Intersectional Patterns in Higher Education STEMM: The Role of Gender, Ethnicity and Parental Transmission

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Abstract

This study examines how gender and ethno-national origin intersect in shaping the likelihood of studying science, technology, engineering, mathematics and medicine (STEMM) in higher education in Germany. Building on research showing gender and ethnic differences in the selection of STEMM-qualified immigrants who entered Germany in the 1980s, we explore whether similar patterns emerge among their offspring. We further analyse whether the effect of parental STEMM occupation varies by gender and ethno-national origin. Using nationally representative data, we find that students of Turkish or Middle Eastern and North African (MENA) descent – both men and women – are more likely to enrol in STEMM fields than their German-origin peers. Men of former Soviet Union (FSU) origin also show higher enrolment, contributing to a larger gender gap in that group compared to German-origin students. Significant differences are also found for Central and Eastern European (CEE) students. Additional analyses reveal that these results mostly reflect enrolment in male-dominated STEMM fields – even among ethnic minority women. Parental STEMM occupation is positively associated with enrolment in STEMM fields, particularly for men, but this association does not vary by ethno-national origin.

Keywords: STEMM enrolment, gender, ethnic origin, parental transmission, Germany.

Introduction

The persistent underrepresentation of women in science, technology, engineering and mathematics (STEM) in education and the labour market continues to be a central topic in research and policy (e.g., Verdugo-Castro et al., 2022; Yazilitas et al., 2013). The gender imbalance is less pronounced in the life sciences, and particularly when medicine is included in the classification (STEMM; Jacob et al., 2020), as these fields tend to exhibit lower levels of gender segregation. Regardless, research often overlooks ethnic disparities in STEMM participation and how gender and ethnic origin intersect in shaping STEMM outcomes (Riegle-Crumb et al., 2018). This is problematic for three reasons. First, the increasing demand for STEMM workforce due to technological advancements, demographic change, and economic growth make the underrepresentation of certain social groups relevant from a social-policy perspective (OECD, 2017). Second, STEMM occupations are typically associated with relatively high pay and prestige (Bol & Heisig, 2021; Rothwell & Jonathan, 2013). Thus, gender and ethnic differences in STEMM participation may contribute to broader social inequalities. Finally, gender ideology varies between countries of origin (e.g., Khoudja & Fleischmann, 2015). Including ethnic minorities in the analysis helps reveal how structural factors (e.g., immigrants' education and labour market integration) and cultural influences (e.g., gender norms and affinity with STEMM) contribute to shaping gender disparities in STEMM participation across different ethno-national groups.

A recent study supports the relevance of STEMM qualifications for immigrant labour market integration in the German case. Kogan and Schabinger (2023) found that a large share of immigrants who entered the country in the 1980s possessed STEMM qualifications. While male STEMM graduates predominantly came from Central and Eastern Europe (CEE), many STEMM-qualified women originated from Asia, Turkey, and Middle East and North African (MENA) countries. Overall, immigrants with STEMM qualifications attained better labour market outcomes than immigrants

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without STEMM qualifications, with medical professions being particularly relevant for female immigrants. However, it remains unclear whether these ethnic and gendered patterns in STEMM participation are unique to first-generation immigrants or whether similar trends are evident among their descendants. Assuming high rates of transmission of parental capital to children, considerable shares of these immigrants' offspring might pursue STEMM careers.

Building on these findings, our study contributes to the literature in two ways. First, we study gender and ethnic patterns in STEMM higher educational enrolment among children of immigrants in Germany. In line with Kogan and Schabinger (2023), we consequently focus on a broader classification of STEMM fields, including medicine, to capture relevant pathways for women and immigrant-origin students. The focus on higher education is justified, as highly educated STEMM workers are essential for fast growing knowledge-based economies to stay globally competitive and address labour shortages (CEDEFOP, 2023). Although youth of immigrant origin are still, on average, less likely to enter higher education in Germany than the native-born majority, the gap is considerably reduced for the second generation (e.g., Gries et al., 2022) – making it timely and relevant to examine who enters STEMM fields in this population.

Ethnic and gender differences in STEMM participation have mostly been examined in the US context (e.g. Ma, 2011; Riegle-Crumb & King, 2010), which differs in migration history and composition of immigrants from European countries. Germany's immigrant population includes individuals originating from other European countries, Turkey, the former Soviet Union (FSU) – particularly Russia and Kazakhstan – MENA countries and Asia. Turkish migrants primarily entered Germany during the guest worker recruitment of the 1960s and 1970s. From the 1980s onward, immigrants arrived mostly for humanitarian reasons from Eastern Europe, the Kurdish region of Turkey, MENA countries and Asia (Kogan, 2011). During this period, ethnic Germans born abroad (*Aussiedler*) from the FSU, Poland and Romania also migrated to Germany. Our categorisation of immigrant groups broadly follows that of Kogan and Schabinger (2023), reflecting both the size and cultural diversity of Germany's immigrant population (e.g., regarding gender norms). Although our sample encompasses descendants of immigrants in higher education, whereas Kogan and Schabinger (2023) examined both medium- and highly-qualified immigrants, selecting comparable ethno-national groups allows for a meaningful comparison of gendered STEMM enrolment patterns between the first generation of immigrants in Germany and a synthetic cohort of their offspring.

Second, we explore whether parental STEMM occupation, as a resource for field-of-study choice, operates differently across social groups. Existing research shows that parental occupation-specific capital – such as knowledge and aspirations – shapes children's career choices (Jonsson et al., 2009). However, the role of parental STEMM occupation for STEMM outcomes in individuals, such as achievement and participation, have rarely been examined (e.g. Chachashvili-Bolotin et al., 2019; Gutfleisch & Kogan, 2022). We investigate the role of parental STEMM occupation in STEMM enrolment, and whether the association differs by gender and ethno-national group.

Using nationally representative data, we address the following questions: Are certain ethnic minority groups more likely than German-origin students to enrol in STEMM fields? How do gender disparities in STEMM enrolment vary by ethno-national origin? What is the role of parental STEMM occupation for choosing a STEMM field, and does this relationship vary by gender and ethno-national origin? Although the share of students choosing STEMM in higher education is larger in Germany compared to other countries (OECD, 2017), women and immigrants continue to be underrepresented (Anger et al., 2021). By investigating these questions, this study contributes to a deeper understanding of how intergenerational dynamics influence educational pathways in STEMM fields.

Empirical and theoretical background

Gender and ethnic origin

Although tertiary education tends to be less gender segregated than the apprenticeship market (e.g., Prix, 2012), gender disparities by field of study have been documented in almost all Western industrialised countries, with men predominantly selecting technical fields and women the humanities, arts, and education (e.g., Barone, 2011; Charles & Bradley, 2009). While rational choice perspectives emphasise achievement differences in STEMM-related school subjects as an explanatory factor (Gabay-Egozi et al., 2015), cultural perspectives highlight the role of gender socialisation processes. Gender stereotypes portraying some STEMM fields as masculine are thought to contribute to lower self-perceptions and reduced interests in these fields among girls (Wang & Degol, 2017). This perspective also helps explain why some STEMM fields are more gender-balanced than others, with the life sciences and medicine being less male-dominated – and in some cases even female-dominated – due to their weaker association with stereotypically masculine attributes (Cheryan et al., 2017).

In contrast, native-immigrant gaps in STEMM enrolment have received less attention, particularly regarding ethnic origin. STEMM fields offer relatively high labour market returns and prestige (Bol & Heisig, 2021), are often less dependent on host-country language skills (except for medicine), and are often perceived as more meritocratic, potentially reducing the risk of labour market discrimination (Xie et al., 2015; Xie & Goyette, 2003). Consequently, STEMM careers may represent a strategic pathway for immigrant upward social mobility. A recent cross-national study suggests that, notwithstanding differences in socio-economic status, immigrants are indeed more likely than native-born students to assign instrumental values and enjoyment to science-related and technical occupations, which partly accounts for their occupational expectations (Sikora & Pokropek, 2021). This is in line with the literature on immigrant optimism (Dollmann & Weißmann, 2019; Möser, 2022), which suggests that the higher educational aspirations of immigrant-origin youth compared to their native-born peers may result in a greater likelihood of studying STEMM.

However, immigrants might differ in how much value they attach to STEMM fields as a means for upward social mobility depending on structural differences, as well as the perceived value of STEMM in their country of origin. Turkish migrants and their descendants, as well as MENA-origin immigrants (Gries et al., 2022), face persistent disadvantages in both the education system and the labour market compared to native-born Germans and other immigrant groups (e.g. Kalter & Granato, 2018; Salikutluk et al., 2020). These structural disadvantages have been linked to high educational aspirations, particularly among Turkish-origin youth compared to other immigrants from the FSU in Germany (Salikutluk, 2016). Among the more positively selected group of Turkish and MENA-origin students who access higher education, these aspirations may translate into a higher likelihood of enrolling in STEMM fields as a clear pathway to high-pay and high-status jobs. Similarly, STEMM participation in the US is considered a strategic pathway for upward social mobility among some Asian-origin groups (Kang et al., 2023). While comparable evidence is lacking for Germany, similar mechanisms may apply. In contrast, for immigrant groups from Eastern Europe and the FSU, a historically rooted STEMM orientation in their countries of origin to increase industrial growth (Bodovski et al., 2014) may foster a lasting cultural affinity for STEMM fields, contributing to higher enrolment among their children. For other European migrants, the patterns should be relatively similar to their native-born counterparts.

