Introducing Tuition Fees for International Students in Sweden: Effects on Universities and Native Students *

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Abstract

This paper evaluates a 2011 Swedish reform that introduced tuition fees for international students applying to universities. For identification, I use two variations in a difference-in-differences design: the timing of the reform and the differences in the pre-reform share of international Master's students across the faculties as a proxy for reform exposure. I find that, for the exposed faculties, the cohort size decreases sharply, driven by a decline in international students and partially mitigated by higher enrolment of natives. There are no effects on the composition of these native students in terms of age, gender, and academic ability. Native students who enroll in Master's programs under exposed faculties see higher labor earnings in the short run. These faculties also respond to the reform by offering a wider set of programs. Taken together, these results show how such reforms affect multiple inputs in the education production function and provide one of the first pieces of evidence on higher education policies related to international students.

JEL codes: F22, I21, I22, I23, J68

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1 Introduction

Some countries charge international students either a positive or higher tuition fee, while others do not. For instance, neither native nor international students pay tuition fees in Germany. In contrast, in the US and the UK, compared to natives, international students pay higher tuition fees. Recently, Norway and Finland have introduced tuition fees for international students. Moreover, the Netherlands and Canada are considering quotas or other non-price policies to restrict the intake of these students.[1] These policy changes often lead to marked changes in the inflow of international students. Yet little is known, especially in the European context, as to how the universities respond to these policies and the effects they have on the natives in terms of academic and labor market outcomes.

How does the introduction of tuition fees for international students impact universities and native students? While a small and growing literature has focused on the effects of such policies on the mobility of international students (see, for instance, Beine et al. (2020)) and finds a decline in their enrollment, evidence is scarce on how these policies affect universities and native students. For example, is there any change in the enrollment of native students? Does the potential decline in class size and competition in the labor market affect the academic and labor market outcomes of these students? Do the universities change their offer of programs to attract paying international students?

In 2011, Sweden introduced tuition fees for international students applying to Swedish higher education institutions, i.e., those coming from outside the European Union or the European Economic Area (hereafter, EU/EEA).[2] The policy had an immediate, negative effect on international student enrollment, especially at the Master's level. Between 2010 and 2011, the number of new international students at the Master's level declined from over 5,600 to below 1,600 – a reduction of 70% – especially from the low-and-middle-income countries (LMICs).[3] This impact on the volume of international students has been recognized and highlighted by universities as a notable change in their learning environment (Bryntesson and Börjesson, 2019). However, to the best of my knowledge, there is

[1] Public universities in Iceland do not charge international students any tuition fees as was the case for Norway before 2023, Finland before 2017, Sweden before 2011, and Denmark before 2006. Germany removed fees for undergraduate courses in 2014, and countries such as France and Italy charge the same – relatively small – fee to all students.

[2] The annual tuition fee for these students increased from 0 SEK to 80-110 thousand SEK for programs in Humanities and Social Sciences, and to 130-145 thousand SEK for programs in STEM.

[3] In the pre-reform period, 96% of the international students come from these LMICs. Moreover, among the remaining international students, thanks to their Swedish ancestry, some students may still have Swedish citizenship and can claim an exemption from tuition fees. Hence, I only use the information on the international students from LMICs to construct all measures for international students.

no study of the effects of this – or similar reforms in the EU – on the academic and labor market outcomes of native students.

To estimate the effect of the reform, I use two variations in a difference-in-differences design: the timing of the reform and the differences in the pre-reform share of international students across the faculties (e.g., Faculty of Social Sciences at Stockholm University and Faculty of Science and Technology at Uppsala University). These pre-reform shares are a proxy for the potential exposure of a faculty to the reform.[4] I choose the faculty as the unit of treatment to allow for changes in the supply of programs by a faculty in response to the reform. I compile a dataset covering the universe of over 72,800 students who register for a Master's program between 2008 and 2014 in Sweden.[5][6] The dataset contains information on the country of birth, which I use to classify the students into three groups: native, EU/EEA, and international. For the native students, I have data on their demographics as well as information tracking them from registration to graduation and then in the labor market.

The reform leads to a significant and persistent change in the cohort size and composition for the exposed faculties.[7] Consider the faculties in the highest exposure quintile, with an 88% pre-reform share of international students. For the cohorts registering between 2011 and 2014 in programs under these faculties, the number of international students drops by 72 (87%; $p < 0.01$). However, the number of *all* students declines by 50 ($p < 0.10$) as native students register in higher numbers (not significant). There is no effect on the number of students from the EU/EEA.

I first investigate whether the reform affects the composition of native students who register in the treated faculties after the reform. The three characteristics I consider, namely age, gender, and previous academic performance, do not suggest any evidence of selection.

Turning to academic and labor market outcomes, for the native students registering in treated faculties, I find that the reform does not affect their graduation rates or their likelihood of employment 4-5 years after registration. On the other hand, their wages

[4] For the rest of the paper, I interchangeably use exposure and treatment.

[5] The sample includes all 21 universities in Sweden that offer these Master's programs during the study period.

[6] I use enrollment and registration interchangeably.

[7] Across the different outcomes I consider either at the faculty or at the student level, there is no systematic evidence of any substantive pre-trends. See Figures 4-6 and B.4-B.5 for a visual representation of this using event-study plots.

increase, especially for the cohorts that register in 2013 and 2014.[8] For the registering natives in 2013-14, those in the highest exposure quintile see their annual wages increase by over 26 thousand SEK, a rise of more than 8% over the pre-reform sample mean ($p < 0.05$). This increase, moreover, is higher for native students with higher pre-registration academic performance.

One candidate mechanism for the wage gains is that the quality of education increases given the lower number of students per class or program. There is a growing body of literature studying the effects of class size and composition at the tertiary level. For a UK university, Bandiera et al. (2010) find a negative effect of higher class sizes on students' test scores. For classes on the right tail of the size distribution, they also find suggestive evidence that the high-ability students may benefit more from a smaller class size. De Giorgi et al. (2012) replicate this adverse impact of class size on academic performance for Bocconi University, with additional evidence on higher class size leading to lower entry wages. While I do not measure class sizes, the sharp reductions I document in the cohort size for faculties – and especially for the Master's programs – presumably translate to smaller class sizes on average, which makes it a potential mechanism for the observed increase in wages.[9][10][11]

Finally, to investigate a potential supply-side response, I consider the total number of programs offered by a faculty. I find that the treated faculties, i.e., those with higher pre-reform shares of international students, offer a larger number of Master's programs ($p < 0.10$). For instance, after the reform, faculties in the highest exposure quintile raise their number of programs by 1.4 (an increase of 25% compared to the pre-reform sample mean of 5.72). This response, for instance, could be an effort by these faculties to attract more students via product differentiation.

Since there is notable heterogeneity in programs and students within a given faculty, as an alternative evaluation strategy, I replicate these analyses using the Master's program as the unit of treatment. I take a set of core programs (e.g., Master's in Economics and Master's in Computer Science) that enroll students throughout the study period.[12] The

[8] I use wages and labor-earnings interchangeably.

[9] I am in the process of collecting data on class size and grades at the course level.

[10] Note that a similar mechanism can be at play in the labor market as a reduction in the number of international students can also result in a negative labor supply shock. This mechanism, however, can be attenuated as only 27% of the international Master's students in Sweden enter the local labor market after graduation. The corresponding estimate is 23% for the US (Beine et al., 2023).

[11] Note that the faculties may eventually reoptimize by, say, laying off teachers. Such downsizing can dilute this mechanism and, in turn, the labor market effects in the long run.

[12] However, given the turnover in the offer of programs during this period and the supply-side response I

findings are similar using this sub-sample. In addition, I conduct the following robustness checks: exclusion of covariates and specifications allowing for flexible trends either at the university level or based on the student's pre-determined characteristics recorded at registration. The key estimates retain their practical and statistical significance.

This paper contributes to the literature in three ways. First, I add to a set of studies from the US documenting the effects of international students on their native peers (see Bound et al. (2021) for a review). For instance, using variation in the share of international students in introductory math classes at a US university, Anelli et al. (2023) find that these students displace their native counterparts from STEM majors and occupations, with limited communication and social interaction within the class as a potential mechanism. Borjas (2004) finds similar crowd-out effects at the US graduate programs.[13] I provide one of the first pieces of evidence on these effects in the European context, where the enrollment of international students has increased substantially over the last two decades.

Second, as briefly discussed above, this work relates to a nascent literature that estimates the effects of class size and composition at universities (Bandiera et al., 2010; De Giorgi et al., 2012; Kara et al., 2021). This paper leverages a reform that leads to marked changes in the size and composition of the student body registering for Master's programs, with reduced-form evidence on wage increases for native students in programs that are affected by the reform.

Third, the supply-side response in program offers contributes to a strand of papers that analyze how the universities respond to changes in student demand. For instance, Kim (2022) finds that, in response to an immigration reform extending post-graduation employment visa for international STEM graduates in the US, universities offer more STEM-designated business programs at the Master's level. The supply-side changes I document, on the other hand, come from a context with universities transitioning to a system where they use prices to compete for international students.

The remainder of the paper proceeds as follows. Section 2 details the tuition fee reform. Sections 3 and 4 describe the data and empirical strategy, respectively. Section 5 presents the findings and Section 6 concludes.

observe in the treated faculties offering more programs, this sub-sample of programs and the corresponding students may not be representative of the underlying populations.

[13] However, with aggregated program-level data for the US, Zhu (2022) finds that higher international enrollment at the Master's programs raises the completion rate of natives at the Bachelor's level, possibly driven by cross-subsidization of tuition. Note that, in Sweden and many other countries in the EU/EEA, native students as well as those from the EU/EEA do not pay – or pay the same minimal – tuition fees for post-secondary education.

2 The Reform

Following a discussion on the rising costs of administration and education, and the potential benefits of letting the universities attract global talent using prices as signals of education quality, Sweden introduced tuition fees for international students attending higher education institutions in Fall 2011. The annual tuition fee for these students increased from 0 SEK to 80-110 thousand SEK for programs in Humanities and Social Sciences, and to 130-145 thousand SEK for programs in STEM.

Compared to Fall 2010, the number of newly registered international students declined by four-fifth, driven by students from low-and-middle-income countries (e.g., India, China, Pakistan, Iran, and Ethiopia). Despite efforts such as government scholarships, this decline persisted: the number of international students who registered for the first time in Fall 2015 was below half of that in 2011 and even lower than the corresponding figure from 2005 (Bryntesson and Börjesson, 2019). Master's programs in STEM were affected the most, with some programs losing up to 50% of students compared to the pre-reform cohorts. Since the majority of international students study at the Master's level (e.g., 58% in 2015/16), I focus on the Master's programs. These programs span two academic years of full-time study (120 credits).

Many universities argued that the policy had a major effect on the learning environment as the student body changed dramatically in terms of diversity and size (Högskoleverket, 2011; Nilsson and Westin, 2022). Did this policy have any effects on the enrollment and graduation of natives (and, in turn, their labor market outcomes)? While the decrease in class size might have been beneficial (De Giorgi et al., 2012; Bandiera et al., 2010), the potential decline in competition (both within the program and in the future labor market) and the loss of diversity could adversely affect the learning environment (Antonio et al., 2004). The decreased presence of international students potentially led to declines in all three key dimensions of diversity: classroom diversity, which enables learning about diverse peers within the classroom; informal interactional diversity i.e., the quantity and quality of interactions with diverse peers outside of the class; and structural diversity e.g., the share of students from low-income countries attending a particular university/program (Bowman, 2010).

3 Data Description

I assemble a novel and comprehensive dataset comprising the universe of students who register for a Master's program between 2008 and 2014 in Sweden. The education in-

formation is collected by Statistics Sweden on behalf of the Swedish Higher Education Authority (UKÄ), covering all registered students in each semester. This enables tracking individual students from their initial semester of registration to their final semester. I also have access to information on the school they attend and the specific program they register for as well as the corresponding field of study (e.g., Humanities and Arts; Science, Mathematics, and Data).

To determine whether the reform applies to a given student, I use data on the student's country of birth from the Total Register of the Population (RTB). Note, however, that the RTB data we have access to often does not identify the exact country of birth but groups these countries into different country-groups. For instance, Germany is exactly identified whereas Djibouti, Eritrea, Ethiopia, Somalia, and Sudan are assigned to one country-group. Using this information, I assign the students to one of three categories: Swedes, EU/EEA citizen, or non-EU/EEA (international) citizen.[14]

I collect information on employment and wage earnings from the LOUISE dataset, which provides annual data on the labor market and educational outcomes for all individuals registered in Sweden as of December 31 each year.

Finally, from the aforementioned registers, I add data on a set of pre-registration student characteristics such as age at registration, gender, and pre-registration academic performance at the exit examinations for elementary (grade 9) and high school (grade 12) as well as at the university entrance exam (Högskoleprovet).

