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Visa Policy and International Student Migration: Evidence from the Student Partners Program in Canada*

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Highlights

- We examine how visa policy affects the quantity of international student migration.
- We evaluate the Student Partners Program, a policy reform that introduced origin-specific requirements in the screening of visa applications for international students pursuing post-secondary college education in Canada.
- The reform increased student migration from India and Vietnam, but had no effect on Chinese students.
- Higher enrollment was driven by an increase in the approval rate and the volume of visa applications at institutions participating in the program.
- We find no evidence of crowding-out of domestic students. However, the recruitment of students from countries eligible to SPP had a crowding-in effect on non-eligible foreign students.

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Abstract

This paper examines how visa policy affects international student migration. Using administrative data on community colleges in Canada, we evaluate a reform that introduced a new visa stream - the Student Partners Program (SPP) - with shorter processing times and higher approval rates for student visa applicants able to demonstrate that they have the financial resources and language skills to succeed academically. Using a triple difference estimator, we find that SPP increased student migration from treated countries by 33% relative to what would have occurred without the reform. In line with our theoretical model, we further show that SPP had a large and positive effect on international enrollment only in countries where migration fraud was a major concern, and that higher enrollment was driven by an increase in both the approval rate and the volume of applications to study at treated institutions. We also leverage the SPP reform to investigate potential crowding-out effects. While we find no evidence that the enrollment of international students took place at the expense of domestic students, our results indicate that the recruitment of students from countries eligible to SPP had a crowding-in effect on non-eligible foreign students.

Keywords

International Migration, Students, Visa Policy, Information.

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RESEARCH AND EXPERTISE ON THE WORLD ECONOMY

1 Introduction

Student migration has become increasingly relevant in the global competition for talents. According to the OECD, the number of international students enrolled at post-secondary education programs grew from 2 million in 1998 to over 6 million in 2019. For receiving countries, international students are a unique type of migrants, who benefit from a better integration on the labour market than other foreign workers because of their domestic credentials and their experience and language proficiency in the destination country (Schaafsma and Sweetman (2001)).[1] Their role for innovation and the dynamism of host economies is also well documented, particularly in the US (Hunt (2011), Stuen et al. (2012)).[2] Understanding how destination countries can meet their recruitment targets and what frictions matter in preventing or fostering international student migration is therefore an important policy question.

This paper investigates how origin-specific requirements in the processing of visa applications affect statistical discrimination and student migration from developing countries. Since the late 2000s, students from fast-developing countries, who represented 70% of foreign enrollment in the OECD in 2019,[3] have suffered from statistical discrimination and significantly lower approval rates of their study visa applications as compared to applicants from richer countries.[4] A key factor to explain this gap is the lack of information included in the supporting documentation attached to visa applications, which sometimes fails to remove immigration officers' specific concerns regarding migration fraud and the intentions of prospective immigrants from developing countries.[5] Statistical discrimination can be a serious impediment to destination countries' efforts to attract the best students - irrespective of their national origin - in order to maintain a competitive edge in the race for talent. First, higher visa refusal rates reduce higher education institutions' (HEI) ability to recruit the most qualified applicants and create unfilled capacities

[1] Schaafsma and Sweetman (2001) found that immigrants who have completed their education in Canada and the United States Canada have earnings comparable to those of national students and higher than that of immigrant workers who graduated in their country of origin.

[2] Immigrants who first enter the USA on a student or trainee visa or a temporary work visa have a large advantage over natives in wages, patenting, commercialising or licensing patents, and publishing (Hunt (2011)), and the contribution of those students to the production of knowledge at American scientific laboratories is statistically comparable to that of natives (Stuen et al. (2012))

[3] Among them, students from India and China account for more than 31% of all foreign students, and close to half of this total (47%) in the United States alone.

[4] In Canada in 2009, the approval rate for European and American applicants was close to 90%, but stood respectively at 68% and 51% for students from China and India. A similar same pattern was found in Australia and the UK, where the approval rate of study visa applications for students from non-OECD countries was 10 to 20 % lower than for students from developed countries. (Source: Department of Home Affairs (Australia), Home Office (UK)).

[5] For instance, governments at destination fear that student visa holders overstay after the expiration date of their visas, that they use it to come to work illegally, or engage in technological or industrial espionage on behalf of their home countries (OECD, 2022). In Canada, study permit applications from India and China were therefore two to four times more likely to be rejected under misrepresentation grounds than those originating from the US or Western European countries between 2015 and 2020 (Source: IRCC).

at universities, with a potential financial cost and adverse consequences in terms of student quality. Second, they create administrative hurdles that can act as a deterrent for international students considering education in a foreign country (Beine et al. (2014)), who may prefer to pick an alternative destination.[6]

Over the past 15 years, changes to student visa frameworks in Australia, France, and Canada suggest that bringing in origin-specific requirements as part of a plan to discourage fraudulent applications - thereby reducing statistical discrimination and improving the recruitment of skilled immigrants from developing countries - can be regarded as an effective policy response to address information failures.[7] Against this backdrop, our paper is the first to investigate how such policies affect the volume of international student migration. By combining a theoretical framework with an empirical analysis, we provide original insight into the effect of statistical discrimination on the recruitment of economic migrants, with important policy implications. In particular, we document the impact of origin-specific requirements in the processing of visa applications and the potential consequences they may have for domestic and international student enrollment.

We analyze the results of a policy reform - the Student Partners Program (SPP) - that introduced a new visa stream for international students from India, China, and Vietnam pursuing college education in Canada. To gain insight on how students' decision may have changed in response to the SPP reform, we first propose a basic theoretical model to understand the benefits of information in the processing of visa applications and characterize the government's optimal policy decision when setting the level of information available to immigration o□icers. A directly testable prediction of our model is that the effect of SPP on international enrollment should be larger in countries suffering from higher statistical discrimination. We test this prediction by estimating its causal impact on international students from India, China, and Vietnam using data on enrollment and graduates of Canadian public post-secondary institutions between 2003 and 2017. The staggered implementation of SPP provides a quasi-experimental design in which treated institutions and foreign nationalities were made eligible to the program at different points in time. We therefore rely on a triple-difference approach, which eliminates potential institution and origin-specific confounding factors that are either endogenous or cannot be controlled for in standard difference-in-difference models used in the recent literature on international enrollment (Arenas (2021), Amuedo-Dorantes et al. (2019)). More specifically, we estimate the causal effect of SPP by comparing how the enrollment of international students who had access to

[6] HEIs in destination countries frequently report difficulties in obtaining visas as a significant barrier to foreign student enrollment. See for instance https://foreignpolicy.com/2020/07/15/ice-drops-student-visa-threat-but-foreign-students-still-face-hurdles/

[7] On the benefits of information in addressing statistical discrimination, see Jensen (2010).

the SPP stream at participating institutions changed relative to non-participating colleges and students who did not have access to SPP.

We find that on average - across all three nationalities eligible to SPP - the reform increased enrollment of foreign students at institutions participating in the program by 33% in the post-treatment period. In other words, absent SPP, enrollment of Indian, Chinese, and Vietnamese students at Canadian institutions that benefited from the SPP visa stream would have been 33% lower during the years covered in our analysis. In line with the theoretical prediction of our model, our results further indicate that the program was very successful among Indian and Vietnamese students, respectively increasing enrollment by 105% and 74%, but had no significant effect on their Chinese counterparts, whose visa approval rates were significantly higher before the reform kicked in. These results pass several robustness tests controlling for possible selection and substitution biases and experimenting with alternative control groups and estimators. We next explore the mechanisms driving the impact of the reform on student migration. We find that SPP increased student enrollment through both the total number of applications processed by visa officers and the approval rates of these applications, suggesting the reform was not only effective at removing officers' bias towards candidates and reducing statistical discrimination but also managed to increase the relative attractiveness of participating colleges with respect to non-treated comparable institutions.

Finally, we leverage the SPP reform to test the potential crowding-out of native as well as non-treated international students at the institution level around the time the reform was implemented. To do so, we address the usual endogeneity concerns associated with time-varying, institution-specific unobservable characteristics - which are likely to affect both foreign and native students - by instrumenting the number of international students with the SPP reform. Our results suggest that increases in the total number of foreign students left domestic enrollment unaffected, while the recruitment of students from countries eligible to SPP had a crowding-in effect on foreign students from countries that were not eligible to the program. This finding is plausibly linked to the expansion of Canadian colleges in response to larger inflows of SPP-eligible students (see Shih (2017) and Machin and Murphy (2017)), whereby high net tuition payments from foreign students helped colleges to finance new programs and increase foreign enrollment.

The rest of the paper is organized as follows. Section 2 presents the related literature. Section 3 describes the historical and institutional context of the SPP reform. Section 4 introduces the theoretical framework. Section 5 discusses the methodology and describes the data used in the empirical analysis. Section 6 contains a discussion of the findings, including several robustness checks, and Section 7 concludes.

2 Related Literature

In a context where developed economies compete to attract an increasingly high number of foreign students, a large literature has explored the drivers of international student mobility. Among studies featuring gravity models with multiple origin and destination countries, Perkins and Neumayer (2014), Beine et al. (2014), Abbott and Silles (2016), Bessey (2012) and Lanati and Thiele (2020) use country-level data to investigate the role of determinants such as geographic factors, networks, quality of university, political freedom, GDP per capita at origin and destination, fees and foreign aid projects in post-secondary education. Other papers focusing on specific destinations include Dreher and Poutvaara (2008) and Rosenzweig (2008), which highlight the importance of networks and skill premium, respectively, in attracting foreign students to the United States. Using university-level data, Beine et al. (2020) and Ragot et al. (2017) study the effect of tuition fees on student migration in Italy and the UK, showing that universities charging higher fees have fewer international students.

The economic literature has devoted less attention to the role of migration policy changes as a driver of international student mobility. In the American context, Kato and Sparber (2013) and Shih (2016) have shown that reducing the number of work visas available for foreign-born workers discourages high-ability international students from pursuing education in the United States. Amuedo-Dorantes et al. (2019) show that the 2008 Optional Practical Training reform extending the time period during which international students in the United States are allowed to temporarily work on their student visas to complement their education for STEM graduates raised student visa arrivers' relative propensity to major in STEM. Expanding the scope of the analysis, Amuedo-Dorantes et al. (2020) found that the 2008 OPT reform and consecutive extensions raised matriculation of international students in bachelor's and master's programs. In contrast, we are not aware of any published work studying the effect of changes in student visa or work policy on international student migration outside of the US. To the best of our knowledge, our paper is therefore one of the first to study the effect of a policy reform targeting student migration on international student enrollment in a non-American context. Within this literature, Ragot and Beine (2022)'s work in progress on Campus France documents that the introduction of a new visa application procedure facilitating the application process of international students led to a global increase of inflows of foreign students. Arenas (2021) shows that lifting the requirement to take the Spanish end-of-high-school exam for foreign students had a positive impact on the quality and quantity of international student migration in Spain. Our paper adds to this literature by exploring whether and how the quality of information on study visa applicants affects the quantity of international student migration and documents how the consequences of this policy vary across students' country of origin with the risk of misrepresentation.

Our exploration of crowding-out is related to Shih (2017) and Machin and Murphy (2017), who document the crowding-in of US students by international students as a consequence of cross-subsidization, where the high net tuition payments from foreign students help subsidizing the cost of enrolling additional local students. In contrast, Borjas (2007) found a strong negative correlation between the number of foreign students enrolled at a particular US university and the number of white native men in that university's graduate program, pointing to a crowding-out effect which is particularly strong at the most elite institutions.

This paper is also related to the literature on the discrimination of immigrant applicants based on their origin country (for a review of the discrimination literature in economics, see Bohren et al. (2019)). Using data on applications for immigrant permanent labor certification evaluated, Rissing and Castilla (2014) show that labor certification approvals differ significantly depending on immigrants' foreign citizenship, even after controlling for key factors. Hersch (2008) found that immigrants with the lightest skin color earn on average 17% more than comparable immigrants with the darkest skin color in the US. Conducting a field experiment with thirteen thousand resumes, Oreopoulos (2011) finds substantial discrimination across a variety of occupations towards applicants with foreign experience or those with Indian, Pakistani, Chinese, and Greek names compared with English names. In a similar experiment, studing race in the labor market by sending fictitious resumes, Bertrand and Mullainathan (2004) found that White names receive 50 percent more callbacks for interviews.

Because the success of policies targeting international students largely depends, at least from the host countries' point of view, on whether or not these students remain at destination after graduation, our paper is also related to the sizable literature exploring the characteristics of international students on the labour market. Dreher and Poutvaara (2011) show that the stock of foreign students is an important predictor of subsequent migration. Beine et al. (2022) provides evidence on the transition rate of foreign graduates into the local labour market in the US following the reform of the Optional Practical Training work permit for STEM graduates, shedding light on the capacity of destination countries to retain international students. Their results, although specific to the US context, highlight the potential of migration policy reforms to attract and retain foreign talents in host countries. Hunt (2011) describes how immigrants who first entered the US on a student or trainee visa perform better than natives in wages and patenting once on the labour market, while Stuen et al. (2012) discuss the contribution of international students to the dynamism and innovation of American companies.

Finally, this paper is related to the literature exploring the effects of migration policy on foreign labour employment. Antecol et al. (2003) show that Australian and Canadian immigrants have higher levels of English fluency, education and income than US immigrants. Mayda et al. (2018)

demonstrates that cap restrictions on H-1B visas in the US significantly reduced the hiring of new workers in for-profit firms relative to what would have occurred in an unconstrained environment. Kerr and Lincoln (2010) find that immigrants' contribution in the US is driving the increase in employment and invention in the field of science and engineering following higher admissions of foreign workers holding H-1B visas.

