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Citizenship, math and gender:

Exploring immigrant students' choice of majors

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Abstract. This paper investigates whether citizenship of immigrant students in the host country influences their choice of majors, and whether these effects differ by gender. Using detailed students' data from an Italian university, combined with characteristics of the countries of origin, I examine the effects of citizenship on enrolments in educational areas categorized by their mathematical content. Results indicate a decrease in the likelihood of enrolment in math-intensive fields among students who acquire citizenship, particularly among males, leading to a reduction in gender gaps. Moreover, gender gaps are smaller and show a more pronounced decrease with citizenship as gender inequality in countries increases. Results are corroborated by matching and instrumental variables strategies. These findings shed light on the existence of trade-offs between empowerment, as manifested through citizenship, and major choices.

JEL I23, I24, I25, J16

Keywords: Citizenship, immigrants, higher education, math, gender gaps, gender inequality.

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Introduction

Citizenship in the host country significantly enhances the civil, social, and economic status of immigrants. It grants them the right to vote and often opens opportunities for employment in the public sector and various professions. Closely linked to institutional support during periods of unemployment, illness, or old age, citizenship provides benefits at both national and international levels. In the context of the host country being a member of the European Union (EU), many of these rights extend to the other 26 member states.

Hence, the acquisition of citizenship holds such transformative power that it can be expected to significantly influence the long-term decisions of immigrants across various dimensions of their lives. This impact includes their performances in the labour market, social integration, and, notably, their decisions regarding investments in education. In the latter context, recent empirical investigations reveal that citizenship influences the educational choices of students with an immigrant background, particularly concerning the duration and quality of their schooling. Patler (2017) Fibbi et al. (2007) Avitabile et al. (2014) Busse et al. (2021) and Labussière et al. (2021) find that immigrant students who acquire citizenship have higher expectations on the number of years spent in school education. Additionally, studies by Kilpi-Jakonen (2014) and Ferrara and Brunori (2023) indicate a tendency among immigrant students with citizenship to transition from vocational to general schools. However, it is crucial to note that the impact of citizenship on the major choices of immigrant students at the tertiary level remains largely unexplored. This research gap is noteworthy, given the pivotal importance of tertiary education choices for both the individuals involved and the host country's human capital composition.

Concerning the selection of majors, empirical research typically considers students' choices based on their attitudes, preferences, cultural influences, school and social backgrounds. However, an often overlooked yet crucial factor is the effective level of empowerment students can anticipate after graduation, especially in the job markets. Notably, with everything elase equal, a lower sense of security may act as motivation for students, particularly those in fragile groups such as immigrant students, [1] to choose majors that prioritize economic prospects over other characteristics, such as intrinsic interest. In this context, the heightened economic and social security provided by citizenship can significantly broaden their effective range of choices.

[1] This possibility aligns with Borgen and Hermansen (2023), who compare the educational choices of immigrants with those of natives in Norway, and find that immigrants exhibit a higher concentration of choices in high-paying fields.

Hence, it is reasonable to expect the choice of majors of immigrant students who attain citizenship to be less concentrated in the high-paying fields of education. To narrow it down further, considering that these fields are typically characterized by a mathematical content that is above average, one might expect that immigrant students acquiring citizenship will decrease the math-intensity of the majors chosen.

This research specifically investigates the impact of citizenship on the choice of majors among immigrant students. The study utilizes data from the University of Modena and Reggio Emilia in Italy (Unimoredata), which encompass detailed information on 1.5 and second-generation students with an immigrant background, as well as information on their parents. The dataset is complemented by characteristics of the countries of origin. The fields of education are categorized into four main areas, ordered by decreasing mathematical content: physical sciences, engineering and economics, life sciences, social sciences, and humanities. The primary inquiries guiding this research are as follows: Does citizenship play a role in influencing the enrolment decisions of immigrant students? To what extent does citizenship impact gender gaps in the four specified areas of study? Does the acquisition of citizenship alter any existing relationships between gender gaps and gender inequality?

The first question is aligned with the hypothesis made above, suggesting that, holding all else constant, enrolments in math-intensive fields and other academic areas should be related to students' levels of empowerment, particularly citizenship. The second question is tied to the extensive body of literature on gender gaps. Existing research underscores the disadvantage girls face in math (Guiso et al., 2008; Nollerberger et al. 2016) and women encounter in Science, Technology, Engineering, and Mathematics (STEM) fields (Chise et. al, 2021; Granato, 2023). Specifically, the current investigation aims to uncover whether women's disadvantages, expected to be more pronounced in math-intensive areas, are influenced by the acquisition of citizenship.

The third question is connected to the approach that links math gender gaps to gender social rules, with these rules being approximated by gender inequalities in students' countries of origin (Rodríguez-Planas and Nollerberger, 2018). By concentrating on immigrant students, that approach aims to isolate the social norms of origin countries, assumedly transmitted through students' households, from the institutions of those countries. This study explores the connections between gender gaps and gender inequality in origin countries and tests whether these connections are impacted by citizenship. The rationale behind this exploration lies in a potential divergence between gender social rules and empowerment. While stereotypes can confine females to their households' preferences regarding education, the empowerment provided by citizenship can liberate them from these constraints.

Hence, this study contributes to two domains of the education literature: one pertaining to citizenship and the other addressing gender gaps and gender inequality. To my knowledge, this is the first analysis of the effects of citizenship on the choice of majors rather than on the duration of schooling or school quality. Furthermore, it pioneers the exploration of the interplay between gender gaps in education, gender inequality and citizenship.

The findings of this study are as follows. First: Immigrant students who acquire citizenship in the host country exhibit a significant decrease in the likelihood of majoring in math-intensive fields. This evidences that citizenship plays a significant role in shaping academic preferences among immigrant students. Second: Gender gaps in these fields are substantial and, as expected, to the disadvantage of women. However, the impact of citizenship on enrolments is more pronounced for males, leading to a reduction in gender gaps. Hence, citizenship has a mitigating effect on gender gaps in math-intensive areas. Third: Female students from countries characterized by higher gender inequality are more likely to enrol in math-intensive fields. However, upon acquiring citizenship, they are also more likely to reduce their enrolments in these fields and transition to other academic areas. Fourth: The decline in enrolments in math-intensive fields driven by citizenship is accompanied by an increase in enrolments in all other areas, except for social sciences, where women partly transition to the humanities. Results are robust to a wide set of controls, specifications, and are corroborated by matching and instrumental variables strategies.

The rest of the paper is structured as follows: Section one reviews the related literature; Section two briefly describes the Italian setting; Section three describes the data and presents some descriptive statistics; Section four sketches the empirical strategy, Section five shows descriptive evidence, Section six discusses results and makes use of identification strategies, and Section seven concludes.

1. Related literature

Research on citizenship shows its pivotal role in facilitating integration within the host country. In Dustmann (2008), it weakens intentions to return to the home country, and hence amplifies the returns on investments in human capita. Increased job opportunities strengthen these effects (Simonsen, 2017), (Gathmann and Keller, 2017; Gathmann and Garbers, 2023).

Regarding citizenship and education, Bean et al. (2011) and Patler (2017) observe a positive impact of parents' naturalization on the length of their children's education in the United States. Similarly, Fibbi et al. (2007) report comparable findings based on data from Switzerland, while Avitabile et al. (2014) and Busse et al. (2021) present analogous results for Germany, and Labussière et al. (2021) for the Netherlands.

However, findings from studies focusing on some Southern European countries exhibit different results. For instance, Contini and Azzolini (2016) evidence that immigrant students in Italy tend to choose vocational rather than academic schools more than natives, but the difference is significant only for boys. Aktaş et al. (2022), underscore a significant influence exerted by teachers' indications on these choices. Fellini and Guetto (2022), also with data from Italy, evidence that citizenship neither enhances the academic performance of immigrant students nor extends their anticipated years of education.

In the context of educational quality, Kilpi-Jakonen (2014) using data from Finland show that immigrant students who acquire citizenship are more inclined to opt for an academic rather than a vocational path. Given that the academic route is often lengthier and more conducive to tertiary studies, these results align with findings on the extended duration of education. In a departure from Fellini and Guetto's (2022) conclusions, Ferrara and Brunori (2023), find that second-generation immigrants with Italian citizenship are more likely than their non-naturalized counterparts, and even of native students, to enrol in academic school tracks.

A segment of the research delves into the gendered effects of citizenship. Drawing from data across 13 European countries, Dronkers and Fleischmann. (2010) show that citizenship is positively correlated with the educational achievements of second-generation female immigrants, particularly when their parents have low education levels. In contrast, no significant effects are observed among male immigrants.

A limitation of the research is that findings are particularly dependent on the characteristics of countries, such as citizenship laws, educational systems, and the composition of the immigrant population. Dronkers and Fleischmann (2010) show that the openness of naturalization laws in the 13 European countries they consider is positively associated with the educational attainment of both male and female second-generation immigrants. At the same time, they highlight that variations in the composition of immigrant populations in host countries, coupled with diverse cultural approaches to education, can significantly impact results.

Self-selection and endogeneity also pose potential challenges (Peters et al., 2016). For instance, if immigrants applying for citizenship are inherently more ambitious and invest more in education than the average, standard estimates will be biased upward (Jensen

et al., 2019; Hainmueller et al., 2018). To address these concerns, researchers have employed diverse methodologies. Cygan-Rehm (2018) utilized a reform of the German citizenship law in 2000, employing a two-stage estimation, while Felfe et al. (2020) employed difference-in-difference regressions. Their results indicate that the reform increased the returns to education for citizen immigrants, improved primary school outcomes for their children, and increased their likelihood of opting for an academic track.

Gathmann et al. (2021), adopting a marginal treatment effects framework, used both the 2000 German reform and an earlier one in 1991 to assess the effects of naturalization and birth right citizenship on school outcomes. Positive effects were observed for both policies, with a particular emphasis on the latter. This indicates that earlier citizenship acquisition leads to better results. To account for time-invariant household characteristics in the Netherlands, Labussière (2023) utilized siblings' variation in exposure to naturalization. Her findings indicate that the academic performance of children acquiring Dutch citizenship surpasses that of non-citizens. Also in this case, improvements are more pronounced when students gain citizenship in early childhood. In alignment with Dronkers and Fleischmann (2010), these effects are more robust for students with lower socioeconomic backgrounds.

A parallel line of research explores gender differences in student outcomes across various fields of education, revealing a male advantage in math-intensive disciplines and a female advantage in those based on reading. In a ground-breaking study, Guiso et al. (2008) utilized PISA-OECD cross-country data on fifteen-year-olds to show that gender inequality, reflective of cultural norms and gender stereotypes, can account for a significant portion of the gender gap in math. Subsequent empirical research reinforces this finding (a review is in Bertocchi and Bozzano, 2020). However, some studies present less unequivocal evidence, evidencing that gender gaps may be smaller or even reversed in countries with high gender inequality, such as some Muslim nations (Fryer and Levitt, 2010), or in former communist economies (Lippmann and Senik, 2018)

As institutions and culture are intricately intertwined, a segment of the research on gender gaps narrows its focus to immigrant students, linking gender gaps in math to gender inequalities in their countries of origin (Nollenberger, et al. 2016). The approach enables the exploration of the impact of various social norms, embodied in students' households, on their education outcomes in the common setting of the host country. The results support the association between gender gaps in math and gender inequality, although these effects may be more pronounced in low-income economies (Anghel et al., 2020).