4 Empirical Strategy

As a measure of exposure to the reform, I use the pre-reform share of international students. In particular, I divide the treatment units into five quintiles based on this share. The unit of treatment, on the other hand, is defined in two ways: school-faculty and program. School-faculties are combinations of schools and fields of study (e.g., the Faculty of Social Sciences at Stockholm University)[15] whereas programs are specific Master's programs (e.g., Master's Program in Economics at Uppsala University). Assigning treatment

[14] There is one exception. Namely, students who resided or engaged in employment in Sweden five years preceding the registration are placed within the Swedish category as these students are likely to have obtained permanent residency or citizenship already when starting their Master's studies, which would exempt them from paying tuition fees. This criterion is used for all students regardless of whether their country of birth is inside or outside the EU/EEA. For all other cases, the assignment is determined by the student's country of birth.

[15] There are eight such fields: Pedagogy & Teacher Education; Humanities & Arts; Social Sciences, Law, Trade & Administration; Science, Mathematics & Data; Technology & Manufacturing; Agriculture, Forestry & Husbandry; Healthcare & Social Work; and Services.

at the school-faculty (hereafter, faculty) level enables capturing the supply-side response of the universities (e.g., in their offer of the total number of programs). This approach also helps avoid a selective loss of sample due to a turnover in the programs that a faculty offers in response to the reform. The resulting analysis sample has 73 faculties across 21 universities with 38,596 registered students.[16]

However, within-faculty heterogeneity in programs and students is substantial. Therefore, I replicate the analysis at the program level. I take a set of core Master's programs that enroll students each year over the study period.[17] Examples are Master's in – Microbiology; Chemistry; Sociology; and Economics. The resulting analysis sample has 180 programs with 18,639 registered native students.

Lastly, for both of these approaches, I make a sharper comparison, considering the first quintile as the 'control' group and quintiles three to five as the 'treatment' group.

I use a difference-in-differences design leveraging two variations: the timing of the reform and the cross-sectional variation in exposure to the reform. The benchmark regression specification is as follows:

$$y_{ipt} = \alpha + \beta Q(IntlShare) * Post_{pt} + \boldsymbol{\tau} \boldsymbol{X}_{ipt} + \boldsymbol{\sigma}_u + \boldsymbol{\mu}_p + \boldsymbol{\lambda}_t + \epsilon_{ipt}, \tag{1}$$

where y_{ipt} represents the outcome for the native student i, registering under faculty/program p in year t. $Q(IntlShare) * Post_{pt}$ is the interaction between a variable representing the pre-reform international-student share quintiles, $Q(IntlShare)_p$, and a dummy variable, $Post_t$, that switches on in the post-reform period, i.e., in 2011.[18] $\boldsymbol{X}_{ipt}$ denotes a vector of predetermined individual characteristics that are recorded in the first year of registration [19]: whether a student is female; their age in years and age-squared[20], and a measure of their pre-registration academic outcome.[21] σ_u and μ_p stand for university and fac-

[16] By imposing the restriction that the faculty enrolls students each year over the study period, I lose less than 5% of the total sample of registered native students.

[17] Hence, arguably more stable and less susceptible to reform-induced turnover.

[18] $Q(IntlShare) * Post_{pt}$ is equivalent to the representation 'Treat X Post' which is also common in difference-in-differences specifications. The latter is what I use for the specifications comparing quintile one to quintiles three to five.

[19] An important caveat is due on the inclusion of these covariates. If the reform affects the selection of the natives along these characteristics, including them in the regression can complicate the causal interpretation, especially if these covariates are not orthogonal to the outcomes. However, as detailed in Section 5.3, I do not find any evidence of such selection in the main analyses.

[20] For students with missing age, I impute by taking the corresponding average at the birthcounty-gender-year-of-registration level.

[21] Specifically, I take their high-school GPA. For those with missing high-school GPA, I use their university entrance exam scores if available. Otherwise, I use their grade-9 GPA. For the remaining missing

ulty/program fixed effects, respectively, and λ_t represents year-of-first-registration fixed effects. β is the coefficient of interest: the Average Treatment Effect for the Treated or ATT, which represents the causal effect of the reform on the treated native students.[22] All the forthcoming tables with regression results report this coefficient. ϵ_{ict} is the error term clustered at the faculty/program level to account for serial correlation in the outcome among students from a faculty/program registering in successive years.

To examine potential differences in responses between cohorts exposed to the reform late versus early, I also present results where I stratify the post-reform cohorts into two groups: i) students graduating between 2011 and 2012, and ii) students graduating between 2013 and 2014. Note that, since these Master's programs span two years, the 2011 cohort can have overlaps with their 2010 counterparts.

Additionally, I present results using an event study specification as follows:

$$y_{ipt} = \alpha + \sum_{t\in(-3,+3),\ t\neq -1} \beta_t Q(IntlShare)_p + \boldsymbol{\tau} \boldsymbol{X}_{ipt} + \boldsymbol{\sigma}_u + \boldsymbol{\mu}_p + \boldsymbol{\lambda}_t + \epsilon_{ipt}, \tag{2}$$

where I normalize the periods relative to 2011 ($t = 0$), with $t = -1$ as the reference point. The rest is identical to Equation (1). All the forthcoming event-study figures report the vector of coefficients $\boldsymbol{\beta}_t$ $[t \in (-3, +3),\ t \neq -1]$.

For both specifications, the identification of the causal effect of the reform relies on the assumption of (conditional) parallel trends: In the absence of the reform, the evolution in the average outcome over registering cohorts, conditional on predetermined covariates, would be the same for students in the exposed/treated faculties as that for students in the control faculties/programs (in other words, across the different quintiles). As part of the event-study plots, I report the result from a test of pre-trends i.e., a joint significance test for all leads in the event-study equation 2.

For regressions with outcomes at the faculty or program level such as cohort size and ethnic composition, the specifications remain the same, except for the absence of covariates. In particular, I use the following model:

$$y_{pt} = \zeta + \theta Q(IntlShare) * Post_{pt} + \boldsymbol{\pi}_u + \boldsymbol{\phi}_p + \boldsymbol{\kappa}_t + \gamma_{pt}, \tag{3}$$

cases, I do an imputation exercise using the corresponding average either at the birthyear-birthcounty-gender or at the birthcounty-gender levels. All the academic outcomes are first standardized by year-of-examination.

[22] In effect, the specification in 1 uses the first quintile as the control group. I do not use faculties with zero pre-reform shares of international students as the control group as there are only six such faculties.

where θ is the coefficient of interest.[23]

For the sake of exposition, I discuss the results in the following sequence: analysis using faculties as the unit of treatment; replication of this analysis with exposure quintiles one (control) and three-five (treatment); analysis using Master's programs as the unit of treatment; and replication of this analysis with exposure quintiles one (control) and three-five (treatment). Throughout, the focus will be on the analyses where I define the faculties as the unit of treatment.

For the analyses using faculties as the unit of treatment, I report five sets of results. First, I describe the summary statistics at the faculty and student level. Second, I present estimates of the reform's effects on the size and ethnic composition of the treated faculties and registration cohorts. Third, I investigate whether the reform affects the selection of native students who register after the reform in treated faculties. Fourth, I discuss the reform's impact on a set of academic and labor market outcomes of these students. Finally, I report results on a potential supply side response: the offer of programs offered by the treated faculties i.e., those who had a relatively high share of international students before the introduction of the tuition fee.

Barring the component on the supply-side response, I follow the same structure when I report results from analyses using programs as the unit of treatment.

5 Results

5.1 Summary Statistics

Figure 1 shows the decline in the number and share of international students after the reform. The number of international students registering in a Master's program declines from over 5,000 in 2010 to below 2,000 in 2011, with the decrease persisting up to 2014. This trend is reflected in their share of each cohort of registered students as well. The share of international students per cohort halves after the reform, going from over 40% to below 20%. Figure 2 plots the relative (%) change in the average number of international students registering each year after the reform across the distribution of faculties with varying pre-reform shares of international students.[24] The higher this pre-reform share of

[23] The corresponding event-study specification is:

$$y_{pt} = \zeta + \sum_{t \in (-3,+3),\ t \neq -1} \theta_t Q(IntlShare)_p + \boldsymbol{\pi}_u + \boldsymbol{\phi}_p + \boldsymbol{\kappa}_t + \gamma_{pt}. \tag{4}$$

[24] This relative change is calculated using the pre-reform average for the number of *all* students registering each year as the denominator.

international students, the greater the relative decline in the number of international registrants after the reform. Figure 3 complements this result by plotting the annual shares of international students over the study period for the five quintiles of faculties which I construct using their pre-reform share of international students. The first quintile of faculties, with a 4.81% pre-reform share of international students, sees limited changes in this share after the reform (see Figure 3 and Table 1). In contrast, the fifth quintile, where close to 90% of the registered students before 2011 are international, sees a decline of over 40 percentage points in this share.[25]

Table B.2 reports the summary statistics for the native students who register in the sample faculties over the study period. Overall, more than a majority are female, with a mean age of 27 years at registration and better pre-registration academic outcomes compared to their population cohorts. Four to five years after registration, 96% of these students are employed and earning annually, on average, over 340 thousand SEK (in 2018 prices; pre-tax wage income).

5.2 Effect on the Size and Composition of the Programs

How does the reform affect the size and ethnic composition of the cohorts that register after the reform? I consider four outcomes: no of – international students, native students, students from the EU/EEA, and all students (i.e., overall cohort size of a given faculty). Table 3 reports the ATT estimates whereas Figure 4 presents the corresponding event study plots.

The reform leads to a decline in the number of international students registering in the treated faculties. For instance, for the cohorts registering between 2011 and 2014, on average, the number of international students drops by 18 and 72 in the faculties in the second and fifth exposure quintiles, respectively (representing relative declines of 22% and 87% over the pre-reform average for the number of international students in these faculties; $p < 0.01$).[26] The estimates for the number of *all* students suggest a corresponding albeit smaller decline in the overall cohort sizes ($p < 0.10$), possibly due to an increase in the number of registered natives (not significant). There is no effect on the number of students from the EU/EEA.

[25] There is also variation in the study fields of faculties across these exposure quintiles. For instance, in the second quintile, shares of Social Science and STEM faculties are 56% and 33%, respectively. The corresponding shares in the fourth quintile are 4% and 92%.

[26] Using equation 3, this is calculated as $(\theta * [i-1])$, where $i \in [2,5]$. An implicit assumption underlying these and similar forthcoming calculations is that of linearity in the effects. For the academic and labor market outcomes, I probe this by estimating quintile-specific effects and report them in Table A.1.

Overall, faculties with higher pre-reform shares of international students experience greater – and substantial – declines in their cohort size after the reform. This is entirely driven by declines in the number of international registrants and partially mitigated by a higher number of native students registering in these faculties.

5.3 Selection of Native Students

Table 4 investigates possible selection effects of the reform on the cohorts of native students who register in the treated faculties after 2010. For the three outcomes age at registration, gender, and pre-registration test scores, I do not find any evidence of such selection. The coefficient on pre-registration test scores is positive but not significant at the conventional levels.

5.4 Impact on the Native Students' Academic and Labor Market Outcomes

Does the reform have any impact on the academic and labor market outcomes of the native students who register in faculties with a high pre-reform share of international students? I use the likelihood of graduation as an academic outcome. For labor market outcomes, I consider the probability of employment 4-5 years after registration and average wage earnings over the same period. [27] Table 5 reports the relevant ATT estimates and Figure 5 presents the corresponding event study graphs.

I do not find any evidence of the reform's impact on graduation or employment (columns 1-4 in Table 5). On the other hand, treated native students, i.e., those who register in faculties with higher exposure to the reform, earn more 4-5 years after registration ($p < 0.10$).[28] There is a notable dynamic: the earning gain appears for the 2012 cohort and grows for the successive cohorts (Figure 5). Note that the 2012 cohort is the first one to have limited overlap with the last pre-reform cohort of 2010 as the Master's programs span two years. For the registering natives in 2013-14, those in the fifth exposure-quintile see their earnings increase by over 26 thousand SEK, an increase of more than 8% over the pre-reform mean ($p < 0.05$).

[27] Specifically, an individual is considered employed if s/he has non-zero wages reported in either the 4th or the 5th year after registration. Mean wage earnings are estimated using the pre-tax labor earnings reported in years 4 and 5 after registration (at 2018 prices).

[28] Note the smaller sample size for the labor market outcomes as the analysis sample includes native students who are residents of Sweden 4-5 years after registration. I do not find any effects on the likelihood of staying in Sweden 2-5 years after registration (see Table A.3).

5.5 Binary Treatment DID using Quintiles One (Control) and Three-Five (Treatment)

Reassuringly, I find similar results when I replicate the analysis in a canonical DID setup, with the first exposure quintile as the Control group and quintiles three to five as the Treatment group. The results are reported in Tables A.4-A.6. After the reform, the cohort size declines in the treated faculties as the number of international registrants fall, with partial compensation by a higher number of native students. There is no evidence of a selection effect among the post-reform native registrants as measured by their age, gender, and prior academic performance. Finally, the native students who register in the treated faculties between 2013 and 2014 see higher wage earnings 4-5 years after registration.

5.6 Supply Side Response of the Faculties

Do the treated faculties change their offer of programs? I consider the total number of programs offered by a faculty as a measure of such supply-side response. Table 6 reports the treatment effect estimates and Figure 6 plots the corresponding event study.