3 The Student Partners Program

3.1 Historical background

Since the late 1990s, Citizenship and Immigration Canada (CIC, now IRCC) has transformed Canada's immigration system to strengthen its status as a welcoming destination for foreign talents. In 2010, the number of international students entering Canada had nearly doubled since 2000,[8] with this upward trend expected to continue and intensify over the next decade. In this context, CICan and Canadian Community colleges renewed their efforts to attract international students to come and study in Canada.[9] These campaigns to improve international student recruitment however came up against the low rates of acceptance of student visa applications. In practice, visa officers had doubts about applicants' financial sustainability and migration abuse - international migrants gaining access to Canada by pretending to be a student -, which made it challenging to decide whether a college-bound applicant was a genuine (or bona fide) student. Moreover, it was difficult to verify supporting documentation and obtain feedback on whether individuals who were issued study permits were actually making their way to the classroom. This problem was particularly salient for Indian nationals, a large number of which unsuccessfully applied for a visa to enroll into specialized trade-based diploma and post graduate diploma programs at community colleges in Canada. As a result, the average study permit approval rate for college-bound Indian students was 34 % in 2008.

In response, CICan and IRCC launched the Student Partnership Program in April 2009 as a joint pilot project in India. The main objective was to address information frictions inherent to the risk of misrepresentation by correcting officers' bias towards Indian students, and increase the number of visas issued to study at Canadian Community Colleges as a result.[10] SPP was

[8] Source: Statistics Canada.

[9] CICan is a national association formed in 1972 to represent the interests of Public Post-Secondary institutions of Applied Learning and Applied Research, which include Community Colleges, Univ. Colleges, Cégeps, Institutes of Technology (Polytechnics), Institutes, Universities. CICan member institutions offer three main types of educational programs. One, 2 and 3 year diplomas designed to train technicians, mid-level managers and service providers, as well as applied degrees equivalent to University Bachelor Degrees but with an applied focus in a particular field. Third, Post graduate certificates focused on current industry practices which provide hands-on professional experience and lead to higher employability of graduates.

[10] Other popular destination countries have implemented policy reforms similar to SPP around the late 2000s. Be-

initially only open to Indian nationals in 20 participating colleges, but considering how successful it turned out to be - the approval rate of visa applications to participating members increased from 34 to 75% and the number of visa issued from 1,503 to 4,243 between 2009 and 2010 -,[11] the project was extended to 39 institutions and a dedicated stream for Chinese students was created in 2010. Over the following eight years, several colleges joined the Indian and / or the Chinese stream of the program. In 2016, CICan and IRCC implemented a similar program in Vietnam, a then rapidly developing market, known as the Canada Express Study (CES) program.[12] The SPP ended in the transition to the Study Direct Stream in 2018, with respectively 46, 53 and 55 colleges then participating in the Indian, Chinese and Vietnamese programs (see Figure 1). The SDS effectively made the SPP visa stream available to all educational institutions designated by their respective province to host international students in China, India, Vietnam and the Philippines. Since 2018, students from those countries applying to virtually any post-secondary institutions can therefore benefit from faster visa processing times by demonstrating upfront that they have the financial resources and language skills to succeed academically in Canada.[13]

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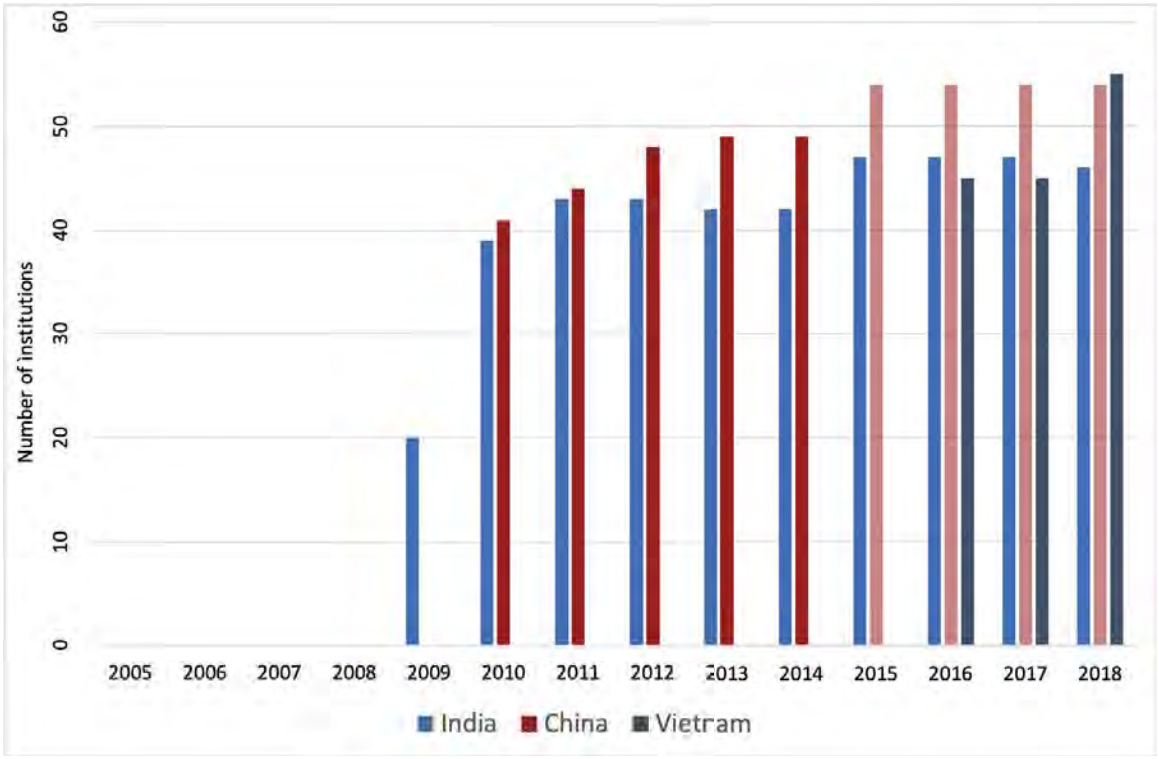
sides Canada, France launched Campus France, a new visa application platform facilitating the application process of international students, in 2007, and the Australian Government strengthened integrity measures in certain parts of the student program caseload to counter fraud and ensure that students had sufficient funds to live and study in Australia in 2009.

[11] Source: CIC statistics. Cohorts for year 2009 includes September 2009 cohort and January 2010 cohort.

[12] Vietnamese students did not formally have access to SPP but to the Canadian Express Study Program, which was very similar and whose objective was, like SPP, to facilitate visa processing for Vietnamese students wishing to study at participating colleges in Canada.

[13] It is worth stressing that while officially launched in India, Vietnam and the Philippines in 2018 (and later extended to other countries), the SDS originally started in China in 2015 as a pilot program with similar criteria to SPP but open to any post-secondary education program eligible for the post-graduate work permit program (PGWPP). In our empirical analysis, we therefore consider SPP to be available to all Chinese students applying to post-secondary institutions in Canada from 2015 onward - see section 5.2.

Figure 1: SPP rollout (2005-2018)



Notes: The vertical bars indicate the number of institutions participating in the SPP program between 2003 and 2018 for each country of origin. From 2015 onwards, the lighter bars for China correspond to the period when SPP was effectively available for Chinese students at all post-secondary institutions through the implementation of the SDS.

3.2 Eligibility and details of the program

With the introduction of SPP, students planning to pursue studies in Canada could apply to any college participating to the program through either the regular or the SPP stream. In practice, SPP applicants from India, China, and Vietnam needed to provide additional documents and certifications proving their intentions, but could also hope for a faster turnaround and more positive outcomes by signalling their intentions more clearly. In particular, there were two major additions to the regular application kit in order to be considered for the SPP stream.

Language proficiency, long used by visa officers as a critical factor in determining whether an applicant is a genuine student, had to be demonstrated through IELTS scores. The required IELTS score was respectively set at 6.0, 5.5, and 5.0 for the Indian, Chinese, and Vietnamese streams. Second, applicants had to provide a copy of receipts by SPP institution for tuition payment, and demonstrate they had the financial resources to live and study in Canada. Up until 2012, a copy of an educational loan covering at least 80% of tuition, living and travel expenses for one academic year was enough for the Indian SPP. However, because fraudulent

banking documents were easy to obtain and extremely difficult to verify in China and India, IRCC and CICan then set up the Guaranteed Investment Certificate (GIC) with selected financial institutions in these countries to ensure students could easily demonstrate proof of funds.

For CICan member institutions, admission into the program worked through voluntary participation, although the final decision to admit any new colleges into the SPP rested with visa offices in partnering countries, in consultation with CICan. In exchange, in order to ensure program integrity and minimize migration violations, institutions selected to participate were supposed to comply with reporting mechanisms providing regular systematic feedback on student enrollment and attendance.

4 Conceptual framework

4.1 General model

In what follows, we propose a basic theoretical model to understand the benefits of *information* in the processing of visa applications. More specifically, we study how policies that aim to increase the level of information available to immigration officers can facilitate visa application processing and increase international student enrollment. We then apply this framework to the specific case of SPP.

We start from a baseline scenario where student visa applications are submitted through a unique, hereafter referred to as *regular* stream. We normalize the volume of study visa applications to 1. For a given country of origin, the risk associated with migration abuse and misrepresentation is proxied by the share $s \in [0, 1]$ of bona fide students in the total number of applications processed by immigration officers. In the absence of perfect information, this share reflects officers' prior about the intentions of study permit applicants originating from a specific country. As outlined in the introduction, risks of migration abuse from non-OECD origin countries are associated with lower visa approval rates, and the SPP itself was explicitly designed to address concerns about immigration officers' doubts in this respect. A greater s therefore corresponds to a lower risk, i.e a lower share of bogus applicants with no intention to study among those applying for a study visa.[14]

We define $I \in [\underline{I}, \overline{I}]$ as the level of information about each applicant available to visa officers when reviewing applications, with $I = \underline{I}$ for applications submitted through the traditional

[14] Bona fide (resp. bogus) students are applicants who intend (resp. pretend but do not actually intend) to come to their destination country for the purpose of studying. In many countries, this risk is assessed ex-post based on several indicators, such as the rate of student visa holders becoming unlawful non-citizens or violating visa restrictions, the rate of visa refusals due to a fraud, or the number of visa applications for international protection.

stream. Because information is conveyed through documents and certifications that applicants submit alongside their application, we define $c(I)$ increasing in I as the cost of providing information I for genuine applicants, and set $c(\underline{I}) = 0$ for simplicity.

Officers' decision to approve or reject applications depends on their prior s and the level of information I at their disposal: They approve visa applications at rate $\rho(s, I) \in [0, 1]$, with $\frac{\partial \rho(s,I)}{\partial s} \geq 0$, and $\frac{\partial \rho(s,I)}{\partial I} \geq 0$, such that ρ is increasing in the level of information provided by applicants and the prior s about the share of bona fide students.[15] Moreover, we assume $\frac{\partial^2 \rho(s,I)}{\partial s \partial I} \leq 0$. This implies that when more information is available to visa officers, the prior about the share of genuine students applying for study permits becomes less important in their decision to accept or reject applications. In other words, when applicants' intentions become more transparent, prior s matters less.[16] We also trivially assume that $\forall I \in [\underline{I}, \overline{I}]$, $\rho(0, I) = 0$ and $\rho(1, I) = 1$, which imply that if visa officers believe there are no genuine (resp. fraudulent) applicants, they will systematically reject (resp. accept) applications regardless of the information at their disposal. Finally, we set $\frac{\partial^2 \rho(s,\underline{I})}{\partial^2 s} > 0$, such that with the regular stream, the share of approved applications is never higher than visa officers' prior about the share of genuine applicants s. In economic terms, this can be interpreted as government's risk aversion regarding illegal immigration.

Suppose now that the government wishes to maximize international student enrollment $\rho(s, I)s$, which corresponds to the rate at which student visa applications are accepted by visa officers multiplied by the share of genuine students among applicants. With only the regular visa stream in place, immigration officers have a hard time distinguishing between bona fide and bogus individual applicants because information $\underline{I}$ at their disposal fails to provide a clear signal about their intentions. As a result, the approval rate and the enrollment of international students are too low. The government therefore wants to raise the level of information available to visa officers from $I = \underline{I}$ to $I > \underline{I}$ by introducing a new visa stream - hereafter referred to as policy I -, improving their ability to tell bona fide study permit applications from bogus ones.

Let b denote the net benefit (potential earnings after graduation and cost of study) that an applicant obtains from studying at destination. It is then straightforward that a student will prefer to use the new visa stream and pay cost $c(I)$ if and only if $b\rho(s, I) - c(I) > b\rho(s, \underline{I})$, i.e if the expected benefit from providing information I is greater than that of applying through the regular stream. This participation constraint is equivalent to

[15] The intuition behind $\frac{\partial \rho(s,I)}{\partial I} \geq 0$ is that information helps applicants convince visa officers of their intentions and therefore unambiguously increases their chances to obtain a visa.

[16] In this regard, note that if officers could perfectly observe applicants' intentions through the information provided in their application, their belief s about the share of genuine applications would become totally irrelevant.

$$b(\rho(s,I) - \rho(s,\underline{I})) > c(I) \tag{1}$$

Let $\Delta(s,I) = s(\rho(s,I) - \rho(s,\underline{I}))$ be the change in international student enrollment when the government implements policy I.

Notice that as long as (1) is satisfied, international student enrollment is trivially increasing in I, since $\frac{\partial \rho(s,I)}{\partial I} \geq 0$. Therefore, the government would like to set $I = \overline{I}$ (i.e, extract as much information as possible from applicants) so that bona fide students' applications are approved at the highest possible rate. However, they can only do so to the extent that participation constraint (1) is satisfied. With (1) binding, the government's choice I^* is implicitly defined by the following equality:

$$b(\rho(s,I^*) - \rho(s,\underline{I})) = c(I^*) \tag{2}$$

Proposition 1: $\frac{\partial I^*}{\partial s} \leq 0$ Government's optimal policy - level of information - I^* is decreasing in the share of genuine applicants s.