While this branch of research primarily relies on school-level data, a few exceptions shift their focus to tertiary education. Among them, Chise et al. (2021) and Granato (2023)

uncover the significant influence of parents' education on gender gaps in STEM fields. Recently, attention within this line of investigation has expanded to economics, a field sharing mathematical content with STEM, where a substantial gender gap in favour of males is observed (Avilova and Goldin, 2018). Bertocchi et al. (2023) reveal that this gap is strongly associated with the mathematical content of the high school curriculum. Interestingly, even in this context, a lower socioeconomic status increases the likelihood of girls enrolling in the field.

Concerning gender inequality, its connection with gender gaps in STEM is less straightforward compared to the relationship with math gender gaps at school. Stoet and Geary (2018) uncover that the proportion of women in STEM disciplines seems to be positively correlated with the level of gender inequality in countries, and Breda et al. (2020) find that the stereotype associating math with men can be stronger in more egalitarian and developed countries. However, Jergens (2023), considering a broader sample of countries, provides evidence that women's relative representation in STEM does not appear to decrease as equity increases.

To sum up, while research on citizenship primarily explores its connection with the duration and quality of education at the school level, occasionally considering gender differences, the present study diverges by investigating the influence of citizenship on the choice of majors.

2. The Italian setting

The Italian citizenship framework operates under the principle of *jus sanguinis*. Individuals with Italian ancestry possess the right to Italian citizenship, regardless of their place of birth. Conversely, children born in Italy without an Italian parent or ancestor are foreign nationals. Second-generation immigrants in Italy can apply for citizenship upon turning 18 and before reaching 19, provided they have continuously resided in the country since birth and meet specific restrictive conditions.

Alternatively, if these conditions are not met, they can pursue naturalization, a more stringent and uncertain process, especially for immigrants from non-EU countries. Requirements for naturalization include a minimum residence period of ten years (which is shorter for EU nationals). In turn, obtaining a residence permit takes approximately three years from the application, and requires a regular work permit. Children of immigrant parents who become naturalized Italians benefit from a more direct route to citizenship.

In the Italian education system, the process of tracking between schools commences at the age of 14, with upper secondary education divided into lyceums, technical, and

vocational schools. While all pathways offer access to tertiary education, students enrolled in lyceums and in technical schools with higher education standards are more likely to pursue further studies. Notably, this tracking system exhibits a pronounced gender bias, with girls disproportionately attending schools characterized by curricula with lower mathematical content.

3. Data and descriptive statistics

UNIMORE is a medium-sized Italian public university that encompasses a diverse array of academic disciplines organized across 12 departments. The dataset employed in this study, known as Unimoredata, emerges from the union of administrative and survey data sourced from UNIMORE, focusing on individual student demographic characteristics and the courses they attend. Additionally, the dataset incorporates extensive information from national databases, particularly AlmaLaurea, which annually supplies data encompassing a comprehensive overview of Italian graduates within the public university system.

In this study, all disciplines are categorized into four main areas: physical sciences, engineering, and economics (PSEE); life sciences (Life Sc); social sciences (Social Sc); and humanities (Humanities). Economics is in the first group due to its mathematical content, which is comparable to the area average, while business economics, following the common classification practice, is placed within the area of social sciences.

The sample utilized is narrowed to immigrant students, in particular to permanent immigrant students of the 1.5 and second generations. The empirical literature designates immigrants arriving in the host country during infancy or early adolescence as the 1.5 generation. Specifically, students in the sample were either born in Italy to foreign parents (strictly second generation) or were born abroad but live in Italy with a regular residence permit and have graduated from an Italian high school.

While precise data on the age of immigration are unavailable, the extended process of obtaining residence, as mentioned earlier, suggests that students are more likely to have immigrated during their primary school years rather than at later stages of development. This is why, the sample can be described as comprising the 1.5 and second generations of immigrant students. This choice lines up with the analytical approach applied to gender gaps and gender inequality, where students are presumed to be influenced by the gender norms of their country of origin but not by its institutions.[2]

[2] Gender inequality in countries of origin is proxied with the Gender Inequality Index (GII) provided by the United Nations Development Programme (UNDP) (Table A2). The Global Gender Gap Index, published by the World Economic Forum, employs comparable indicators and is commonly utilized in

Furthermore, the sample is limited to students without a parent holding Italian citizenship, to the first level of tertiary studies – encompassing 3-year bachelor programs and 5- or 6-year single-cycle courses –, and to years of high school graduation from 1996 to 2021. It excludes EU citizens because of the similarity in rights provided by citizenship of an EU country to those of Italian citizenship. Further analyses expand the sample to include students originating from EU countries and students with one Italian parent.[3]

The resulting sample comprises 3,701 observations, with 96 percent corresponding to 1.5 generation students and the remaining 4 percent to second-generation individuals. Among immigrant students, 39.7 percent hold the Italian citizenship. Depicting the gender distribution, Table 1 indicates that the share of female students is 59.1 percent, surpassing that of males. Moreover, contrary to findings in some empirical studies where citizenship is more frequently reported among females (Gathmann, 2023), the current study reveals a higher prevalence of citizenship among males (42.8 percent) compared to females (37.6 percent).

Table 1.- Descriptive statistics. Males, females, citizens

				Total
Males	1,513	Females	2,188	3,701
	40.9		59.1	100
Male citizens	42.8	Female citizens	37.6	1,470
Male non-citizens	57.2	Female non-citizens	62.4	2,231
Total	100		100	3,701

Notes: the sample comprises first-cycle immigrant students from year 1996 to 2021.

empirical research, but the GII is the preferred metric for this study due to its broader coverage of both years and countries.

[3] Due to the Unimoredata's lack of differentiation between students who were born Italian and those who are second generation naturalized citizens, some dropped observations can in fact concern second generation students. However, the overall percentage of second-generation immigrants holding Italian citizenship is exceedingly low (ISTAT, 2020), which makes the expected proportion of such dropped observations to be minimal.

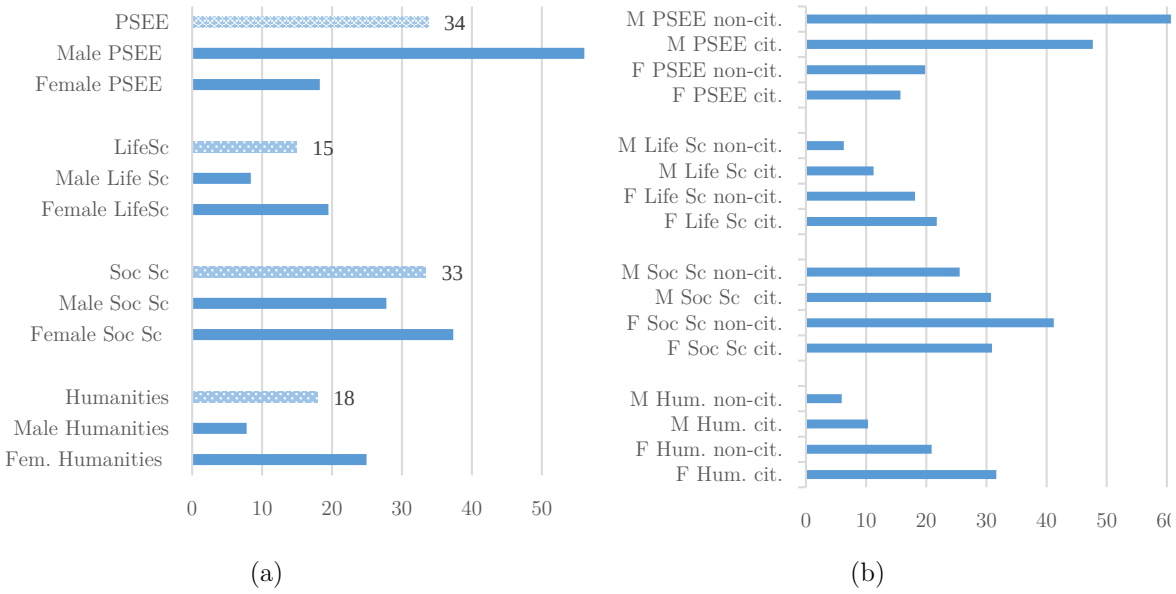

Figure 1.- Male and female frequencies across areas (a) and citizenship (b)
Notes: the sample comprises first-cycle immigrant students from year 1996 to 2021. Proportions across areas are computed with each gender group = 100.

Panel (a) in Figure 1 depicts the distribution of males and females across education areas, while Panel (b) illustrates the same distributions disaggregated by citizenship. The overrepresentation of PSEE among male majors is striking, highlighting its more prominent role in males' academic choices. Conversely, the role of PSEE is notably smaller in the preferences of female students. The distribution across other areas presents a reversed pattern, with females showing a stronger inclination toward humanities. In Panel (b), the heterogeneity related to citizenship becomes apparent. The shares of PSEE fields decrease for both males and females, while all other areas experience an increase, except for social sciences, which becomes less frequent among females. [4]

4. Empirical strategy

This study centres around three primary questions. Firstly, it explores whether acquiring citizenship in the host country influences the selection of university majors, particularly emphasizing the more mathematically-intensive fields grouped into PSEE. Secondly, it investigates whether females and males exhibit different responses to changes in citizenship status. Lastly, the study explores whether acquiring citizenship alters any

[4] The proportions of both male and female immigrant students majoring in PSEE are greater than those of natives, both overall and by gender. The proportion of natives majoring in PSEE is 30.6 percent. Disaggregated, it is 15 percent among females (18 percent for female immigrant students) and 47.5 percent among males (56 among male immigrant students). The complete dataset comprises 153,233 observations, which include native students and students with immigrant background not comprised into the sample.

existing relationships between gender gaps in the chosen academic areas and gender inequality in the origin countries.

I start by estimating the correlates of the decision to enrol in PSEE relative to all other fields with the following logistic specification:

$$\mathrm{PSEE}^{*}_{ityr} = \beta_0 + \beta_1 \mathrm{Citizenship}_{it} + \beta_2 \mathrm{Female}_{it} + \beta_3 \mathrm{GII}_{ty} + \beta_4(\mathrm{Citizenship}_{it} * \mathrm{Female}_{it}) + \beta_5(\mathrm{Citizenship}_{it} * \mathrm{GII}_{ty}) + \beta_6(\mathrm{Female}_{it} * \mathrm{GII}_{ty}) + \beta_7(\mathrm{Citizenship}_{it} * \mathrm{Female}_{it} * \mathrm{GII}_{ty}) + X'_{it}\chi + Z_{yrt}\zeta + D'_t\delta_t + Y'_y\delta_\gamma + R'_r\delta_r + (Y'_y * \mathrm{Female}_i)\tau_\gamma + \epsilon_{ityr} \quad (1)$$

with PSEE^{*}_{ityr} being a latent variable and PSEE_{ityr} a binary variable observed according to the rule:

$$\begin{cases} \mathrm{PSEE}_{ityr} = 1 \text{ if } \mathrm{PSEE}^{*}_{ityr} > 0 \\ \mathrm{PSEE}_{ityr} = 0 \text{ if } \mathrm{PSEE}^{*}_{ityr} \leq 0 \end{cases}$$

PSEE_{ityr} is a binary variable taking value one if student i, at time t, from origin country or world region y, residing in Italian area r, is enrolled in PSEE, and zero otherwise. Female is a binary variable that takes value one if the student is female. Citizenship takes value one if the immigrant student holds the Italian citizenship. The Gender Inequality Index (GII) is an index denoting the degree of gender inequality in the country of origin. The vector $X'_{it}\chi$ includes a set of individual characteristics that may affect the choice of field, such as gender, year of graduation from high school, mathematical content of the high school curriculum, high school final grade, socioeconomic status, enrolment status, immigrant generation. The vector $Z_{yrt}\zeta$ includes characteristics of the country of origin, such as GDP per capita and, in some specifications, time-invariant characteristics, such as norms on dual citizenship, distance from Italy, communist political regime – former or present–, country of Italian emigration, or religion. D_t, Y_y and R_r are dummies taking value one in correspondence, respectively, to each cohort of students at the time of graduation from high school, each country/world region of origin, and Italian area of residence. The interaction between female and the country/world area of origin is meant to capture the characteristics of origin countries or areas that do not change in time and differently influence female and male likelihoods of enrolling in PSEE; errors are clustered at the country/world area level.