The treated faculties, i.e., those with higher pre-reform shares of international students, offer a larger number of Master's programs ($p < 0.10$). For instance, after the reform, faculties in the highest exposure quintile raise their number of programs by 1.4 (an increase of 25% compared to the pre-reform mean of 5.72).

5.7 Robustness

How robust are the results on wage earnings for the cohorts registering in 2013-2014? I conduct three tests. First, I exclude the covariates, thereby invoking the less restrictive unconditional parallel trends assumption. In Table A.8, Column 1 presents the ATT estimates similar to those in Column 6 of Table 5, while excluding all covariates. Second, to account for potential variations in outcome trends among the different universities, I add University*Year-of-registration fixed effects. The results are detailed in Column 2 of the same table. Third, I interact the covariates with year-of-registration fixed effects. This specification, for instance, allows for differential trends for students with different age, gender, and pre-registration academic performance. This is potentially relevant if these characteristics vary across the exposure quintiles, and are correlated with the outcome. The results are detailed in Column 3 of the same table.

Across these tests, the estimates are similar to those from the benchmark specification and show a positive effect on labor earnings for the cohorts registering between 2013 and 2014.

5.8 Heterogeneity

Do these effects on wages for the 2013-14 cohorts vary by gender or academic ability? To answer this question, I use the following regression specification (Feigenberg et al., 2021):

$$y_{ipt} = \alpha + \kappa Q(IntlShare) * Post_{pt} + \zeta Q(IntlShare) * Post_{pt} * H_{ipt} + \phi H_{ipt} * Q(IntlShare)_p + \gamma H_{ipt} * D_t + \boldsymbol{\tau} \boldsymbol{X}_{ipt} + \boldsymbol{\sigma}_u + \boldsymbol{\mu}_p + \boldsymbol{\lambda}_t + \epsilon_{ipt}, \quad (5)$$

which follows the same structure as Equation (1) except that I interact one pre-determined characteristic (H_{ipt}) with the treatment variable ($Q(IntlShare) * Post_{pt}$), an indicator variable for the post-reform period (D_t), and $Q(IntlShare)_p$. I use the rest of the pre-determined characteristics as regular covariates (in vector $\boldsymbol{X}_{ict}$).

The interaction effect of interest is ζ, representing the differential impact of the treatment for individuals with a particular predetermined characteristic. The total effect on this sub-group is the sum of the baseline effect (κ) and this additional effect (ζ).

The results are reported in Table A.7, where I assess heterogeneity in the effect on earnings by gender (Column 1) and pre-registration test scores (Column 2). I find that the earning gains are higher for female students but the difference is not statistically significant. On the other hand, treated students with higher pre-registration test scores see significantly larger increases in mean wages ($p < 0.05$).

5.9 Master's Program as the Unit of Treatment

As mentioned earlier, I replicate the main analyses with the Master's program as the unit of treatment, taking a sample of 180 core programs that enroll students throughout the study period. Tables B.1 and B.2 present the summary statistics for these programs and the corresponding native registrants. Figures B.1-B.3 describe the dynamics in the size and ethnic composition of the registering cohorts before and after the reform. Table B.3 reports the ATT estimates of the reform on these outcomes, complemented by the event study plots in Figure B.4. Table B.4 looks at any selection effects for the natives registering after the reform. Finally, Table B.5 presents the impact estimates for the academic and labor market outcomes, with Figure B.5 plotting the corresponding event studies.

Overall, the results mirror those from using the faculty as the unit of treatment, with two notable exceptions.[29] First, there is no suggestive evidence of a higher number of natives registering in the programs with higher share of pre-reform international students

[29] The canonical DID using the exposure quintiles one (control) and three-five (treatment) yields similar conclusions. I report these results in Tables B.6-B.8.

(Columns 3-4, Table B.3). Instead, there is an increase in registration by students from the EU/EEA ($p < 0.10$; Columns 5-6, Table B.3). The magnitude, however, is small: approximately one more student in the fifth exposure quintile.[30]

Second, post-reform native registrants in the treated programs have higher pre-registration test scores (Columns 5-6, Table B.4). However, the gains in earnings (Columns 5-6, Table B.5) are unlikely to be completely driven by such *positive* selection as the estimating regressions control for these test scores.[31]

However, given the turnover in the offer of programs during this period and the supply-side response I observe in the treated faculties offering more programs, this subsample of programs and the corresponding students may not be representative of the underlying populations. Note, for instance, that the sample size of native students here is less than half of the main analysis sample. Hence, I warrant caution in the interpretation of these results, especially in comparing these findings with those in the main analytical approach.

6 Conclusion

This paper studies a Swedish reform in 2011 that introduced tuition fees for international students at universities who come from outside the EU/EEA. Focusing on the native students in the Master's programs, I present evidence on how this reform affects their enrollment and selection as well as their academic and labor market outcomes. I also investigate how faculties with a high pre-reform share of international students respond to the reform in terms of their program offerings.

For a causal evaluation of the reform, I use two variations in a difference-in-differences design: the timing of the reform and the differences in the pre-reform share of international students across the faculties, a proxy for the potential exposure of a faculty to the reform. Leveraging these two variations, I find that the reform leads to a significant and persistent change in the cohort size and composition for the exposed faculties. Their cohort size declines sharply, driven by a decrease in international students and partially mitigated by higher enrolment of natives.

Turning to the composition of the natives who register after the reform, I do not find any evidence of differential selection in terms of age, gender, or pre-registration academic

[30] Note, however, that the relative increase is over 40% from the pre-reform mean of 2.25 students. The pre-reform mean for the total cohort size is 25.

[31] The results are similar when I replicate this analysis in a canonical DID setup, with the first exposure quintile as the Control group and quintiles three to five as the Treatment group. The results are reported in Tables B.6-B.8.

performance. However, there might still be selection on unobservable characteristics that this analysis can not rule out.

Finally, I estimate the impact of the reform on the natives' academic and labor market outcomes. Findings on graduation and employment do not suggest any detectable effects. On the other hand, native students in treated faculties experience higher wages 4-5 years after registration. For the registering natives in 2013-14, those in the highest exposure quintile see their annual wages increase by over 8% compared to the pre-reform sample mean. These earning gains are higher for native students with higher pre-registration academic performance.

I also document a supply-side response. The treated faculties, who have a higher share of international students before the reform, increase the number of Master's programs they offer to all students after the reform.

Taken together, these results show how the reform affects multiple inputs in the education production function. Cohort size and composition undergo marked shifts, for instance. The faculties also change their offer of programs. The existing literature on the relationship between class size and student outcomes in higher education suggests that the potential decline in class size from the reform might be an important mechanism underlying the observed increase in the wages of native students.

In a period where many countries are actively pursuing policies related to the intake of international students, this paper offers insights into the potential effects of such policies on universities and native students. Future research can investigate similar policies implemented elsewhere, thereby building up a knowledge base that policymakers can draw from when deciding on higher education policies.

References

Anelli, Massimo, Kevin Shih, and Kevin Williams, "Foreign students in college and the supply of STEM graduates," *Journal of Labor Economics*, 2023, *41* (2), 511–563.

Antonio, Anthony Lising, Mitchell J Chang, Kenji Hakuta, David A Kenny, Shana Levin, and Jeffrey F Milem, "Effects of racial diversity on complex thinking in college students," *Psychological science*, 2004, *15* (8), 507–510.

Bandiera, Oriana, Valentino Larcinese, and Imran Rasul, "Heterogeneous class size effects: New evidence from a panel of university students," *The Economic Journal*, 2010, *120* (549), 1365–1398.

Beine, Michel, Giovanni Peri, and Morgan Raux, "International college students' impact on the US skilled labor supply," *Journal of Public Economics*, 2023, *223*, 104917.

_ , Marco Delogu, and Lionel Ragot, "The role of fees in foreign education: evidence from Italy," *Journal of Economic Geography*, 2020, *20* (2), 571–600.

Borjas, George J, "Do foreign students crowd out native students from graduate programs?," 2004.

Bound, John, Breno Braga, Gaurav Khanna, and Sarah Turner, "The globalization of postsecondary education: The role of international students in the US higher education system," *Journal of Economic Perspectives*, 2021, *35* (1), 163–184.

Bowman, Nicholas A, "College diversity experiences and cognitive development: A meta-analysis," *Review of Educational Research*, 2010, *80* (1), 4–33.

Bryntesson, André and Mikael Börjesson, "Internationella studenter i Sverige: Avgiftsreformens påverkan på inflödet av studenter," Technical Report, Delmi 2019.

Feigenberg, Benjamin, Ben Ost, and Javaeria A Qureshi, "Omitted variable bias in interacted models: A cautionary tale," *The Review of Economics and Statistics*, 2021, pp. 1–47.

Giorgi, Giacomo De, Michele Pellizzari, and William Gui Woolston, "Class size and class heterogeneity," *Journal of the European Economic Association*, 2012, *10* (4), 795–830.

Högskoleverket, Sverige., *Avgiftsreformen - lärosätenas första erfarenheter* Högskoleverkets rapportserie, Högskoleverket, 2011.

Kara, Elif, Mirco Tonin, and Michael Vlassopoulos, "Class size effects in higher education: Differences across STEM and non-STEM fields," *Economics of Education Review*, 2021, *82*, 102104.

Kim, Sie Won, "The effects of the OPT visa extension rule on STEM business programs in the US," *Applied Economics*, 2022, *54* (14), 1654–1671.

Nilsson, Per A and Lars Westin, "Ten years after. Reflections on the introduction of tuition fees for some international students in Swedish post-secondary education," *Education Inquiry*, 2022, pp. 1–21.

Zhu, Julia Li, "Comparative Immigration Policies and the Resource Effects of International Students in U.S. Higher Education," *Working Paper*, 2022.

Tables

Table 1: Summary statistics: Faculty characteristics

	Quintile 1	Q2	Q3	Q4	Q5	All
Pre-reform share of international students (%)	4.81	24.88	42.91	67.51	88.19	45.11
	(4.97)	(6.97)	(4.84)	(6.43)	(6.51)	(30.40)
Pre-reform share of native students (%)	87.91	58.45	43.59	19.56	8.16	44.02
	(11.20)	(12.97)	(9.92)	(8.84)	(5.17)	(30.24)
Pre-reform share of EU students (%)	5.94	12.67	10.90	11.35	3.29	8.88
	(8.06)	(5.93)	(6.23)	(6.10)	(2.86)	(6.93)
Mean annual no of registered students pre-2011	48.40	300.33	69.36	150.11	92.76	133.59
	(46.30)	(416.80)	(53.00)	(181.18)	(110.64)	(227.56)
Mean annual no of registered intl students pre-2011	3.91	79.58	28.55	104.69	83.76	60.21
	(5.72)	(122.80)	(20.62)	(134.25)	(103.25)	(99.49)
Change in the average no of intl students post-2011	-0.89	-46.88	-20.01	-69.96	-67.94	-41.06
	(3.21)	(75.86)	(15.32)	(81.87)	(84.49)	(67.08)
Change in the average share of intl students post-2011 (pp)	-1.19	-14.49	-31.35	-49.67	-44.21	-27.92
	(3.44)	(6.19)	(10.45)	(9.50)	(21.43)	(21.65)
Number of MS prorgams offered by the faculty	3.87	11.80	4.57	9.80	3.00	6.68
	(3.78)	(12.05)	(3.50)	(11.38)	(1.47)	(8.45)

Notes: This table presents the summary statistics for the 73 faculties in the analysis sample. The five quintiles are based on the distribution of the pre-reform share of international students across these faculties.

Table 2: Summary statistics: Student characteristics

	Quintile 1	Q2	Q3	Q4	Q5	All
Age at registration (years)	34.20	26.99	29.81	25.69	26.93	27.89
	(9.33)	(6.13)	(8.61)	(4.80)	(5.62)	(7.13)
Female	0.71	0.52	0.65	0.41	0.33	0.53
	(0.45)	(0.50)	(0.48)	(0.49)	(0.47)	(0.50)
Pre-registration test scores (High School/SAT/Grade-9)	0.42	0.73	0.51	0.74	0.34	0.66
	(0.88)	(0.85)	(0.84)	(0.84)	(0.76)	(0.85)
Graduated from the Master's program	0.21	0.54	0.33	0.52	0.28	0.47
	(0.41)	(0.50)	(0.47)	(0.50)	(0.45)	(0.50)
Employed 4-5 years after registration	0.96	0.96	0.96	0.96	0.96	0.96
	(0.20)	(0.19)	(0.18)	(0.19)	(0.19)	(0.19)
Mean annual earnings 4-5 years after registration ('000 SEK)	309.70	340.85	339.33	366.51	347.06	342.19
	(162.72)	(156.10)	(168.58)	(174.84)	(137.58)	(162.51)

Notes: This table presents the summary statistics for the 38,596 native students in the analysis sample. The five quintiles are based on the distribution of the pre-reform share of international students across the sample faculties summarized in Table 1. For instance, native students summarized here under Quintile 2 register in a program administered by a faculty corresponding to that Quintile.