This comes immediately from differentiating both sides of (2) with respect to s and observing that the *informational* value of prior s decreases with the level of information I available to visa officers (recall that $\frac{\partial^2 \rho(s,I)}{\partial s \partial I} \leq 0$). The LHS of (2) is decreasing in s, while the RHS of (2) remains invariant, which gives $\frac{\partial I^*}{\partial s} \leq 0$. When the share of genuine applicants s increases, the relative benefit from using the new visa stream instead of the regular stream for genuine applicants decreases. Incidentally, the level of information they are willing to provide is lower and the cost $c(I^*)$ associated with the optimal policy I^* is also decreasing in s.

Corollary 1: For any $I \in [\underline{I}, \overline{I}]$, there exists $\overline{s} \in [0,1]$ such that $\forall\ s \geq \overline{s}(I)$, $\Delta(s,I) = 0$

The intuition for this result is straightforward. When s approaches 1, the approval rate ρ also approaches 1 as information becomes useless (recall $\rho(1,I) = 1$). In other words, visa officers do not require information about individual applications if they are convinced that all applications originate from genuine students. This implies that there always exists a share s of bona fide students such that students' participation constraint is not satisfied, i.e the cost of information exceeds the benefit of providing any additional information $I \geq \underline{I}$.[17] When this happens, students prefer to keep using the regular stream.

[17] For any $I \in [\underline{I}, \overline{I}]$, the value of $\overline{s}$ is implicitly defined by the following equality: $b(\rho(\overline{s},I) - \rho(\overline{s},\underline{I})) = c(I)$

From a policy perspective, we can now examine how the impact of a given I on international student enrollment varies with the share of bona fide applicants s in a given country. When $0 \leq s < \overline{s}$, the increase in international student enrollment writes $\Delta(s, I) = s(\rho(s, I) - \rho(s, \underline{I}))$, which is trivially increasing in I, since $\frac{\partial \rho(s,I)}{\partial I} \geq 0$. The impact of policy I then depends on the share of genuine students s and the relative effect of information on approval rates $\rho(s, I) - \rho(s, \underline{I})$: Δ increases as long as the number effect - genuine students now able to signal their type and obtain a study permit - outweighs the signal effect - the difference between approval rates in the two visa streams, which is decreasing in s. Note however that when all or close to all applications originate from fraudulent applicants (s is close to 0), information policies are inefficient ($\Delta \sim 0$) because there are too few genuine students for information policy I to have any significant impact on enrollment. When s is greater than $\overline{s}$, providing information is too costly for genuine students, who prefer to keep using the regular stream, and the information policy is totally inefficient: $\Delta(s, I) = 0$.

4.2 A Specific case: The Student Partners Program

Using this framework, we investigate how student enrollment changed after the implementation of the SPP reform in India and China. The intention of the SPP reform was to facilitate the recruitment of foreign students for community colleges in Canada by allowing genuine applicants to provide greater linguistic and financial guarantees and therefore better signal their intentions.[18] While we are not able to directly observe the share s of genuine students in origin countries that were eligible to SPP around the time the reform was implemented, we have information on student visa approval rates, which can be regarded as a proxy for the rate $\rho(s, \underline{I})$ at which visa officers accepted applications through the regular stream prior to the reform. In particular, approval rates for college-bound applicants from India and China differed markedly during the year that preceded the introduction of the SPP stream in these countries. In India, only 34% of applicants saw their study permit approved by Canadian immigration services in 2008. In contrast, this rate stood at 66% in China in 2009.[19]

Let I_{spp} measure the level of information required to enter the SPP stream, with s_j the share of genuine student visa applications s originating from country $j \in \{i, c\}$ (India and China respectively), and $\Delta_j(s_j, I_{spp})$ the causal effect of SPP on student enrollment. We assume that providing information $I = I_{spp}$ allowed SPP applicants to be granted study visas with probability

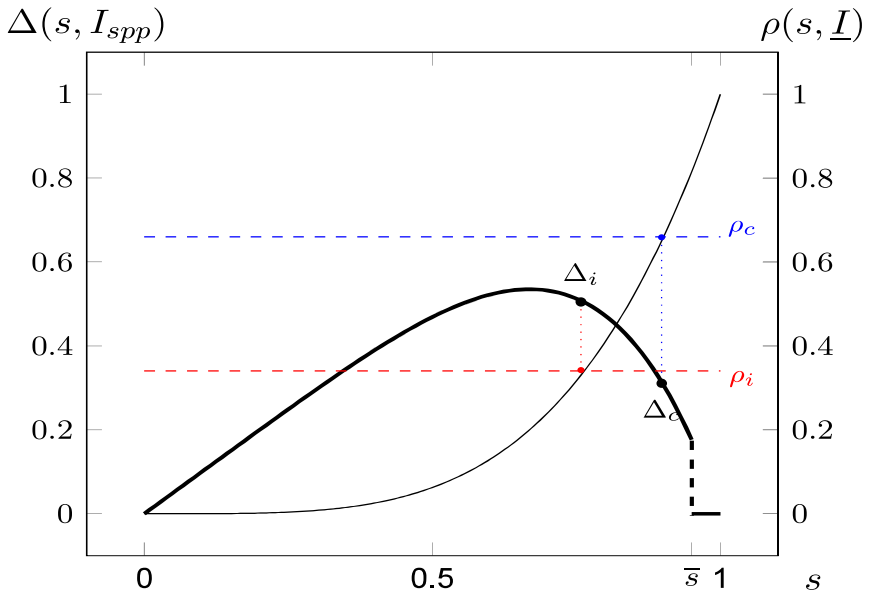
[18] In this regard, the Guaranteed Investment Certificate mentioned in section 3.2 was specifically designed to prevent bogus applicants from forging banking documents.

[19] Higher approval rates for Chinese students are plausibly linked to a change in the Chinese visa licensing for students which made studying abroad considerably easier for self-funded Chinese students, whose number substantially increased from 1999 (see Machin and Murphy (2017) for a discussion)

1: $\rho(s, I_{spp}) = 1$.[20] We also assume $s_i < \overline{s}(I_{spp})$ and explore the following two scenarios based on Proposition 2: $s_c < \overline{s}(I_{spp})$, and $s_c \geq \overline{s}(I_{spp})$.[21]

Figure 2 and 3 illustrate both scenarios for the case where $\rho(s, \underline{I}) = s^4$.[22] They graph $\rho(s, \underline{I})$ and the corresponding change in student enrollment $\Delta(s, I_{spp}) = s(\rho(s, I_{spp}) - \rho(s, \underline{I})) = s(1 - s^4)$ as a function of the share s of genuine students, represented by the full and thick black curves, respectively. The red and blue dashed lines correspond to the value of $\rho(s_i, \underline{I}) = 0,34$ and $\rho(s_c, \underline{I}) = 0,66$ for India and China. The effect of SPP on student enrollment in India and China is captured by points Δ_i and Δ_c.

Figure 2: Enrollment response function- case where $s_c < \overline{s}$

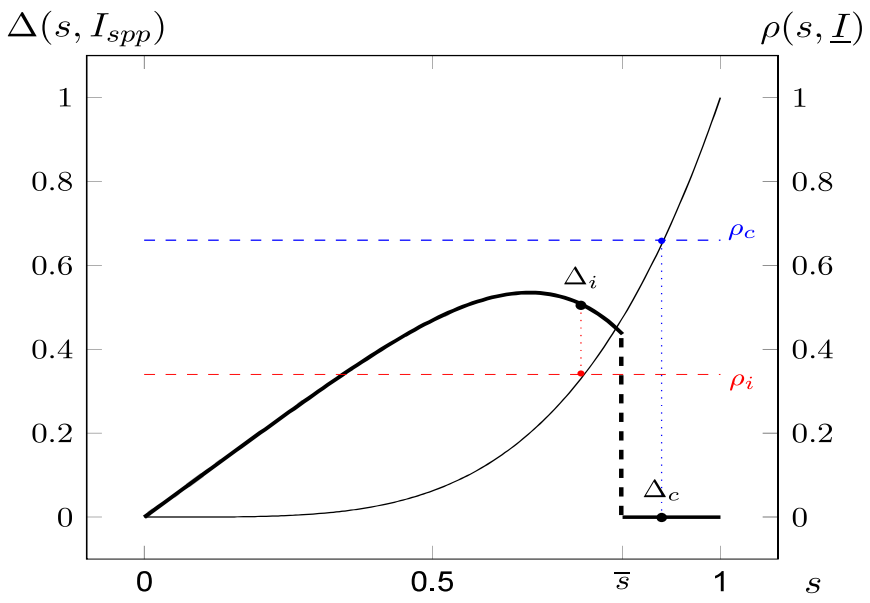


[20] Relaxing this assumption and using a probability strictly lower than 1 ($\rho(s_j, I_{spp}) < 1$) would not change our results qualitatively but unnecessarily complicate the exposition.

[21] We do not study the case where $s_i \geq \overline{s}(I_{spp})$, i.e when the SPP stream would have been too costly for Indian students to use. Note that this scenario would trivially yield $\Delta(s_c, I_{spp}) = \Delta(s_i, I_{spp})$ =0 as both Chinese and Indian applicants would have continued to apply through the regular channel.

[22] The following results holds qualitatively for any $\rho(s, \underline{I}) = s^a$ such that the risk aversion assumption is satisfied, i.e for any $a > 1$.

Figure 3: Enrollment response function - case where $s_c \geq \overline{s}$



Observe that $\Delta_i > \Delta_c$ whether $s_c > \overline{s}$ or not, i.e whether Chinese students use the SPP stream or not. In this simplified framework, we therefore expect that the reform was more successful at increasing international student enrollment in India than in China. More generally, our theoretical model suggests that the positive impact of SPP on enrollment was more likely to materialize for students from countries suffering from greater statistical discrimination, with lower visa approval rates and where bogus applications was a greater concern from the perspective of the Canadian government. In the next section of the paper, we study empirically the effect of SPP on international student enrollment and check whether this effect varies across India, China, and Vietnam, where the study permit approval rate was 45% before the SPP roll out in 2016.

It is important to recognize that we only model here part of the supply side of international students' decision and that the consequences of SPP on enrollment could also be moderated by other supply and demand side factors. For instance, the reform could have led to unintended effects whereby the composition and volume of applications changed after the opening of the SPP stream. In particular, it is possible that prospective students who were not considering applying to SPP colleges before the reform chose to do so after it was implemented, leading to cross-institution substitution as well as larger spillover effects driven by an increase in the attractiveness of treated colleges with respect to other institutions in Canada and abroad. On the demand side, we are also unable to assess the extent to which institutions met or adjusted

their international student quotas before and in reaction to the reform, with potential direct implications for international enrollment. Although these effects are not captured by the model, our empirical analysis examines possible substitution biases and investigates various supply-side channels driving the effect of SPP.

5 Data, Methodology and Descriptive Evidence

This section presents the data and the methodology used to estimate the causal impact of the SPP reform on foreign student enrollment in Canadian colleges.

5.1 Data

The key dependent variable used in the empirical analysis is the number of international students enrolled in a given year at Canadian institutions from a specific country of origin over the period 2003-2017. The main source of data is the Post-Secondary Student Information System (PSIS) from the Canadian National Statistical Office (Statistics Canada), which contains detailed information on enrollment and graduates of Canadian public post-secondary institutions. Enrollment counts are based on the number of students enrolled at a given institution in the fall - the exact date varying across institutions between September 30 and December 1.[23] For some institutions, enrollment data is missing from the PSIS data set and we choose to replace them with the number of approved study permit applications, also obtained from IRCC. We discuss the potential implications of this choice in section 7.1.2 and Table 16 of the Appendix.[24] Information about institutions participating in SPP has been collected from CICan and online archives of the Canadian Government.[25] The list of participating institutions and date of entry into the program can be found in Tables 10 and 11, and 12. The baseline sample includes international students from 195 countries of origin that are listed in Table 14.

[23] During the time period under investigation (2003 - 2017), a handful of colleges, both treated and non-treated, merged or split from their parent institution. When this happened, we have recreated panel data for the whole period by summing enrollment counts across merged institutions. Missing data for a maximum of 2 consecutive years were handled using linear interpolation.

[24] Applications data were used for the following institutions: Booth University College, Columbia College, Canadore College, Cambrian College, Centennial College, Conestoga College, Confederation College, Douglas College, Georgian College, Lambton College, Loyalist College, Mohawk College, Red River College, Sault College, St. Lawrence College, University College of the North.

[25] Source: www.canadainternational.gc.ca, accessed in September 2021. These archived web pages contain the list of SPP institutions in China and India for every year since the launch of the pilot program in 2008. Data about the CES program (SPP equivalent) in Vietnam was obtained directly from CICan. The final list of SPP institutions for all three nationalities has been reviewed and approved by CICAN officials.

5.2 Methodology and Design

Correctly estimating the impact of the reform on international student enrollment is challenging, not least because SPP is one of several policies implemented simultaneously by the Canadian government to attract foreign talents at the time of the reform.[26]

Our identification strategy relies on a triple difference design taking advantage of the implementation of the SPP reform for a selected group of treated institutions and eligible nationalities. In this context, we deem the triple-difference approach as superior with respect to a standard diff-in-diff design with only two dimensions of variation in the treatment that is commonly employed in the literature (e.g. Arenas (2021), Amuedo-Dorantes et al. (2019)). Specifically, the triple-difference method eliminates all potential institution and origin specific confounding factors that are either endogenous or cannot be easily controlled for in a double-diff model because data are not readily available (Berck and Villas-Boas (2016), Olden and Møen (2022)). In the empirical setup, we therefore fit a model exploiting all three dimensions of variation in the data, namely post-secondary institution j, country of origin of students i and time t. The model takes the following form:

$$\ln(N_{ijt}) = \alpha_0 + \alpha_{jt} + \alpha_{it} + \alpha_{ji} + \beta Pol_{ijt} + e_{ijt} \tag{3}$$

where N_{ijt} is the number of students enrolled in post-secondary institution j from country i in year t. Pol_{ijt} is the treatment indicator. It takes the value of 1 when foreign students of nationality i – namely India, China and Vietnam - are enrolled in a post-secondary institution j where a dedicated SPP visa stream is opened as of year t, and 0 otherwise. Recall that the SDS, a visa stream similar to SPP, was implemented as a pilot program in China in 2015 (see section 3.1). For this reason, we consider that the SPP stream effectively available ($Pol = 1$) to Chinese students enrolled at any post-secondary institution from 2015 onward.[27] α_0 is the constant term, while α_{jt}, α_{it} and α_{ji} are institution-year, origin-year and institution-origin high-dimensional fixed effects, respectively. These cross fixed effects capture all the unobserved factors that may confound the impact of SPP on student enrollment and enable to better identify our parameter of interest β. All institution specific characteristics such as size, tuition fees, cost

[26] In 2008, the Canada Experience Class stream allowed skilled foreign workers or foreign graduates of Canadian higher education institutions to apply for permanent residency without having to leave the country. At the same time, IRCC extended the Post-Graduation Work Permit (PGWP) rules for international students who want to work in Canada after graduation to three years and eliminated the requirement for job offer or offer of employment in a particular field of study. In 2015, the Express Entry system was launched in order to improve the management of Canadian permanent residence applications for filling labour gaps.