A few studies from the US indeed support the notion that certain immigrants and ethnic minorities may be more prone to pursue STEMM education than the majority population (Han, 2016; Ma, 2011; Ma & Lutz, 2018), although the composition of ethnic minority groups differs from many European countries. Two studies from Israel found that FSU-origin immigrants were more likely to choose STEMM courses in secondary school than native-born students and other immigrants (Chachashvili-Bolotin et al., 2019; Lissitsa & Chachashvili-Bolotin, 2019). Against this background, *we expect a higher likelihood of enrolment in STEMM for ethno-national minority students compared to the native-born majority*, and empirically explore whether the size of this difference varies across ethno-national groups.

Intersectional patterns

Given the strong gender-stereotyped cultural associations of STEMM fields and their influence on occupational preferences (Cheryan et al., 2017), different patterns of STEMM participation may emerge for men and women from immigrant and non-immigrant backgrounds due to different gender socialisation processes (Fleischmann et al., 2014). Immigrants and their descendants tend to hold on average more traditional gender norms than their native-born counterparts (e.g. Guerrero & Schober, 2021; Kretschmer, 2018), although differences in gender ideology tend to diminish over time as a result of acculturation processes (Röder & Mühlau, 2014). If traditional gender ideology is reflected in immigrant occupational preferences, women originating from more traditional contexts, such as Turkey or MENA (Inglehart & Norris, 2003), might be less likely than German-origin women to enrol in STEMM fields, particularly male-dominated fields, contributing to larger gender gaps among immigrants compared to native-born individuals. In contrast, a cross-country study found that a substantial share of women who pursue higher education in some MENA countries opt for STEM majors (Gebel & Heyne, 2014). Moreover, Kogan and Schabinger (2023) suggest that immigrant women from MENA countries are more positively selected on STEMM qualifications than other immigrants, which might translate to the next generation. These findings align with the literature on the gender equality paradox, describing the phenomenon of smaller gender gaps in male-dominated STEMM outcomes in more gender unequal countries (e.g., Breda et al., 2020). The resulting patterns are partly attributed to the correlation between economic prosperity and gender equality, which may allow women in more affluent societies greater freedom to follow personal interests influenced by gender stereotypes (e.g., Stoet & Geary, 2018). A different mechanism may apply to immigrants from the FSU and CEE. Gender equality was part of socialist ideology in these countries, which, together with the high value of STEMM in socialist economies (Heiniger & Imdorf, 2018; Schlenker, 2015), may lead to smaller gender differences among immigrants originating from these countries.

Indeed, studies from Israel found only small gender differences in participation in male-dominated STEMM fields among students with parents from the FSU (Chachashvili-Bolotin et al., 2019; Lissitsa & Chachashvili-Bolotin, 2019). Studies in the US also suggest intersectional patterns in STEMM participation by ethno-racial group (e.g., Ma & Liu, 2017; Riegle-Crumb & King, 2010). Overall, patterns of STEMM enrolment among immigrant-origin men and women may reflect the interplay of structural opportunities, cultural norms related to gender, and the symbolic value attached to STEMM fields in both the country of origin and the host society (Kogan, 2018), which may result in varying patterns of STEMM enrolment in higher education. Therefore, we *expect the likelihood of enrolment in a STEMM field to differ by ethno-national origin and gender, resulting in variation in the size of the gender gap across ethno-national groups compared to German-origin students*. In additional analyses, we further explore whether similar patterns emerge across STEMM fields that are male and female dominated.

Parental STEMM occupation

Diverging from conventional models of social mobility and their focus on parental class background as the key driver of educational outcomes (Breen & Goldthorpe, 1997; Erikson et al., 2012), the micro class mobility model (MMM) emphasises the role of the parents' actual occupations (Jonsson et al., 2009; Weeden & Grusky, 2004). Accordingly, parents may transmit occupation-specific capital to their children (e.g., perceived relevance of certain occupations), which makes it more likely that they follow in their parents' footsteps. Regarding STEMM, parents may transmit occupation-specific capital directly, such as through cultivating positive attitudes towards STEMM (Hazari et al., 2013; Plasman et al., 2021) and providing knowledge, support and encouragement (e.g. Chakraverty & Tai, 2013), or indirectly by acting as role models for careers in STEMM (e.g. Lissitsa & Chachashvili-Bolotin, 2021). Prior research corroborates this notion regarding achievement in STEMM-related school subjects (e.g. Bowden et al., 2017; Gutfleisch & Kogan, 2022), occupational aspirations (e.g. Holmes et al., 2018; Sikora & Pokropek, 2012b), and field-of-study choice in upper secondary and higher education (e.g. Anaya et al., 2022; Oguzoglu & Ozbeklik, 2016). In line with this research, *we expect parental STEMM occupation to be positively associated with the likelihood of enrolment in STEMM in higher education over and above socio-economic status differences.*

While the proposed mechanism does not necessarily assume ethnic or gender differences in the parental transmission of occupations, the strength of the association between parental STEMM occupation and STEMM enrolment might differ across social groups. On the one hand, immigrants often face limited transferability of country-specific resources to the host society, as structural and cultural differences (e.g., language) between origin and destination countries constrain the successful integration of immigrants – even for those who are highly skilled (Friedberg, 2000; Kogan et al., 2011; Portes & Rumbaut, 2001). In addition, returns to STEMM qualifications have been shown to vary by ethnic origin and gender in Germany (Grigoleit-Richter, 2017; Kogan & Schabinger, 2023). Kogan and Schabinger (2023) have found that, among men, immigrants from CEE with STEMM qualifications are more successful in the labour market. Whereas among women, immigrants from Turkey and MENA were most successful, albeit not as successful as men. While many STEMM skills are more easily transferable across national contexts due to their universality and lower dependency on host-country language proficiency (Han, 2016), parental transmission might thus be lower in immigrant families compared to native-born families due to, for example, lack of knowledge about the host-country education system (Kretschmer, 2019). For students with a migrant background, other sources of STEMM-related capital, such as schools or peers may play a more significant role. On the other hand, closer intra-family ties and stronger parental authority, which are more common in non-Western countries (Inglehart & Norris, 2003; Phalet & Schönpflug, 2001), may strengthen parental influence on children's occupational aspirations. Therefore, depending on origin-specific family norms and the structural integration of parents, the role of parental STEMM occupation may either be weaker or stronger for immigrants compared to the native-born majority.

Gender-specific transmissions of parental STEMM occupation may be affected by cultural stereotypes linking certain STEMM fields to masculine traits and stereotypical male behaviours (Garr-Schultz et al., 2023). Given the lack of role models in many STEMM fields, the family-based transmission of STEMM capital may be particularly crucial for girls. Prior research is mixed as to whether parental STEMM occupation is more relevant for girls or boys (e.g., Anaya et al., 2022; Bowden et al., 2017), partly reflecting differences in study design, and whether the mother's or father's occupation is considered (Stefani, 2024). Intersectional studies considering immigrant background or ethnic origin and gender in the intergenerational transmission of STEMM-related capital remain scant. Van der Vleuten (2018) suggests that the mother's gender-atypical occupation is particularly important for field of study in upper secondary school among non-Western immigrants in the Netherlands. In a recent study for Germany, Gutfleisch and Kogan (2022) found no intersectional patterns in the role of the parental transmission of STEMM occupation regarding maths achievement in school-aged children. Focusing on STEMM enrolment, in the current study, we empirically explore *whether different patterns may be observed regarding higher education enrolment by gender and ethno-national origin*.

While our empirical expectations are primarily descriptive and exploratory, they address important gaps in the literature by systematically examining gender and ethno-national variation in STEMM enrolment in higher education. These findings may serve as a foundation for future research to develop more targeted explanations for the observed differences and to test the underlying mechanisms.

Data and methods

We use representative data from the National Educational Panel Study (NEPS) (NEPS-Netzwerk, 2022). NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi, Germany) in cooperation with a nationwide network, and provides nationally representative cross-sectional and longitudinal data on educational processes (Blossfeld & Roßbach, 2019). We focus on the first wave of starting cohort 5, consisting of first-year students in the 2010/2011 academic year at public or state-approved institutions of higher education. From the 17,909 students who participated in the first wave, we restricted the sample to those aged 17 to 35 who began their studies between August and October (typical starting dates in Germany), remained in their study programme for at least two months (to exclude cases of short-term enrolment without serious study intent), obtained their higher education entrance qualification in Germany, and for whom sampling weights were available.