Table 3: Effect on the size and composition of the student body

	Intl		Native		EU/EEA		All	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pre-Reform Intl Student Share X Post	-18.164***		5.150		-0.012		-12.732*	
	(5.591)		(6.536)		(0.847)		(7.043)	
Pre-Reform Intl Student Share X Cohorts 2011-12 X Post		-17.705***		4.636		0.139		-12.635*
		(5.583)		(5.910)		(0.667)		(6.342)
Pre-Reform Intl Student Share X Cohorts 2013-14 X Post		-18.611***		5.651		-0.159		-12.827
		(5.715)		(7.241)		(1.053)		(8.017)
Observations	494	494	494	494	494	494	494	494
Pre-reform mean	63.27	63.27	60.99	60.99	14.24	14.24	141.56	141.56

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with equation 3. The unit of observation is a faculty. Pre-Reform Intl Student Share represents the five quintiles I divide the faculties into based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are the number of registered students who are: international (columns 1 & 2); native (columns 3 & 4); or from the EU/EEA (columns 5 & 6). Results for the number of *all* registered students are reported in columns 7 & 8. Even-numbered columns, i.e., columns 2, 4, 6, and 8, report the cohort-stratified estimates. Standard errors are clustered by faculty and reported in parentheses.

Table 4: Effect on the selection of the native students

	Age (years)		Female		Pre-registration test scores	
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-Reform Intl Student Share X Post	-0.188		0.001		0.025	
	(0.160)		(0.008)		(0.032)	
Pre-Reform Intl Student Share X Cohorts 2011-12 X Post		-0.196		0.001		0.036
		(0.153)		(0.008)		(0.032)
Pre-Reform Intl Student Share X Cohorts 2013-14 X Post		-0.181		0.001		0.017
		(0.182)		(0.010)		(0.032)
Observations	38596	38596	38596	38596	38596	38596
Pre-reform mean	28.28	28.28	0.54	0.54	0.63	0.63

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with equation 1. The unit of observation is a native student. Pre-Reform Intl Student Share represents the five quintiles I divide the faculties into based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are: age at registration (in years; columns 1 & 2), female (%; columns 3 & 4), and pre-registration/high-school test scores (standardized; columns 5 & 6). Even-numbered columns, i.e., columns 2, 4, and 6 report the cohort-stratified estimates. Standard errors are clustered by faculty and reported in parentheses.

Table 5: Effect on the academic and labor market outcomes of natives

	Graduation		Employment		Wage ('000 SEK)	
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-Reform Intl Student Share X Post	-0.010		0.001		4.691*	
	(0.011)		(0.003)		(2.727)	
Pre-Reform Intl Student Share X Cohorts 2011-12 X Post		-0.014		-0.002		2.087
		(0.011)		(0.003)		(2.592)
Pre-Reform Intl Student Share X Cohorts 2013-14 X Post		-0.007		0.004		6.737**
		(0.013)		(0.003)		(3.085)
Observations	38596	38596	37218	37218	37218	37218
Pre-reform mean	0.47	0.47	0.96	0.96	319.52	319.52

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with equation 1. The unit of observation is a native student. Pre-Reform Intl Student Share represents the five quintiles I divide the faculties into based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are: graduation (%; columns 1 & 2), employment 4-5 years after registration (%; columns 3 & 4), and mean annual wage earnings 4-5 years after registration (in thousand SEK; columns 5 & 6). Even-numbered columns, i.e., columns 2, 4, and 6 report the cohort-stratified estimates. Standard errors are clustered by faculty and reported in parentheses.

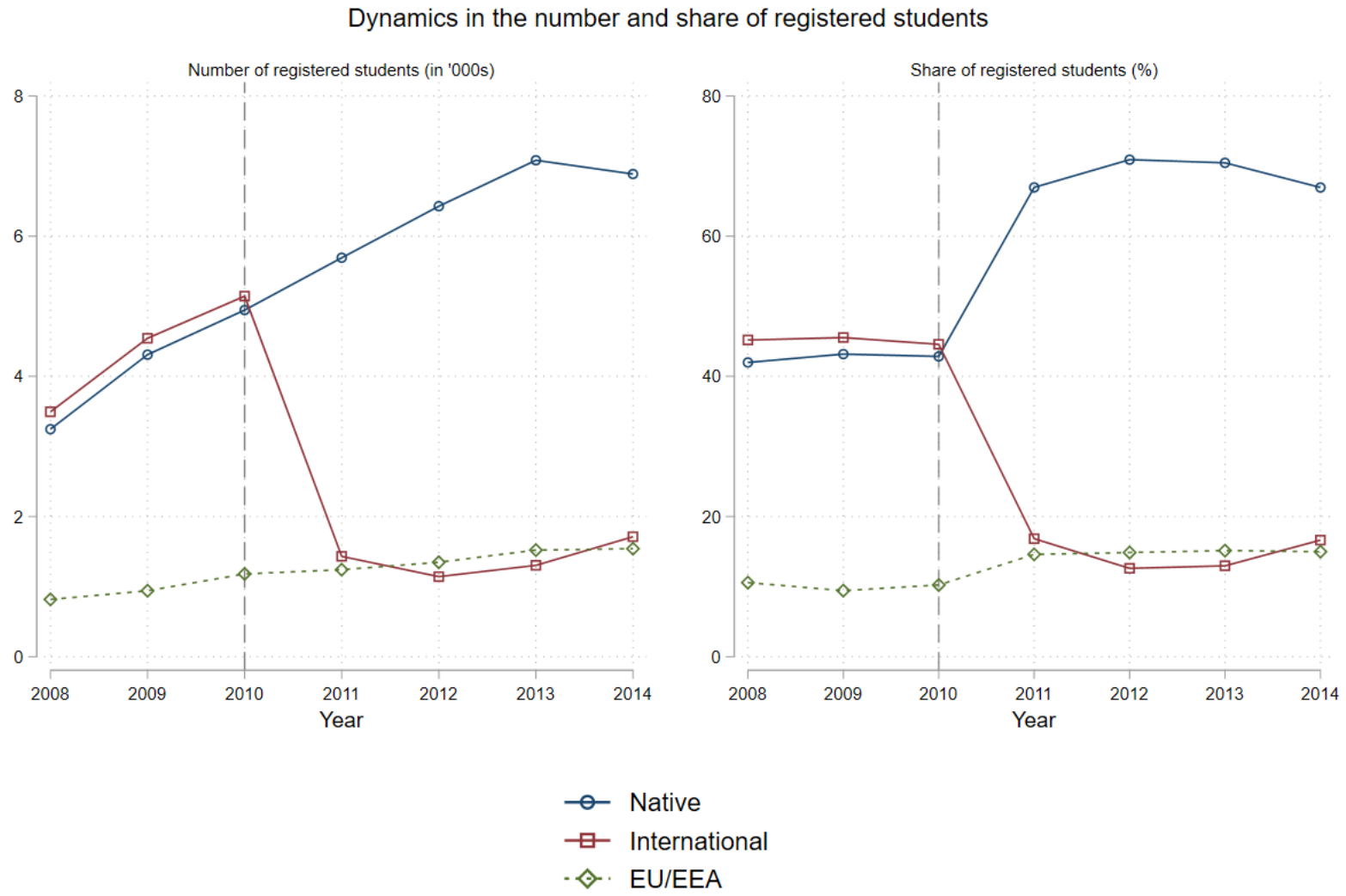
Table 6: Effect on the supply of programs offered by the faculties

	No of MS programs	
	(1)	(2)
Pre-Reform Intl Student Share X Post	0.352*	
	(0.207)	
Pre-Reform Intl Student Share X Cohorts 2011-12 X Post		0.387*
		(0.213)
Pre-Reform Intl Student Share X Cohorts 2013-14 X Post		0.317
		(0.210)
Observations	494	494
Pre-reform mean	5.72	5.72

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with equation 3. The unit of observation is a faculty. Pre-Reform Intl Student Share represents the five quintiles I divide the faculties into based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcome is the number of unique Master's programs offered by a faculty in a given year. Column 2 reports the cohort-stratified estimates. Standard errors are clustered by faculty and reported in parentheses.

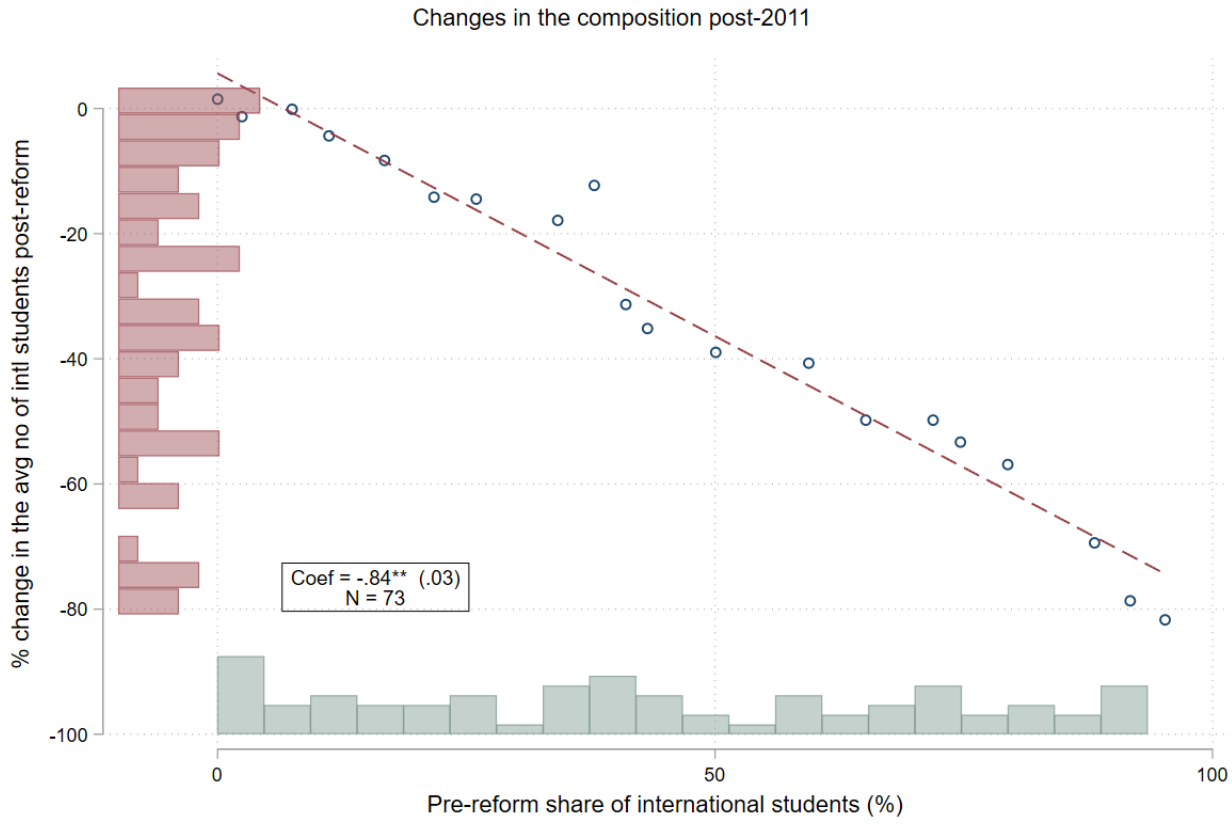
Figures

Figure 1: Dynamics in the volume and composition of registered students



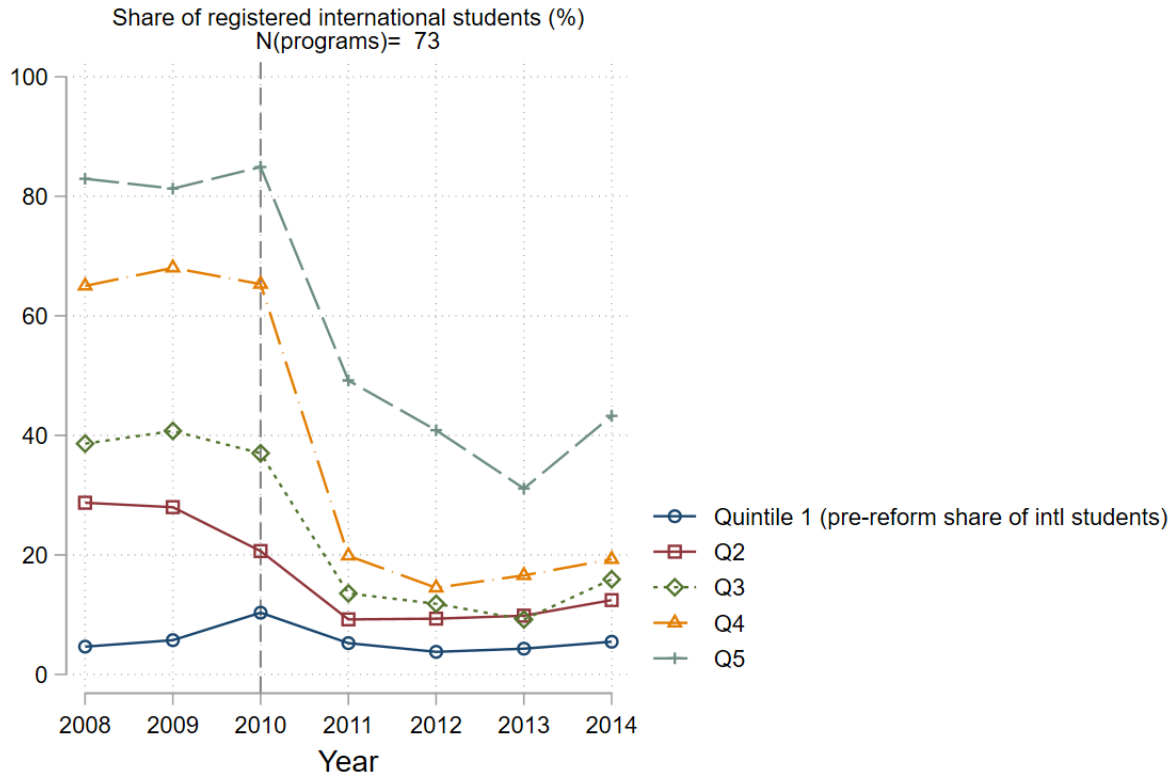
Notes: For the period 2008-2014, this figure reports the trends in the volume and share of registered students, stratified by country/region of origin: Sweden (native), EU/EEA, and non-EU/EEA (International). The tuition fee reform comes into effect in 2011.