The key coefficients of interest are as follows: β_1, representing the relationship between citizenship and enrolments in PSEE, β_4, indicating the impact of citizenship on gender gaps in this area, and β_7, gauging the influence of citizenship on the associations between

gender gaps and gender inequality (GII). In further regressions, multinomial logistic specifications are employed to test students' choices across education areas. Initial regressions are conducted on the raw sample; subsequently, matched samples and instrumental variables are utilized to assess the robustness of the results.

5. Results

5.1 Descriptive evidence

Columns (1), (3) and (5) in Table 2 show results from logistic regressions on the raw sample, while columns (2), (4) and (6) show the same coefficients from a matched sample and will be considered subsequently. Addressing the primary inquiries of this study, an initial key finding indicates that obtaining citizenship is associated with a reduced likelihood of students majoring in PSEE. The coefficient on the Citizenship variable consistently exhibits a negative value, and its statistical significance at the 1 percent level in column (1) persists in columns (3) and (5) when considering its interactions with Female and GII. More specifically, predictive margins of the variable Citizenship in the full regression of column (5) reveal he magnitude of the changes related to citizenship: the likelihood of majoring in PSEE of immigrant students who are citizens is 6.5 percentage points below that non-citizens; respectively, they are 30.1 and 36.6 percent. As expected, the coefficient on the Female dummy is always negative and significant, indicating a substantial gender gap in favour of males in the math-intensive area.

Table 2 - Enrolment in PSEE and citizenship

	(1) U	(2) M	(3) U	(4) M	(5) U	(6) M
Citizenship	-0.388***	-0.401***	-0.489***	-0.543***	-0.693**	-0.542
	(0.091)	(0.110)	(0.148)	(0.150)	(0.332)	(0.399)
Female	-2.019***	-1.806***	-2.082***	-1.962***	-3.368***	-2.826***
	(0.037)	(0.042)	(0.082)	(0.142)	(0.315)	(0.623)
GII	0.259**	0.084	0.263**	0.088	-0.083	-0.138
	(0.127)	(0.135)	(0.128)	(0.137)	(0.190)	(0.240)
Citizenship*Female			0.214	0.309	0.923**	0.427
			(0.188)	(0.238)	(0.394)	(0.746)
Citizenship*GII					0.086	-0.006
					(0.149)	(0.181)
Female*GII					0.736***	0.531*
					(0.169)	(0.309)
Citizenship*Female*GII					-0.316*	-0.051
					(0.188)	(0.337)
Math high school	0.692***	0.720***	0.692***	0.718***	0.698***	0.723***
	(0.054)	(0.073)	(0.054)	(0.073)	(0.054)	(0.073)

High school grade	1.681***	1.802***	1.679***	1.804***	1.696***	1.826***
	(0.278)	(0.287)	(0.277)	(0.286)	(0.277)	(0.274)
Socioeconomic status	0.016	0.012	0.016	0.012	0.016	0.012
	(0.016)	(0.020)	(0.016)	(0.020)	(0.017)	(0.020)
Second generation	0.433	0.780**	0.435	0.779**	0.410	0.765**
	(0.277)	(0.329)	(0.275)	(0.336)	(0.273)	(0.355)
GDP pc	-0.222	-0.432**	-0.214	-0.423**	-0.250*	-0.431**
	(0.142)	(0.189)	(0.142)	(0.188)	(0.138)	(0.196)
Ancestry	0.278	0.192	0.273	0.175	0.309	0.178
	(0.409)	(0.705)	(0.409)	(0.715)	(0.449)	(0.752)
Year	yes	yes	yes	yes	yes	yes
Enrolment status	yes	yes	yes	yes	yes	yes
Country/world region FE	yes	yes	yes	yes	yes	yes
Italian area FE	yes	yes	yes	yes	yes	yes
Female*Country/w region	yes	yes	yes	yes	yes	yes
Observations	3,630	3,558	3,630	3,558	3,630	3,558

Notes: Logistic regressions, PSEE is the binary dependent variable. U: unmatched sample, M: matched sample. Constant not reported. Standard errors in parentheses, clustered at the country/world region level. *** p<0.01, ** p<0.05, * p<0.1.

A second outcome emerges from the analysis of margins on the interacted variable Citizenship*Female, revealing heterogeneous effects of citizenship across genders. Specifically, the likelihood of treated males of majoring in PSEE registers a notable decrease of almost 11 percentage points, declining from 57.1percent to 46.4 percent, equating to an 18.7 percent reduction. In contrast, the likelihood among females diminishes by 4 percentage points, decreasing from 21.7 percent to 17.4 percent, representing an 18.5 percent reduction. Consequently, the overall results indicate that citizenship is associated with a diminished likelihood of enrolment in the math-intensive area of tertiary education, and predictive margins uncover that this decrease is more pronounced among men, thereby narrowing gender gaps. The reduction of gaps is also evidenced by the positive coefficients on the interaction between Female and Citizenship in columns (3) and (5).

A third key finding highlights the impact of citizenship on the enrolment of females in PSEE across varying levels of inequality in countries of origin. This result comprises two primary components. Firstly, the coefficient on Female*GII reveals a positive association between the likelihood among women of majoring in PSEE and gender inequality. While this finding diverges from the predominant outcomes in existing literature on math gender gaps (Guiso et al. 2008; Nollenberger et al., 2016), it aligns with recent research on STEM gender gaps and inequality (Stoet and Geary, 2018; Breda et al., 2020; Jergens, 2023). Secondly, the negative coefficient on the triple interaction Citizenship*Female*GII indicates that citizenship moderates the aforementioned

positive relationship between female enrolments and gender inequality. In other words, women from households characterized by more unequal gender norms are more likely to major in PSEE, but they are also more likely to switch to other areas when they acquire citizenship. Potential heterogeneities across different levels of gender inequality will be examined in greater detail in subsequent analyses.

Additional factors that exhibit a positive and statistically significant correlation with the likelihood of enrolling in PSEE in Table 2 include High school math, representing the mathematical content of high school curricula, and High school grade, indicating the high school final grade. These results offer support for prior findings in the literature on enrolments in the STEM area (Chise et al., 2021; Granato, 2023), and in the field of economics (Bertocchi et al., 2023). The coefficient on the degree of gender inequality in the country of origin, GII, is positive, although not always significant. Ancestry is a binary variable that takes value one when the country of origin corresponds to one of the primary destinations of Italian emigration and zero otherwise (the list of these countries is in Table A2). Students from these countries are more likely than the average to have Italian ancestors, which in turn increases the likelihood of holding Italian citizenship. Although there is no expectation of a direct impact of Ancestry on the likelihood of majoring in PSEE, there exists a potential indirect effect that is mediated by the Citizenship coefficient. If, as expected, Ancestry positively influences Citizenship, then the magnitude of the Citizenship coefficient in the PSEE regression would be larger without the inclusion of this control. Other factors commonly associated with math or STEM gender gaps in the empirical literature, along with time-invariant characteristics of origin countries, are incorporated in Table A3, yet they do not alter the main results of Table 2.

6 Identification

6.1 Matching. PSEE

Before analysing results in more detail, it is necessary to consider the potential for unobserved heterogeneity between immigrant students who are Italian citizens and those who are not. This consideration is important as unmatched specifications do not account for this potential heterogeneity, thereby introducing a risk of bias in the estimates. To mitigate this potential bias, I employ matching estimators designed to narrow the comparison to students with similar characteristics. While only observable characteristics can be matched, the comprehensive set of observable factors considered is rich enough to reasonably expect a balance in unobservable factors as well.

In essence, by matching on individual characteristics and those of countries of origin, the aim is to control for unobservable factors that may influence both the eligibility for citizenship and the incentives to apply for it. As the preferred matching strategy, I employ kernel matching with multivariate distance (MD). To assess the robustness of the resulting matching coefficients, I also explore alternative matching specifications, which include a combination of kernel MD and propensity score (PS), and kernel PS alone. Different bandwidths are also considered to ensure a comprehensive examination of the robustness of the matching outcomes.

The matching specifications presented in Table 3 are kernel MD in columns (1) to (4b), MD combined with PS in column (5), and kernel PS in column (6). The covariates included in the analysis are: Female, High school math, High school grade, Socioeconomic status, Enrolment status, Second generation, GII, GDP per capita, Ancestry, Year, Countries/world regions, and Italian areas.

To mitigate selection into treatment, all specifications incorporate exact matching on the variables Second generation and Ancestry. The inclusion of Second generation is relevant as these students may be facilitated in acquiring citizenship upon turning 18, and Ancestry for its role in easing access to citizenship.

Table 3. - Citizenship and PSEE enrolment. Kernel matching coefficients

	MD all		MD Male		MD Female		MD-PS all	PS all
	(1)	(2)	(3a)	(3b)	(4a)	(4b)	(5)	(6)
ATE	-0.056***	-0.049**	-0.034**	-0.040**	-0.015	-0.011	-0.055***	-0.079***
	(0.017)	(0.020)	(0.016)	(0.017)	(0.013)	(0.013)	(0.016)	(0.016)
ATT	-0.061***	-0.042**	-0.035*	-0.034*	-0.016	0.001	-0.049***	-0.064***
	(0.019)	(0.020)	(0.018)	(0.020)	(0.013)	(0.013)	(0.018)	(0.018)
ATC	-0.052***	-0.054**	-0.033*	-0.043**	-0.015	-0.019	-0.059***	-0.089***
	(0.019)	(0.022)	(0.018)	(0.018)	(0.015)	(0.015)	(0.019)	(0.018)
Observations	3,630	3,630	3,630	3,630	3,630	3,630	3,630	3,630

Notes: Treated students are Citizens. Kernel matching in all equations, computed with MD in columns (1) to (4b), a combination of MD and PS in (5), and PS in (6). Bandwidths: (1) 5.1, 4.2; (2): 2, 2; (3) 4.8, 3.7; (3b) 2, 2; (4): 4.8, 3.7; (4b): 2, 2; (5) 8, 6; (6) 0.004, 0.007. In column (3), (3b) and (4), (4b) the outcome takes value one in correspondence to females (males) majoring in PSEE and zero otherwise. Bootstrap standard errors computed with 5x replications, *** p<0.01, ** p<0.05, * p<0.1.

The coefficients presented in Table 3, evidencing the treatment effect of citizenship on the probabilities of majoring in PSEE, exhibit a notable degree of similarity across the

different specifications. These results support the above findings derived from the regressions on the raw sample and show that, even in the matched sample, upon acquiring citizenship, students are significantly less likely to major in PSEE. Furthermore, when examining the outcomes split by gender, it becomes apparent that the overall decline in PSEE enrolment is predominantly driven by males (as observed in columns 3a and 3b), while the impact on females (columns 4a and 4b), is less pronounced and not statistically significant. Consequently, this reduction in PSEE male enrolment contributes to a narrowing of gender gaps.