While missing data on most variables were relatively limited (< 1% to 6%), we observed substantial gaps for parental occupation (mothers: 10%, fathers: 20%). To address this missing data, we applied multiple imputations using chained equations (MICE) generating 25 imputed datasets (Van Buuren, 2012). The imputation model included all variables used in the analysis as well as auxiliary variables likely to improve imputation quality: ethno-national language, whether the respondent obtained their higher education entrance qualification abroad, and the date of study participation. All respondents were included in the imputation process. However, the analysis was restricted to those with observed values on the dependent variable and within the defined sample. Overall, our analytical sample encompasses N = 16,988 students. About 60% of our sample are women, and about 85% have no migrant background. Around 44% of the sample have at least one parent with a STEMM occupation. Table A1 in the Appendix provides descriptive statistics of our sample.

Measurements

Our dependent variable is whether students are enrolled in a STEMM or non-STEMM major. Study fields were classified based on the official 2-digit codes provided by the German statistical office (Destatis). We employ a broad definition of STEMM fields that not only includes mathematics, natural sciences, engineering, and computer sciences but also life sciences and medicine. A detailed list referencing the Destatis codes is provided in Table A2 in the Appendix. Students could list up to three study fields and indicated whether they were major or minor programmes. We coded students as STEMM students if they pursued at least one major in a respective field. Students who studied a STEMM field only as minor were categorised as non-STEMM. A sensitivity analysis in which these students were classified as STEMM did not alter our results.

Our main independent variables are gender, ethno-national origin and parental STEMM occupation. We use a binary measure of gender (1 = woman). Ethno-national origin was assigned based on the country of birth of the students and their parents. Students with both parents born in Germany are considered native-born, independent of the country of birth of the grandparents. These students were categorised as being of German descent. If one parent was born abroad, the country of birth of that parent was assigned to the student. If both parents were born abroad and in the same country, that country was assigned. If the parents were born in different countries, the mother's country of birth was assigned. We conducted sensitivity analysis to examine whether assigning the father's country of birth alters our results. If the students themselves were born abroad, their country of birth was assigned, independent of where the parents were born. Following Kogan and Schabinger (2023), we differentiated between the following aggregated origin groups to represent the diversity of immigrants in Germany while ensuring a sufficient group size for our statistical analysis: Former Soviet Union (FSU), Central and Eastern Europe (CEE), rest of Europe as well as North America and Australia (RE-NAA), Turkey, Middle East and North Africa (MENA), Asia, and rest of the world.

Parental STEMM occupation was defined based on the 4-digit codes of the International Standard Classification of Occupations 2008 (ISCO-08). We measure whether, when the students were 15 years old, at least one parent has worked in either a STEMM field or another field. We include both high and middle-skilled parental STEMM occupations, as STEMM-related knowledge, values, and occupational expectations may be transmitted regardless of the educational level required for the occupation, in line with our theory. This broader definition is especially important for capturing intergenerational influences in immigrant families, where immigrant parents may have a higher likelihood of occupational mismatch (Khoudja, 2018), yet still transmit STEMM-related capital. The composition of parental occupations classified as STEMM was selected to closely mirror the classification of students' study fields, including life science and medical occupations, and follows the categorisation proposed by Kogan and Schabinger (2023). If no information on occupation was available, but information on the parent's employment history was provided, we categorised those who never worked as non-STEMM respectively. This mostly referred to mothers.

We further control for student background characteristics that may confound the relationship between ethno-national groups, gender, parental STEMM occupation, and the likelihood of studying STEMM. These include student age and age squared, parental tertiary educational attainment (non-tertiary = reference), the type of school leaving certificate (general university entry qualification or *Abitur* = reference, specialised university entry qualification or *Fachabitur*, other), and whether students had already completed a tertiary degree before the winter term 2010/2011 (reference: no tertiary degree). These variables capture differences in access to more selective school tracks, delayed or non-linear entry into higher education, and parental familiarity with the education system that may correlate with ethno-national origin. We also control for the aspired degree (bachelor = reference, teaching degree, other), and type of university (university = reference, or university of applied sciences), as the availability and structure of STEMM programmes may differ across institution types (e.g., medicine can only be studied at universities). To capture regional variation in study opportunities, we also controlled for whether the higher education institution is situated in East or West Germany (reference = East Germany). Finally, we include students' intra-individual grade difference in maths and German as categorical variable, derived from their school grades in the last school year. In the German grading system, higher grades mean lower performance; we therefore re-scaled the grades such that higher values mean better performance. We then subtracted the German grade from the maths grade and classified students as having a comparative advantage in maths (i.e., with a grade difference > 0.5), equal performance (i.e., with a grade difference between -0.5 and + 0.5), or a comparative advantage in German (i.e., with a grade difference < 0.5). Although maths performance may also mediate the relationship between parental STEMM occupation and student STEMM enrolment, testing this mediation is beyond the scope of this study. We include it as a control variable to reflect our theoretical assumption that parents working in STEMM fields may influence their children's field-of-study choice beyond academic performance through mechanisms such as role modelling, familiarity with STEMM careers, or the transmission of domain-specific values (see theory section).

Analytical strategy

We performed stepwise logistic regression analyses to test our hypotheses. Model 1 includes all independent and control variables, but no interaction effects, to test the main effect of our variables of interest on the likelihood of enrolling in STEMM. An interaction effect between ethno-national origin and gender is included in Model 2, and an interaction effect between ethno-national origin and parental STEMM occupation in Model 3. Model 4 includes an interaction effect between gender and parental STEMM occupation, to be able to fully test the three-way interaction effect between all three variables of interest in Model 5. All our statistical models apply cluster robust standard errors at the level of higher education institutions and include stratification weights. Our approach is in line with the inter-categorical framework of intersectional analysis, which focuses on comparing inequalities across cross-classified groups (McCall, 2005).[1]

As recommended by Mize (2019), we interpret our results in the natural metric of our dependent variable, which is the probability of choosing a STEMM or a non-STEMM field. For the main effects, we calculated the average marginal effects (AMEs) of our key variables of interest based on Model 1 (Table 1). For the interpretation of interaction effects, we graphically present predictive margins of the probability of choosing a STEMM field across relevant cross-classified groups. We applied Wald tests to examine whether the differences in predictive probabilities between groups are statistically significant. Interpreting interaction effects and statistical significances based on the coefficient of the product term in the logistic regression could otherwise lead to a bias (see Mize, 2019 for a discussion). Nevertheless, the results largely align with the significance tests for the log-odds for our main results. Full models of the logistic regression analysis are presented in Table A3 in the Appendix. The analysis was conducted using Stata 16.0 (Williams, 2012). The syntax for our analyses is accessible online.

1 MAIHDA (Multilevel Analysis of Individual Heterogeneity and Discriminatory Accuracy) has been introduced as a multilevel framework for studying intersectional inequalities. It is particularly useful for estimating between-group variation and the relative ranking of intersectional strata when a large number of intersections is involved (Evans et al., 2024; Keller et al., 2023). However, our focus lies in testing specific interaction effects between gender, ethno-national origin, and parental STEMM occupation. This objective aligns more closely with classical interaction models.

Results

Main analysis

As depicted in Figure 1, the share of STEMM students in our sample varies by gender and ethno-national origin. Overall, there are more male STEMM students than women for all ethno-national groups. The gender gap varies between 19 percentage points among Asian-origin students to 41 percentage points among FSU-origin students. Among women, almost half of Turkish/MENA and Asian origin students are enrolled in a STEMM field (43% and 48%), showing higher shares of STEMM students than German-origin women (30%). Students of CEE origin show only slightly higher shares of STEMM students compared to German-origin women (33% vs. 30%). Similarly, among men, students of FSU (70%), Turkey/MENA (68%), and Asian origin (67%) show higher shares of STEMM students compared to native-born men (60%). CEE-origin men show lower shares of STEMM students than German-origin men (55%).