[27] In a robustness test (Table 17), we restrict our sample to the period prior to 2015 where only a fraction of institutions were participating in SPP for Chinese students. The results are in line with our baseline estimates.

of living, quality and language (English or French) potentially related to the enrollment of foreign students are absorbed by the α_{jt} term; all the dyadic pre-existing specific connections - such as exchange programs - between Canadian colleges and students' country of origin are captured by institution-origin pair dummies α_{ji}, while origin-year fixed effects α_{it} account for every factor at the origin, such as quality of education, living conditions, business cycle. To account for serial correlation in student migration decisions within college-origin dyads, standard errors are clustered at college-origin pair level. Equation 3 can be seen as the equivalent of a structural gravity model with high dimensional fixed effects applied to international student mobility (see for instance Larch et al. (2019) and Ragot and Beine (2022)). In line with existing applications of the gravity model of migration (e.g. Beine et al. (2014), Beine et al. (2020) and Beine and Parsons (2015)), we estimate Equation 3 using Poisson Pseudo-Maximum Likelihood (PPML). The choice of using PPML as our preferred estimator is justified by two main considerations. First, the share of zeros in our dependent variable is approximately 63% in the baseline model, which is definitely large enough to bias the results of standard log-linear fixed effect models (see Silva and Tenreyro (2006) and Silva and Tenreyro (2011)). Second, PPML remains consistent in presence of heteroscedasticity and does not require statistical independence of the error term.[28]

Causal inference in a difference-in-difference exercise requires that the control group represents an appropriate counterfactual for international student enrollment in the absence of SPP. More specifically, it must be that control, non-treated institutions are sufficiently similar to colleges where SPP was implemented. Against this backdrop, we include in our baseline counterfactual all post-secondary Canadian colleges or institutes that did not participate in the SPP program but whose educational provision is similar to that of treated community colleges. These institutions, both CICan and non-CICan members, include Canadian Community Colleges, University Colleges, Cégeps, and Institutes of Technology (Polytechnics) offering applied learning, research programs and diplomas. In order to obtain a suitable control group that can be matched against treated institutions in terms of size and student composition, we also include international enrollment at Canadian universities in programs of study that are comparable to community college education. More specifically, we include post-secondary undergraduate international enrollment (i.e lower than the Masters degree) at Canadian universities that rank lower than 800 or are absent from the Shanghai worldwide ranking of Universities.[29] This ranking criterion is meant to account for the fact that Canadian community colleges are not internationally renowned, and therefore attract foreign students for specific educational purposes that are most likely inde-

[28] In a simulation exercise Ciani and Fisher (2019) showed that in a difference-in-differences setting with a continuous outcome it is preferable to estimate a Poisson Pseudo Maximum Likelihood over running OLS on the log-linearised model because the former does not require statistical independence of the error term.

[29] Source: www.shanghairanking.com.

pendent from their international reputation. By the same token, they also charge lower tuition fees, similar to those of community colleges. What's more, the implementation of the Study Direct Stream in 2018 suggests that Canadian universities could be regarded as comparable institutions with what regards visa policy, since the Canadian Government deemed the benefits of SPP worth extending to all post-secondary institutions receiving foreign students in Canada (see section 3.1). Finally, we exclude French-speaking only institutions, which are unlikely to appeal to international students from India or China. For similar reasons, we do not consider institutions whose programs of study focus exclusively on one of the following activities: Religion, dance, music, and circus. Because Chinese, Indian and Vietnamese students together represent the majority of international enrollment at Canadian post-secondary institutions, our counterfactual includes all foreign students who did not benefit from SPP in order to build a control group with enough observations and properly estimate the difference in enrollment trends. The list of control institutions and countries of origin can be found in Tables 13 and 14.

In the robustness section of the paper (section 6.2), we also address several limitations of our baseline control group.

First, one may be concerned about the validity of this counterfactual to the extent that Indian, Chinese, or even Vietnamese students are not directly comparable to students from all other countries. We therefore test our results using foreign students from non-OECD countries as an alternative control group. These students are closer substitutes to Indian, Chinese and Vietnamese students to the extent that they are likely to meet similar economic conditions influencing their migration decision at origin and are also more likely to be regarded as posing a risk of misrepresentation by Canadian visa officers. In addition, we propose in Appendix difference-in-difference model to capture the nationality-specific difference in enrollment between treated and non-treated institutions.

Second, because a significant share of control institutions are a close substitute to community colleges that participated in SPP, there is a risk that the treatment effect is biased upwards if SPP induced potential students to apply to - and subsequently enroll at - SPP instead of non-SPP institutions. This substitution effect would artificially increase our estimates of the impact of the SPP reform on international student enrollment. To assess the scope of the substitution bias, we split the control group between community colleges on the one hand and universities, which are less prone to substitution, on the other hand.

Third, concerns about selection into the program could cast doubts about the validity of the analysis. In particular, because SPP was initially designed to help institutions recruit students from specific countries, there is a risk that treated and control institutions faced different incentives to join the program. To test the sensitivity of our results to a possible selection bias, we use propensity score matching and experiment with a different specification where we augment

model (3) by adding lagged approval rates as a control variable. It is worth stressing however that the inclusion of universities in the baseline control group should already mitigate these concerns. Indeed, because only community colleges were lawfully eligible to participate in SPP, the risk of selection bias is limited as a significant share of institutions in the control group were barred from joining SPP for institutional reasons.

5.3 Descriptive Evidence

In the triple-difference model outlined in Equation 3, we exploit the fact that a number of college institutions gradually joined SPP over time. The difference-in-difference set up usually requires a parallel trend assumption for the estimated effect to have a causal interpretation. Even though the triple difference estimator is the difference between two difference-in-differences, it does not actually require parallel trend assumptions on both dimensions of heterogeneity (see Olden and Møen (2022)). Rather, it requires the relative outcome of non-eligible and eligible origins within the treatment group (in our context, institutions) to trend in the same way as the relative outcome in the control group, in the absence of treatment. In other words, the crucial assumption for a causal interpretation of β in Equation 3 is that student enrollment from both eligible and non-eligible origins follow a parallel trend within treated and non-treated institutions before SPP was introduced, i.e. in the absence of policy change.

Figure 4 compares the trend over time of yearly student enrollment for treated (left panel) and non-treated institutions between eligible and non-eligible origins. In the period before the SPP reform – prior to the introduction of the Pilot program when most treated college institutions joined SPP - there were no visible differences in the enrollment trends across nationalities within treated and non-treated institutions. After 2009 when the reform kicked in - once SPP was officially introduced -, we observe a substantial increase in student enrollment for treated nationalities relative to non-treated nationalities, which occurs exclusively at treated institutions, while the parallel trend in student enrollment between SPP and non-SPP nationalities remains substantially unchanged in the absence of the treatment. In support of the underlying assumptions of the Triple-Diff model estimated for each treated origin, Figure 5 shows the parallel trends for Indian, Chinese and Vietnamese students, comparing the trends over time between the single eligible nationality with non-treated origins within treated and non-treated institutions. There seems to be a clear diverging trend after the policy was introduced for Indian students within institutions participating in SPP, and no evidence of a significant impact of the reform for the Chinese counterparts.

6 Assessing the Impact of SPP on International Student Enrollment

6.1 Main results

Table 1 reports Poisson Pseudo Maximum Likelihood (PPML) triple-difference estimates for Equation 3. The coefficient in Column 1 indicates that - on average - the student partnership program (SPP) increased the enrollment of foreign students by 33,4% $(e^{0.288} - 1)$. In other words, absent the reform, international enrollment of Indian, Chinese, and Vietnamese students at treated institutions would have been 33,4% lower than what it was after the reform during the years covered in our analysis. Moreover, as emphasized in the theoretical framework (Section 4.2), we expect that this aggregate point estimate hides some heterogeneity in treatment effect across nationalities. Columns (2-4) of Table 1 show the result of the triple-diff model of Equation 3 estimated separately for each treated nationality. In line with our prediction, we find that the effect of the program decreases with the extent of statistical discrimination in origin countries. While SPP was very effective among Indian and Vietnamese students - for whom the approval rate in the pre-reform years stood at 34 and 45 % -, increasing enrollment by respectively 105% and 74%, it had no significant impact on Chinese students, whose study visa approval rate prior to the SPP rollout was significantly higher (66 %). In what follows, we propose a series of robustness tests assessing the validity of the identification strategy and the degree to which these results can be interpreted as causal.

6.2 Identification and Robustness Tests

A first possible concern regards the possibility of pre-existing differential trends in international student enrollments in treated relative to non-treated institutions driving the results. To gauge if that is the case, we conduct an event study analysis for international students. Because of the staggered implementation of SPP and the fact that institutions participating in the program were different across eligible nationalities, we run this analysis separately for each treated nationality. We include up to 5 years prior and 7 years post each SPP reform, except for Vietnam, for which the CES (SPP equivalent for Vietnamese students) ran from 2016 onwards. Coefficients are measured relative to one year prior to the introduction of the reform. We include institution and year fixed effects. Figure 6 plots the estimated coefficients, along with the corresponding 95% confidence intervals. We find evidence of generally higher international student enrollments of Indian and Vietnamese students after the SPP reforms, but not before. Moreover, international enrollment of Chinese students is not distinguishable from zero after to the introduction of SPP. These results suggest that our findings are not subject to pre-existing differential trends

in enrollment before the implementation of the program.

Next, we check that our baseline point estimates are not sensitive to restricting the control group of international students. As outlined previously, we focus our attention on foreign students from non-OECD countries, which can be regarded as closer substitutes to Indian, Chinese and Vietnamese students than those born in high-income countries. Moreover, the list of countries currently eligible to the Study Direct Stream program suggests that concerns regarding visa applications are mostly salient for non-OECD countries.[30] Results are presented in Table 2. The aggregate and nationality specific point estimates are very close to the baseline in both magnitude and statistical significance. Although now significant at the conventional level, the coefficient for China remains very small in magnitude as compared to other treated nationalities. We can therefore safely conclude that our results are robust to restricting control nationalities to non-OECD students.

To address concerns about a possible substitution effect between control institutions - especially community colleges - and treated institutions, we compare the results of our baseline using either community colleges or universities as control institutions. Within the control group, universities can be regarded as somewhat less prone to substitution insofar as they do not offer typical *"college"* education. By the same token, they are less likely to suffer from substitution of students opting out to enroll at SPP institutions. This comparison therefore allows us to assess the extent to which our baseline coefficients capture net growth in international enrollment as opposed to students switching from non-SPP to SPP institutions, who would represent a substitution rather than an actual increase in enrollment and bias our estimates upwards. Columns 1 to 4 of Table 3 capture to what extent our main results depend on using only colleges as control institutions. The aggregate coefficient is hardly sensitive to restricting the control group (0.311 vs 0.288), and country-specific estimates remain very close to the baseline presented in Table 1. More importantly, these coefficients are very similar to the one presented in columns 5 to 8, which estimate model (3) using universities as the control group.[31] The substitution bias therefore appears to be very limited, from which we conclude that the SPP reform had an actual, positive impact on the net growth in the number of eligible students enrolled at Canadian community colleges.

We now address possible concerns regarding selection into SPP. As argued previously, the risk

[30] The Study Direct Stream is an expedited study permit processing program for international students who are applying to study in Canada at a post-secondary institution (DLI). It replaced SPP in 2018. As of 2023, it offers a special visa pathway to students from Antigua and Barbuda, Brazil, China, Colombia, Costa Rica, India, Morocco, Pakistan, Peru, Philippines, Senegal, Saint Vincent and the Grenadines, Trinidad and Tobago, Vietnam.

[31] This statement should be nuanced for India, where the coefficient obtained using colleges as counterfactual is 0.626 as compared to 0.81 with the universities. That said, the point estimate is smaller with the former as opposed to larger, as we would expect if coefficients were seriously affected by a substitution bias.

of endogeneity is limited by the inclusion of universities which were barred from joining SPP on institutional grounds. That said, because the SPP program hoped to lift visa officers' doubts about the intentions of foreign applicants who wanted to study at community college in Canada, there is a possibility that participating institutions were selected based on their willingness to attract students from treated origins and the barriers they faced to do so. Using propensity score matching, we create an alternative control group that accounts for a possible bias along this dimension. For each institution, we capture willingness to recruit students eligible to SPP through the share those students represent in total international enrollment and proxy their ability to do so using study visa approval rates prior to the reform. Because the participation of institutions in SPP is origin-specific, with many colleges only participating in the program for a single nationality (see Tables 10, 11, and 12), we run separate regressions for each of the three treated countries of origin. We use the share of treated students in total international enrollment and the approval rates during the three years leading up to the reform (2006-2008 for India, 2007-2009 for China and 2013-2015 for Vietnam) as matching variables. Our results are presented in Table 4. Because of the scarcity of data on visa applications, the sample size used for the PSM analysis is significantly smaller (about 50 %) than the baseline control group. We therefore provide unweighted estimates obtained from running model (3) with the resulting sample in column (1), (3), and (5) for each nationality. Our results indicate that correcting for possible selection into the treatment does not change our coefficients of interest, neither in magnitude nor statistical significance, for any of the treated origin country.