6.2 Gender gaps in PSEE and citizenship

Regressions conducted in columns (1), (3), and (5) of Table 2 were based on the raw sample. Now, upon re-running these regressions on the sample matched by incorporating the average treatment on the treated (ATT) weights from column (1) in Table 3, results are confirmed. Specifically, coefficients in columns (2), (4), and (6) of Table 2 show that citizenship is associated with a decline in the likelihood of enrolling in PSEE that exhibits a magnitude and significance similar to those observed in the raw sample.[5]

To elaborate further, predictive margins on Citizenship in the full regression (column 6) reveal that the probabilities of majoring in PSEE are 36.7 percent for non-citizens and 29.6 percent for citizens, indicating a decrease of 7.1 percentage points, slightly larger than in the unmatched sample. Among males, this drop is larger, with a difference between the 55.9 percent probability for non-citizens and the 44.2 percent for citizens, surpassing the decline observed in the unmatched sample. Conversely, for females, the differences are smaller, ranging from 21.7 percent for non-citizens to 17.6 percent for citizens.

These results persist even when applying alternative matching specifications from Table 3, spanning columns (2) to (6) (not presented here but available upon request). The robustness of the findings across various matching strategies enhances the credibility of the conclusion that acquiring citizenship is associated with a diminished likelihood of enrolling in PSEE.

The observed findings offer room for two potential interpretations. One is that, all else being equal, immigrant students opt to major in PSEE as a strategic response to

[5] Regressions in Table 2 include interactions that are not included in the matching specifications of Table 3, but results on the likelihood of citizens of attending PSEE are very similar in the two cases; they are 0.58 in Table 3 and 0.6 in columns (2), (4) and (6) of Table 2, with significance is at the 1% level. On comparisons between results from matched and raw samples, see Ho et al. (2007).

anticipated vulnerabilities in the future labour market, and redirect their choices to other fields when their sense of economic security is enhanced through citizenship. Another possible interpretation is that immigrants are primarily driven by ambition, akin to the analysis conducted by Borgen and Hermansen (2023), who compare immigrants with natives. However, in the context of our findings, this interpretation would imply that citizenship weakens ambition among immigrants – an assertion that may seem unlikely.

The available data do not permit a clear disentangling of students' motivations,[6] but, an indirect indicator, namely the enrolment status, unveils that immigrants obtaining citizenship have lower dropout rates compared to non-citizens. This holds even within the PSEE area (Table A3.b),[7] and implies that immigrants who undergo the naturalization process are not necessarily less ambitious than their counterparts. Instead, they may be redirecting their ambition towards acquiring a distinct form of human capital, one that may be less economically rewarding but potentially more personally fulfilling, and, at the same time, that can be compatible with jobs restricted to citizens, for example in the public sector.

Figure 2 presents the probabilities of majoring in PSEE and the corresponding gender gaps. The likelihoods are derived from the predictive margins on citizenship status and gender, computed from the interaction Citizenship*Female in the full regression of column (6). The gender gaps associated with each citizenship status are calculated as the ratio between the likelihood among males majoring in the specific area and the same likelihood among females, minus one.[8] Panel (a) highlights the proportionately larger decrease in the probabilities of males compared to females of majoring in PSEE, while in Panel (b) this translates into a smaller gender gap among citizens relative to non-citizens.

[6] The dataset contains very sparse information on students' declared ambitions and interests. Only about 12 percent of them declare what motivated their choice of major, whether interest or economic opportunity, and within this very restricted sample there are no significant differences in motivations between citizens and non-citizens.

[7] Results are not affected by the higher dropout rates among non-citizens. Running the same set of regressions after excluding all observations concerning dropouts leads to the same main findings.

[8] Gender gaps are calculated as follows: $\frac{\text{Males' likelihood}_j - \text{Females' likelihood}_j}{\text{Females' likelihood}_j} = \frac{\text{Males' likelihood}_j}{\text{Females' likelihood}_j} - 1$, where the likelihoods among each gender of majoring in area j are the predictive margins on the Female dummy in a regression with j as the dependent variable; j denotes PSEE, life sciences, social sciences, or humanities. Positive numbers indicate a gap in favour of males, negative numbers in favour of females, and a gap equal to zero denotes equal likelihoods among both genders.

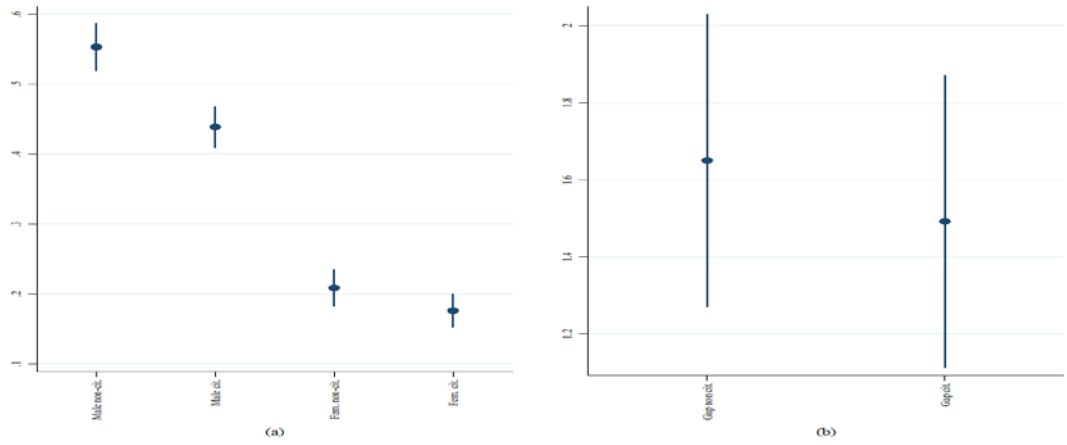

Figure 2. Likelihood of enrolling in PSEE and gender gaps. Matched sample

Notes: Treated students are Citizens. Coefficients in Panel (a) are predictive margins on Female*Citizenship from the full regression of column (6) in Table 2. Panel (b) gender gaps are the ratio of the likelihood of enrolling in PSEE among males and the same likelihood among females, minus one. Capped vertical lines represent 95% confidence intervals based on standard errors clustered at the country/world region level.

6.3 Gender gaps in PEE, gender inequality and citizenship

To facilitate the analysis, GII has been divided into terciles, with gender inequality increasing from GII1 to GII3. Figure A1, based on the matched sample, illustrates that female probabilities of enrolling in PSEE increase markedly with gender inequality, while males' likelihoods decrease, albeit to a lesser extent. Consequently, gender gaps in PSEE diminish with growing gender inequality. This supports previous results, in Section 5.1, based on the raw sample.

Figure 3(a), also based on he matched sample, extends these findings to account for citizenship as well. In this case, the likelihoods are the predictive margins on the triple interaction Citizenship*Female*GII in the full regression of column (6) in Table 2.

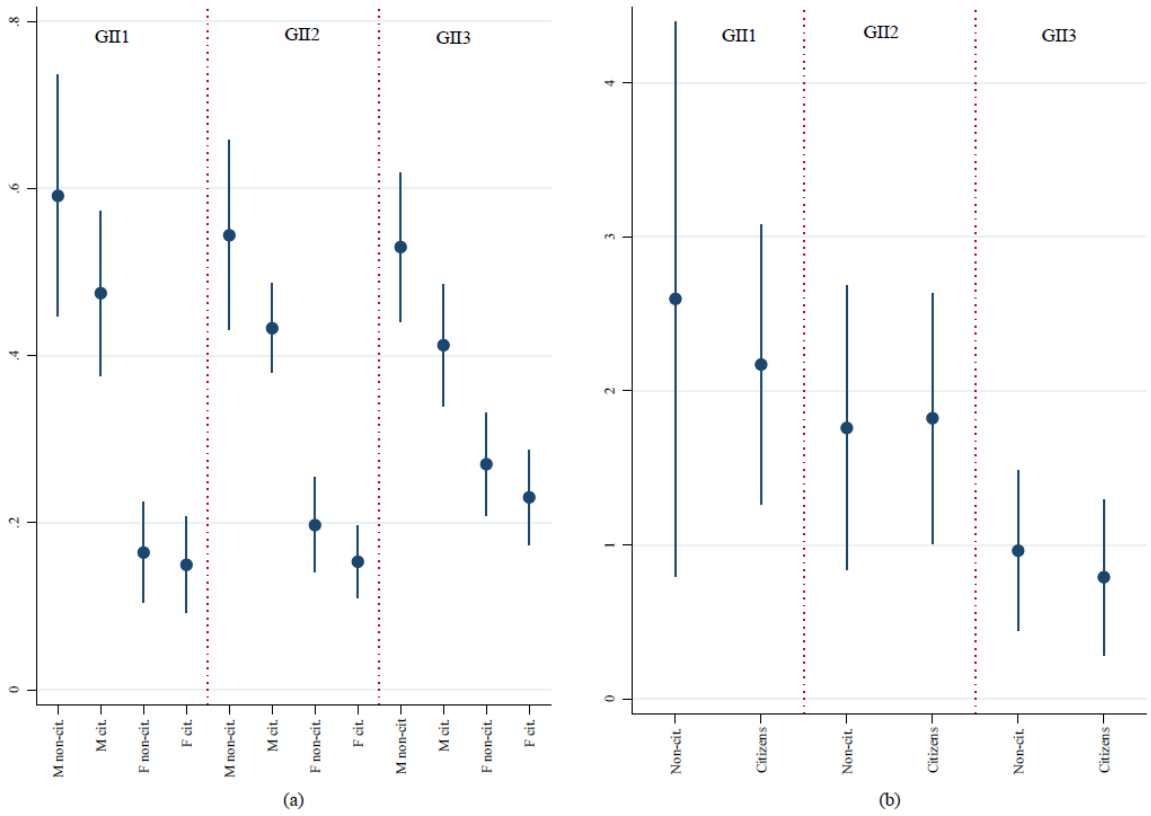

Figure 3. Likelihoods of citizens and non-citizens of majoring in PSEE and gender gaps. Matched sample

Notes: Treated students are Citizens. Coefficients in Panel (a) are predictive margins on Female*Citizenship*GII from the full regression of column (6) in Table 2. Gender inequality increases from GII1 to GII3. Gender gaps in Panel (b) are the ratio of the likelihood of enrolling in PSEE among males and the same likelihood among females, minus one. Capped vertical lines represent 95% confidence intervals based on standard errors clustered at the country/world region level.

The results presented in Figure 3 confirm the above findings: holding all else constant, an increase in gender inequality is associated with increasing female enrolments in PSEE and a slight decrease in male enrolments. Consistently, in Panel (b) of Figure A1, gender gaps diminish as gender inequality rises, with the most substantial decline occurring at the highest level of inequality. This diminishing trend is also evident in the positive coefficients on the Female*GII interactions in columns (5) and (6) of Table 2, pertaining to the unmatched and matched samples, respectively.

Focusing specifically on the impact of citizenship, Panel (a) in Figure 3 illustrates a decrease in the likelihood of majoring in PSEE at all levels of inequality for both males and females. However, the decline is more pronounced for females, particularly at the highest levels of gender inequality. Hence, women subject to more restrictive household rules regarding gender are more likely to major in PSEE, yet they also show a higher

likelihood of transitioning to other areas when empowerment increases through citizenship. Overall, gender gaps shrink with citizenship, with a proportionally greater fall at GII3 compared to GII1, while at GII2, a slight increase is observed.

In summary, holding citizenship is associated with a diminished likelihood of majoring in PSEE. Given that this decline is more pronounced among males, there is a reduction in gender gaps. Females are more likely to major in PSEE as gender rules are more unequal, but with citizenship they are also more likely to transition to other areas. Citizenship implies a nonlinear reduction in gender gaps, which is more pronounced at low and high levels of gender inequality.