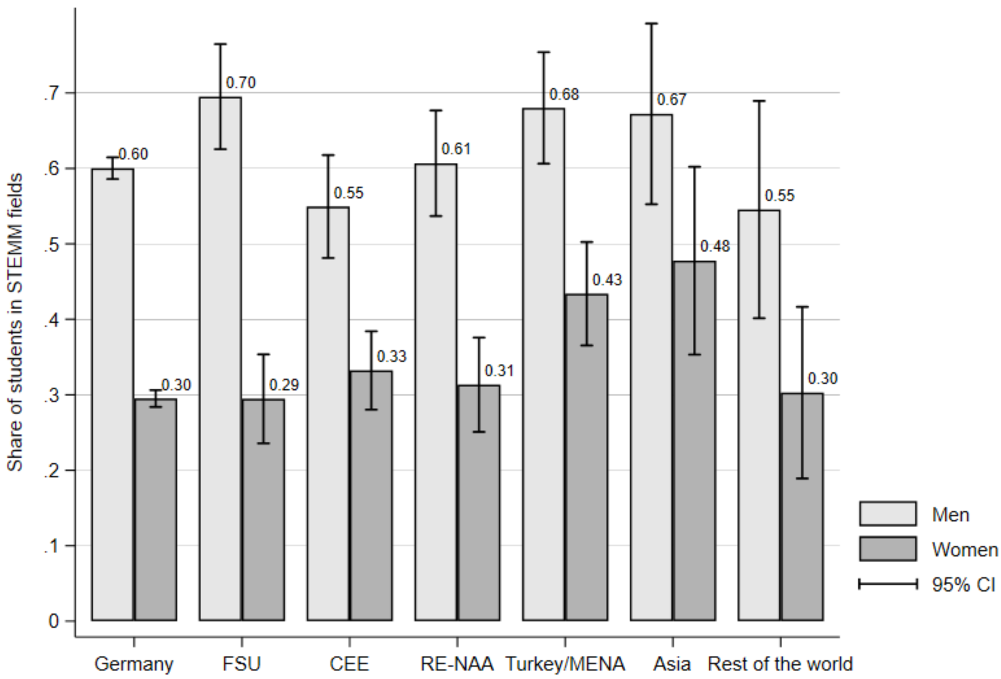

Figure 1. Share of STEMM students within ethno-national groups by gender

Note: NEPS, SC-5, weighted; N=16,988. Results based on 25 multiple imputed datasets. FSU = Former Soviet Union, CEE = Central and Eastern Europe, RE-NAA = rest of Europe, North America, and Australia, MENA=Middle East and North Africa.

Multivariate regression analysis, including control variables, partly confirms these patterns. First, an examination of the overall effects of ethno-national origin and gender (see Table 1) reveals that only students of Turkish or MENA origin show a statistically significant difference of 9.1 percentage points of the likelihood of studying STEMM compared to German-origin students. The gender difference is much larger, with women being about 27.5 percentage points less likely to study STEMM than men. Second, including an interaction effect in Model 2 reveals that FSU-origin men are more likely to study a STEMM field than their native-born counterparts; no significant differences are found for the other ethno-national groups based on Wald tests (see Figure 2, presenting the predicted probabilities of studying STEMM). In contrast, we find that women of

Turkish, MENA, or Asian origin are significantly more likely to study STEMM than native-born women. The gender gap in favour of men is significantly larger among students of FSU origin compared to those of German origin, and smaller among students of CEE origin, primarily driven by the variation in men's likelihood of studying STEMM. No significant differences are observed for the other groups.

Table 1. Average marginal effects (AMEs) of key variables, based on Model 1

	AMEs
Ethno-national origin (ref.: Germany)	
FSU	0.043
	(0.026)
CEE	-0.018
	(0.023)
RE-NAA	0.011
	(0.024)
Turkey/MENA	0.091*
	(0.036)
Asia	0.088
	(0.045)
Rest of the world	-0.001
	(0.053)
Women (ref.: Men)	-0.275***
	(0.023)
At least one parent in STEMM (ref.: no parents in STEMM)	0.059***
	(0.009)

Note: NEPS, SC-5, weighted; N=16,988. Results based on 25 multiply imputed datasets. AMEs of control variables not shown. FSU = Former Soviet Union. CEE = Central and Eastern Europe, RE-NAA = rest of Europe, North America, and Australia, MENA=Middle East and North Africa; * p<.05 ** p<.01 *** p<.001, standard errors in parentheses.

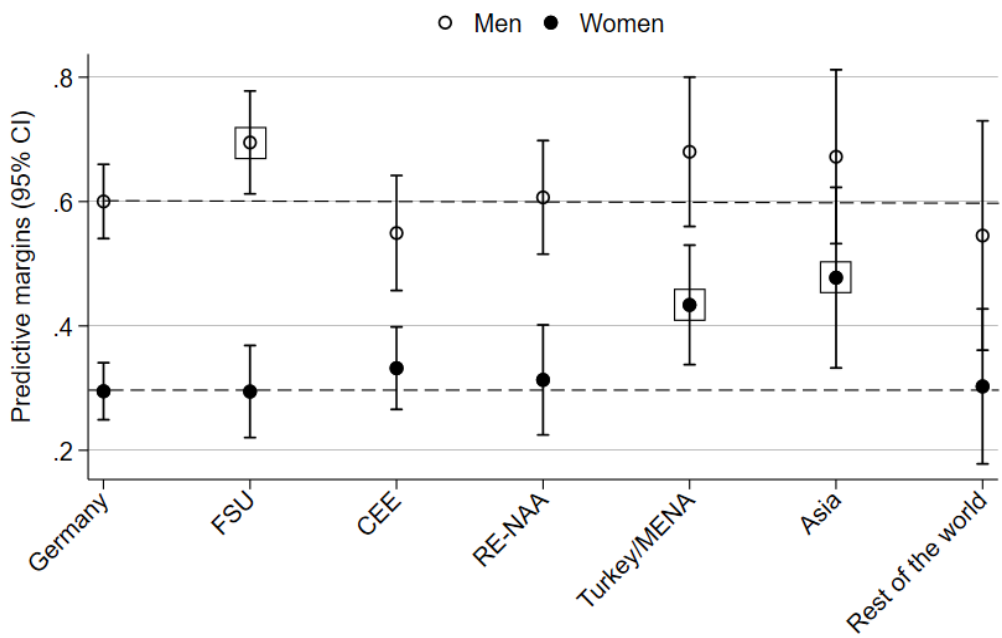

Figure 2. Predicted probability of studying STEMM (vs. non-STEMM) by gender and ethno-national origin (Model 2)

Note: NEPS, SC-5, weighted; N=16,988. Results based on 25 multiply imputed datasets. FSU = Former Soviet Union. CEE = Central and Eastern Europe, RE-NAA = rest of Europe, North America, and Australia, MENA=Middle East and North Africa; dashed line = native-born majority values; squares: statistically significant difference compared to the German-origin reference group within gender; $p < 0.05$.

Our results further show that students with at least one parent with a STEMM occupation are 5.9 percentage points more likely to study STEMM than other students (see Table 1). Figure 3 shows the probability of studying STEMM for students with and without STEMM-affiliated parents by ethno-national origin (based on Model 3). Among both those without and with STEMM-affiliated parents, Turkish or MENA origin students are significantly more likely to study STEMM than German-origin students. Significant differences are also observed for RE-NAA students without STEMM-affiliated parents. However, the Wald tests showed no significant differences in the effect of parental STEMM occupation between ethno-national groups. Regarding gender, we find that having parents with occupational STEMM-affiliation matters more for men than women in the probability to study STEMM (based on Model 4, see Figure 4). When examining ethno-national variation in the effect of parental STEMM occupation by gender, based on Model 5, no significant differences across men and women in the effect of parental STEMM occupation between groups were found (see Figure 5). Sensitivity analysis, assigning the father's country of birth instead of the mother's for students with two foreign-born parents, does not substantially change our results (Table A5). Classifying students who study STEMM only as a minor as STEMM instead of non-STEMM also led to similar results (Table A6). The greater likelihood of studying STEMM for Asian-origin compared to German-born students observed in our study became marginally significant in these analyses.

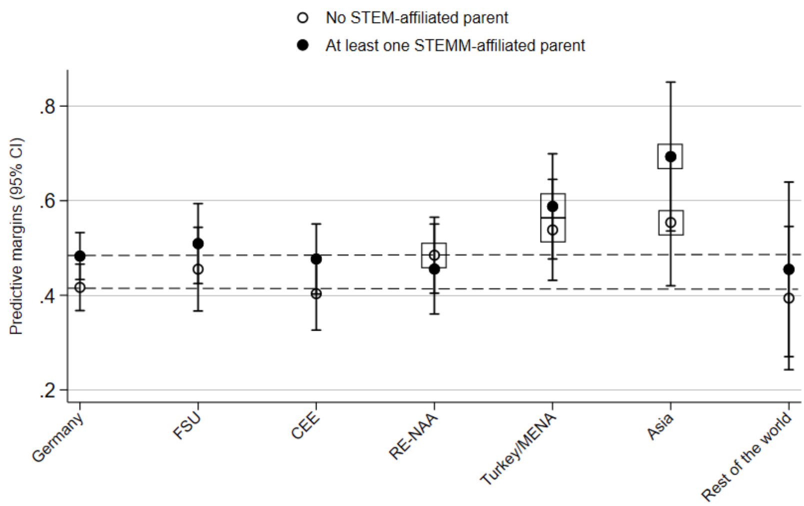

Figure 3. Predicted probability of studying STEMM (vs. non-STEMM) by ethno-national origin and parental STEMM occupation (Model 3)

Note: NEPS, SC-5, weighted; N=16,988. Results based on 25 multiply imputed datasets. FSU = Former Soviet Union. CEE = Central and Eastern Europe, RE-NAA = rest of Europe, North America, and Australia, MENA=Middle East and North Africa; dashed line = native-born majority values; squares: statistically significant difference compared to the German-origin reference group within parental groups; $p < 0.05$.

