12 August 2024.

SIRI (2024d). Ulovligt arbejde. `https://www.nyidanmark.dk/da/Words%20and%20Concepts%20Front%20Page/SIRI/Illegal%20work`. Accessed 12 August 2024.

Specht, L. S. (2022). International trade effects of student migration. Technical report, UCD Centre for Economic Research Working Paper Series.

Tonello, M. (2016). Peer effects of non-native students on natives' educational outcomes: mechanisms and evidence. *Empirical Economics 51*, 383–414.

Your Europe (2023). Opholdsret for jobsøgende. `https://europa.eu/youreurope/citizens/residence/residence-rights/jobseekers/index_da.htm#just-moved`. Accessed 12 August 2024.

Zimmerman, D. J. (2003). Peer effects in academic outcomes: Evidence from a natural experiment. *Review of Economics and statistics 85*(1), 9–23.

A Appendix

A.1 Additional Tables and Graphs

Table 15: Heterogenous Effects w. Interactions

	(1) Work	(2) Work	(3) Work	(4) Work
Native share (std.)	0.0360**	0.0380**	0.0323	0.0376**
	(0.0129)	(0.0130)	(0.0254)	(0.0131)
Native share (std.)×**1**[Non-EU/EEA Citizen]	0.0248*			
	(0.00996)			
Native share (std.)×**1**[Female]		0.00898		
		(0.00637)		
Native share (std.)×Age			0.000409	
			(0.000819)	
Native share (std.)×**1**[>24 y/o]				0.0115+
				(0.00617)
1[>24 y/o]				0.0147+
				(0.00778)
Constant	0.192***	0.189***	0.189***	0.220***
	(0.0513)	(0.0509)	(0.0509)	(0.0511)
Institution-Programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution × Year FE	✓	✓	✓	✓
Institution-Programme Trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓
N	21441	21441	21441	21441
R^2	0.147	0.147	0.147	0.147

Standard errors in parentheses

$+ p < 0.10$, $* p < 0.05$, $** p < 0.01$, $*** p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

A.2 Additional Robustness Tests

In this section, I conduct a series of additional robustness, and specification checks.

Sensitivity to the exclusion of students in the sample

In the main analysis I have excluded individuals with unobserved citizenship. There can be many reasons why I do not observe citizenships for some students. However, one reason might that these students do not live in Denmark during their studies and are not registered in the population registry. These individuals might either complete the study

as remote studies or live in a neighboring country (most likely Sweden or Germany) and commute to the university. If this is the cause for the citizenship status being unobserved, the potential peer effects will arguably be weaker for this type of students as they cannot engage as much with their fellow students if they don't live in the country. I estimate equation 4.1 without excluding individuals with unobserved citizenship.[25] The results are reported in table 16 column 1. Additionally, I have only included foreign students which did not work or live in Denmark one year prior to enrollment. I have done this to exclude individuals who came to Denmark with other purposes than to study. This cutoff of one year, however is somewhat arbitrary. I estimate equation 4.1 i) excluding individuals who lived/worked in Denmark any of the three prior years of enrollment, and iii) excluding individuals who lived/worked in Denmark any of the five prior years of enrollment. The results are reported in table 16 column 2, and 3 respectively. Finally, I test whether excluding students from countries which change EU-status in the period affects the results. is possible that individuals from countries with changing EU/EEA status confounds the results. Imagine a country becoming a member of EU during the analysis period. This might change the number and type of individuals from that country who apply for a master's degree (as studying in Denmark suddenly becomes free). Further it might change their probability of working in Denmark after ended studies as obtaining a work permit becomes significantly easier (see section 2). Two countries change EU-status in the analysis: Croatia becomes member in 2013 and Great Britain left EU in 2020. I estimate equation 4.1 while excluding students from Great Britain and Croatia. The results are reported in table 16 column 4.

---

[25]Note that I cannot include the control variables age and gender, as I do not have this information either for individuals where citizenship status is missing. The reason is that this information is recorded in the same registry (BEF).

Table 16: Sensitivity to Inclusion/Exclusion of Students

	Unobserved citizenship	No Living/Working in DK 3 years prior	No Living/Working in DK 5 years prior	No Croatian or British Students
	(1)	(2)	(3)	(4)
	Work	Work	Work	Work
Native share (std.)	0.0397***	0.0404***	0.0422***	0.0410**
	(0.00937)	(0.0120)	(0.0120)	(0.0126)
Constant	0.176***	0.242***	0.241***	0.235***
	(0.0389)	(0.0550)	(0.0552)	(0.0519)
Institution-Programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution × Year FE	✓	✓	✓	✓
Institution-Programme Trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓
N	25727	21110	21020	20809
R^2	0.113	0.147	0.148	0.150

Source: Statistics Denmark and own calculations.
Note: Standard errors are clustered at the study programme level and are in parantheses. $^+ p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

From table 16 we see that the results are generally robust to the exclusion and inclusion of the specific groups of foreign students.

Alternative specifications

In order to make sure that the results are not driven by errors or specific choices in the way I define the main variables, I estimate equation 4.1 using alternative definitions of the outcome variable. In order to mitigate this concern, I estimate equation 4.1 using three alternative definitions of the labor supply of foreign students in Denmark two years after ended studies. In the first specification, I define labor supply as a dummy for whether the individual has non-zero business income (i.e. both salary and profits from own company). In the second specification, I define the outcome variable as total business income two years after ended studies (in DKK). In the third specification, the outcome variable is hours worked in Denmark two years after ended studies. The results are reported in table 17.

Table 17: Sensitivity to Alternative Definitions

	Non-zero Business Income	Business Income	Hours Worked
	(1)	(2)	(3)
	Work	Work	Work
Native share (std.)	0.0430***	11745.9**	61.96**
	(0.0118)	(4215.4)	(20.98)
Constant	0.231***	57319.6**	335.8***
	(0.0546)	(18722.8)	(85.65)
Institution-Programme FE	✓	✓	✓
Year FE	✓	✓	✓
Institution × Year FE	✓	✓	✓
Institution-Programme Trends	✓	✓	✓
Individual Controls	✓	✓	✓
N	21441	21441	21441
R^2	0.154	0.156	0.153

Source: Statistics Denmark and own calculations.
Note: Standard errors are clustered at the study programme level and are in parantheses. $^+ p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

From table 17 we observe that the results are generally robust to alternative definitions of either the outcome variable or the treatment variable.