6.4 Matching. Choice of majors across areas

In this Section the analysis now broadens its scope to encompass a more comprehensive range of choices across all academic areas. Observations are now matched with kernel MD specifications that are identical to those outlined in Table 2 (columns 1 to 4-b), except that four outcome variables are adopted in the first specification, one for each academic area (columns 1 to 4), and eight outcome variables are used in the second, one for each area and gender (columns 5 to 12).

Table 4. - Citizenship and enrolment across areas. Matched sample

	(1) PSEE	(2) Life Sc	(3) Social Sc	(4) Humanities
ATE	-0.056***	0.033**	-0.031	0.053***
	(0.017)	(0.014)	(0.019)	(0.015)
ATT	-0.061***	0.040***	-0.034	0.055***
	(0.019)	(0.015)	(0.022)	(0.017)
ATC	-0.052***	0.028*	-0.028	0.052***
	(0.019)	(0.016)	(0.021)	(0.016)
Observations	3,630	3,630	3,630	3,630

	(5) PSEE Male	(6) PSEE Female	(7) Life Sc M	(8) Life Sc F	(9) Social Sc M	(10) Social Sc F	(11) Human. M	(12) Human. F
ATE	-0.034**	-0.015	0.019***	0.013	0.017	-0.049***	0.015**	0.034**
	(0.016)	(0.013)	(0.007)	(0.013)	(0.012)	(0.017)	(0.007)	(0.014)
ATT	-0.035*	-0.016	0.023***	0.014	0.022	-0.061***	0.015	0.038**
	(0.018)	(0.013)	(0.008)	(0.013)	(0.015)	(0.019)	(0.010)	(0.016)
ATC	-0.033*	-0.015	0.017**	0.012	0.015	-0.041**	0.015**	0.031**
	(0.018)	(0.015)	(0.009)	(0.015)	(0.013)	(0.020)	(0.007)	(0.015)

Observations	3,630	3,630	3,630	3,630	3,630	3,630	3,630	3,630

Notes: Treated students are Citizens. Kernel MD matching. Bandwidths are: (1)-(4): 5.1, 4.2; (5)-(12): 4.8, 3.7. In columns (5)-(12), outcome variables take value one in correspondence to females (males) majoring in each area and zero otherwise. Bootstrap standard errors computed with 5x replications, *** p<0.01, ** p<0.05, * p<0.1.

Table 4 displays the matching coefficients across academic areas. PSEE results (columns 1, 5, and 6) mirror those in Table 2 (columns 1, 3, and 4), while those in other areas show that citizenship leads to an increase in enrolments in life sciences and humanities (columns 2 and 4), but not in social sciences (column 3), where coefficients are negative and significant.

Upon initial inspection, the results for social sciences may appear puzzling and somewhat contradictory to the earlier evidence that citizenship weakens incentives to choose math-intensive fields, which should lead to increases in the less math-intensive areas. However, this apparent contradiction is clarified when results are split by gender. The breakdown reveals that the negative coefficient in column (3) is primarily driven by females opting out of this area, while males (columns 9 and 10) are more inclined to enrol in it. Although coefficients on males are positive, they do not reach statistical significance.

Moreover, a closer examination within the social sciences area reveals that treated females are less likely than the untreated to major in business economics but equally likely to major in other fields in the area. Considering that business economics is the more math-intensive discipline within the social sciences, this suggests that citizen females are shifting from business to less math-intensive fields, such as the humanities. While some treated males may undergo a similar shift, their departure seems to be outweighed by a contrary influx, presumably from more math-intensive areas, like PSEE.

To gain a clearer understanding of the impact of citizenship on the various educational areas, a multinomial logit specification is employed on the matched sample, with matching being based on the ATT weights from column (1) in Table 4. The dependent variable is a categorical indicator representing the four academic areas and the variables of interest and cofactors are the same of the logistic regression of equation (1). Predictive margins – computed from the interaction between Female and Citizenship in the multinomial regression – are the likelihoods of enrolment in each area of males and females, citizens and non-citizens. Figure 4 visually represents the effects of citizenship in terms of the probabilities of majoring in each academic area.

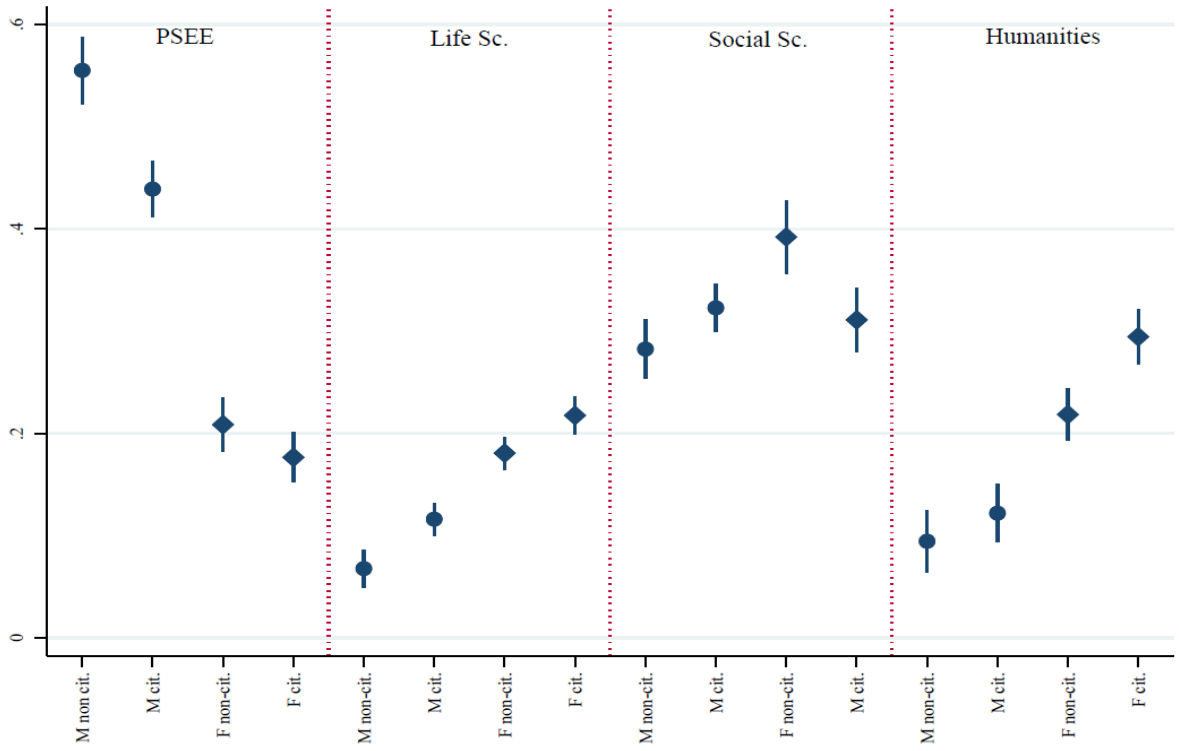

Figure 4. Treated and untreated likelihoods of majoring in each education area. Matched sample

Notes: Treated students are Citizens. Coefficients are predictive margins on the interactions Female*New citizens from a multinomial logit regression on the matched sample, where the dependent variable is a categorical indicator with the four education areas. Capped vertical lines represent 95% confidence intervals based on standard errors clustered at the country/world region level;
◆ Female ● Male.

In Figure 4, the likelihoods of both males and females majoring in life sciences and humanities increase with citizenship. Differently, patterns diverge in the social sciences, with the likelihood of males increasing, and those of women dropping. As previously noted, the decline in women's enrolment in social sciences is influenced by a reduced participation in business economics, and a potential shift towards the humanities.

Overall, the results suggest that citizenship is associated with a decrease in the selection of math-intensive fields across the field areas. The effect is particularly marked in PSEE, but there is a partial decline also within the social sciences.

6.6 Instrumental variables

Results may still be vulnerable to selection bias if the influence of unobservable factors is not sufficiently addressed through covariate matching. Therefore, this section introduces a two-stage procedure, where Citizenship is instrumented with the stocks of immigrants from and emigrants to the students' countries of origin. Assuming that citizenship is granted by the host country independently from the specific student's country of origin or the size of the related ethnic network, these stocks are expected to influence students' likelihoods of acquiring citizenship through distinct channels. Concerning immigrants, it can be hypothesised that a larger ethnic community provides information and guidance on the procedures needed to obtain the status of regular resident and citizen. In this case the immigrant stock should be positively associated with Citizenship. On the other hand, a larger ethnic community can reinforce the links with the origin country and weaken the individual's incentives to apply for citizenship, making in this case the correlation to be negative. Concerning the emigrant stock, it has been previously hypothesized that students from countries with a higher Italian emigrant population are more likely to have Italian parents or ancestors and, consequently, of obtaining the Italian citizenship. This suggests a positive sign for the coefficient on this instrument.[9]

Table 5. IV specification: Citizenship and choice of majors

	(1)	(2)	(3)	(4)	(5)	(6)
Stage I dependent variable			Citizenship			
ln Immigrant stock	-0.046***		-0.046***	-0.046***	-0.046***	-0.046***
	(0.015)		(0.013)	(0.013)	(0.013)	(0.013)
ln Emigrant stock		0.057***	0.047***	0.047***	0.047***	0.047***
		(0.01)	(0.011)	(0.011)	(0.011)	(0.011)
Covariates	yes	yes	yes	yes	yes	yes
Stage II dependent variable	PSEE	PSEE	PSEE	Life Sc	Soc Sc	Humanities
Citizenship	-0.393**	-0.421***	-0.470***	0.095*	-0.097	0.483***
	(0.176)	(0.081)	(0.123)	(0.055)	(0.067)	(0.085)
Covariates	yes	yes	yes	yes	yes	yes
S-W F test	9.62	32.72	11.80	11.80	11.80	11.80
Underidentification t (Kleibergen–Paap)	4.185	10.101	6.91	6.91	6.91	6.91
p-value	0.04	0.002	0.03	0.03	0.03	0.03
Overidentification test			0.54	0.01	0.43	0.03
p-value			0.46	0.93	0.51	0.86
Observations	3,441	3,607	3,441	3,441	3,441	3,441
Uncentered R-squared	0.411	0.402	0.376	0.179	0.346	0.082

[9] Immigrant and emigrant stocks are used instead of dummies (such as the dummy Ancestry) in order to preserve the time and size variability of the instruments. However, similar results are obtained if they are replaced by the respective zero-one dummies.

Notes: Two-stage least-squares linear probability model (2SLS-LPM).[10] Covariates are Female, High school math, High school grade, Socioeconomic status, Enrolment Status, Second generation, GII, GDP per capita, Year, Countries/regions, Italian areas. Robust standard errors in parentheses, clustered at the world region/country level. *** p<0.01, ** p<0.05, * p<0.1. No constant computed.

The two instruments in Table 5 are first introduced separately, in columns (1) and (2). Results in the first stage show that the immigrant stock is negatively and significantly (at the 1 percent level) associated with citizenship, which, regarding the two mechanisms hypothesised above, suggests that the links with the origin country through the ethnic community prevail. The emigration variable, on the other hand, as expected, is positively and significantly related to Citizenship. Both instruments appear to perform quite well. The underidentification test (Kleibergen–Paap statistics) confirms that the estimation does not suffer from a weak instrument problem. The instrument suitability is not rejected by the overidentification test.

In the second stage, results confirm this study's main findings. Citizenship negatively and robustly affects the likelihood of majoring in PSEE (columns 1-3). It is strongly and positively associated with the likelihood of majoring in the humanities, and to a lesser degree, but also significantly (at the 10 percent level), with the choice of the life sciences, while it does not affect the likelihood of majoring in the social sciences. These same findings are obtained if these regressions are run on a matched sample.