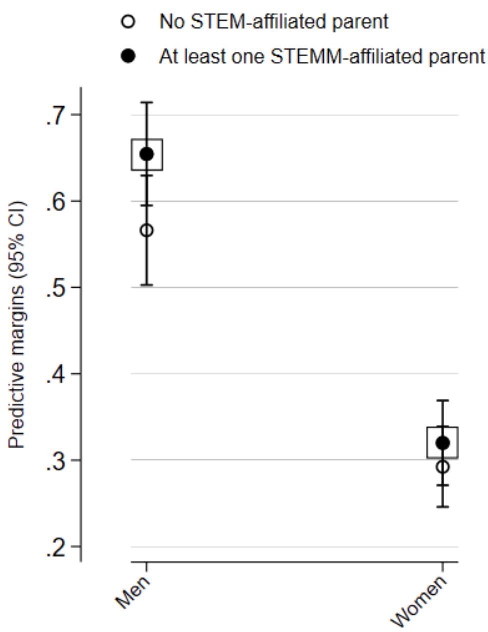

Figure 4. Predicted probability of studying STEMM (vs. non-STEMM) by gender and parental STEMM occupation (Model 4)

Note: NEPS, SC-5, weighted; N=16,988; Results based on 25 multiply imputed datasets. Squares: statistically significant difference by parental occupation for men and women; $p < 0.05$.

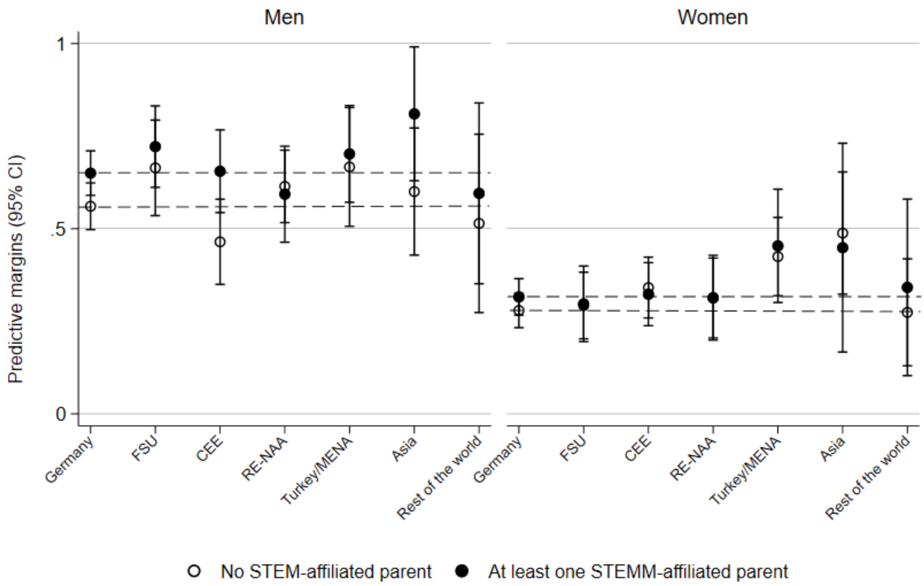

Figure 5. Predicted probability of studying STEMM (vs. non-STEMM) by ethno-national origin, gender, and parental STEMM occupation (Model 5)

Note: NEPS, SC-5, weighted; N=16,988. Results based on 25 multiply imputed datasets. FSU = Former Soviet Union. CEE = Central and Eastern Europe, RE-NAA = rest of Europe, North America, and Australia, MENA=Middle East and North Africa; dashed line = native-born majority values.

Additional analyses

As discussed, STEMM fields vary in their gender composition. Girls are more likely to aspire to life sciences and medicine (LSM), which are more gender-balanced, whereas boys are more likely to aspire to male-dominated core-STEMM fields such as computer science, engineering, and mathematics (CEM) (e.g. Sikora, 2019; Sikora & Pokropek, 2012a; van der Vleuten, 2023). It has also been suggested that the children of immigrants might be less likely to pursue gender-typical careers (e.g. Wicht & Siembab, 2022). To test whether our results differ by STEMM subdiscipline, we estimated a multinomial regression model on the probability of studying either CEM, LSM, or a non-STEMM field including an interaction between gender and ethno-national groups. To this end, we excluded individuals that study both CEM and LSM as majors to be able to clearly separate between students, slightly reducing our sample size to N=16,782 (CEM and LSM minors are included as non-STEMM as in the main analysis).

The predicted probabilities based on this model are presented in Figure 6 (full model in Table A4). Our overall findings seem to be driven by enrolment in CEM fields. Turkish or MENA origin, and Asian origin women are significantly more likely than native-born counterparts to enrol in the more male-dominated CEM fields. FSU-origin men are more likely to enrol in CEM fields than native-born students, and we find a significantly larger gender gap in CEM fields among FSU students compared to German-born counterparts. Regarding enrolment in LSM, no significant ethno-national differences are observed for women. For men, students with a CEE and RE-NAA background are less likely to enrol in LSM. As in our main results, the gender gap is significantly different for CEE-origin as well as RE-NAA students compared to German-origin students, suggesting a slightly larger gap in these groups. In further analyses (not shown), we distinguished between parental CEM and LSM occupations. We found that parental LSM occupations were not significantly associated with studying CEM, and parental CEM occupations were not significantly associated with studying LSM. This supports our theoretical expectation of the field-specific intergenerational transmission of occupational capital. However, due to our small sample sizes in some cross-classified groups – particularly for parental LSM occupations and ethno-national origin – we refrained from re-estimating all our models by subfield.

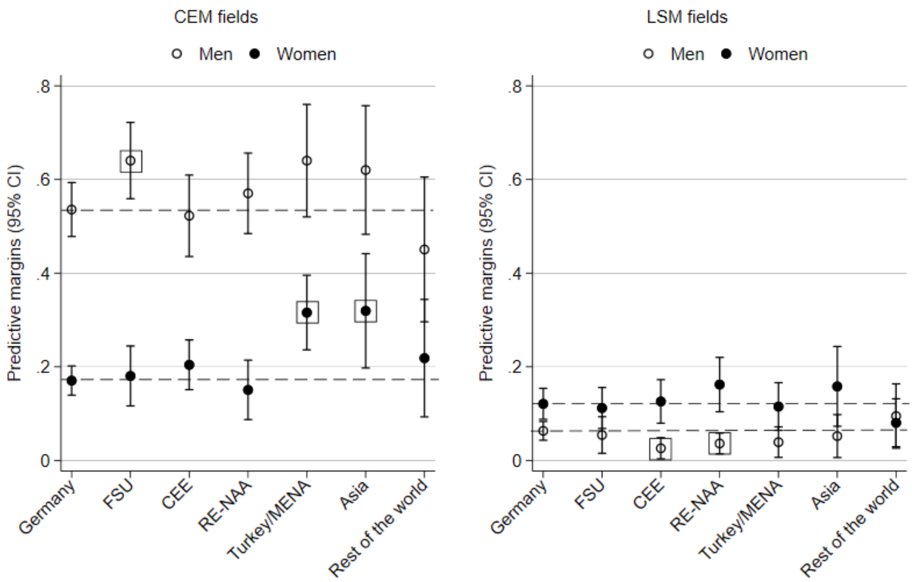

Figure 6. Predicted probability of studying CEM or LSM (vs. non-STEMM) by ethno-national origin and gender

Note: NEPS, SC-5, weighted; N=16,782. Results based on 25 multiply imputed datasets. FSU = Former Soviet Union. CEE = Central and Eastern Europe, RE-NAA = rest of Europe, North America, and Australia, MENA=Middle East and North Africa. Dashed line = native-born majority values; squares: statistically significant difference compared to the German-origin reference group within gender; $p < 0.05$.

Discussion and conclusion

Against the background of the underrepresentation of women and ethnic minorities in many STEMM fields in education and the labour market (Anger et al., 2021) and the increasing demand for highly skilled STEMM workers (CEDEFOP, 2023), this study set out to provide new empirical evidence on gender and ethno-national patterns of STEMM enrolment in higher education in Germany. We further focused on the role of parental STEMM occupation for the likelihood of enrolling in a STEMM field. Given that the share of women in STEMM fields differs by subdiscipline (Cheryan et al., 2017), we also tested differences by STEMM subdiscipline. Our empirical expectations were guided by prior research and relevant theoretical perspectives on the potential value of STEMM among immigrant groups, gender socialisation, and the intergenerational transmission of occupational capital. We used nationally representative data on students who enrolled in German higher education institutions in the 2010/2011 winter term.