Figure 2: Post-reform changes in the composition of registering cohorts across faculties with varying pre-reform share of international students



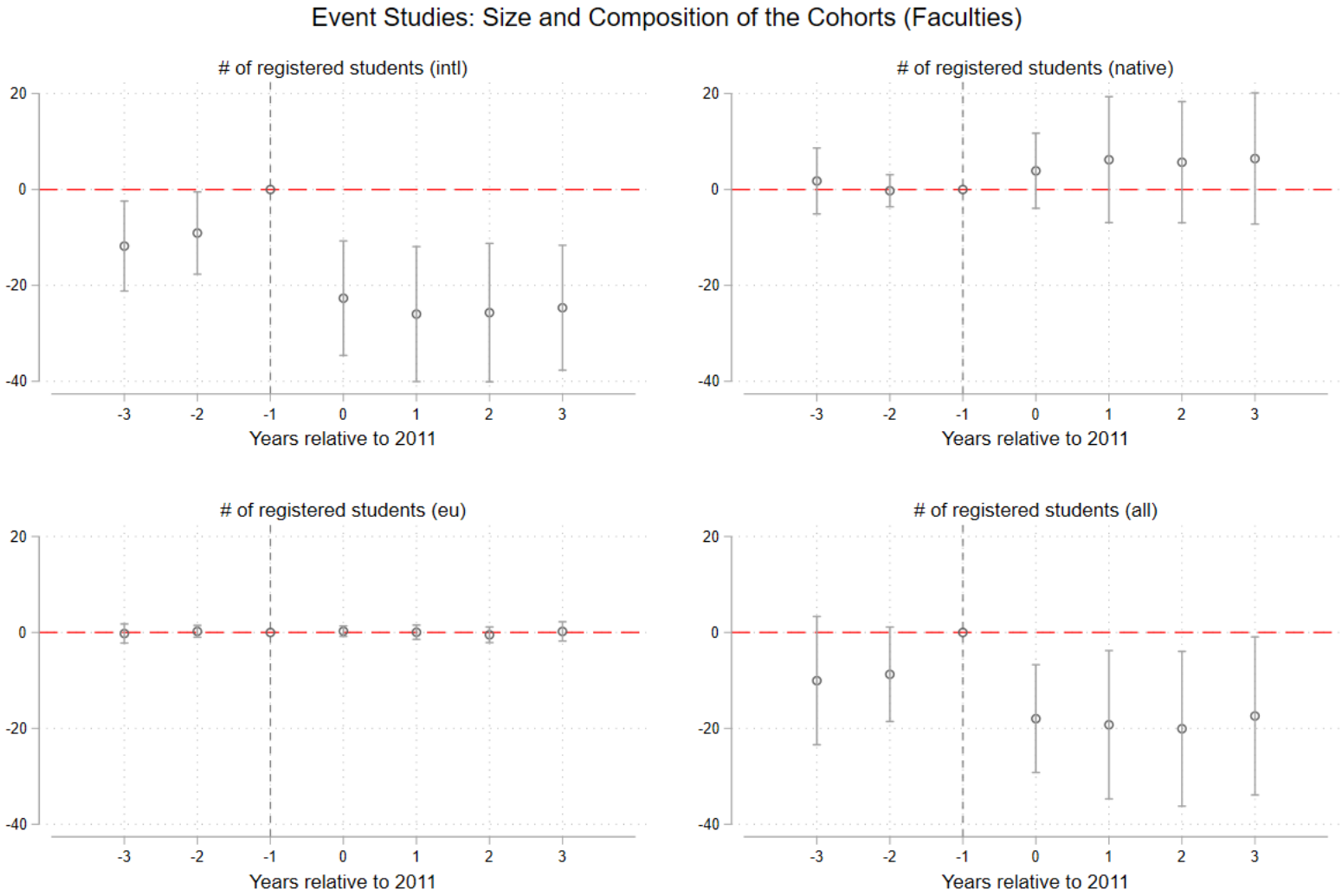
Notes: This figure plots the relative (%) change in the average number of international students registering each year after the reform across the distribution of faculties with varying pre-reform shares of international students. The tuition fee reform comes into effect in 2011.

Figure 3: Dynamics in the share of registered international students across faculties



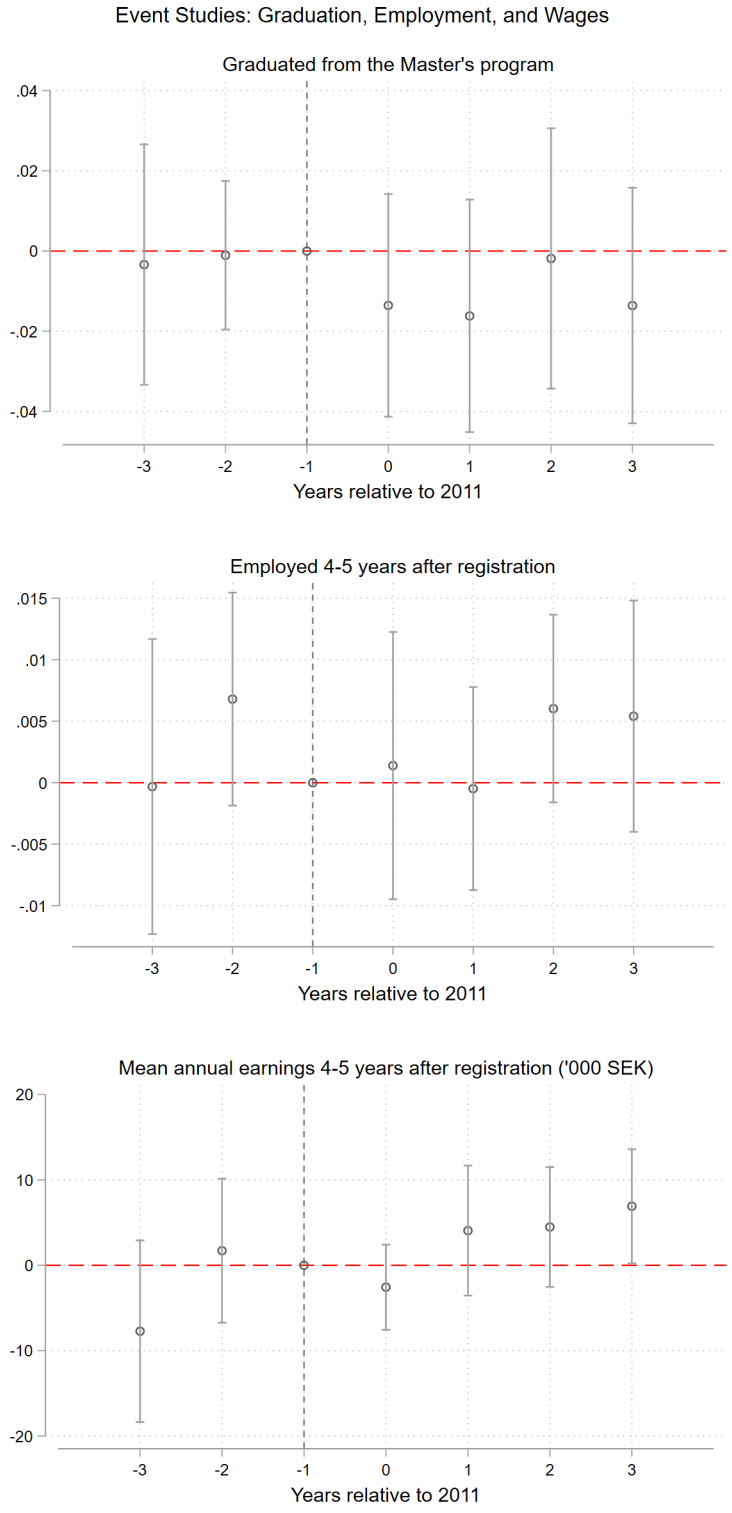
Notes: This figure plots the annual shares of international students over the study period for the five quintiles of faculties. These quintiles are based on the distribution of the pre-reform share of international students across the 73 faculties in the analysis sample. The tuition fee reform comes into effect in 2011.

Figure 4: Effect on the size and composition of the student body: Event study



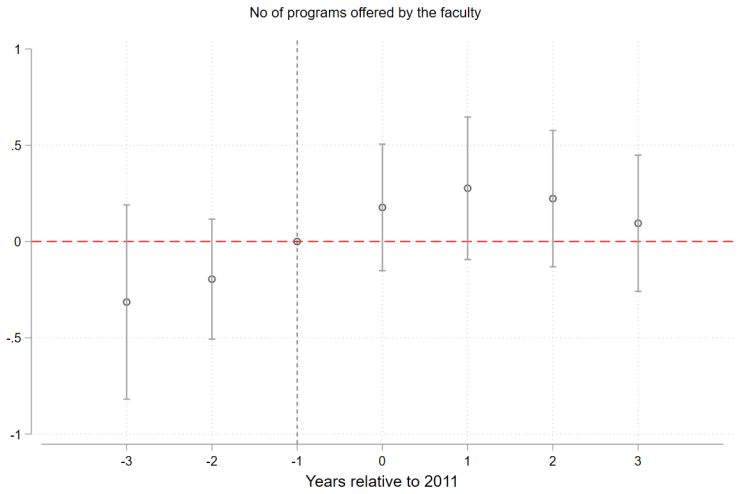
Notes: This figure reports the event-study estimates of the effect of the reform estimated with equation 4 and corresponds to results presented in Table 3. The unit of observation is a faculty. Outcomes are numbers of registered students of different origins and are reported as titles in every panel. Year 0 is 2011 when the reform comes into effect. Year t = -1 i.e., 2010, is the omitted group. For example, the coefficient estimate for Year t = +2 represents the ATT estimate for the treated/exposed faculties in 2013. 95% percent confidence intervals are displayed around each point estimate. Standard errors are clustered by faculty. The sample comprises 73 such faculties. The pretest p-values are 0.04 (intl), 0.81 (native), 0.67 (eu), and 0.19 (all). These p-values correspond to the joint significance test for leads in the event-study equation 4.

Figure 5: Effect on the natives' academic and labor market outcomes: Event study



Notes: This figure reports the event-study estimates of the effect of the reform estimated with equation 2 and corresponds to results presented in Table 5. The unit of observation is a native student. Outcomes are reported as titles in every panel. Year 0 is 2011 when the reform comes into effect. Year t = -1 i.e., 2010, is the omitted group. For example, the coefficient estimate for Year t = +2 represents the ATT estimate for the natives registered in the treated/exposed faculties in 2013. 95% percent confidence intervals are displayed around each point estimate. Standard errors are clustered by faculty. The sample comprises 73 such faculties. The pretest p-values are 0.97, 0.20, and 0.17, respectively. These p-values correspond to the joint significance test for leads in the event-study equation 2.

Figure 6: Effect on the number of Master's programs offered by faculties: Event study



Notes: This figure reports the event-study estimates of the effect of the reform estimated with equation 4 and corresponds to results presented in Table 6. The unit of observation is a faculty. Outcome is the number of unique Master's programs offered by a faculty in a given year. Year 0 is 2011 when the reform comes into effect. Year t = -1 i.e., 2010, is the omitted group. For example, the coefficient estimate for Year t = +2 represents the ATT estimate for the treated/exposed faculties in 2013. 95% percent confidence intervals are displayed around each point estimate. Standard errors are clustered by faculty. The sample comprises 73 such faculties. The pretest p-value is 0.40. This p-value corresponds to the joint significance test for leads in the event-study equation 4.