6.7 Robustness and sensitivity

Further regressions (Table A4) include additional covariates, the allowance of dual citizenship by the origin country, distance from Italy, religion, and other time-invariant country characteristics. In subsequent tests (Section B of the Online Appendix), the analysis is extended to a larger sample that comprises students originating from EU countries or having a parent holding Italian citizenship. Further checks address concerns about missing observations on parents' citizenship. In all cases, this study's main results are confirmed.

7. Conclusions

[10] The 2SLS-LPM chosen specification follows Angrist and Pischke (2009, p.107). Similar findings derive from a Probit three-steps IV specification (Cerulli, 2014).

The impact of citizenship on the selection of majors among immigrant students is a relatively unexplored area. Nevertheless, it is of substantial importance, not only for the economic outlook of the students but also for shaping the human capital composition in the host country. This study investigates it by using comprehensive data on immigrant students at an Italian university, completed with characteristics of their countries of origin. Controlling for the factors influencing the choice of majors of immigrant students, results show that citizenship leads to shifts from more to less math-intensive majors.

The association between math-intensive majors and higher expected post-graduation earnings is widely acknowledged. This attribute makes such majors potentially more appealing to non-citizens, who need to discount economically uncertain circumstances. In contrast, citizens may perceive majors with lower mathematical content as less risky. They rely on higher economic security, thus reducing the opportunity costs associated with choosing these fields. Furthermore, the risks are mitigated because graduating in these majors may be sufficient to gain access to professions and jobs restricted to citizens, for example in the public sector.

Similar to the prevailing trend in the literature addressing gender disparities in mathematics, my findings also reveal a gender gap in math-intensive fields at the tertiary level. Notably, this gap diminishes with citizenship because of a proportionately larger decline in male enrolments compared to females. This result suggests that citizenship may amplify the sense of empowerment among males to a greater extent than it does for females.

At the same time, consistently with findings of a branch of the literature on STEM gender gaps, women originating from countries with more gender-unequal social norms exhibit a higher propensity to enrol in math-intensive majors. This study further indicates that upon acquiring citizenship, these women are more likely to switch to different majors. This suggests that while women from households entrenched in more pronounced gender stereotypes may initially feel compelled to challenge these constraints by pursuing greater economic independence through math-intensive majors, the acquisition of citizenship provides them with the freedom to explore and choose alternative fields of study.

These findings align with results in the literature showing that, because of higher ambition or more insecurity, immigrant students in some western developed countries tend to choose high-paying fields of study more than natives. This study adds a third, intermediate, dimension: that of immigrant students who are host country citizens. In

choosing among a wider range of majors than non-citizens, including less economically secure fields, their behaviour appears converge to that of natives.

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APPENDIX A

Table A1. Countries and world regions

ALB°		DOM	Central & North America	MOZ°	Sub-Saharan Africa
MAR		DZA	North Africa & Middle East	MRT	Sub-Saharan Africa
MDA°		ECU	South America	MUS	Sub-Saharan Africa
IND		EGY	North Africa & Middle East	MWI	Sub-Saharan Africa
UKR		ERI	Sub-Saharan Africa	MYS	East Asia
GHA		ESP*	Europe	NGA	Sub-Saharan Africa
RUS°		EST	Europe	NIC	Central & North America
CHE*		ETH	Sub-Saharan Africa	NLD	Europe
BRA*		FIN	Europe	NOR	Europe
ARG*		FRA*	Europe	NPL	Central Asia
PAK		GBR	Europe	NZL	East Asia
PER		GEO°	Central Asia	PHL	East Asia
TUN		GIN	Sub-Saharan Africa	POL°	Europe
CHN°		GMB	Sub-Saharan Africa	PRT	Europe
AFG	Central Asia	GRC	Europe	PRY	South America
AGO	Sub-Saharan Africa	HND	Central & North America	ROU°	Europe
ARE	North Africa & Middle East	HRV°	Europe	SAU	North Africa & Middle East
ATG	Central & North America	HUN°	Europe	SCG	Europe
AUS*	East Asia	IDN	East Asia	SEN	Sub-Saharan Africa
AUT	Europe	IRL	Europe	SLV	Central & North America
BDI	Sub-Saharan Africa	IRN	North Africa & Middle East	SMR	Europe
BEL*	Europe	IRQ	North Africa & Middle East	SOM	Sub-Saharan Africa
BEN	Sub-Saharan Africa	ISR	North Africa & Middle East	SRB°	Europe
BFA	Sub-Saharan Africa	JEY	Europe	SVN°	Europe
BGD	Central Asia	JOR	North Africa & Middle East	SVK°	Europe
BGR°	Europe	JPN	East Asia	SWE	Europe
BIH°	Europe	KAZ°	Central Asia	SYC	Sub-Saharan Africa
BLR°	Europe	KEN	Sub-Saharan Africa	SYR	North Africa & Middle East
BOL	South America	KGZ	Central Asia	TCD	Sub-Saharan Africa
CAF	Sub-Saharan Africa	KOS°	Europe	TGO	Sub-Saharan Africa
CAN*	Central & North America	LAO	East Asia	THA	East Asia
CHL	South America	LBN	North Africa & Middle East	TKM°	Central Asia
CIV	Sub-Saharan Africa	LBR	Sub-Saharan Africa	TUR	North Africa & Middle East
CMR	Sub-Saharan Africa	LBY	North Africa & Middle East	TWN	East Asia
COD	Sub-Saharan Africa	LKA	Central Asia	TZA°	Sub-Saharan Africa
COL	South America	LTU°	Europe	UGA	Sub-Saharan Africa
CRI	Central & North America	LUX	Europe	URY	South America
CSK°	Europe	LVA°	Europe	USA*	Central & North America
CUB°	Central & North America	MCO	Europe	UZB°	Central Asia
CYP	Europe	MDG	Sub-Saharan Africa	VEN*	South America
CZE°	Europe	MEX	Central & North America	VNM°	East Asia
DDR	Europe	MKD°	Europe	YUG°	Europe
DEU*	Europe	MLI	Sub-Saharan Africa	ZAF	Sub-Saharan Africa
DJI	Sub-Saharan Africa	MNE°	Europe	ZMB	Sub-Saharan Africa
DNK	Europe	MNG	East Asia		

Notes: First 15 countries in decreasing order of number of observations (minimum 93), all other countries grouped within respective world areas, indicated in the corresponding row. *: country of main Italian emigration; °: communist or former communist country.

Table A2. - Variables and sources

Variable	Description	Source

Citizenship	Binary: takes value one when the student is an Italian citizen and zero otherwise.	Unimoredata
Female	Binary: takes value one when the student is female.	Unimoredata
PSEE, Life Sc Social Sc, Humanities	Binary variables, taking value one if the student majors in the area and zero otherwise.	Unimoredata
GII	Gender Inequality Index: varies between 0 and 1. Higher values denote more inequality. The GII evaluates the position of women in society through: reproductive health, labour market participation, education, and parliamentary seats.	United Nations Development Programme.
Math high school	Ordinal variable, takes value zero when the mathematical content is low, one when it is intermediate, two when it is high.	Unimoredata
High school grade	Graduation grade at high school. Varies between 60 and 100.	Unimoredata
Socioeconomic status	University fees payed by the student. Fees increase with household income; they vary from zero to 4,841 Euros.	Unimoredata
Enrolment status	Categorical variable, indicating: dropout, attending, graduate, transferred.	Unimoredata
GDP per capita	Gross value added produced during the year in the economy divided by mid-year population.	World Bank Statistics
Ancestry	Countries of main Italian emigration (Denoted by '*' in Table A1)	Anagrafe Italiani Residenti all'Estero (AIRE). ISTAT
Emigrant stock	Number of Italian residents in foreign countries registered at AIRE	AIRE
Immigrant stock	Number of immigrant population by country of origin	OECD statistics. Bilateral migration database
Dual citizenship	Binary variable taking value one if the country allows dual citizenship and zero otherwise	https://www.henleyglobal.com/citizenship-investment/dual-citizenship
EU	Time-varying variable taking value one when a country is an EU member and zero otherwise	

Communist	Binary variable taking value one when a country's political regime is or was socialist or communist and zero otherwise (Denoted by '°' in Table A1)	
Distance	Weighted distance between country's capital and Italy's capital.	CEPII, http://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele_item.asp?id=6
Muslim	Percentage if people of Muslim religion, year 2000	Robert Barro: Religion adherence dataset.

Table A3.a. - Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Female	3,701	0.59	0.49	0.00	1.00
PSEE	3,701	0.34	0.47	0.00	1.00
PSEE_fem	3,701	0.11	0.31	0.00	1.00
PSEE_male	3,701	0.23	0.42	0.00	1.00
LifeSc	3,701	0.15	0.36	0.00	1.00
LifeSc_fem	3,701	0.11	0.32	0.00	1.00
LifeSc_male	3,701	0.03	0.18	0.00	1.00
SocSc	3,701	0.33	0.47	0.00	1.00
SocSc_fem	3,701	0.22	0.41	0.00	1.00
SocSc_male	3,701	0.11	0.32	0.00	1.00
Humanities	3,701	0.18	0.38	0.00	1.00
Hum_fem	3,701	0.15	0.35	0.00	1.00
Hum_male	3,701	0.03	0.18	0.00	1.00
Second generation	3,701	0.04	0.20	0.00	1.00
Citizenship	3,701	0.40	0.49	0.00	1.00
GII	3,640	0.37	0.15	0.02	0.72
Year	3,701	2,012	6	1,996	2,021
Socioeconomic status	3,690	612	656	0	4,841
Ancestry	3,701	0.13	0.34	0.00	1.00
Communist	3,701	0.38	0.49	0.00	1.00
Muslim	3,679	0.34	0.38	0.00	0.99
High school grade	3,694	76.06	11.61	60.00	100.00
High school math	3,701	1.24	0.78	0.00	2.00
Distance	3,661	3,976	3,436	328	15,855
GDP per capita	3,643	11,794	10,146	429	74,599
Dual citizenship	3,701	0.79	0.40	0.00	1.00
Parents (missing obs.)	3,701	0.88	0.33	0.00	1.00

Table A3.b Descriptive statistics: Enrolment status

	Dropout	Enrolled	Graduate	Transferred	Total
Overall					
Non-citizens	991	540	677	23	2,231
Percent	44.4	24.2	30.3	1.0	100.0
Citizens	564	435	432	39	1,470
Percent	38.4	29.6	29.4	2.7	100.0
Total	1,555	975	1,109	62	3,701
PSEE					
Non-citizens	402	214	184	7	807
Percent	49.8	26.5	22.8	0.9	100.0
Citizens	176	130	128	5	439
Percent	40.1	29.6	29.2	1.1	100.0
Total	578	344	312	12	1,246

PISA-OECD data from 2003 to 2018 reveal that math gender gaps, to the disadvantage of girls, in Italy are larger than the OECD average. Additionally, between 2006 and 2015, the percentage of students with an immigrant background in upper secondary education increased from approximately 7 percent to 17 percent (OECD, 2018) at the national level, but these percentages are well above the national average in Emilia Romagna, the region where the University of Modena and Reggio Emilia (UNIMORE), considered in this research, is located.[1]

Table A4. - Citizenship and enrolment in PSEE

	(1)	(2)	(3)	(4)	(5)	(6)
Citizenship	-0.444***	-0.453***	-0.659**	-0.521***	-0.745***	-0.607***
	(0.125)	(0.137)	(0.296)	(0.128)	(0.275)	(0.148)
Female	-1.977***	-2.309***	-3.671***	-1.796***	-2.755***	-1.834***
	(0.095)	(0.133)	(0.425)	(0.110)	(0.243)	(0.112)
GII		1.106	-0.954	0.931	-0.388	0.917
		(1.061)	(1.202)	(0.899)	(0.929)	(0.968)
Citizenship*Female	0.275*	0.208	1.263***	0.303*	1.223***	0.239
	(0.151)	(0.191)	(0.317)	(0.178)	(0.368)	(0.188)
Citizenship*GII			0.415		0.634	
			(0.667)		(0.657)	
Female*GII			5.242***		3.378***	
			(1.395)		(0.985)	

[1] Addabbo et al. (2019), using Italian PISA-OECD data, find that math gender gaps among immigrant students tend to be narrower compared to those among native students.