In line with prior research (Yazilitas et al., 2013), women are less likely to enrol in STEMM fields, which holds for all ethno-national groups. The gender difference was much larger than ethno-national differences in STEMM enrolment. Overall, only Turkish-origin students showed a significantly higher likelihood of enrolling in STEMM than German-born students. Importantly, some relevant intersectional patterns emerged. Women of Turkish, MENA, or Asian descent were more likely to study STEMM than native-born counterparts, particularly regarding more male-dominated subfields, than German-origin women. These findings lend support to theoretical assumptions underlying the gender equality paradox, which suggests that women from less gender-equal societies may be more likely to study STEMM fields, contributing to narrowing the gender gap in STEMM participation compared to other groups. In line with the literature on immigrant optimism, these findings may possibly be explained due to instrumental values associated with STEMM (Sikora & Pokropek, 2021). However, the gender gap did not significantly vary between these groups and their German-born counterparts.

In contrast to German-origin counterparts, men of FSU origin were more likely to enrol in STEMM fields, particularly in male-dominated subfields, which contributes to a significantly larger gender gap in this group. Among CEE-origin students, the gender gap in the likelihood of studying STEMM compared to German-origin students was smaller, mostly due to a lower likehood of men entering these fields. However, when differentiating by subfield, this pattern mostly applied to female-dominated subfields, resulting in a larger gender gap in these fields compared to German-born students. These findings only partially align with our expectations. While the high enrolment of FSU-origin men may reflect the historically strong emphasis on STEMM in socialist countries, we do not observe corresponding patterns among women from FSU or CEE backgrounds and men from CEE backgrounds, at least regarding female-dominated subfields.

The current results for women of Turkish, MENA and Asian descent tend to correspond with Kogan and Schabinger's (2023) descriptive evidence on the representation of highly skilled female immigrants from these countries in STEMM fields who obtained their qualifications abroad. However, our results regarding CEE-origin men contradict their findings, as they found high shares of STEMM-qualified CEE-origin men at the non-tertiary level. This discrepancy likely reflects a more pronounced pattern of STEMM participation in non-tertiary education among men originating in CEE countries. Moreover, the authors did not differentiate by male and female dominated subfield. Overall, our findings indicate a more complex picture regarding the potential role of structural and cultural factors (e.g., aspirations for upward mobility, value associated with STEMM) for women's STEMM participation in higher education than for men's, at least in male-dominated subfields.

Moreover, in line with prior research (Plasman et al., 2021), we find a positive association between parental STEMM occupation and STEMM enrolment, which was slightly larger for boys than for girls. No variation in this effect was found by ethno-national origin. These results are similar to a previous study that examined intersectional patterns in the role of parental STEMM occupation by gender and ethno-national origin in Germany regarding maths achievement (Gutfleisch & Kogan, 2022). Immigrant parents seem to be equally likely to transmit STEMM-related capital to their children, potentially due to the universal nature of STEMM skills. Therefore, theoretical expectations of variation in the transferability of parental STEMM capital; for example, due to limited knowledge of the German education and labour market or stronger intra-family ties, were not supported by our findings. Ethno-national group differences found in this study might be explained by the selection of STEMM qualifications in the parent generation, as suggested by Kogan and Schabinger's (2023) study, along with cultural differences associated with the country of origin (e.g., value of STEMM for upward mobility). However, direct comparisons with Kogan and Schabinger's (2023) findings are limited due to differences in the study populations: while their study included all immigrants to Germany since the 1980s with vocational or tertiary education, the present study observes (the occupations of) parents residing in Germany whose children have entered tertiary education.

We acknowledge some limitations to our study. First, we focused on individuals who had already entered higher education. Although native-immigrant gaps in higher education entry have narrowed (e.g., Gries et al., 2022), our sample of immigrants is likely more positively selected on educational outcomes than the sample of native-born individuals, and therefore we are limited in generalising our results on STEM enrolment to broader cultural differences between groups. Second, we cannot dismiss the possibility that some of our null findings are due to the small sample sizes in some groups, particularly among Asian origin students, and the results should therefore be interpreted with caution. Third, we compared aggregated ethno-national groups, which may neglect more nuanced differences between countries of origin within that group (e.g., related to religion).

Overall, our study contributes to prior research by providing new evidence on gender-ethnic patterns of STEMM enrolment in higher education in Germany. One possible extension of this study would be to examine the underlying mechanisms behind gender-ethnic patterns in STEMM enrolment by collecting data on the value attributed to STEMM occupations across different ethnic groups (Sikora & Pokropek, 2021). While our study focuses on enrolment patterns as a critical first step in the STEMM pipeline, future research could examine completion rates in STEMM to capture potential barriers to persistence for women and ethno-national groups. Such empirical inquiry will help develop a more comprehensive understanding of gender and ethnic patterns in STEMM participation, and hold potential implications for the increasing demand for a skilled STEMM workforce.

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The replication files will be made available upon publication under this link: https://osf.io/9j576/

Appendix

Table A1. Descriptive statistics of variables

	N	Mean / Share	Sd	Min	Max
STEMM study field (ref.: non-STEMM)	16,988	0.44	0.50	0	1
At least one parent in STEMM (ref.: non-STEMM parents)	16,988	0.42	0.49	0	1
Women (ref.: Men)	16,988	0.60	0.49	0	1
Age	16,988	20.92	2.48	17	35
Completed tertiary degree (ref.: no)	16,988	0.002	0.04	0	1
University of applied sciences (ref.: university)	16,988	0.24	0.43	0	1
West-Germany (ref.: East-Germany)	16,988	0.77	0.42	0	1
At least one tertiary-educated parent (ref: no tertiary-educated parent)	16,988	0.45	0.50	0	1
Ethno-national origin	16,988				
Germany	14,371	84.60			
FSU	522	3.07			
CEE	730	4.30			
Europe, North America, Australia	561	3.30			
Turkey/MENA	506	2.98			
Asia	160	0.94			
Rest of the world	140	0.83			
Aspired degree	16,988				
Bachelor	10,046	59.14			
Teaching degree (BA and state exam)	5,520	32.48			
Other degree	1,422	8.39			
School degree	16,988				
Abitur	14,773	86.95			
Fachabitur	1,682	9.90			
Other degree	535	3.15			
Differences in grades (math vs. German)	16,988				
Better in math	5,122	30.15			
Equally good in both subjects	5,841	34.37			
Better in German	6,025	35.48			

Note: NEPS, SC-5. Proportions and approximate category sizes are based on multiply imputed data (25 imputed data sets). Ns for categorical variables were calculated by multiplying pooled proportions by the total analysis sample.

Table A2. List of study fields categorised as STEMM

STEMM fields	Subdiscipline
Math and natural sciences	
36 Mathematics, natural sciences (general)	CEM
37 Mathematics	CEM
39 Physics, astronomy	CEM
40 Chemistry	LSM
41 Pharmacy	LSM
42 Biology	LSM
43 Earth science (without geography)	CEM
44 Geography	CEM
Computer science	
38 Informatics	CEM
Engineering and construction	
61 Engineering (general)	CEM
62 Mining, metallurgy	CEM
63 Mechanical engineering	CEM
64 Electrical engineering	CEM
65 Traffic engineering, nautical engineering	CEM
66 Architecture	CEM
67 Spatial planning	CEM
68 Civil engineering	CEM
69 Surveying	CEM
70 Industrial engineering	CEM
Medicine	
49 Medicine	LSM
50 Dental medicine	LSM
51 Veterinary medicine	LSM

Note: Destatis classification 2010/2011

Table A3. Full models of logistic regressions predicting the likelihood of studying STEMM