Appendix

A Additional Exhibits for the Analysis using Faculties **30**

B Analysis using Master's Programs: Tables and Figures **36**

A Additional Exhibits for the Analysis using Faculties

Table A.1: Effect on the academic and labor market outcomes of natives: Quintile-specific Estimates

	Graduation	Employment	Wage ('000 SEK)')
	(1)	(2)	(3)
Pre-Reform Intl Student Share: Quintile 2 X Post	-0.006	-0.000	8.224
	(0.032)	(0.006)	(8.147)
Pre-Reform Intl Student Share: Quintile 3 X Post	0.013	0.003	17.862
	(0.029)	(0.009)	(12.766)
Pre-Reform Intl Student Share: Quintile 4 X Post	-0.053	0.002	13.262
	(0.037)	(0.010)	(9.822)
Pre-Reform Intl Student Share: Quintile 5 X Post	0.010	0.006	19.630
	(0.041)	(0.010)	(13.661)
Observations	38596	37218	37218
Pre-reform mean	0.47	0.96	319.52

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The unit of observation is a native student. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with a modified version of equation 1, with interacting the post-reform-period dummy with indicators representing the different quintiles of exposure. I divide the faculties into five quintiles based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are: graduation (%; column 1), employment 4-5 years after registration (%; column 2), and mean annual wage earnings 4-5 years after registration (in thousand SEK; column 3). Standard errors are clustered by faculty and reported in parentheses.

Table A.2: Effect on the natives: Wages 2-5 years after registration

	Wage (i) years after registration ('000 SEK)			
	(2)	(3)	(4)	(5)
Pre-Reform Intl Student Share X Cohorts 2011-12 X Post	-0.636	1.539	1.540	2.528
	(3.521)	(2.988)	(2.527)	(2.804)
Pre-Reform Intl Student Share X Cohorts 2013-14 X Post	1.850	5.814*	6.421*	6.749**
	(3.370)	(3.403)	(3.265)	(2.931)
Observations	37722	37319	37056	36888
Pre-reform mean	183.37	273.65	310.91	330.73

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with equation 1. The unit of observation is a native student. Pre-Reform Intl Student Share represents the five quintiles I divide the faculties into based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcome in a column titled (i) is an individual's annual wage i-years after registration, where $i \in [2, 5]$. Standard errors are clustered by faculty and reported in parentheses.

Table A.3: Effect on the natives: Residency in Sweden 2-5 years after registration

	Resident (i) years after registration			
	(2)	(3)	(4)	(5)
Pre-Reform Intl Student Share X Cohorts 2011-12 X Post	0.002	0.005	0.005	0.001
	(0.003)	(0.003)	(0.004)	(0.004)
Pre-Reform Intl Student Share X Cohorts 2013-14 X Post	0.003	0.004	0.005	0.002
	(0.003)	(0.003)	(0.004)	(0.004)
Observations	38596	38596	38596	38596
Pre-reform mean	0.97	0.96	0.96	0.95

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with equation 1. The unit of observation is a native student. Pre-Reform Intl Student Share represents the five quintiles I divide the faculties into based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcome in a column titled (i) is an indicator variable representing whether an individual resides in Sweden i-years after registration, where $i \in [2, 5]$. Standard errors are clustered by faculty and reported in parentheses.

Table A.4: Effect on the size and composition of the student body: Binary treatment DID

	Intl		Native		EU/EEA		All	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat X Post	-55.741***		28.974		3.028		-23.886	
	(11.825)		(19.525)		(2.389)		(17.045)	
Treat X Cohorts 2011-12 X Post		-56.138***		25.892		2.739		-27.611*
		(12.193)		(17.418)		(1.801)		(14.002)
Treat X Cohorts 2013-14 X Post		-55.345***		32.051		3.316		-20.164
		(11.739)		(21.779)		(3.103)		(20.577)
Observations	389	389	389	389	389	389	389	389
Pre-reform mean	58.68	58.68	28.39	28.39	8.23	8.23	96.91	96.91

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with a modified version of equation 3, with interacting the post-reform-period dummy with an indicator Treat, which is 1 for exposure Quintiles 3-5 (Treatment) and 0 for Quintile 1 (Control). The unit of observation is a faculty. I divide the faculties into five quintiles based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are the number of registered students who are: international (columns 1 & 2); native (columns 3 & 4); or from the EU/EEA (columns 5 & 6). Results for the number of *all* registered students are reported in columns 7 & 8. Even-numbered columns, i.e., columns 2, 4, 6, and 8, report the cohort-stratified estimates. Standard errors are clustered by faculty and reported in parentheses.

Table A.5: Effect on the selection of the native students: Binary treatment DID

	Age (years)		Female		Pre-registration test scores	
	(1)	(2)	(3)	(4)	(5)	(6)
Treat X Post	-0.643		-0.000		0.069	
	(0.559)		(0.021)		(0.071)	
Treat X Cohorts 2011-12 X Post		-0.615		0.002		0.107
		(0.510)		(0.020)		(0.072)
Treat X Cohorts 2013-14 X Post		-0.666		-0.003		0.038
		(0.686)		(0.025)		(0.074)
Observations	17234	17234	17234	17234	17234	17234
Pre-reform mean	30.70	30.70	0.61	0.61	0.45	0.45

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with a modified version of equation 1, with interacting the post-reform-period dummy with an indicator Treat, which is 1 for exposure Quintiles 3-5 (Treatment) and 0 for Quintile 1 (Control). The unit of observation is a native student. I divide the faculties into five quintiles based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are: age at registration (in years; columns 1 & 2), female (%; columns 3 & 4), and pre-registration/high-school test scores (standardized; columns 5 & 6). Even-numbered columns, i.e., columns 2, 4, and 6 report the cohort-stratified estimates. Standard errors are clustered by faculty and reported in parentheses.

Table A.6: Effect on the academic and labor market outcomes of natives: Binary treatment DID

	Graduation		Employment		Wage ('000 SEK)	
	(1)	(2)	(3)	(4)	(5)	(6)
Treat X Post	-0.017		0.002		15.369*	
	(0.030)		(0.007)		(8.699)	
Treat X Cohorts 2011-12 X Post		-0.016		-0.010		9.178
		(0.027)		(0.007)		(7.756)
Treat X Cohorts 2013-14 X Post		-0.018		0.013		20.568*
		(0.036)		(0.010)		(11.151)
Observations	17234	17234	16638	16638	16638	16638
Pre-reform mean	0.32	0.32	0.95	0.95	306.90	306.90

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with a modified version of equation 1, with interacting the post-reform-period dummy with an indicator Treat, which is 1 for exposure Quintiles 3-5 (Treatment) and 0 for Quintile 1 (Control). The unit of observation is a native student. I divide the faculties into five quintiles based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are: graduation (%; columns 1 & 2), employment 4-5 years after registration (%; columns 3 & 4), and mean annual wage earnings 4-5 years after registration (in thousand SEK; columns 5 & 6). Even-numbered columns, i.e., columns 2, 4, and 6 report the cohort-stratified estimates. Standard errors are clustered by faculty and reported in parentheses.

Table A.7: Effect on the wages of native students registering in 2013-14: Heterogeneity

	Wage ('000 SEK)	
	(1)	(2)
Pre-Reform Intl Student Share X Post	4.685	3.394
	(4.334)	(3.929)
Pre-Reform Intl Student Share X Post X Female	2.246	
	(4.422)	
Pre-Reform Intl Student Share X Post X Pre-registration test scores		5.258**
		(2.528)
Observations	25560	25560
Pre-reform mean	319.52	319.52

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports the heterogeneous ATT estimates of the effect of the reform, estimated with equation 5. The sample includes the cohorts that register between 2008-10 or between 2013-14. The unit of observation is a native student. Pre-Reform Intl Student Share represents the five quintiles I divide the faculties into based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in 2013-14. The reform comes into effect in 2011. Female is an indicator variable representing whether the student is female. Pre-registration test score represents the student's high-school GPA. Outcome is the mean annual wage earnings 4-5 years after registration (in thousand SEK). Standard errors are clustered by faculty and reported in parentheses.

Table A.8: Effect on the wages of native students registering in 2013-14: Robustness

	Without Controls	University X Year FEs	Control X Year FEs
	(1)	(2)	(3)
Pre-Reform Intl Student Share X Cohorts 2011-12 X Post	2.064	4.556	1.575
	(2.509)	(2.966)	(2.772)
Pre-Reform Intl Student Share X Cohorts 2013-14 X Post	6.029*	8.145*	5.787*
	(3.228)	(4.213)	(3.156)
Observations	37218	37217	37218
Pre-reform mean	319.52	319.52	319.52

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with equation 1. The unit of observation is a native student. Pre-Reform Intl Student Share represents the five quintiles I divide the faculties into based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcome is the mean annual wage earnings 4-5 years after registration (in thousand SEK). Estimates are analogous to those reported in column 6 in Table 5, with the following modifications. Column 1 excludes all controls. Column 2 augments the benchmark model by adding University*Year-of-registration fixed effects. Finally, column 3 augments the benchmark model by adding interactions between year fixed effects and each of the controls. Standard errors are clustered by faculty and reported in parentheses.

B Analysis using Master's Programs: Tables and Figures

Table B.1: Summary Statistics: Master's Program Characteristics

	Quintile 1	Q2	Q3	Q4	Q5	All
Pre-reform share of international students (%)	1.05	14.74	36.07	59.03	84.88	39.16
	(1.73)	(4.42)	(6.88)	(8.33)	(7.67)	(30.86)
Pre-reform share of native students (%)	94.12	71.36	44.95	22.70	7.24	48.07
	(8.68)	(15.81)	(17.57)	(11.39)	(5.24)	(34.01)
Pre-reform share of EU students (%)	4.25	11.82	13.20	14.72	6.88	10.17
	(6.17)	(12.52)	(10.26)	(9.17)	(5.30)	(9.82)
Mean annual no of registered students pre-2011	23.92	32.16	24.42	16.31	24.05	24.17
	(19.72)	(24.69)	(15.51)	(10.50)	(13.00)	(17.95)
Mean annual no of registered intl students pre-2011	0.32	4.50	8.56	9.78	20.79	8.79
	(0.61)	(2.82)	(5.03)	(6.60)	(12.01)	(9.52)
Change in the average no of intl students post-2011	0.11	-1.49	-5.52	-6.38	-16.15	-5.89
	(0.74)	(2.16)	(4.47)	(5.16)	(10.87)	(8.10)
Change in the average share of intl students post-2011 (pp)	1.23	-6.99	-18.99	-30.91	-39.90	-19.11
	(3.99)	(5.82)	(13.71)	(19.22)	(18.28)	(20.29)

Notes: This table presents the summary statistics for the 180 Master's programs in the analysis sample. The five quintiles are based on the distribution of the pre-reform share of international students across these programs.

Table B.2: Summary statistics: Student characteristics

	Quintile 1	Q2	Q3	Q4	Q5	All
Age at registration (years)	30.77	25.38	25.78	26.22	26.37	27.31
	(8.41)	(4.27)	(4.53)	(5.21)	(5.44)	(6.54)
Female	0.69	0.41	0.41	0.41	0.33	0.50
	(0.46)	(0.49)	(0.49)	(0.49)	(0.47)	(0.50)
Pre-registration test scores (High School/SAT/Grade-9)	0.47	0.89	0.75	0.71	0.56	0.70
	(0.87)	(0.82)	(0.82)	(0.83)	(0.82)	(0.86)
Graduated from the Master's program	0.34	0.61	0.61	0.59	0.51	0.52
	(0.48)	(0.49)	(0.49)	(0.49)	(0.50)	(0.50)
Employed 4-5 years after registration	0.97	0.96	0.96	0.95	0.95	0.96
	(0.17)	(0.19)	(0.20)	(0.23)	(0.21)	(0.19)
Mean annual earnings 4-5 years after registration ('000 SEK)	314.42	361.21	343.25	326.65	354.82	339.74
	(144.77)	(163.28)	(160.54)	(165.92)	(152.44)	(158.00)

Notes: This table presents the summary statistics for the 18,639 native students in the analysis sample. The five quintiles are based on the distribution of the pre-reform share of international students across the sample of Master's programs summarized in Table B.1. For instance, native students summarized here under Quintile 2 register in a Master's program corresponding to that Quintile.

Table B.3: Effect on the size and composition of the student body

	Intl		Native		EU/EEA		All	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pre-Reform Intl Student Share X Post	-3.729***		-0.207		0.234*		-3.706***	
	(0.353)		(0.462)		(0.130)		(0.639)	
Pre-Reform Intl Student Share X Cohorts 2011-12 X Post		-3.798***		-0.133		0.224*		-3.728***
		(0.369)		(0.525)		(0.122)		(0.679)
Pre-Reform Intl Student Share X Cohorts 2013-14 X Post		-3.664***		-0.277		0.244		-3.685***
		(0.355)		(0.500)		(0.158)		(0.694)
Observations	1153	1153	1153	1153	1153	1153	1153	1153
Pre-reform mean	8.21	8.21	14.29	14.29	2.25	2.25	25.29	25.29

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with equation 3. The unit of observation is a Master's program. I divide the Master's programs into five quintiles based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 1.1, 14.7, 36.1, 59, and 84.9. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are the number of registered students who are: international (columns 1 & 2); native (columns 3 & 4); or from the EU/EEA (columns 5 & 6). Results for the number of *all* registered students are reported in columns 7 & 8. Even-numbered columns, i.e., columns 2, 4, 6, and 8, report the cohort-stratified estimates. Standard errors are clustered by program and reported in parentheses.