To further address potential selection issues, we use one-year lagged, institution-origin specific approval rates as an additional covariate. As pointed out in Olden and Møen (2022), including variables driving selection into treatment as controls in a triple difference framework rises the precision of the causal effect under scrutiny because it lowers the residual variance and accounts for compositional differences across groups, making the parallel trend assumption more credible. In our setting, the inclusion of pre-treatment bilateral (institution-origin) approval rates would therefore mitigate the role of selection in the identification strategy. Such inclusion, however, substantially reduces the statistical power of our model: Applications data is available for only a fraction of institutions and also suffer from a break in series in 2014, which forces us to restrict the analysis between 2003 and 2013. Incidentally, Vietnam is not included as the reform took place after 2013 in this country. That said, the estimates reported in Column (2) and (3) of Table 5 suggest that the model is well specified: They show that the coefficients are close to the baseline and very stable across specifications with and without the inclusion of approval rates as a control variable. Also, the impact of the reform is only significant for Indian students when disaggregating across treated nationalities (Column 4-5).

Finally, we carry out a placebo test. Table 6 shows the triple diff estimates of Equation 3 using

the baseline specification on naturalized Canadian students born outside of Canada. If the effect of the SPP reform on international student enrollment was indeed channeled through the benefits of the new visa stream, it should not affect the enrollment of students with Canadian nationality. As expected, the coefficients of interest are all negligible in magnitude and statistically not significant. More importantly, this finding applies irrespective of the treated nationality under scrutiny - which substantiates the causal interpretation of our benchmark results.

Further robustness tests experimenting with different time periods, data composition and alternative estimators are presented in the Appendix.

6.3 Mechanisms

Our main findings indicate that SPP had a significant and positive impact on international student enrollment. In this section, we look into the supply-side mechanisms driving this result. We present in Table 7 the results of model 3 using the number of student visa applications, the number of approved student visa applications, and the approval rate of student visa applications as dependent variables. The first column of each panel reports the baseline estimates for total student enrollment when limiting the analysis to the pre-2014 years.[32]

First, SPP was designed to help boost the approval rates of Indian students applying to community colleges in Canada. We find that the program effectively worked by increasing the rate at which visa applications were approved, as illustrated by the positive and significant coefficients in column 2. Further, in line with our expectation that the policy reform incentivized bona fide applicants to use the SPP stream only in countries suffering from statistical discrimination - as measured by pre-reform approval rates - where it may significantly increase the chances of obtaining a study permit, columns 5 to 12 demonstrate that the impact of SPP is entirely driven by Indian students, while no effect is visible for Chinese students.[33]

Perhaps more surprisingly, we find that SPP also increased the volume of applications at colleges participating in the program, which can be regarded as a positive spillover of the reform. A plausible mechanism behind this result is the increase in the relative benefit that prospective students derived from applying to participating institutions. Indeed, by lowering processing times and increasing the likelihood of obtaining a visa, SPP reduced the cost of applying to colleges participating in the program for international students and therefore made them more likely pick a SPP-eligible college over another institution. This interpretation is in line with the recent

[32] As indicated in the previous section, we are forced to limit any analysis involving a comprehensive use of applications data to the 2003-2014 period.

[33] Unfortunately, data about the proportion of applicants using the SPP rather than the traditional visa stream are not available, which prevents us from formerly testing this hypothesis.

literature documenting how prospective international students respond to policy changes improving economic outcomes and expected chances of success at destination (see for instance Amuedo-Dorantes et al. (2019) and Arenas (2021)).

6.4 Crowding-out

Finally, we explore the crowding-out of domestic students by international students at Canadian community colleges around the time the reform was implemented. Our econometric specification focuses on the institution-year dimension of the data and regress the volume of domestic students on the total number of foreign students:

$$\ln[N_{jt}^{(i=Can)}] = \alpha_0 + \alpha_j + \alpha_{pt} + \delta \ln[\sum_{i=1}^{i\neq Can} N_{jt}^{(i)}] + e_{jt}^{(i=Can)} \quad (4)$$

where the term α_j accounts for institution fixed-effect and α_{pt} refers to province - year fixed effects controlling for unobservable province-specific characteristics that might affect students' decision to apply to colleges in a particular geographical area.

It is also possible that both domestic and foreign students' decision to enroll is influenced by time-varying institution characteristics that we fail to observe, such as their size, the quality of infrastructures, connections to local businesses or the variety of academic programs. This, in turn, could result in an omitted variable bias, which we address using an instrumental variable strategy. More specifically, we leverage the introduction of SPP as an instrument for the number of foreign students. The validity of SPP as a powerful instrument is supported by the results showed so far in this paper. First, the benchmark estimates of Equation 3 suggest that the instrument should be strong enough since SPP is positively associated with the volume of (eligible) foreign students. As expected, the KP-F Statistic is well above conventional levels (see Table 8), which points to the validity of SPP as an instrument to predict the number of foreign students in Equation 4. Moreover, the reform is uncorrelated with the number of domestic students as showed in the reduced form test reported in Columns 5 and 6,[34] suggesting that newly enrolled international students in treated institutions leave the number of Canadian students unaffected, in support of the exclusion restriction.

The estimates reported in Column (1-6) of Table 8 reveal no significant relationship between changes in the volume of international students and the number of enrolled Canadian students at community colleges, pointing to the absence of crowding-out effect around the time the reform

[34] In our setting, the reduced form test is a simple diff-in-diff specification which regresses the total number of Canadian students in a given college (j) on a dummy which takes the value of 1 if an institution participates in SPP for at least one country of origin.

was introduced. To strengthen this conclusion, we follow Machin and Murphy (2017) and Shih (2017) and run the same IV model using (a) an imputed measure of student inflows obtained as the difference in student enrollment between t and t-1 and (b) a proxy of student immigration rate, with the latter accounting for the size of post-secondary institution. In our context, taking the difference in stocks can only be regarded as a very rough proxy of student inflows, given it doesn't account for students who drop out and/or those who have not graduated within the set time period (3 years). The estimates of the model with imputed student inflows and student immigration rates reported in Column (7-8) of Table 8 confirm the absence of a substitution effect between foreign and domestic students.[35]

Finally, we look at substitution between foreign students eligible to the SPP channel and those coming from non-eligible countries. For that purpose, we regress the number of students coming from non-eligible nationalities at the institution level on the total number of students from India, China and Vietnam - using here again the introduction of SPP as an instrument for treated students. The results are reported in Table 9 and point to a statistically significant crowding-in effect on non-treated nationalities.[36] While higher enrollment of foreign students generally does not affect the number of domestic students, inflows of students from SPP eligible origin countries are crowding-in students from other, non-treated countries. In line with existing studies (Shih (2017) and Machin and Murphy (2017)), we interpret this finding as the result of an increase in the size of Canadian colleges in response to larger inflows of SPP-eligible students, whereby additional revenues were used to expand colleges' capacity and enroll additional international students.

7 Conclusion

In the context of growing demand for global education, international student mobility is a key factor of success for OECD countries' plan to attract highly skilled workers. While the recent economic literature documents the role of foreign students' transition into the labour market, human capital portability, economic conditions, geographical distance or university quality as drivers of international student mobility, we focus in this paper on the effect of information frictions and statistical discrimination in the processing of student visa applications. Understanding to what extent and under which circumstances correcting those frictions can improve interna-

[35]The introduction of SDS in 2015 made all Canadian post-secondary institutions eligible to the program as far as Chinese students were concerned. In practical terms, this doesn't affect the validity of SPP as an instrument of foreign students. As a further robustness test we restrict the sample to the pre-2015 period; the results - available upon request - still point to a null effect.

[36]The results hold when including the number of domestic students as additional control; estimates are available from the authors upon request.

tional student mobility is an important policy question. It is also interesting from an economic perspective because it engages with information issues which are a common feature of the economic literature but rarely, if ever, discussed in the context of immigration policy.

This article proposes a theoretical framework and an empirical analysis to quantify the effect of the Student Partners Program - a policy that gave visa applicants the opportunity to provide a more accurate signal of their financial and educational credentials - on international student enrollment at community colleges in Canada. Our results show that introducing origin-specific requirements in visa application processes can help reduce statistical discrimination and has the potential to significantly increase international enrollment from countries where migration fraud is a major concern. We find that on average - across all three nationalities eligible to SPP - the reform increased enrollment of foreign students at institutions participating in the program by 33%. In line with the theoretical prediction of our model, our results further indicate that the program was very successful among applicants who suffered from statistical discrimination, respectively increasing the enrollment of Indian and Vietnamese students by 105% and 74%, but had no significant effect on their Chinese counterparts. Our findings also shed light on the mechanisms through which the SPP policy worked and the impact it had on non-treated students. Our investigation of the supply-side mechanisms suggest that the reform increased student enrollment through both the total number of applications processed by visa officers and the approval rates of these applications, suggesting that SPP was not only effective at removing immigration officers' bias and reduce statistical discrimination but also managed to increase the relative attractiveness of participating colleges with respect to non-treated comparable institutions. Finally, while we find no evidence that inflows of international students led to a crowding-out of domestic students around the time period the reform was introduced, our results indicate that the recruitment of students from countries eligible to SPP had a crowding-in effect on non-eligible foreign students.

Whether or not the SPP and similar reforms have the potential to increase the average quality of international students lies beyond the scope of this paper but are interesting avenues for future research. More generally, asymmetric information between prospective immigrants and national administrations arise at various stages of the migration process. Extracting information about immigrants' intentions beyond their study plans, on the labour market or regarding their willingness to stay in their destination country, is a fundamental policy issue that scholars should see fit to address.

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Table 1: Baseline Statistics

	(1)	(2)	(3)	(4)
Estimator	PPML	PPML	PPML	PPML
Dep. Var.	N_{jit}	N_{jit}	N_{jit}	N_{jit}
Treated Origin(s)	All	India	China	Vietnam
Pol_{jit}	0.288***	0.717***	0.0785	0.552***
	(3.67)	(3.38)	(1.43)	(3.49)
Inst×Year FE	√	√	√	√
Origin×Year FE	√	√	√	√
Inst×Origin FE	√	√	√	√
Obs	101758	98878	99015	98568
% Zeros	62.6%	63.5%	63.3%	63.7%

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered by Institution*Origin pairs. The sample covers the period 2003-2017. Table shows difference-in-differences-in-differences estimates of the impact of the SPP reform. The dependent variable is the total number of enrolled students in institution j from country of origin i at a given year t.

Table 2: Non-OECD Origin Countries as Control Group

	(1)	(2)	(3)	(4)
Control Group	Non-OECD	Non-OECD	Non-OECD	Non-OECD
Estimator	PPML	PPML	PPML	PPML
Dep. Var.	N_{jit}	N_{jit}	N_{jit}	N_{jit}
Treated Origin(s)	All	India	China	Vietnam
Pol_{jit}	0.335***	0.768***	0.0987*	0.529***
	(4.03)	(4.12)	(1. 79)	(3.23)
Inst×Year FE	√	√	√	√
Origin×Year FE	√	√	√	√
Inst×Origin FE	√	√	√	√
Obs	77065	74056	74346	73773

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered by Institution*Origin pairs. The sample covers the period 2003-2017. Table shows difference-in-differences-in-differences estimates of the impact of the SPP reform on foreign student enrollment by removing OECD origin countries from the control group. The list of OECD contries include countries that were OECD members before the SPP reform started.

Table 3: Substitution effect

Control Group	(1) Colleges	(2) Colleges	(3) Colleges	(4) Colleges	(5) Univ.	(6) Univ.	(7) Univ.	(8) Univ.
Estimator	PPML	PPML	PPML	PPML	PPML	PPML	PPML	PPML
Dep. Var.	N_{jit}	N_{jit}	N_{jit}	N_{jit}	N_{jit}	N_{jit}	N_{jit}	N_{jit}
Treated Origin(s)	All	India	China	Vietnam	All	India	China	Vietnam
Pol_{jit}	0.311***	0.626***	0.0588	0.507***	0.285***	0.810***	0.0869	0.476***
	(3.07)	(2.78)	(1.04)	(2.93)	(3.56)	(2.89)	(1.27)	(3.08)
Inst×Year FE	√	√	√	√	√	√	√	√
Origin×Year FE	√	√	√	√	√	√	√	√
Inst×Origin FE	√	√	√	√	√	√	√	√
Obs	72924	70905	70905	70635	91694	78697	77425	82960
% Zeros	62.7%	62,14%	63,4%	63.7%	61.7%	62.9%	62.5%	62.4%

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered by Institution*Origin pairs. The sample covers the period 2003-2017. In Columns 1-4 the Reduced control group excludes lower-ranked Canadian Universities, whereas in Columns 5-8 only Universities (Univ.) are used as a counterfactual.

Table 4: Propensity score matching

Estimator	(1) PPML	(2) PPML	(3) PPML	(4) PPML	(5) PPML	(6) PPML
Treated Origin(s)	India	India	China	China	Vietnam	Vietnam
Model	DDD	DDD	DDD	DDD	DDD	DDD
Method	Unweighted	PSM	Unweighted	PSM	Unweighted	PSM
Dep. Var.	Enrollment	Enrollment	Enrollment	Enrollment	Enrollment	Enrollment
Pol_{jit}	0.621**	0.652**	0.0717	0.0784	0.642***	0.672***
	(2.57)	(2.14)	(1.05)	(1.13)	(3.34)	(3.32)
Inst×Year FE	√	√	√	√	√	√
Origin×Year FE	√	√	√	√	√	√
Inst×Origin FE	√	√	√	√	√	√
Obs	50777	50544	50857	50513	50557	45150

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered by Institution-Origin pairs. The sample covers the period 2003-2017. Columns (2,4,6) report the PSM weighted regression results on common support for each nationality. The PSM score is built using as matching variables the approval rate and the share of students in foreign enrollment averaged over the three years leading up to the treatment. Columns (1,3,5) report the corresponding unweighted regressions.