Citizenship*Female*GII			-2.515***		-2.526***	
			(0.825)		(0.899)	
Ancestry				-0.056	-0.029	-0.305
				(0.190)	(0.208)	(0.344)
Dual citizenship				-0.208*	-0.211*	-0.250*
				(0.112)	(0.125)	(0.140)
Citizenship*Dual citizenship						0.104
						(0.180)
Citizenship*Ancestry						0.365
						(0.328)
Math high school		0.703***	0.705***	0.695***	0.701***	0.696***
		(0.054)	(0.053)	(0.054)	(0.053)	(0.055)
High school grade		1.657***	1.679***	1.666***	1.663***	1.649***
		(0.273)	(0.272)	(0.263)	(0.264)	(0.268)
Socioeconomic status		0.014	0.014	0.013	0.012	0.013
		(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Second generation		0.427	0.409	0.455	0.451	0.476
		(0.297)	(0.288)	(0.308)	(0.299)	(0.302)
GDP pc		-0.168*	-0.203**	-0.043	-0.056	-0.056
		(0.099)	(0.098)	(0.109)	(0.126)	(0.123)
EU				-0.233	-0.257	-0.267
				(0.216)	(0.210)	(0.215)
Distance				-0.057	-0.085	-0.065
				(0.206)	(0.216)	(0.215)
Communist				0.051	0.110	0.052
				(0.372)	(0.396)	(0.377)
Muslim				0.029	0.002	-0.006
				(0.154)	(0.177)	(0.176)
Enrolment status	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Country/region FE	yes	yes	yes	no	no	no
World region FE	no	no	no	yes	yes	yes
Female *Country/region	no	yes	yes	no	no	no
Female*World region	no	no	no	yes	yes	yes
Italian area FE	yes	yes	yes	yes	yes	yes
Observations	3,701	3,607	3,607	3,577	3,577	3,577

Notes: Logistic regression, PSEE is the binary dependent variable. Constant computed. Standard errors in parentheses, clustered at the country/region level (columns 1-3) or the world region level (columns 4-6); *** p<0.01, ** p<0.05, * p<0.1.

Table A4 shows coefficients from regressions on the unmatched sample. Columns (1)-(3) include countries/world region fixed effects, which are subsequently replaced in columns (4)-(6) by more aggregated world-region fixed effects. The EU dummy takes one when the student's country of origin is an EU member country and zero otherwise; Distance serves to capture the dissimilarity between the institutions and norms of origin countries and those of Italy; Communist, taking a value one when the political regime in the origin

country is or was communist, is intended to test its potential influence on the coefficient on Female variable (Lippmann and Senik, 2018); Muslim, representing the percentage of people of the Muslim religion in origin countries, is included to capture its influence on the coefficient of the Female variable (Fryer and Levitt, 2010); Dual citizenship should evidence the effect of immigrants being allowed by their home country's rules to retain their original citizenship when becoming citizens of the host country. This is expected to make citizenship in the host country more attractive. Results indicate that coefficients on the mentioned variables are not significant, and they do not alter the main findings of this study. Meanwhile, the significant and positive coefficient on the interaction term Female*GII supports the result in Table 2 that female enrolments in PSEE increase with inequality in origin countries.

Table A5. – Kernel MD statistics

	Means						Variances					
	Raw			Matched(ATE)			Raw			Matched(ATE)		
	Treated	Untreated	StdDif	Treated	UUntreated	StdDif	Treated	Untreated	Ratio	Treated	Untreated	Ratio
Female	0.5612316	0.6129477	-0.1051522	0.5879122	0.6022501	-0.0291528	0.2464231	0.2373518	1.038219	0.2424505	0.2396566	1.011658
Math high school	1.212036	1.26079	-0.062049	1.257979	1.24991	0.0102695	0.6854012	0.5493208	1.247725	0.6256559	0.5469384	1.143924
High school grade	4.318554	4.320503	-0.0130515	4.318055	4.316354	0.0113896	0.0215146	0.0230629	0.932866	0.0198042	0.0225151	0.8795953
Enrolment status	1.959412	1.879247	0.0909692	1.888826	1.859675	0.0330795	0.7854663	0.7676812	1.023167	0.6985029	0.7740256	0.9024287
Socioeconomic status	4.971255	4.219019	0.2500758	4.697401	4.344168	0.11743	9.004135	9.092386	0.9902941	9.492946	8.880348	1.068984
Second generation	0.0608817	0.0293848	0.1521135	0.0312769	0.0352273	-0.0190782	0.0572152	0.0285344	2.005131	0.0303211	0.0340022	0.891739
GII3	2.040588	2.018365	0.0265467	2.003603	2.030887	-0.0325935	0.6944299	0.7070581	0.9821399	0.719589	0.6881393	1.045702
Ancestry	0.2456263	0.0491276	0.5767419	0.1190818	0.1207386	-0.004863	0.1854238	0.0467356	3.967509	0.1049788	0.1062103	0.9884054
Year	2012.132	2012.27	-0.0225606	2012.921	2011.847	0.1744373	41.18716	34.59243	1.190641	35.10825	39.14786	0.8968114
ln_pcGDP	9.304425	9.003253	0.4251569	9.13622	9.104884	0.0442363	0.6616554	0.3419458	1.934971	0.4665862	0.428546	1.088766
SSA	0.0587824	0.0642792	-0.0228695	0.061693	0.0610226	0.002789	0.0553657	0.060175	0.9200792	0.0579297	0.0573256	1.010539
Cent_Asia	0.0188943	0.0229568	-0.0283771	0.020373	0.0201705	0.001415	0.0185503	0.0224401	0.8266583	0.0199727	0.0197728	1.01011
M_East_N_Af	0.0412876	0.0385675	0.0138894	0.0390244	0.0397727	-0.0038211	0.0396107	0.0370971	1.067757	0.0375292	0.0382087	0.9822172
East_Asia	0.0244927	0.0229568	0.0100886	0.0215208	0.0227273	-0.0079252	0.0239095	0.0224401	1.065479	0.0210732	0.0222211	0.948343
South_Am	0.0713786	0.0257117	0.21363	0.0436155	0.04375	-0.0006292	0.0663301	0.0250621	2.646632	0.041744	0.0418554	0.9973378
CnN_Am	0.053184	0.0142332	0.2170174	0.0281205	0.0284091	-0.0016078	0.0503908	0.0140371	3.589827	0.02735	0.0276149	0.9904063
ALB	0.0888733	0.1804408	-0.2706175	0.1454472	0.1512159	-0.0170488	0.0810316	0.1479498	0.5476963	0.1243842	0.1284095	0.9686525
ARG	0.0552834	0.0119376	0.2421893	0.0284075	0.028125	0.0015782	0.0522637	0.0118005	4.428953	0.0276209	0.0273467	1.010025
BRA	0.0580826	0.0142332	0.2364466	0.0298422	0.0295455	0.0016	0.0547473	0.0140371	3.900186	0.028973	0.0286859	1.01001
CHN	0.0097971	0.0344353	-0.1680847	0.0238164	0.0235795	0.0016155	0.0097079	0.0332647	0.2918366	0.0232663	0.0230343	1.010074
CHE	0.0636809	0.0096419	0.2904722	0.0295552	0.0315341	-0.0106368	0.0596674	0.0095533	6.24574	0.0287029	0.0305539	0.9394184
GHA	0.0209937	0.0610652	-0.2030011	0.045911	0.0454545	0.0023126	0.0205674	0.0573626	0.3585501	0.0438356	0.0434087	1.009835
IND	0.0608817	0.0445363	0.0731769	0.0522238	0.0517045	0.0023247	0.0572152	0.0425723	1.343952	0.0495331	0.049054	1.009765
MAR	0.1336599	0.1469238	-0.0381886	0.1440793	0.1389894	0.0146546	0.115876	0.1253948	0.9240898	0.1234116	0.1197271	1.030774
MDA	0.0321903	0.1166208	-0.325887	0.0857963	0.0854207	0.0014496	0.0311759	0.1030677	0.3024803	0.0784932	0.0781604	1.004258
PAK	0.0223933	0.0330579	-0.0649706	0.0292683	0.0289773	0.0017729	0.0219072	0.0319797	0.6850328	0.0284327	0.0281507	1.010016
PER	0.0237929	0.0261708	-0.0152325	0.0252511	0.025	0.0016083	0.023243	0.0254976	0.9115772	0.0246317	0.0243864	1.010058
RUS	0.056683	0.0119376	0.2476172	0.030703	0.0303977	0.0016894	0.0535075	0.0118005	4.534351	0.0297823	0.0294874	1.01
TUN	0.0202939	0.0243343	-0.0273493	0.0232425	0.0230114	0.0015644	0.019896	0.023753	0.8376201	0.022719	0.0224923	1.01008
UKR	0.0377887	0.0624426	-0.1131459	0.0542324	0.0536923	0.002479	0.0363861	0.0585704	0.6212375	0.0513292	0.0508331	1.009759
2.ITA _area	0.0188943	0.0215794	-0.0190644	0.015208	0.0150568	0.0010736	0.0185503	0.0211235	0.8781857	0.0149878	0.014837	1.010163
3.ITA_area	0.0573828	0.0215794	0.1845787	0.0243902	0.0258523	-0.0075373	0.0541279	0.0211235	2.562454	0.0238129	0.0251957	0.9451205

Notes: Kernel MD specification: column (1), Table 3.

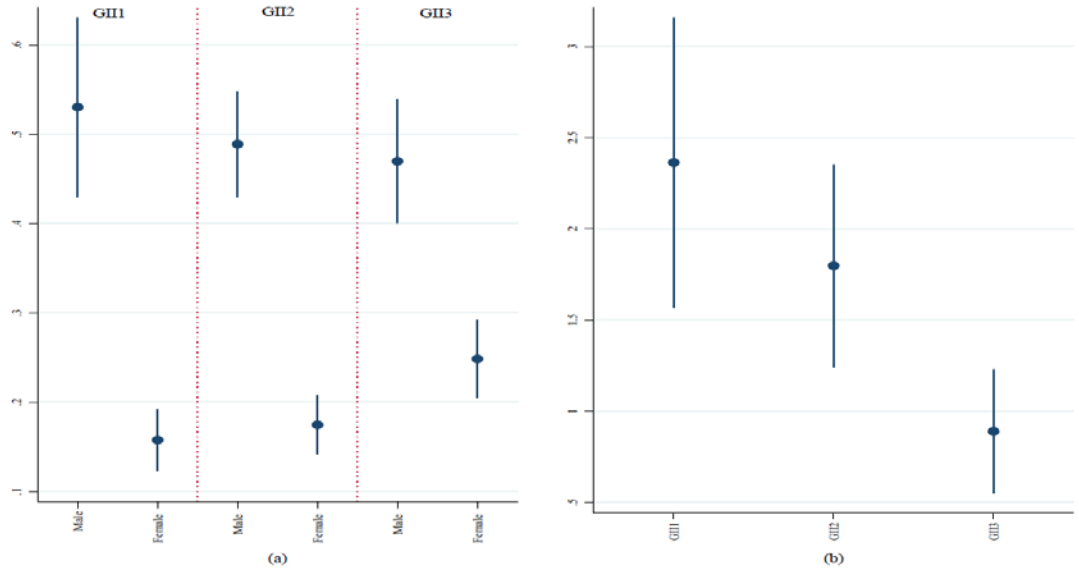

Figure A1. – Likelihood of enrolling in PSEE, gender inequality and gender gaps

Notes: Coefficients in Panel (a) are predictive margins on the interactions Female*GII in the full regression of column (6) in Table 2, with gender inequality increasing from GII1 to GII3. Capped vertical lines represent 95% confidence intervals based on standard errors clustered at the country/world region level. Gender gaps in Panel (b) are the ratio of the likelihood of enrolling in PSEE among males and the same likelihood among females, minus one.