Table B.4: Effect on the selection of the native students

	Age (years)		Female		Pre-registration test scores	
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-Reform Intl Student Share X Post	-0.165		-0.001		0.044***	
	(0.121)		(0.006)		(0.014)	
Pre-Reform Intl Student Share X Cohorts 2011-12 X Post		-0.059		-0.007		0.032**
		(0.143)		(0.008)		(0.016)
Pre-Reform Intl Student Share X Cohorts 2013-14 X Post		-0.263*		0.004		0.054***
		(0.136)		(0.008)		(0.014)
Observations	18637	18637	18637	18637	18637	18637
Pre-reform mean	27.59	27.59	0.50	0.50	0.68	0.68

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with equation 1. The unit of observation is a native student. Pre-Reform Intl Student Share represents the five quintiles I divide the Master's programs into based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 1.1, 14.7, 36.1, 59, and 84.9. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are: age at registration (in years; columns 1 & 2), female (%; columns 3 & 4), and pre-registration/high-school test scores (standardized; columns 5 & 6). Even-numbered columns, i.e., columns 2, 4, and 6, report the cohort-stratified estimates. Standard errors are clustered by program and reported in parentheses.

Table B.5: Effect on the academic and labor market outcomes of natives

	Graduation		Employment		Wage ('000 SEK)	
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-Reform Intl Student Share X Post	-0.004		0.001		5.863**	
	(0.009)		(0.003)		(2.313)	
Pre-Reform Intl Student Share X Cohorts 2011-12 X Post		-0.000		-0.004		2.613
		(0.009)		(0.004)		(2.630)
Pre-Reform Intl Student Share X Cohorts 2013-14 X Post		-0.007		0.005		8.812***
		(0.011)		(0.003)		(2.638)
Observations	18637	18637	17946	17946	17946	17946
Pre-reform mean	0.53	0.53	0.96	0.96	324.99	324.99

Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with equation 1. The unit of observation is a native student. Pre-Reform Intl Student Share represents the five quintiles I divide the Master's programs into based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 1.1, 14.7, 36.1, 59, and 84.9. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are: graduation (%; columns 1 & 2), employment 4-5 years after registration (%; columns 3 & 4), and mean annual wage earnings 4-5 years after registration (in thousand SEK; columns 5 & 6). Even-numbered columns, i.e., columns 2, 4, and 6, report the cohort-stratified estimates. Standard errors are clustered by program and reported in parentheses.

Table B.6: Effect on the size and composition of the student body: Binary treatment DID

	Intl		Native		EU/EEA		All	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat X Post	-9.084***		0.013		0.824**		-8.531***	
	(0.798)		(1.662)		(0.366)		(1.871)	
Treat X Cohorts 2011-12 X Post		-9.306***		-0.353		0.582		-9.365***
		(0.834)		(1.980)		(0.368)		(2.177)
Treat X Cohorts 2013-14 X Post		-8.864***		0.376		1.062**		-7.706***
		(0.800)		(1.804)		(0.413)		(2.005)
Observations	902	902	902	902	902	902	902	902
Pre-reform mean	9.25	9.25	11.33	11.33	2.08	2.08	23.20	23.20

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with a modified version of equation 3, with interacting the post-reform-period dummy with an indicator Treat, which is 1 for exposure Quintiles 3-5 (Treatment) and 0 for Quintile 1 (Control). The unit of observation is a Master's program. I divide these programs into five quintiles based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are the number of registered students who are: international (columns 1 & 2); native (columns 3 & 4); or from the EU/EEA (columns 5 & 6). Results for the number of *all* registered students are reported in columns 7 & 8. Even-numbered columns, i.e., columns 2, 4, 6, and 8, report the cohort-stratified estimates. Standard errors are clustered by program and reported in parentheses.

Table B.7: Effect on the selection of the native students: Binary treatment DID

	Age (years)		Female		Pre-registration test scores	
	(1)	(2)	(3)	(4)	(5)	(6)
Treat X Post	-0.388		-0.001		0.104***	
	(0.317)		(0.017)		(0.035)	
Treat X Cohorts 2011-12 X Post		-0.072		-0.017		0.071*
		(0.394)		(0.022)		(0.040)
Treat X Cohorts 2013-14 X Post		-0.686*		0.014		0.136***
		(0.387)		(0.021)		(0.039)
Observations	11422	11422	11422	11422	11422	11422
Pre-reform mean	28.81	28.81	0.57	0.57	0.56	0.56

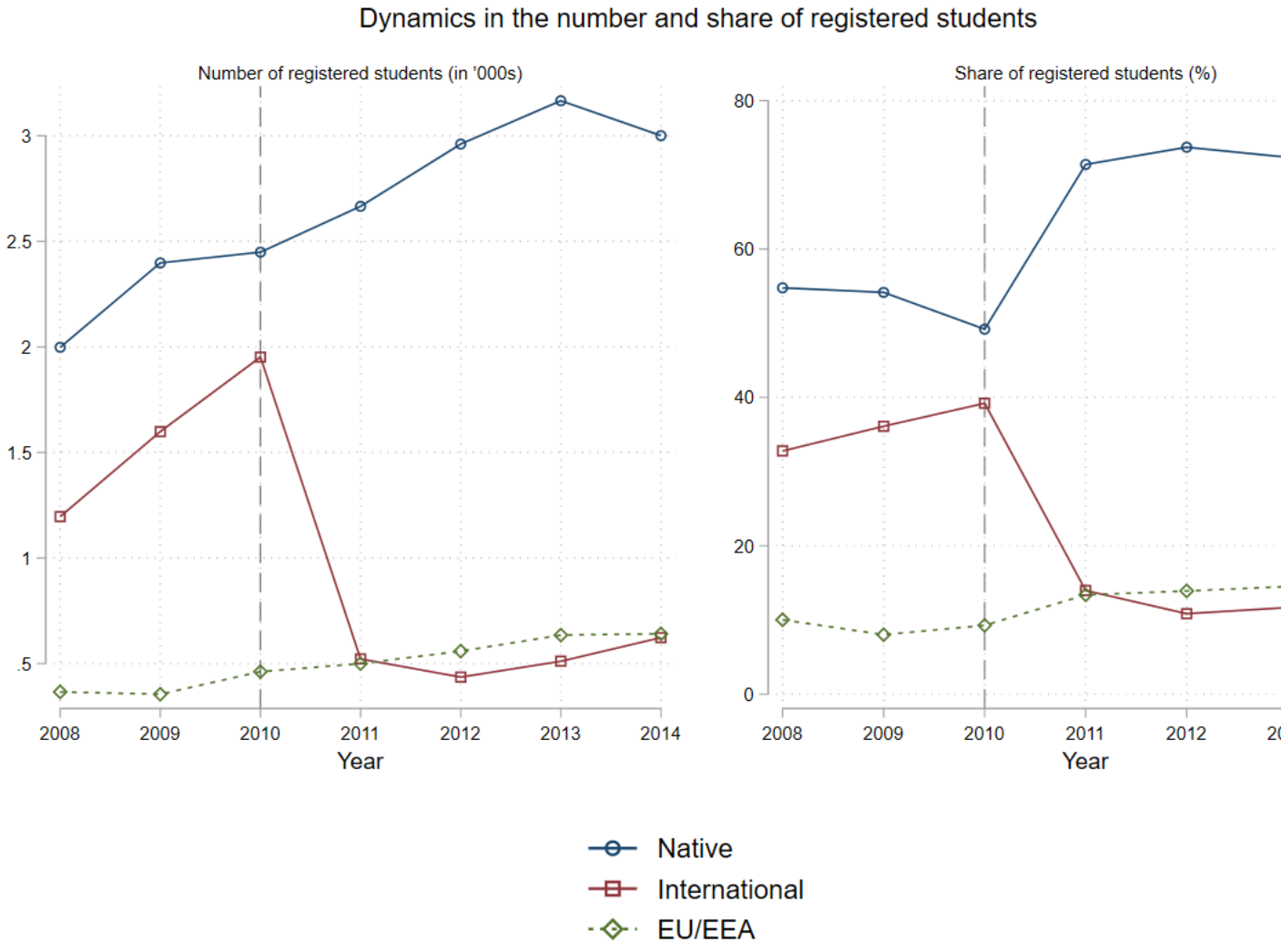
Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with a modified version of equation 1, with interacting the post-reform-period dummy with an indicator Treat, which is 1 for exposure Quintiles 3-5 (Treatment) and 0 for Quintile 1 (Control). The unit of observation is a native student. I divide the Master's programs into five quintiles based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are: age at registration (in years; columns 1 & 2), female (%; columns 3 & 4), and pre-registration/high-school test scores (standardized; columns 5 & 6). Even-numbered columns, i.e., columns 2, 4, and 6 report the cohort-stratified estimates. Standard errors are clustered by program and reported in parentheses.

Table B.8: Effect on the academic and labor market outcomes of natives: Binary treatment DID

	Graduation		Employment		Wage ('000 SEK)	
	(1)	(2)	(3)	(4)	(5)	(6)
Treat X Post	-0.025		0.005		17.950***	
	(0.024)		(0.008)		(5.972)	
Treat X Cohorts 2011-12 X Post		-0.010		-0.006		10.940
		(0.024)		(0.009)		(6.933)
Treat X Cohorts 2013-14 X Post		-0.038		0.015*		24.518***
		(0.030)		(0.009)		(7.105)
Observations	11422	11422	11024	11024	11024	11024
Pre-reform mean	0.46	0.46	0.96	0.96	309.82	309.82

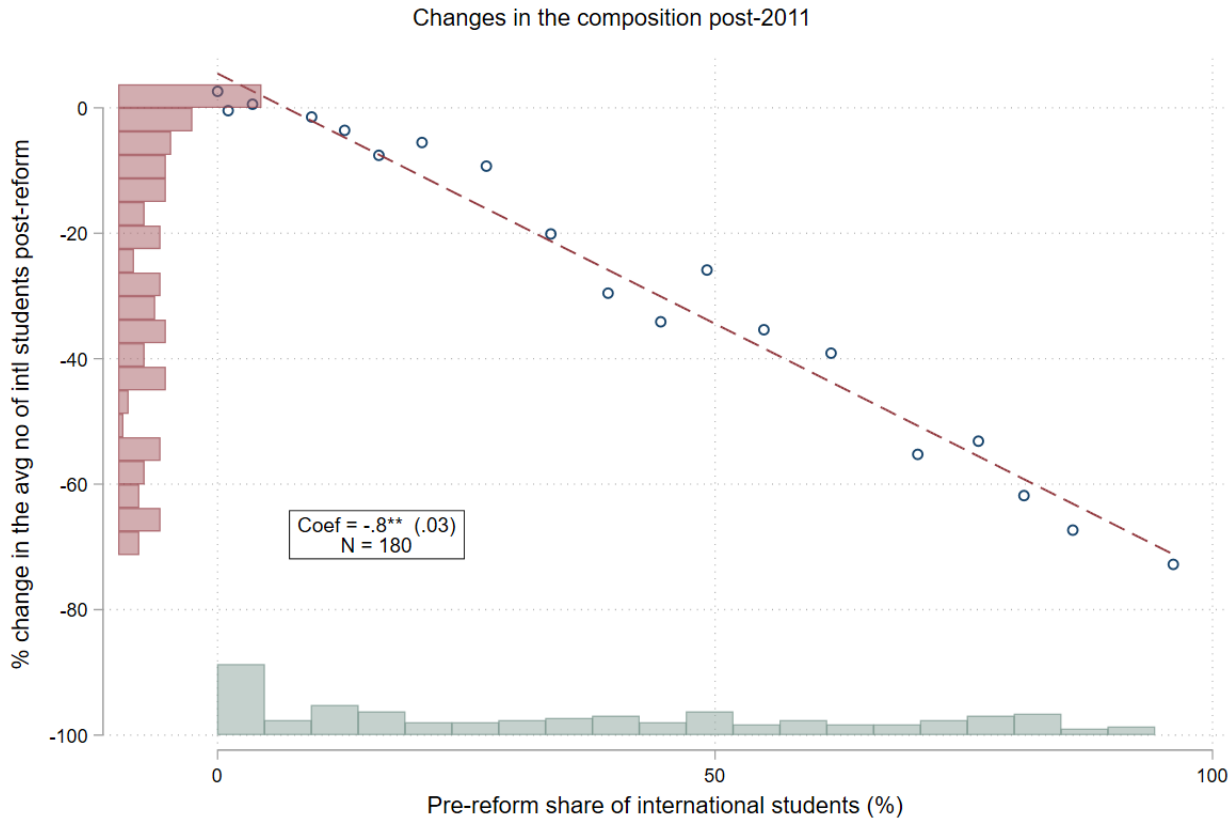
Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Using a DID design, this table reports ATT estimates of the effect of the reform, estimated with a modified version of equation 1, with interacting the post-reform-period dummy with an indicator Treat, which is 1 for exposure Quintiles 3-5 (Treatment) and 0 for Quintile 1 (Control). The unit of observation is a native student. I divide the Master's programs into five quintiles based on their pre-reform share of international students (%). These shares for the five quintiles, in ascending order, are: 4.8, 24.9, 42.9, 67.5, and 88.2. Post is an indicator variable for the cohorts registering in or after the first year of the reform, namely 2011. Outcomes are: graduation (%; columns 1 & 2), employment 4-5 years after registration (%; columns 3 & 4), and mean annual wage earnings 4-5 years after registration (in thousand SEK; columns 5 & 6). Even-numbered columns, i.e., columns 2, 4, and 6 report the cohort-stratified estimates. Standard errors are clustered by program and reported in parentheses.