Table 5: (Lagged) Approval Rates as Additional Control

	(1)	(2)	(3)	(4)	(5)
Estimator	PPML	PPML	PPML	PPML	PPML
Treated Origin(s)	All	All	All	India	China
Model	DDD	DDD	DDD	DDD	DDD
Dep. Var.	Enrollment	Enrollment	Enrollment	Enrollment	Enrollment
App. Rate$_{ji,t-1}$	0.00239***		0.00240***	0.00170***	0.00152***
	(4.67)		(4.72)	(3.24)	(3.33)
Pol$_{ji,t}$		0.356***	0.356***	0.990***	0.160
		(2.92)	(2.95)	(4.52)	(1.38)
Inst×Year FE	√	√	√	√	√
Origin×Year FE	√	√	√	√	√
Inst×Origin FE	√	√	√	√	√
Obs	12201	12201	12201	11401	11446

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered by Institution-Origin pairs. The sample covers the period 2004-2013.

Table 6: Placebo Test

	(1)	(2)	(3)	(4)
Estimator	PPML	PPML	PPML	PPML
Dep. Var.	N_{jit}	N_{jit}	N_{jit}	N_{jit}
Treated Origin(s)	All	India	China	Vietnam
Pol_{jit}	0.0435	0.0676	0.0334	-0.167
	(0.92)	(0.92)	(0.57)	(-0.94)
Inst×Year FE	√	√	√	√
Origin×Year FE	√	√	√	√
Inst×Origin FE	√	√	√	√
Obs	48893	46947	47248	46710

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered by Institution-Origin pairs. The sample covers the period 2003-2017. The dependent variable is the number of Canadian Students (with Canadian citizenship) born in countries other than Canada. The institutions for which we use approved applications data are excluded from the sample.

Table 7: Mechanisms - Applications

Estimator	(1) PPML	(2) PPML	(3) PPML	(4) PPML	(5) PPML	(6) PPML	(7) PPML	(8) PPML	(9) PPML	(10) PPML	(11) PPML	(12) PPML
Treated Origin(s)	All	All	All	All	India	India	India	India	China	China	China	China
Model	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD
Dep. Var.	Enrollment	App. Total	App. Appr.	App. Rate	Enrollment	App. Total	App. Appr.	App. Rate	Enrollment	App. Total	App. Appr.	App. Rate
Pol$_{jit}$	0.257**	0.279**	0.391***	0.244***	1.036***	0.657***	1.385***	0.633***	0.0161	-0.112	-0.0677	-0.0492
	(2.05)	(2.18)	(2.68)	(3.87)	(4.82)	(3.88)	(7.56)	(5.80)	(0.13)	(-0.99)	(-0.61)	(-0.87)
Inst×Year FE	√	√	√	√	√	√	√	√	√	√	√	√
Origin×Year FE	√	√	√	√	√	√	√	√	√	√	√	√
Inst×Origin FE	√	√	√	√	√	√	√	√	√	√	√	√
Obs	32533	42302	42302	17039	31409	41131	41131	16129	31408	41149	41093	16175

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered by Institution-origin pairs. In each regression the time span is reduced till 2013. In Columns (1-4) the dependent variables are the total number of enrolled students, the total number of college applications, the total number of approved applications, the approval rate calculated as the ratio of approved student visa applications over the total number of student visa applications, and the number of students enrolled, respectively. The Triple-Diff estimates are reported when using India and China as the only treated nationalities in Columns (5-8) and (9-12), respectively.

Table 8: Crowding-Out on Native Students

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimator	OLS(IHS)	PPML	IV-2SLS	IV-PPML	OLS(IHS)	PPML	IV-2SLS	IV-2SLS
Dep. Var.	Can Studs $\ln[N_{jt}^{(i=Can)}]$	Can Studs $N_{jt}^{(i=Can)}$	Can Studs $\ln[N_{jt}^{(i=Can)}]$	Can Studs $N_{jt}^{(i=Can)}$	Can Studs $\ln[N_{jt}^{(i=Can)}]$	Can Studs $N_{jt}^{(i=Can)}$	Can Studs $\Delta_{jt,t-1}^{(Can)}$	Can Studs $\text{Rate}_{jt,t-1}^{(Can)}$
					Reduced Form Test	Reduced Form Test		
$\ln[\sum_{i=1}^{i\neq Can} N_{jt}^{(i)}]$	0.014	0.070	0.011	0.013				
	(0.56)	(1.64)	(0.100)	(0.310)				
$\text{Pol}_{jt}^{(i)}$					0.023	0.001		
					(0.45)	(0.10)		
$\sum_{i=1}^{i\neq Can} \Delta_{jt,t-1}^{(i)}$							0.002	
							(0.390)	
$\sum_{i=1}^{i\neq Can} \text{Rate}_{jt,t-1}^{(i)}$								1.654
								(1.55)
Cragg-Donald F-Stat			69.234				38.319	13.170
Kleibergen-Paap F-Stat			21.532				22.983	11.133
Pol_{jt} (1st Stage)				0.478***				
				(4.64)				
Inst FE	√	√	√	√	√	√	√	√
Year FE	√	√	√	√	√	√	√	√
Province*Year FE	√	√	√	√	√	√	√	√
Obs	1339	1339	1339	1339	1339	1339	1353	1353

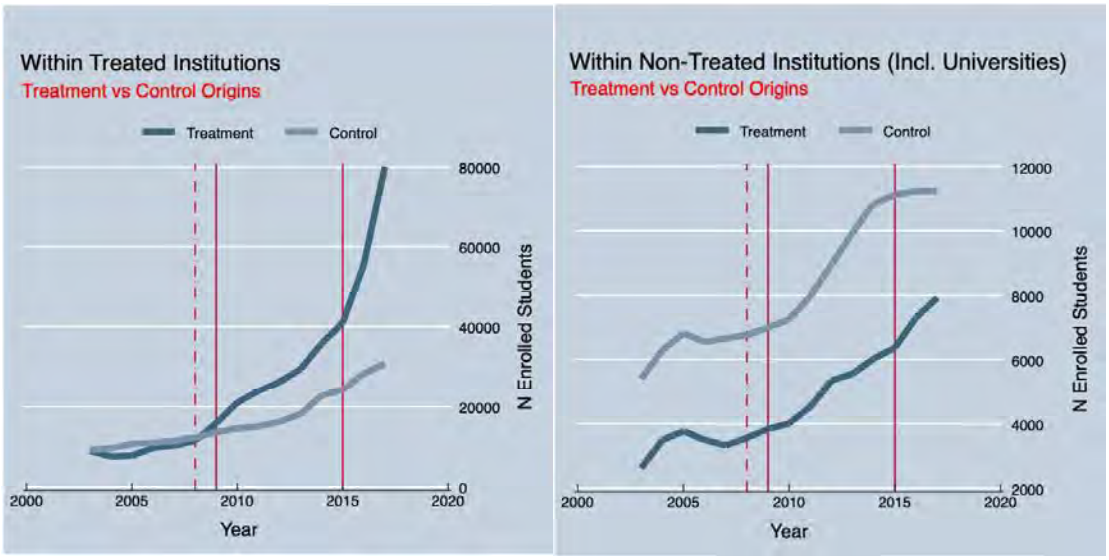
Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered by Institution. The sample covers the period 2003-2017. The dependent variable is the number of enrolled Canadian Students in Columns (1-6); in Column 7 both dependent and the independent variables are expressed as the difference in enrollment between t and t-1 $[\Delta_{jt,t-1}^{(i=Can)}]$ - while in Column 8 these differences in enrollment are weighted by the total number of students. In Column 1, 3 and 5 enrollment are specified in inverse hyperbolic sine. In Column (4) IV estimates are obtained with the control function approach.

Table 9: Crowding-Out on Non-Treated Foreign Students

	(1)	(2)	(3)	(4)
Estimator	OLS(IHS)	PPML	IV-2SLS	IV-PPML
Dep. Var.	Non-Treated Int. Studs	Non-Treated Int. Studs	Non-Treated Int. Studs	Non-Treated Int. Studs
	$\ln[\sum_{i=1}^{i\neq Treated} N_{jt}^{(i)}]$	$\sum_{i=1}^{i\neq Treated} N_{jt}^{(i)}$	$\ln[\sum_{i=1}^{i\neq Treated} N_{jt}^{(i)}]$	$\sum_{i=1}^{i\neq Treated} N_{jt}^{(i)}$
$\ln[\sum_{i=1}^{i=Treated} N_{jt}^{(i)}]$	0.203***	0.193***	0.297*	0.271*
	(4.56)	(3.79)	(1.76)	(1.93)
Cragg-Donald F-Stat			71.250	
Kleibergen-Paap F-Stat			12.948	
PoI_{jt} (1st Stage)				0.655***
				(3.60)
Inst FE	√	√	√	√
Year FE	√	√	√	√
Province*Year FE	√	√	√	√
Obs	1145	1145	1145	1145

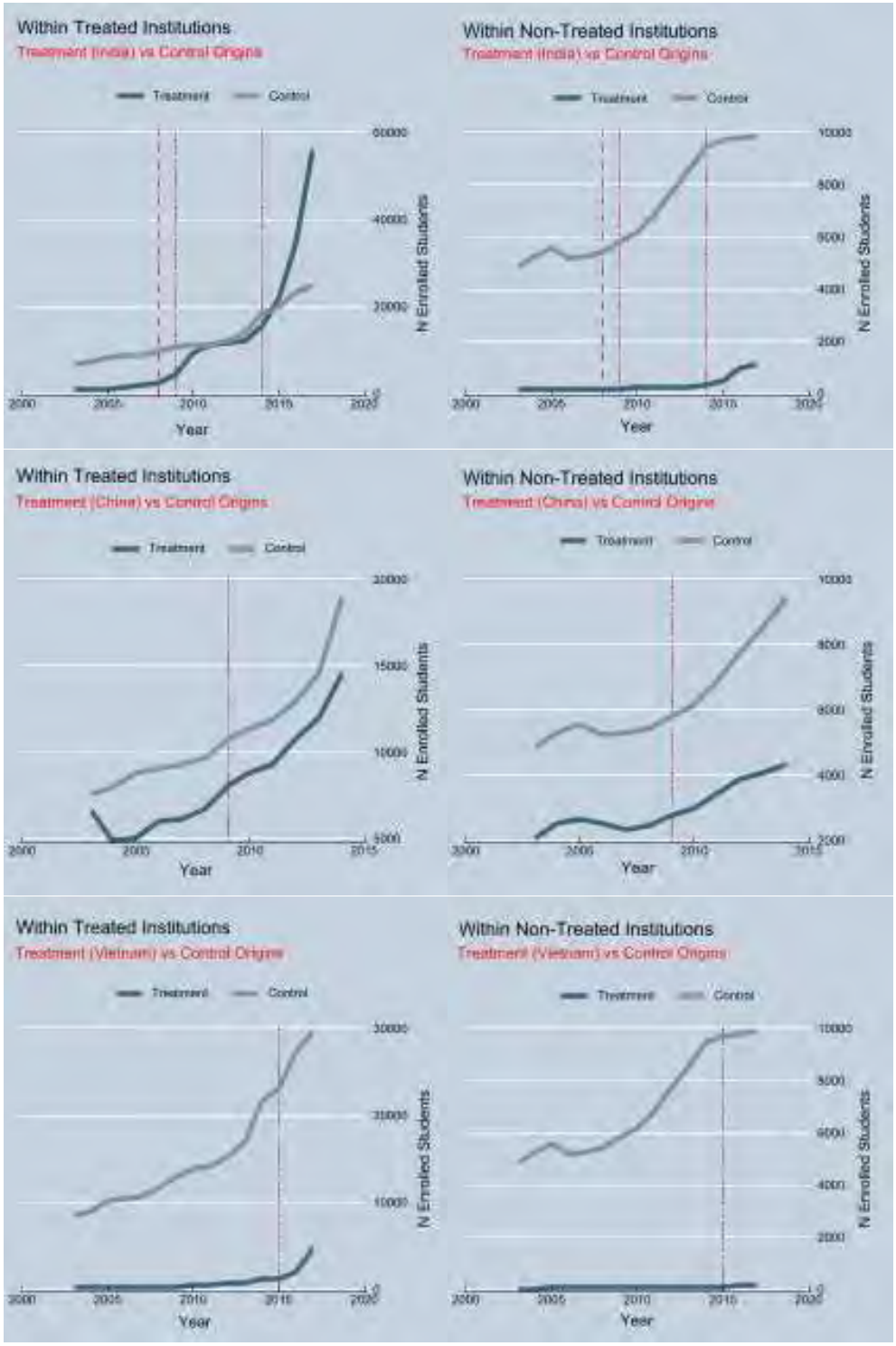
Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered by Institution. The sample covers the period 2003-2017. The dependent variable is the number of enrolled foreign students from non-treated nationalities. In Column 1 and 3 enrollment are specified in inverse hyperbolic sine. In Column (4) IV estimates are obtained with the control function approach.