	Model 1	Model 2	Model 3	Model 4	Model 5
Ethno-national origin (ref.: Germany)					
FSU	0.203	0.407*	0.321	0.202	0.564
	(0.123)	(0.179)	(0.185)	(0.124)	(0.297)
CEE	-0.087	-0.293	-0.116	-0.084	-0.449*
	(0.109)	(0.154)	(0.146)	(0.109)	(0.208)
RE-NAA	0.054	0.024	0.223	0.060	0.230
	(0.116)	(0.145)	(0.150)	(0.116)	(0.187)
Turkey/MENA	0.430*	0.225	0.502*	0.427*	0.340
	(0.185)	(0.263)	(0.227)	(0.184)	(0.360)
Asia	0.418	0.265	0.343	0.415	0.068
	(0.216)	(0.291)	(0.265)	(0.214)	(0.338)
Rest of the world	-0.005	-0.136	-0.036	-0.001	-0.003
	(0.255)	(0.349)	(0.327)	(0.256)	(0.489)
Women (ref.: Men)	-1.233***	-1.263***	-1.233***	-1.136***	-1.177***
	(0.108)	(0.110)	(0.108)	(0.112)	(0.117)
At least one parent in STEMM (ref.: no parents in STEMM)	0.280***	0.279***	0.307***	0.386***	0.402***
	(0.043)	(0.043)	(0.049)	(0.063)	(0.071)
Interaction: gender and ethno-national origin					
FSU × Women		-0.384			-0.455
		(0.228)			(0.347)
CEE × Women		0.429**			0.739**
		(0.178)			(0.274)
RE-NAA × Women		0.067			-0.012
		(0.222)			(0.304)
Turkey/MENA × Women		0.384			0.284
		(0.291)			(0.395)
Asia × Women		0.363			0.648
		(0.395)			(0.469)
Rest of the world × Women		0.268			0.080
		(0.404)			(0.581)
Interaction: ethno-national origin and parental STEMM					
FSU × At least one parent in STEMM			-0.245		-0.335
			(0.269)		(0.450)
CEE × At least one parent in STEMM			0.061		0.360
			(0.191)		(0.314)
RE-NAA × At least one parent in STEMM			-0.437**		-0.565
			(0.219)		(0.308)
Turkey/MENA × At least one parent in STEMM			-0.204		-0.293
			(0.313)		(0.467)
Asia × At least one parent in STEMM			0.277		0.743
			(0.466)		(0.676)
Rest of the world × At least one parent in STEMM			-0.105		-0.358
			(0.549)		(0.765)
At least one parent in STEMM × Women				-0.223**	-0.197*
				(0.085)	(0.097)
Three-way interactions					
FSU × At least one parent in STEMM × Women					0.162
					(0.537)

CEE × At least one parent in STEMM × Women					-0.666
					(0.454)
RE-NAA × At least one parent in STEMM × Women					0.260
					(0.499)
Turkey/MENA × At least one parent in STEMM × Women					0.217
					(0.594)
Asia × At least one parent in STEMM × Women					-1.144
					(0.993)
Rest of the world × At least one parent in STEMM × Women					0.464
					(1.052)
At least one parent with tertiary (ref.: no tertiary education)	-0.010	-0.007	-0.008	-0.010	-0.004
	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)
Age	-0.337**	-0.335**	-0.339**	-0.335**	-0.334**
	(0.107)	(0.107)	(0.107)	(0.107)	(0.108)
Age Square	0.006*	0.006*	0.006*	0.006*	0.006*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Aspired degree (ref.: Bachelor)					
Teaching degree (Bachelor and state exam)	0.327	0.327	0.328	0.326	0.328
	(0.193)	(0.193)	(0.193)	(0.193)	(0.193)
Other degree	0.674	0.669	0.676	0.674	0.673
	(0.541)	(0.541)	(0.540)	(0.539)	(0.539)
School degree (ref.: general entry qualification)					
Specialized entry qualification	0.247	0.248	0.248	0.246	0.248
	(0.169)	(0.168)	(0.169)	(0.169)	(0.169)
Other degree	-0.155	-0.160	-0.153	-0.156	-0.156
	(0.188)	(0.188)	(0.187)	(0.189)	(0.189)
Grade difference (ref.: equally good in both)					
Better in math	0.523***	0.521***	0.524***	0.522***	0.521***
	(0.068)	(0.069)	(0.069)	(0.069)	(0.069)
Better in German	-0.536***	-0.540***	-0.537***	-0.536***	-0.542***
	(0.074)	(0.074)	(0.074)	(0.074)	(0.074)
University of applied sciences (ref.: university)	0.142	0.141	0.141	0.142	0.141
	(0.270)	(0.270)	(0.270)	(0.270)	(0.271)
Completed tertiary degree (ref.: no)	0.252	0.241	0.246	0.258	0.242
	(0.512)	(0.508)	(0.508)	(0.508)	(0.501)
Constant	4.274***	4.260***	4.286***	4.209***	4.194***
	(1.260)	(1.266)	(1.261)	(1.261)	(1.273)

Note: NEPS, SC-5, weighted; N=16,988. Results based on 25 multiply imputed datasets. FSU = Former Soviet Union. CEE = Central and Eastern Europe, RE-NAA = rest of Europe, North America, and Australia, MENA=Middle East and North Africa. Regional dummy not shown due to confidentiality issues. Standard errors in parentheses. * p<.05 ** p<.01 *** p<.001.

Table A4. Multinomial regression analysis regarding STEMM subdisciplines

	Model 2	
	CEM (vs. non-STEMM)	**LSM (vs. non-STEMM)**
Ethno-national origin (ref.: Germany)		
FSU	0.366*	0.406
	(0.178)	(0.434)
CEE	-0.250	-1.053**
	(0.157)	(0.403)
RE-NAA	0.068	-0.542
	(0.154)	(0.302)
Turkey/MENA	0.230	-0.176
	(0.279)	(0.496)
Asia	0.227	0.302
	(0.293)	(0.555)
Rest of the world	-0.110	0.028
	(0.334)	(0.650)
Women (ref.: Men)	-1.678***	0.093
	(0.100)	(0.114)
Interaction: gender and ethno-national origin		
FSU × Women	-0.342	-0.218
	(0.254)	(0.446)
CEE × Women	0.483*	0.989**
	(0.214)	(0.383)
RE-NAA × Women	-0.118	0.778*
	(0.282)	(0.310)
Turkey/MENA × Women	0.652*	0.208
	(0.308)	(0.453)
Asia × Women	0.693	-0.203
	(0.400)	(0.638)
Rest of the world × Women	0.487	-0.468
	(0.482)	(0.774)
At least one parent in STEMM (ref.: no parents in STEMM)	0.285***	0.256***
	(0.047)	(0.076)
At least one parent with tertiary (ref.: no tertiary education)	-0.011	-0.046
	(0.058)	(0.100)
Age	-0.383***	-0.151
	(0.112)	(0.162)
Age Square	0.006**	0.003
	(0.002)	(0.003)
Aspired degree (ref.: Bachelor)		
Teaching degree (Bachelor and state exam)	0.341	-0.031
	(0.211)	(0.253)
Other degree	-2.616***	1.984***
	(0.783)	(0.549)
School degree (ref.: general entry qualification)		
Specialized entry qualification	0.239	-0.182
	(0.178)	(0.351)
Other degree	-0.052	-0.761*
	(0.201)	(0.358)

Grade difference (ref.: equally good in both)		
Better in math	0.564***	0.353**
	(0.073)	(0.117)
Better in German	-0.567***	-0.431***
	(0.081)	(0.123)
University of applied sciences (ref.: university)	0.445	-3.185***
	(0.292)	(0.671)
Completed tertiary degree (ref.: no)	-0.125	0.375
	(0.697)	(0.400)
Constant	4.710***	-0.231
	(1.340)	(1.967)

Note: NEPS, SC-5, weighted; N=16,782. Results based on 25 multiply imputed datasets. FSU = Former Soviet Union. CEE = Central and Eastern Europe, RE-NAA = rest of Europe, North America, and Australia, MENA=Middle East and North Africa. Regional dummy not shown due to confidentiality issues. Standard errors in parentheses. * p<.05 ** p<.01 *** p<.001.

Table A5. Assigning the father's country of birth, logistic regressions

	Model 1	Model 2	Model 3	Model 4	Model 5
Ethno-national origin (ref.: Germany)					
FSU	0.199	0.397*	0.303	0.198	0.537
	(0.124)	(0.180)	(0.191)	(0.125)	(0.302)
CEE	-0.062	-0.291	-0.079	-0.059	-0.430*
	(0.112)	(0.158)	(0.153)	(0.112)	(0.211)
RE-NAA	0.035	-0.001	0.180	0.041	0.142
	(0.113)	(0.139)	(0.151)	(0.113)	(0.187)
Turkey/MENA	0.403*	0.214	0.514*	0.400*	0.377
	(0.181)	(0.255)	(0.234)	(0.180)	(0.370)
Asia	0.399	0.279	0.309	0.395	0.073
	(0.220)	(0.293)	(0.265)	(0.218)	(0.336)
Rest of the world	-0.029	-0.073	0.048	-0.036	-0.005
	(0.249)	(0.345)	(0.324)	(0.250)	(0.492)
Women (ref.: Men)	-1.233***	-1.264***	-1.234***	-1.139***	-1.184***
	(0.108)	(0.110)	(0.108)	(0.113)	(0.118)
At least one parent in STEMM (ref.: no parents in STEMM)	0.277***	0.276***	0.306***	0.380***	0.393***
	(0.041)	(0.041)	(0.045)	(0.061)	(0.070)
Interaction: gender and ethno-national origin					
FSU × Women		-0.373			-0.438
		(0.229)			(0.346)
CEE × Women		0.479**			0.791**
		(0.185)			(0.269)
RE-NAA × Women		0.079			0.099
		(0.216)			(0.300)
Turkey/MENA × Women		0.355			0.241
		(0.285)			(0.395)
Asia × Women		0.280			0.545
		(0.410)			(0.478)
Rest of the world × Women		0.202			0.095
		(0.408)			(0.577)