Figure B.1: Dynamics in the volume and composition of registered students (Master's program sample)



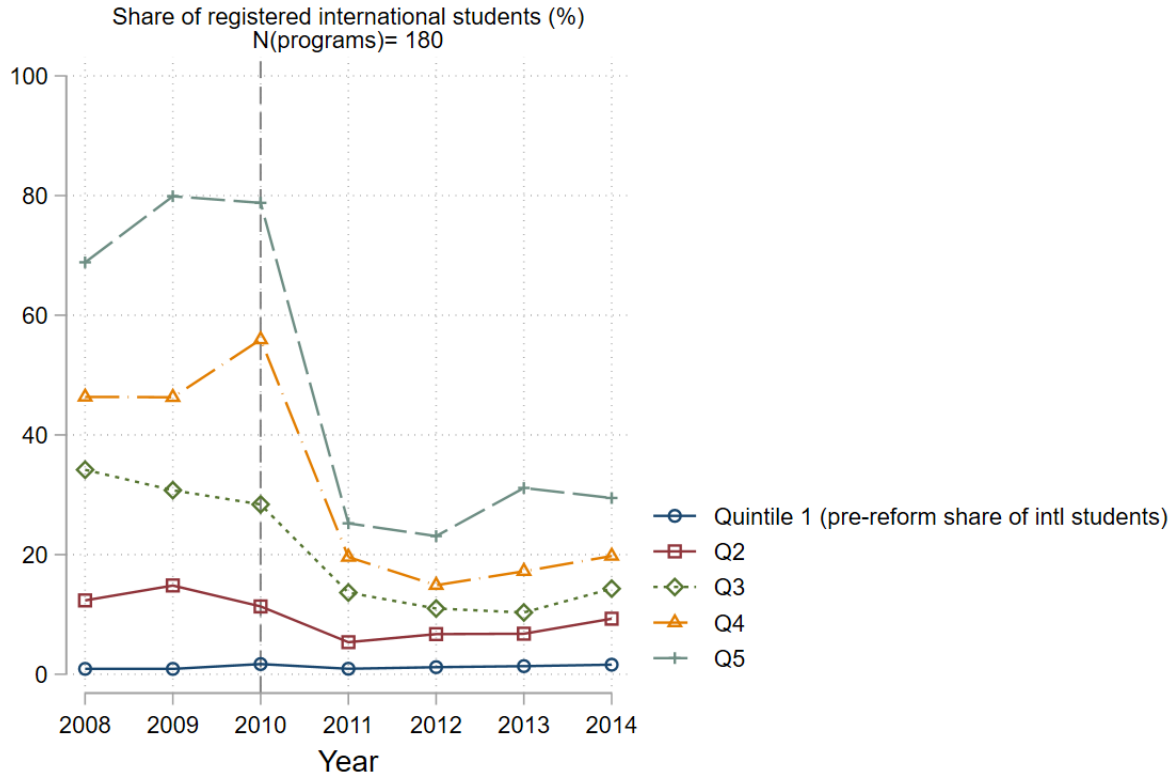
Notes: For the period 2008-2014, this figure reports the trends in the volume and share of registered students, stratified by country/region of origin: Sweden (native), EU/EEA, and non-EU/EEA (International). The estimates are from the 180 Master's programs in the analysis sample. The tuition fee reform comes into effect in 2011.

Figure B.2: Post-reform changes in the composition of registering cohorts across Master's programs with varying pre-reform share of international students



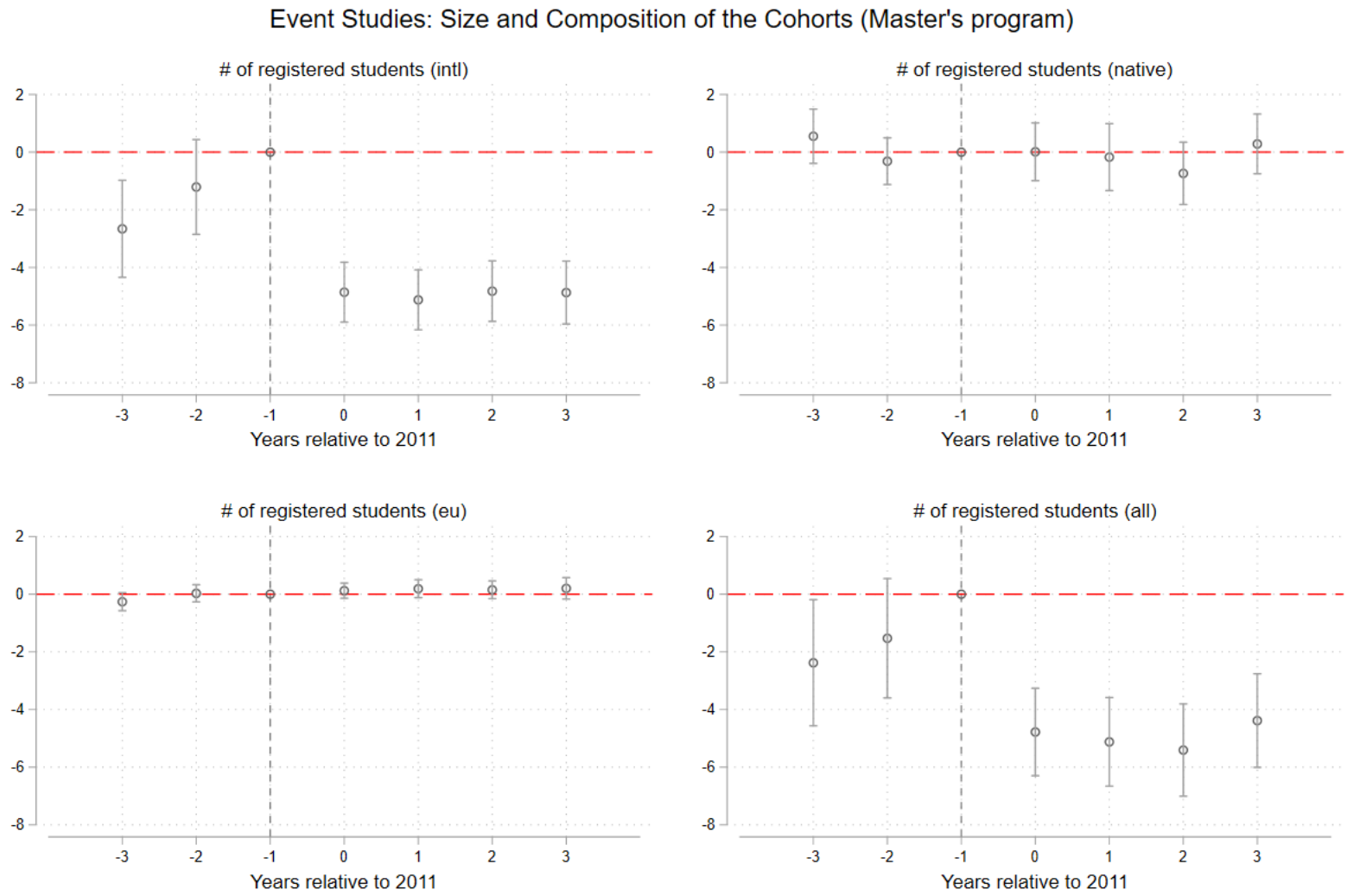
Notes: This figure plots the relative (%) change in the average number of international students registering each year after the reform across the distribution of Master's programs with varying pre-reform shares of international students. The tuition fee reform comes into effect in 2011.

Figure B.3: Dynamics in the share of registered international students across Master's programs



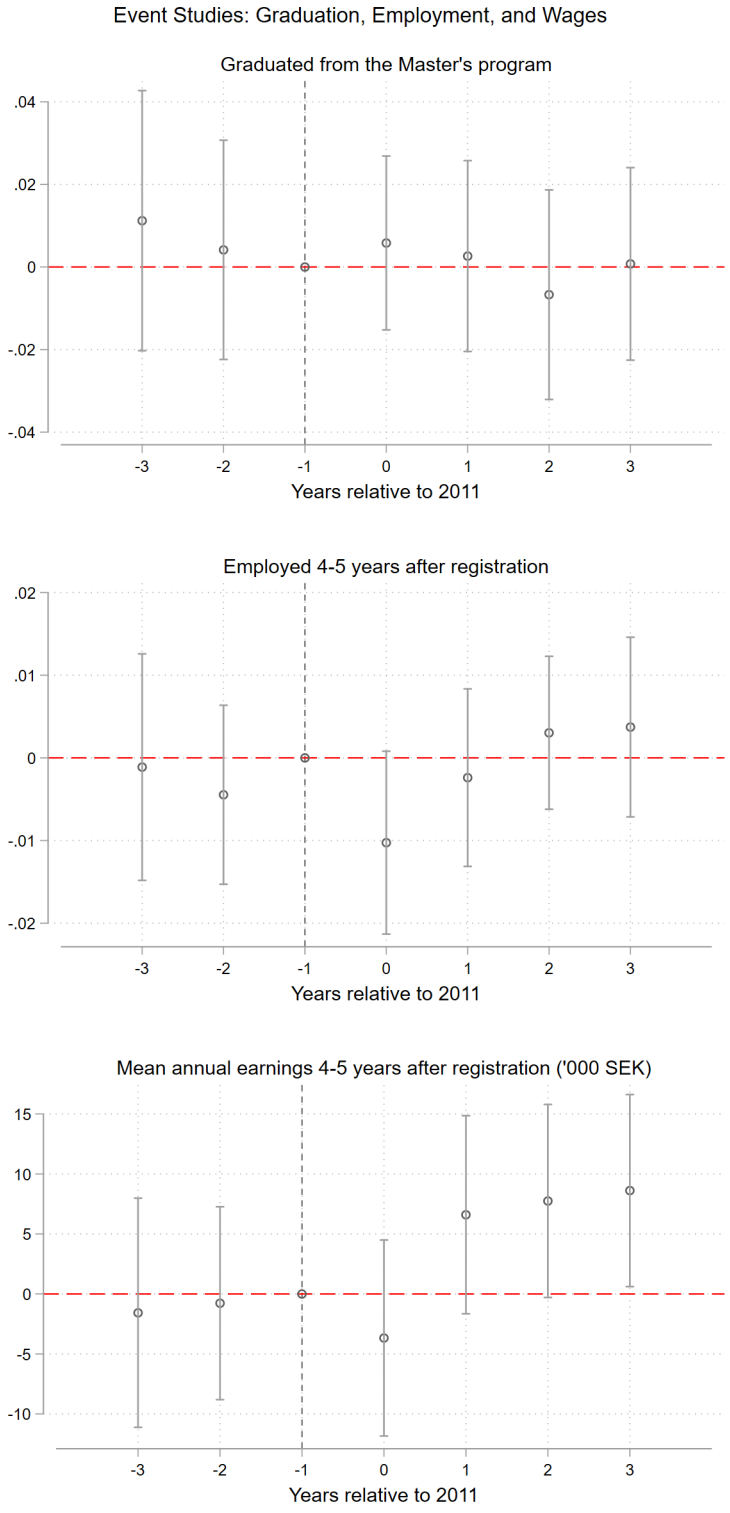
Notes: This figure plots the annual shares of international students over the study period for the five quintiles of Master's programs. These quintiles are based on the distribution of the pre-reform share of international students across the 180 Master's programs in the analysis sample. The tuition fee reform comes into effect in 2011.

Figure B.4: Effect on the student body composition: Event study



Notes: This figure reports the event-study estimates of the effect of the reform estimated with equation 4 and corresponds to results presented in Table 3. The unit of observation is a Master's program. Outcomes are numbers of registered students of different origins and are reported as titles in every panel. Year 0 is 2011 when the reform comes into effect. Year t = -1 i.e., 2010, is the omitted group. For example, the coefficient estimate for Year t = +2 represents the ATT estimate for the treated/exposed programs in 2013. 95% percent confidence intervals are displayed around each point estimate. Standard errors are clustered by program. The sample comprises 180 such programs. The pretest p-values are 0.003 (intl), 0.10 (native), 0.05 (eu), and 0.10 (all). These p-values correspond to the joint significance test for leads in the event-study equation 4.

Figure B.5: Effect on the natives' academic and labor market outcomes: Event study



Notes: This figure reports the event-study estimates of the effect of the reform estimated with equation 2 and corresponds to results presented in Table 5. The unit of observation is a native student. Outcomes are reported as titles in every panel. Year 0 is 2011 when the reform comes into effect. Year t = -1 i.e., 2010, is the omitted group. For example, the coefficient estimate for Year t = +2 represents the ATT estimate for the natives registered in the treated/exposed Master's programs in 2013. 95% percent confidence intervals are displayed around each point estimate. Standard errors are clustered by program. The sample comprises 180 such programs. The pretest p-values are 0.78, 0.72, and 0.95, respectively. These p-values correspond to the joint significance test for leads in the event-study equation 2.