Figure 4: Parallel Trends - Triple-Diff



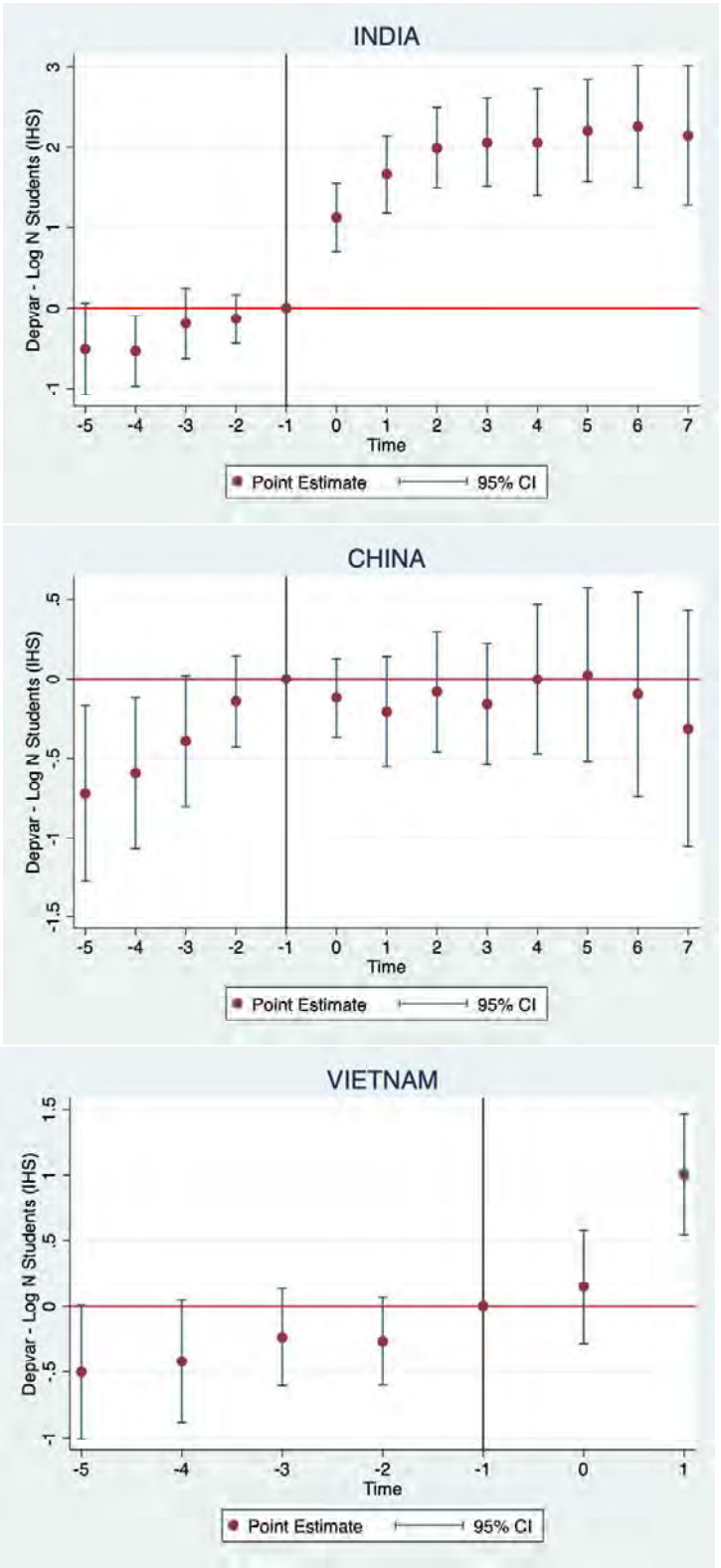
Notes: The figure shows the parallel trends in support of the underlying assumptions of the Triple-Diff model. The dashed red line refers to the (academic) year before (t-1) in which the pilot SPP program for Indian Students kicked in. The solid red lines refer to the (academic) years before (t-1) in which - for each eligible nationality - the majority of institutions joined the program. The sample includes treated and control institutions of the baseline sample (see Table 12-15 in the Appendix).

Figure 5: Parallel Trends - Triple-Diff (by Treated Origin)



Notes: The figure shows the parallel trends in support of the underlying assumptions of the Triple-Diff model for Indian (upper panel), Chinese (center panel) and Vietnamese (bottom panel) students, respectively. The dashed-dotted red line in the upper panel refers to the (academic) year before (t-1) in which the pilot SPP program for Indian Students kicked in. The dashed red lines refer to the (academic) years before (t-1) in which - for each eligible nationality - the majority of institutions joined the program. The center panel focuses on a reduced time-span (2003-2014) because in 2015 an equivalent of the SPP program was introduced for Chinese students which applied to all Canadian institutions.

Figure 6: Event Studies - By Treated Nationality



Notes: Effect of SPP on the enrollment of international students. Figure shows the coefficients and 95% confidence intervals from event study regressions that estimate enrollment levels for each academic year and across treated nationality.

Table 10: List of SPP institutions - China

Institutions	Date of entry into SPP	Region
Bow Valley College	2010	Alberta
Grant MacEwan University*	2010	Alberta
Lethbridge College	2010	Alberta
Medicine Hat College	2010	Alberta
Northern Alberta Institute of Technology	2010	Alberta
Lakeland College	2015	Alberta
NorQuest College	2015	Alberta
Camosun College	2010	British Columbia
College of New Caledonia	2010	British Columbia
College of the Rockies	2010	British Columbia
Columbia College	2010	British Columbia
Douglas College	2010	British Columbia
Kwantlen Polytechnic University	2010	British Columbia
Langara College	2010	British Columbia
North Island College	2010	British Columbia
Northern Lights College	2010	British Columbia
Okanagan College	2010	British Columbia
Selkirk College	2010	British Columbia
University of the Fraser Valley**	2010	British Columbia
Vancouver Community College	2010	British Columbia
Vancouver Island University	2010	British Columbia
Coast Mountain College	2015	British Columbia
Red River College	2010	Manitoba
Manitoba Institute of Trades and Technology	2012	Manitoba
Assiniboine Community College	2015	Manitoba
New Brunswick Community College	2011	New Brunswick
Marine Institute of Memorial University**	2010	Newfoundland
Nova Scotia Agricultural College	2010	Nova Scotia
Cape Breton University*	2012	Nova Scotia
Algonquin College	2010	Ontario
Cambrian College	2010	Ontario
Centennial College	2010	Ontario
Conestoga College	2010	Ontario
Confederation College	2010	Ontario
Durham College	2010	Ontario
Fanshawe College	2010	Ontario
George Brown College	2010	Ontario
Georgian College	2010	Ontario
Humber College	2010	Ontario
Loyalist College	2010	Ontario
Mohawk College	2010	Ontario
Niagara College	2010	Ontario
Seneca College	2010	Ontario
Sheridan College	2010	Ontario
St. Clair College	2010	Ontario
St. Lawrence College	2010	Ontario
Canadore College	2011	Ontario
Lambton College	2011	Ontario
Centennial College	2012	Ontario
Northern College of Applied Arts and Technology	2012	Ontario
Fleming College	2013	Ontario
Holland College	2010	Prince Edward Island
Collège LaSalle	2015	Québec
Yukon College	2010	Yukon

* Cape Breton University and Grant MacEwan University respectively left the program in 2013 and 2016.
** These institutions were dropped from the analysis because of data limitations.

Table 11: List of SPP institutions - India

Institutions	Date of entry into SPP	Region
Bow Valley College	2009	Alberta
Grant McEwan College*	2009	Alberta
Northern Alberta Institute of Technology	2009	Alberta
Southern Alberta Institute of Technology	2009	Alberta
Medicine Hat College	2010	Alberta
Lakeland College	2015	Alberta
NorQuest College	2015	Alberta
Camosun College	2009	British Columbia
Columbia College	2009	British Columbia
Vancouver Community College	2009	British Columbia
Vancouver Island University	2009	British Columbia
College of New Caledonia	2010	British Columbia
College of the Rockies	2010	British Columbia
Douglas College	2010	British Columbia
Kwantlen Polytechnic University	2010	British Columbia
North Island College	2010	British Columbia
Northern Lights	2010	British Columbia
Okanagan College	2010	British Columbia
Selkirk College	2010	British Columbia
University of The Fraser Valley**	2010	British Columbia
Red River College	2009	Manitoba
Manitoba Institute of Trades and Technology	2013	Manitoba
Assiniboine Community College	2015	Manitoba
New Brunswick Community College	2011	New Brunswick
Marine Institute of Memorial University**	2010	Newfoundland
Algonquin College	2009	Ontario
Cambrian College	2009	Ontario
Centennial College	2009	Ontario
George Brown College	2009	Ontario
Georgian College	2009	Ontario
Humber College	2009	Ontario
Loyalist College	2009	Ontario
Mohawk College	2009	Ontario
Niagara College	2009	Ontario
Seneca College	2009	Ontario
Sheridan College	2009	Ontario
Conestoga College	2010	Ontario
Confederation College	2010	Ontario
Durham College	2010	Ontario
Fanshawe College	2010	Ontario
Lambton College	2010	Ontario
Northern College of Applied Arts and Technology	2010	Ontario
St. Clair College	2010	Ontario
St. Lawrence College	2010	Ontario
Fleming College	2011	Ontario
Canadore College	2015	Ontario
Sault College	2015	Ontario
Collège LaSalle	2015	Québec
Parkland College**	2011	Saskatchewan
Saskatchewan Polytechnic**	2011	Saskatchewan

* Grant MacEwan University left the program in 2013.

** These institutions were dropped from the analysis because of data limitations.

Table 12: List of SPP institutions - Vietnam

Institutions	Date of entry into SPP	Region
Bow Valley College	2016	Alberta
Lakeland College	2016	Alberta
Medicine Hat College	2016	Alberta
Norquest College	2016	Alberta
Northern Alberta Institute of Technology	2016	Alberta
Southern Alberta Institute of Technology	2016	Alberta
British Colombia Institute of Technology	2016	British Columbia
Camosun College	2016	British Columbia
Capilano University	2016	British Columbia
College of New Caledonia	2016	British Columbia
College of the Rockies	2016	British Columbia
Douglas College	2016	British Columbia
Emily Carr University	2016	British Columbia
Kwantlen Polytechnic University	2016	British Columbia
Langara College	2016	British Columbia
North Island College	2016	British Columbia
Coast Mountain College	2016	British Columbia
Okanagan College	2016	British Columbia
Selkirk College	2016	British Columbia
University of the Fraser Valley**	2016	British Columbia
Vancouver Community College	2016	British Columbia
Northern Lights College	2018	British Columbia
Thompson Rivers University	2018	British Columbia
Vancouver Island University	2018	British Columbia
Assiniboine Community College	2016	Manitoba
Manitoba Institutions of Trades and Technology	2016	Manitoba
Red River College	2016	Manitoba
New Brunswick Community College	2016	New Brunswick
Marine Institute of Memorial University**	2016	New Foundland
Nova Scotia Agricultural College	2018	Nova Scotia
Algonquin College	2016	Ontario
Cambrian College	2016	Ontario
Canadore College	2016	Ontario
Centennial College	2016	Ontario
Conestoga College	2016	Ontario
Confederation College	2016	Ontario
Durham College	2016	Ontario
Fanshawe College	2016	Ontario
Fleming College	2016	Ontario
George Brown College	2016	Ontario
Georgian College	2016	Ontario
Humber College	2016	Ontario
Lambton College	2016	Ontario
Loyalist College	2016	Ontario
Mohawk College	2016	Ontario
Niagara College	2016	Ontario
Seneca College	2016	Ontario
St. Claire College	2016	Ontario
Northern College of Applied Arts and Technology	2018	Ontario
Sault College	2018	Ontario
Sheridan College	2018	Ontario
St. Lawrence College	2018	Ontario
Lasalle College	2018	Quebec
Saskatchewan Polytechnic**	2016	Saskatchewan
Parkland College	2018	Saskatchewan

** These institutions were dropped from the analysis because of data limitations.

Table 13: List of control institutions

Institutions	Region	Type
Alberta College of Art and Design	Alberta	College
Burman University	Alberta	University
Concordia University of Edmonton	Alberta	University
Grande Prairie Regional College	Alberta	College
Keyano College	Alberta	College
Mount Royal University	Alberta	University
Northern Lakes College	Alberta	College
Olds College	Alberta	College
Portage College	Alberta	College
Red Deer College	Alberta	College
St. Mary's University	Alberta	University
The King's University	Alberta	University
University of Lethbridge	Alberta	University
Nicola Valley Institute of Technology	British Columbia	College
Royal Roads University	British Columbia	University
University of Northern British Columbia	British Columbia	University
Booth University College	Manitoba	College
Brandon University	Manitoba	University
University College of the North	Manitoba	College
Maritime College of Forest	New Brunswick	College
Mount Allison University	New Brunswick	University
St. Thomas University	New Brunswick	University
Acadia University	Nova Scotia	University
Mount St. Vincent University	Nova Scotia	University
Nova Scotia Community Colleges	Nova Scotia	College
NSCAD University	Nova Scotia	University
Saint Mary's University	Nova Scotia	University
St. Francis Xavier University	Nova Scotia	University
Université Sainte-Anne	Nova Scotia	College
Algoma University	Ontario	University
Brock University	Ontario	University
Kemptville College	Ontario	College
Lakehead University	Ontario	University
Laurentian University	Ontario	University
Nipissing University	Ontario	University
OCAD University	Ontario	University
Trent University	Ontario	University
Université de Moncton	Ontario	University
University of Ontario Institute of Technology	Ontario	College
University of Prince Edward Island	Prince Edward Island	University
Bishop's University	Québec	University
Campus Notre-Dame-de-Foy	Québec	College
CÉGEP d'Abitibi-Témiscamingue	Québec	College
CÉGEP de la Gaspésie et des Îles	Québec	College
CÉGEP de Sept-Îles	Québec	College
CÉGEP John Abbott	Québec	College
CÉGEP Marie-Victorin	Québec	College
Champlain Regional College	Québec	College
Collège Centennal / Centennial College	Québec	College
Collège Dawson	Québec	College
Collège Heritage / Heritage College	Québec	College
Collège Marianopolis	Québec	College
Collège Mother House	Québec	College
Collège O'Sullivan de Montréal inc	Québec	College
Collège O'Sullivan de Québec inc	Québec	College
Collège Shawinigan	Québec	College
Collège Vanier	Québec	College
Université du Québec à Trois-Rivières	Québec	University
University of Regina	Saskatchewan	University