Interaction: ethno-national origin and parental STEMM					
FSU × At least one parent in STEMM			-0.216		-0.298
			(0.279)		(0.454)
CEE × At least one parent in STEMM			0.033		0.320
			(0.208)		(0.316)
RE-NAA × At least one parent in STEMM			-0.378		-0.395
			(0.243)		(0.335)
Turkey/MENA × At least one parent in STEMM			-0.314		-0.421
			(0.339)		(0.482)
Asia × At least one parent in STEMM			0.338		0.792
			(0.477)		(0.712)
Rest of the world × At least one parent in STEMM			-0.058		-0.217
			(0.559)		(0.793)
At least one parent in STEMM × Women				-0.216*	-0.182
				(0.086)	(0.097)
Three-way interactions					
FSU × At least one parent in STEMM × Women					0.142
					(0.527)
CEE × At least one parent in STEMM × Women					-0.648
					(0.439)
RE-NAA × At least one parent in STEMM × Women					0.008
					(0.509)
Turkey/MENA × At least one parent in STEMM × Women					0.251
					(0.565)
Asia × At least one parent in STEMM × Women					-1.102
					(1.029)
Rest of the world × At least one parent in STEMM × Women					0.264
					(1.082)
At least one parent with tertiary (ref.: no tertiary education)	-0.009	-0.006	-0.008	-0.009	-0.004
	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)
Age	-0.334**	-0.332**	-0.336**	-0.332**	-0.331**
	(0.107)	(0.107)	(0.107)	(0.107)	(0.108)
Age Square	0.006*	0.006*	0.006*	0.006*	0.006*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Aspired degree (ref.: Bachelor)					
Teaching degree (Bachelor and state exam)	0.326	0.327	0.327	0.325	0.328
	(0.193)	(0.193)	(0.193)	(0.193)	(0.193)
Other degree	0.673	0.668	0.675	0.672	0.671
	(0.541)	(0.542)	(0.541)	(0.539)	(0.539)
School degree (ref.: general entry qualification)					
Specialized entry qualification	0.251	0.252	0.253	0.250	0.252
	(0.169)	(0.168)	(0.169)	(0.169)	(0.169)
Other degree	-0.136	-0.141	-0.135	-0.136	-0.138
	(0.186)	(0.186)	(0.186)	(0.188)	(0.187)
Grade difference (ref.: equally good in both)					
Better in math	0.518***	0.516***	0.520***	0.517***	0.517***
	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)
Better in German	-0.539***	-0.544***	-0.539***	-0.539***	-0.545***
	(0.074)	(0.074)	(0.074)	(0.074)	(0.074)

University of applied sciences (ref.: university)	0.141	0.141	0.140	0.140	0.141
	(0.270)	(0.270)	(0.270)	(0.270)	(0.271)
Completed tertiary degree (ref.: no)	0.299	0.288	0.299	0.304	0.287
	(0.505)	(0.502)	(0.503)	(0.502)	(0.494)
Constant	4.243***	4.231***	4.251***	4.177***	4.164**
	(1.262)	(1.269)	(1.264)	(1.263)	(1.277)

Note: NEPS, SC-5, weighted; N=16,988. Results based on 25 multiply imputed datasets. FSU = Former Soviet Union. CEE = Central and Eastern Europe, RE-NAA = rest of Europe, North America, and Australia, MENA=Middle East and North Africa. Regional dummy not shown due to confidentiality issues. Standard errors in parentheses. * p<.05 ** p<.01 *** p<.001.

Table A6. Assigning STEMM minor to STEMM fields, logistic regressions

	Model 1	Model 2	Model 3	Model 4	Model 5
Ethno-national origin (ref.: Germany)					
FSU	0.200	0.407*	0.303	0.199	0.544
	(0.124)	(0.181)	(0.190)	(0.124)	(0.304)
CEE	-0.086	-0.305*	-0.114	-0.083	-0.459*
	(0.110)	(0.154)	(0.149)	(0.109)	(0.207)
RE-NAA	0.052	0.017	0.207	0.058	0.190
	(0.115)	(0.144)	(0.152)	(0.115)	(0.190)
Turkey/MENA	0.422*	0.223	0.502*	0.419*	0.350
	(0.183)	(0.262)	(0.234)	(0.182)	(0.372)
Asia	0.424*	0.279	0.341	0.421*	0.073
	(0.216)	(0.293)	(0.264)	(0.214)	(0.337)
Rest of the world	-0.017	-0.145	0.023	-0.013	-0.001
	(0.255)	(0.346)	(0.326)	(0.256)	(0.491)
Women (ref.: Men)	-1.215***	-1.245***	-1.215***	-1.120***	-1.164***
	(0.108)	(0.111)	(0.108)	(0.113)	(0.119)
At least one parent in STEMM (ref.: no parents in STEMM)	0.275***	0.274***	0.301***	0.379***	0.391***
	(0.042)	(0.042)	(0.046)	(0.062)	(0.070)
Interaction: gender and ethno-national origin					
FSU × Women		-0.389			-0.447
		(0.229)			(0.347)
CEE × Women		0.452*			0.761**
		(0.178)			(0.263)
RE-NAA × Women		0.078			0.049
		(0.220)			(0.298)
Turkey/MENA × Women		0.372			0.265
		(0.291)			(0.399)
Asia × Women		0.341			0.627
		(0.296)			(0.463)
Rest of the world × Women		0.262			0.048
		(0.399)			(0.580)
Interaction: ethno-national origin and parental STEMM					
FSU × At least one parent in STEMM			-0.214		-0.289
			(0.277)		(0.453)

CEE × At least one parent in STEMM			0.057		0.355
			(0.202)		(0.312)
RE-NAA × At least one parent in STEMM			-0.402		-0.480
			(0.238)		(0.330)
Turkey/MENA × At least one parent in STEMM			-0.230		-0.331
			(0.342)		(0.499)
Asia × At least one parent in STEMM			0.308		0.793
			(0.478)		(0.714)
Rest of the world × At least one parent in STEMM			-0.111		-0.400
			(0.552)		(0.787)
At least one parent in STEMM × Women				-0.217*	-0.187
				(0.086)	(0.098)
Three-way interactions					
FSU × At least one parent in STEMM × Women					0.126
					(0.525)
CEE × At least one parent in STEMM × Women					-0.663
					(0.429)
RE-NAA × At least one parent in STEMM × Women					0.141
					(0.500)
Turkey/MENA × At least one parent in STEMM × Women					0.237
					(0.590)
Asia × At least one parent in STEMM × Women					-1.171
					(1.016)
Rest of the world × At least one parent in STEMM × Women					0.533
					(1.082)
At least one parent with tertiary (ref.: no tertiary education)	-0.010	-0.007	-0.009	-0.010	-0.004
	(0.053)	(0.053)	(0.052)	(0.053)	(0.053)
Age	-0.325**	-0.323**	-0.326**	-0.323**	-0.320**
	(0.106)	(0.106)	(0.106)	(0.106)	(0.107)
Age Square	0.005*	0.005*	0.005*	0.005*	0.005*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Aspired degree (ref.: Bachelor)					
Teaching degree (Bachelor and state exam)	0.468*	0.469*	0.469*	0.467*	0.470
	(0.198)	(0.197)	(0.198)	(0.197)	(0.197)
Other degree	0.659	0.654	0.660	0.658	0.656
	(0.538)	(0.539)	(0.538)	(0.536)	(0.536)
School degree (ref.: general entry qualification)					
Specialized entry qualification	0.248	0.249	0.249	0.247	0.249
	(0.168)	(0.168)	(0.1688)	(0.168)	(0.168)
Other degree	-0.148	-0.153	-0.147	-0.148	-0.149
	(0.185)	(0.185)	(0.185)	(0.186)	(0.186)
Grade difference (ref.: equally good in both)					
Better in math	0.514***	0.512***	0.515***	0.513***	0.512***
	(0.068)	(0.068)	(0.068)	(0.068)	(0.069)
Better in German	-0.531***	-0.535***	-0.532***	-0.531***	-0.538***
	(0.073)	(0.073)	(0.073)	(0.0743	(0.073)

University of applied sciences (ref.: university)	0.131	0.131	0.130	0.131	0.130
	(0.269)	(0.269)	(0.269)	(0.269)	(0.269)
Completed tertiary degree (ref.: no)	0.265	0.254	0.263	0.270	0.253
	(0.501)	(0.497)	(0.498)	(0.498)	(0.489)
Constant	4.130***	4.115***	4.135***	4.063***	4.038**
	(1.249)	(1.256)	(1.251)	(1.250)	(1.264)

Note: NEPS, SC-5, weighted; N=16,988. Results based on 25 multiply imputed datasets. FSU = Former Soviet Union. CEE = Central and Eastern Europe, RE-NAA = rest of Europe, North America, and Australia, MENA=Middle East and North Africa. Regional dummy not shown due to confidentiality issues. Standard errors in parentheses. * p<.05 ** p<.01 *** p<.001.