APPENDIX B

This Section presents results from a wider sample that includes EU countries and students with one parent holding the Italian citizenship, or even both parents if the student was born abroad; observations are 5123.

Table B1, column (1), presents matching coefficients based on the extended sample. The matching specification employed is identical to the one in column (1) of Table 3, utilizing the same kernel MD matching method. Notably, additional matching covariates have been incorporated, including an EU dummy (taking a value of one for EU member countries and zero otherwise) and a Parent dummy (taking a value of one when a parent holds Italian citizenship).[2]

[2] The results obtained using the matching specifications of columns (2)-(6) in Table 3 with the wider sample are similar to those from the restricted sample.

Table B1: Citizenship and PSEE enrolment. Kernel matching coefficients. Broad sample

	(1) Broad sample	(2) Restricted sample
ATE	-0.037***	-0.056***
	(0.014)	(0.017)
ATT	-0.041***	-0.061***
	(0.016)	(0.019)
ATC	-0.034**	-0.052***
	(0.016)	(0.019)
Observations	4,974	3,630

Notes: Treated students are Citizens. Kernel MD matching on variables: Female, High school math, High school grade, Socioeconomic status, Enrolment Status, Second Generation, GII, GDP per capita, Ancestry, EU, Parent, Year, Countries/regions, Italian areas: Outcome adjusted on the same variables. Exact matching on Second generation and Ancestry; Bootstrap standard errors computed with 5x replications, *** p<0.01, ** p<0.05, * p<0.1. Column (2)* coefficients are from Table 3.

Column (2)*, which replicates column (1) of Table (3), has been incorporated into Table B1 for a quick comparison of coefficients between the broader and more restricted samples. Notably, the signs and significance of the coefficients remain similar, but the changes resulting from citizenship are less pronounced in the wider sample. This difference could be attributed to the larger sample's inclusion of students from EU countries – whose status undergoes only marginal changes when they become Italian citizens – as well as of students with one Italian parent – who have a facilitated access to citizenship. Indeed, both groups of students may exhibit behaviour in their choice of majors that closely resembles that of citizens, even if they have not yet acquired citizenship themselves.

Table B2 presents coefficients derived from the same specifications as those in Table 2 but applied to the wider sample. Columns (1)-(6) provide the results from various specifications, and two additional columns, (7) and (8), with regression on the matched sample, exclude parents with Italian citizenship or EU countries, respectively.

Table B2. - Enrolment in PSEE and citizenship. Broad sample

	(1) U	(2) M	(3) U	(4) M	(5) U	(6) M	(7) M	(8) M
Citizenship	-0.270***	-0.268**	-0.373***	-0.452***	-0.566**	-0.286	-0.265	-0.188
	(0.092)	(0.111)	(0.125)	(0.131)	(0.243)	(0.254)	(0.404)	(0.405)
Female	-1.789***	-1.659***	-1.855***	-1.860***	-3.300***	-2.884***	-3.047***	-3.145***

	(0.032)	(0.034)	(0.075)	(0.106)	(0.379)	(0.621)	(0.740)	(0.734)
GII	0.025	-0.112	0.030	-0.105	-0.306**	-0.296	-0.328	-0.277
	(0.121)	(0.213)	(0.122)	(0.216)	(0.148)	(0.281)	(0.299)	(0.296)
Citizenship*Female			0.213	0.400**	1.008**	0.608	0.240	0.544
			(0.159)	(0.167)	(0.409)	(0.437)	(0.614)	(0.611)
Citizenship*GII					0.076	-0.091	-0.112	-0.129
					(0.111)	(0.134)	(0.186)	(0.173)
Female*GII					0.750***	0.539*	0.577	0.701*
					(0.201)	(0.325)	(0.369)	(0.366)
Citizenship*Fem.*GII					-0.348*	-0.092	0.078	-0.093
					(0.194)	(0.234)	(0.313)	(0.277)
Math high school	0.731***	0.755***	0.731***	0.755***	0.739***	0.763***	0.686***	0.732***
	(0.048)	(0.072)	(0.047)	(0.072)	(0.046)	(0.073)	(0.062)	(0.071)
High school grade	1.910***	2.000***	1.901***	1.992***	1.899***	2.013***	1.606***	1.891***
	(0.245)	(0.204)	(0.242)	(0.203)	(0.237)	(0.197)	(0.228)	(0.256)
Socioeconomic status	0.030***	0.027**	0.030***	0.026**	0.030**	0.026**	0.019	0.019
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.016)	(0.017)
Second generation	0.164	0.215	0.166	0.218	0.147	0.224	0.361	0.347
	(0.191)	(0.259)	(0.190)	(0.260)	(0.190)	(0.262)	(0.429)	(0.321)
GDP pc	-0.180	-0.452*	-0.172	-0.438*	-0.213*	-0.454*	-0.463**	-0.447
	(0.131)	(0.239)	(0.129)	(0.239)	(0.127)	(0.238)	(0.184)	(0.294)
Ancestry	-0.166	-0.234	-0.166	-0.242	-0.162	-0.232	-0.091	-0.012
	(0.272)	(0.406)	(0.270)	(0.401)	(0.289)	(0.416)	(0.430)	(0.890)
EU	-0.021	0.517***	-0.027	0.512***	-0.024	0.518***	0.542***	
	(0.066)	(0.087)	(0.065)	(0.088)	(0.064)	(0.087)	(0.090)	
Parent	0.063	0.206	0.063	0.204	0.063	0.211		0.105
	(0.067)	(0.132)	(0.068)	(0.135)	(0.068)	(0.135)		(0.118)
Year	yes	yes	yes	yes	yes	yes	yes	yes
Enrolment status	yes	yes	yes	yes	yes	yes	yes	yes
Country/region FE	yes	yes	yes	yes	yes	yes	yes	yes
Country area FE	yes	yes	yes	yes	yes	yes	yes	yes
Female*country/region	yes	yes	yes	yes	yes	yes	yes	yes
Observations	4,974	4,868	4,974	4,868	4,974	4,868	3,807	3,964

Notes: Logistic regression, PSEE is the binary dependent variable. U: unmatched sample, M: matched sample. Column (7): excluding parent with Italian citizenship; column (8): excluding EU countries of origin. Standard errors in parentheses, clustered at the country/region level; *** p<0.01, ** p<0.05, * p<0.1.

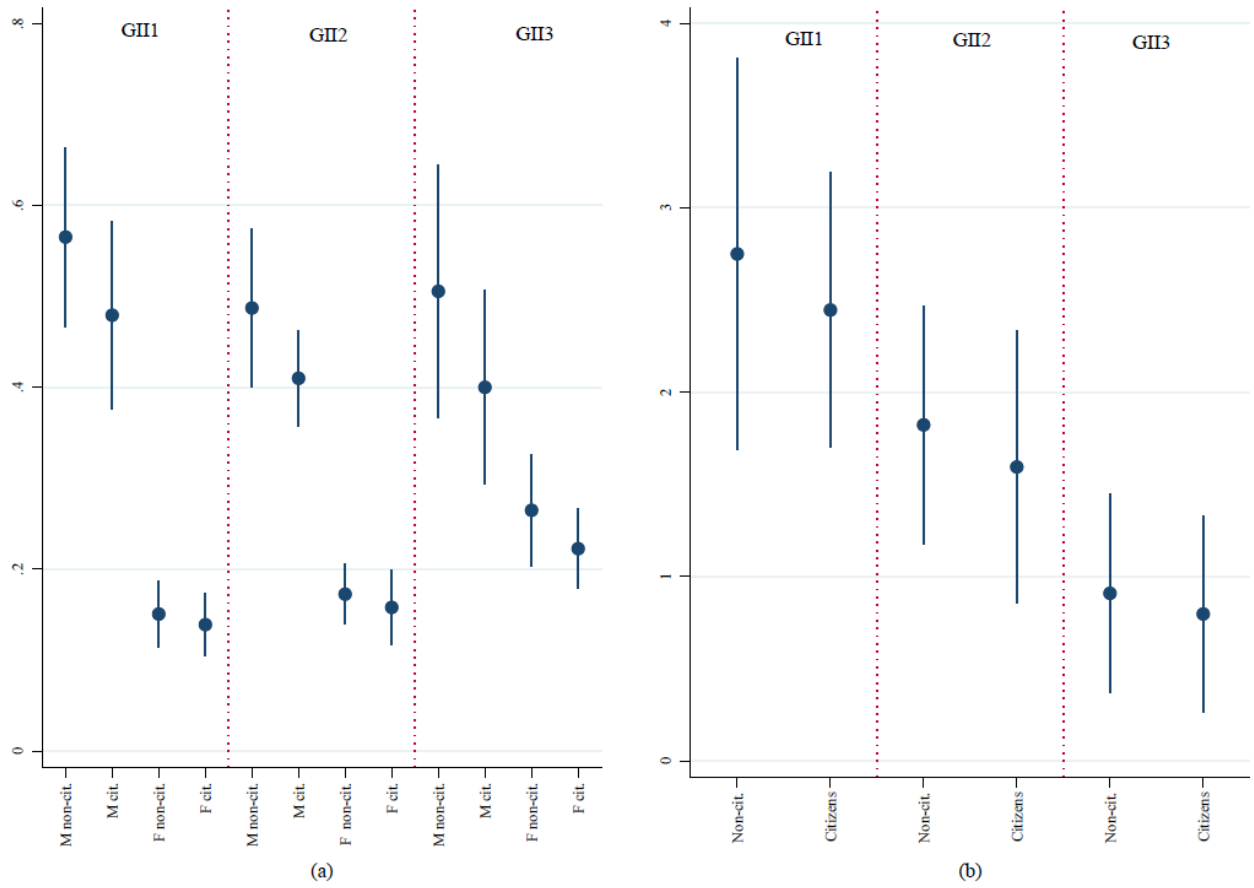

Figure B1. Likelihoods of non-citizens and citizens of majoring in PSEE, and gender gaps. Matched sample, broad sample.

Notes: Treated students are Citizens. Logistic regression on the matched sample. Likelihoods are predictive margins on Female*Citizenship*GII from the full regression of column (6) in Table B2. Gender inequality increases from GII1 to GII3. Panel (a): Likelihoods of female and male non-citizens and citizens of enrolling in PSEE; Panel (b): gender gaps in PSEE.

Figure B1 illustrates the results obtained from the broad sample, revealing patterns that align with those observed in the restricted sample. Specifically, the likelihoods of females increasing with gender inequality and a concurrent decrease in gender gaps are consistent across both samples. Additionally, citizens tend to enrol less in PSEE than non-citizens at all levels of inequality, with a proportionately larger decline observed for students originating from less equal countries. This later result may be explained by the fact that the third tercile of GII does not include EU countries and has a lower proportion of parents with Italian citizenship compared to the other terciles. Therefore, for these students, citizenship marks a more substantial change in status than for students in the other two terciles.

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