Table 14: List of Countries of Origin / Nationalities

Afghanistan	Congo, Rep. of the	Hungary	Morocco	Solomon Islands
Albania	Costa Rica	Iceland	Mozambique	Somalia
Algeria	Cote d'Ivoire	**India**	Myanmar	South Africa
Angola	Croatia	Indonesia	Namibia	South Korea
Antigua and Barbuda	Cuba	Iran	Nepal	South Sudan
Argentina	Curacao	Iraq	Netherlands	Spain
Armenia	Cyprus	Ireland	Netherlands Antilles	Sri Lanka
Aruba	Czech Republic	Israel	New Caledonia	Sudan
Australia	Denmark	Italy	New Zealand	Suriname
Austria	Djibouti	Jamaica	Nicaragua	Sweden
Azerbaijan	Dominica	Japan	Niger	Switzerland
Bahamas	Dominican Republic	Jordan	Nigeria	Syria
Bahrain	Ecuador	Kazakhstan	North Korea	Taiwan
Bangladesh	Egypt	Kenya	North Macedonia	Tajikistan
Barbados	El Salvador	Kosovo	Norway	Tanzania
Belarus	Equatorial Guinea	Kuwait	Oman	Thailand
Belgium	Eritrea	Kyrgyzstan	Pakistan	Togo
Belize	Estonia	Laos	Panama	Trinidad & Tobago
Benin	Eswatini	Latvia	Papua New Guinea	Tunisia
Bermuda	Ethiopia	Lebanon	Paraguay	Turkey
Bhutan	Fiji	Lesotho	Peru	Turkmenistan
Bolivia	Finland	Liberia	Philippines	Turks & Caicos Isl.
Bosnia & Herzegovina	France	Libya	Poland	Uganda
Botswana	French Polynesia	Lithuania	Portugal	Ukraine
Brazil	Gabon	Luxembourg	Qatar	United Arab Emirates
British Virgin Isl.	Gambia	Macao	Reunion	United Kingdom
Brunei	Georgia	Madagascar	Romania	United States
Bulgaria	Germany	Malawi	Russia	Uruguay
Burkina Faso	Ghana	Malaysia	Rwanda	Uzbekistan
Burundi	Greece	Maldives	St. Kitts & Nevis	Vanuatu
Cambodia	Grenada	Mali	St. Lucia	Venezuela
Cameroon	Guadeloupe	Malta	St. Pierre & Miquelon	**Vietnam**
Cape Verde	Guam	Martinique	Saudi Arabia	Yemen
Cayman Islands	Guatemala	Mauritania	Senegal	Zambia
Central African Rep.	Guinea	Mauritius	Serbia	Zimbabwe
Chad	Guinea-Bissau	Mayotte	Seychelles	
Chile	Guyana	Mexico	Sierra Leone	
China	Haiti	Moldova	Singapore	
Christmas Island	Honduras	Mongolia	Slovakia	
Colombia	Hong Kong	Montenegro	Slovenia	

* Notes: in **bold** the treated countries of origin included in the baseline sample.

7.1 Appendix

7.1.1 Nationality specific Difference-in-difference

As outlined in Section 5.2, we consider a "lighter" diff-in-diff model capturing differences in enrollment trends between treated and non-treated institution for each treated nationality. This amounts to testing the impact of SPP on enrollment without using a benchmark of foreign students that were not eligible to the reform. This origin-specific specification reduces to:

$$\ln(N_{jt}^{(i)}) = \alpha_0 + \alpha_j + \alpha_t + \theta Pol_{jt}^{(i)} + e_{jt}^{(i)} \tag{5}$$

Where $N_{jt}^{(i)}$ is the number of students of nationality i enrolled in a post-secondary institution j on year t. α_j and α_t are institution and year dummies, respectively, while α_0 is the constant term. The coefficient of interest is θ, and measures the difference the change in student enrollment after the SPP reform between treated and control institutions.

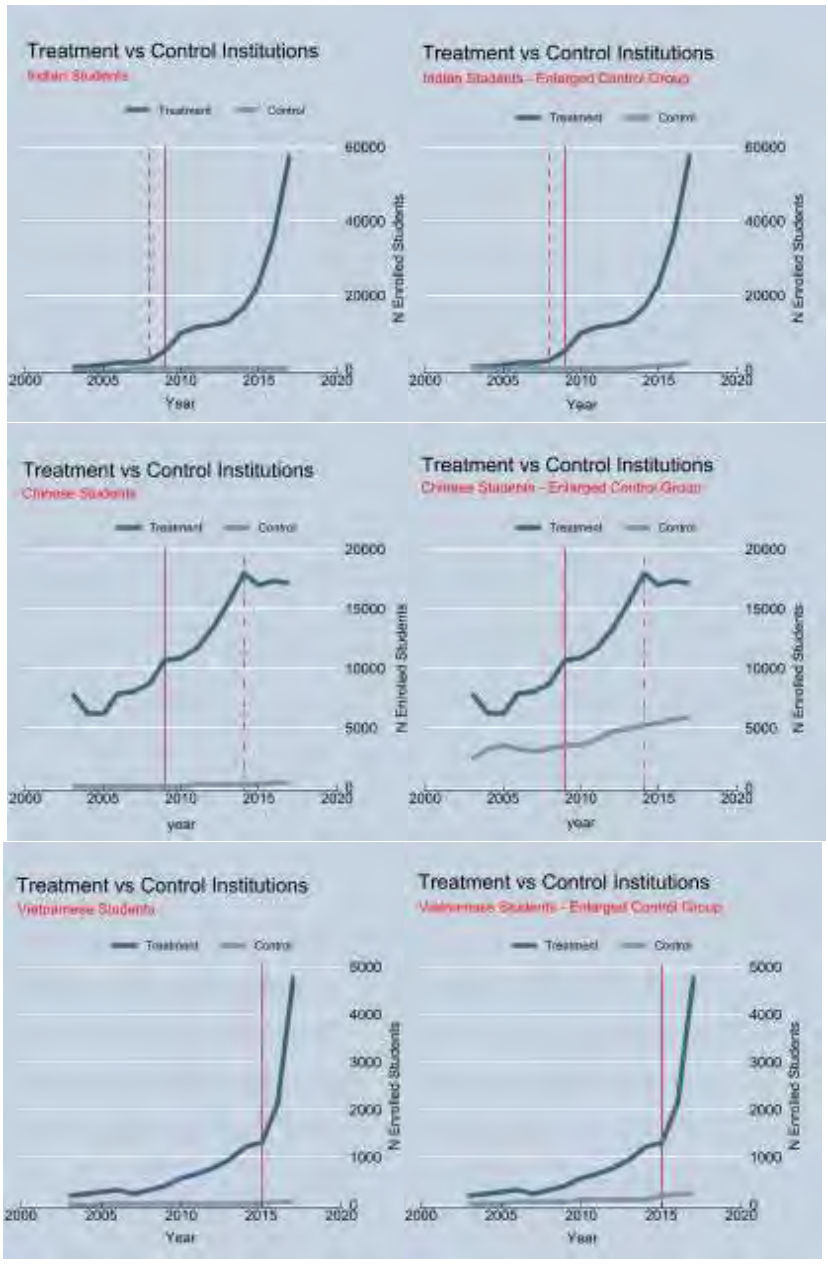
As showed in Figure 7, for this exercise the parallel trend assumption generally holds across origin countries. The Diff-in-Diff estimates of Equation 5 are presented in Table 15 and corroborate the baseline statistics.

Table 15: Simple Difference-in-Difference Estimation

	(1)	(2)	(3)	(4)
Estimator	PPML	PPML	PPML	PPML
Dep. Var.	$N_{jt}^{(i)}$	$N_{jt}^{(i)}$	$N_{jt}^{(i)}$	$N_{jt}^{(i)}$
Treated Origin(s)	All	India	China	Vietnam
Model	DD	DD	DD	DD
$Pol_{jt}^{(i)}$	1.511***	1.194***	0.007	0.954***
	(10.18)	(3.67)	(0.10)	(3.99)
Inst FE	√	√	√	√
Year FE	√	√	√	√
Obs	2912	976	1047	889
% Zeros	24.9%	21.7%	17.2%	38.7%

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered by Institution. Table shows difference-in-differences estimates of the impact of the SPP reform. The dependent variable is the total number of enrolled students in institution j from country of origin i at a given year t.

Figure 7: Parallel Trends - Diff-in-Diff



Notes: the figure shows the parallel trends in support of the underlying assumptions of the Diff-in-Diff model with different control groups for Indian (upper panel), Chinese (center panel) and Vietnamese (bottom panel) students, respectively. The dashed line in the upper panel refers to the (academic) year in which the pilot SPP program for Indian Students kicked in. The dashed line in the center panel refers to the year in which an equivalent of the SPP program was introduced for Chinese students which applied to all Canadian institutions.

7.1.2 Excluding Data on Approved Applications

As pointed out in Section 5, we constructed our baseline sample using data on approved applications for some selected institutions because information on student enrollment were not available. While approved study permit applications are – by definition - a very close substitute to international student enrollment, one could argue that some minor differences between them could bias the estimation. In particular, students who get their study permits approved might change their mind and decide not to travel to Canada, or they may fail to enroll in school once in Canada and therefore become illegal. While it is safe to assume that the former channel has no reason to be affected by the introduction of the SPP program and can therefore be controlled for with the use of origin-year fixed effect, the latter could bias our analysis if it affected international students applying to SPP and non-SPP institutions in specific ways after the implementation of the reform, potentially acting as a co-founder of the SPP treatment we are trying to capture.[37] The risk then would be that our estimates of the true effect of SPP is biased downwards.
To address this potential threat to the identification strategy, we estimate model 3 without any applications data on a sample excluding institutions for which student enrollment data is missing. Results are presented in Table 16. Despite the difference in the sample size, the baseline coefficients are qualitatively similar, and we can safely conclude that the parameters of interest β of the quasi-experimental models reflect the true causal impact of the SPP reform on student enrollment.

[37] More specifically, since SPP required participating institutions to set up a reporting mechanism providing feedback on student enrollment and attendance to the Canadian Government, it likely decreased the comparative share of SPP applicants entering the country on a study permit who then failed to enroll at school. Given that no such incentives played out among students applying to non-SPP institutions, it is possible that using study permit applications data rather than actual enrollment counts leads to underestimating the actual difference between the number of students who enrolled at non-SPP institutions and those who enrolled at SPP institutions after the implementation of the reform. However, we argue that the threat to the identification should be minimal. This is mainly because the regular visa stream was still opened for SPP institutions after the introduction of the reform, with bogus students still able to apply to SPP institutions.

Table 16: Excluding Approved Applications

	(1)	(2)	(3)	(4)
Estimator	PPML	PPML	PPML	PPML
Dep. Var.	N_{jit}	N_{jit}	N_{jit}	N_{jit}
Treated Origin(s)	All	India	China	Vietnam
Model	DDD	DDD	DDD	DDD
Pol_{jit}	0.242***	0.658***	0.049	0.322**
	(3.06)	(3.16)	(0.89)	(2.27)
Inst×Year FE	√	√	√	√
Origin×Year FE	√	√	√	√
Inst×Origin FE	√	√	√	√
Obs	84863	82365	82643	82224

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered by Institution*Origin pairs. The sample excludes the information on the approved number of applications included in our baseline sample.

7.1.3 Pre-2015 effect of SPP

When comparing the effect of SPP between Chinese and Indian students, one might object that the null effect in China is driven by the introduction of the SDS for Chinese students in 2015, a pilot program with similar benefits to those of SPP but open to any post-secondary education program (see Section 2.1). To test whether this is the case, we compare in Table 17 the effect of the SPP reform between Chinese and Indian students until 2014. The coefficient for Chinese students (Column 3) once again suggests that SPP had no impact on enrollment.

Table 17: Pre-2015 effect

	(1)	(2)
Estimator	PPML	PPML
Dep. Var.	N_{jit}	N_{jit}
Treated Origin(s)	India	China
Model	DDD	DDD
Pol_{jit}	0.770***	0.00915
	(4.29)	(0.10)
Inst×Year FE	√	√
Origin×Year FE	√	√
Inst×Origin FE	√	√
Obs	66515	66613

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered by Institution. In each regression the time span is reduced till 2014. Vietnam is excluded from the results as SPP started in 2016 for this country.

7.1.4 Alternative estimators

Throughout this paper, we use Poisson PML as the workhorse estimator to estimate Equation 3, in the spirit of structural gravity model of international migration with high-dimensional fixed effects. This choice is in line with the literature and motivated mostly by the large presence of zeros in the dependent variable. In Table 18 we re-estimate the baseline specifications using Ordinary Least Squares, first by taking the log of student enrolments - which automatically excludes zeros from the sample. Alternatively, we also use enrollment counts specified in inverse hyperbolic sine. Overall - despite the inflated coefficients which are plausibly due to the inconsistency of the OLS estimator in the presence of a large share of zeros - the results are qualitatively very similar to the benchmark statistics.

Table 18: Alternative Estimators (with HDFEs)

Treated Origin(s)		(1) All DDD	(2) India DDD	(3) China DDD	(4) Vietnam DDD	(5) India DD	(6) China DD	(7) Vietnam DD
OLS								
	Dep. Var.	$\ln(N_{jit})$	$\ln(N_{jit})$	$\ln(N_{jit})$	$\ln(N_{jit})$	$\ln(N_{jt}^{(i)})$	$\ln(N_{jt}^{(i)})$	$\ln(N_{jt}^{(i)})$
Pol_{jit}		0.984***	1.849***	0.160	0.981***			
		(8.64)	(8.43)	(1.54)	(6.40)			
$Pol_{ji}^{(i)}$						2.038***	0.0709	1.241***
						(8.62)	(0.61)	(6.29)
Obs		35897	33990	34187	33631	1032	1229	669
OLS - IHS								
	Dep. Var.	$N_{jit}IHS$	$N_{jit}IHS$	$N_{jit}IHS$	$N_{jit}IHS$	$N_{jt}^{(i)}IHS$	$N_{jt}^{(i)}IHS$	$N_{jt}^{(i)}IHS$
Pol_{jit}		1.214***	2.183***	0.249*	0.937***			
		(9.20)	(9.80)	(1.75)	(4.51)			
$Pol_{ji}^{(i)}$						2.290***	0.212	1.250***
						(9.84)	(1.43)	(5.53)
Obs		101758	99069	99170	98943	1357	1458	1231

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. In the upper panel enrollment are specified in log form, so all zeros are excluded from the specification. In the bottom panel enrollment are specified in inverse hyperbolic sine.