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Reinforcing Gendered STEM Aspirations: How the Local Prevalence of STEM

Occupations Shapes Adolescents' Career Goals

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Reinforcing Gendered STEM Aspirations: How the Local Prevalence of STEM

Occupations Shapes Adolescents' Career Goals

Young people's career aspirations are shaped by persistent gender divides, particularly in the fields of science, technology, engineering, and mathematics (STEM), which are in high demand and often associated with prestige and high wages. This study examines how the local prevalence of STEM occupations is associated with adolescents' early aspirations for STEM careers. Drawing on data from the German National Educational Panel Study (NEPS), linked with district-level information on local labor markets (NUTS-3), we apply logistic regression models to explore gendered patterns of STEM aspirations. Findings show that boys are more likely to aspire to STEM careers in local contexts with a high prevalence of STEM occupations, which is mainly due to increased aspirations for non-academic STEM careers. By contrast, girls' career aspirations do not significantly vary with local STEM prevalence, even in local contexts with relatively high shares of women employed in STEM. These results suggest that STEM-intensive local labor markets reinforce gendered patterns of STEM aspirations, especially among adolescents oriented towards non-academic career paths. Efforts to promote gender equity in STEM (e.g., school interventions) would benefit from incorporating strategies that address the segregating impact of local labor market structures.

Keywords: Career aspirations, gender, Germany, local labor markets, occupational structure, STEM

Introduction

Adolescence is a formative phase in the life course in which girls and boys develop ideas about their future careers, framed by personal interests, social contexts, and structural conditions (Dietrich et al., 2012; Gottfredson, 1981). These ideas crystallize into career aspirations, which are defined by the occupations that adolescents aim to achieve (Gottfredson, 1981). Career aspirations play a crucial role for educational and career trajectories later in life (Nießen et al., 2023; Schoon & Polek, 2011; Weeden et al., 2020), and they help adolescents to form an identity and a sense of direction for the future (Dietrich et al., 2012; Skorikov & Vondracek, 2011).

Career aspirations are gendered, and especially in the fields of science, technology, engineering, and mathematics (STEM) these differences have been highly persistent over time

(Thébaud and Charles, 2018). Since STEM occupations are often prestigious, highly paid, and increasingly in demand (Anger et al., 2025; Fayer et al., 2017; Webber, 2014), it is important to understand the gendered mechanisms that influence adolescents' STEM aspirations in order to promote more gender-equitable career orientation among young people.

The structure of the local labor market is a factor that may influence adolescents' career aspirations, but has received limited attention (Flohr et al., 2020). A high prevalence of STEM occupations in the local living environment may shape local cultural work norms, influence the specific occupational information and resources conveyed through social interactions with adults, and affect adolescents' perceived opportunity structures (Friedrichs & Nonnenmacher, 2014; Galster, 2012; Roberts, 1968). Contextual influences arising from the prevalence of STEM occupations can be expected to be gender-specific, as STEM occupations are typically seen as "male" occupations (O'Connor et al., 2018; Thébaud & Charles, 2018), which is also reflected in the gender composition of STEM workers (Anger et al., 2021). Therefore, the present study asks: *Does the prevalence of STEM occupations in the local labor market and its gender composition affect the STEM aspirations of adolescent boys and girls?*

There are two strands of research on which this study can draw: the first examines the causes of gendered aspirations and choices in STEM, while the second explores the impact of local labor-market conditions on adolescents' aspirations. However, these two research strands are mostly unconnected. Previous research on gendered STEM aspirations and choices has highlighted the role of individual attributes, such as attitudes, motivation, interest, and achievement (Mulvey et al., 2023; Ochsenfeld, 2016; Polavieja & Platt, 2014; Wang, 2013), the role of the immediate family (Chesters, 2023; Hardie, 2015), and the role of peer relationships (Beckmann, 2021; Raabe et al., 2019).

Research on how characteristics of local labor markets shape career aspirations and choices (Flohr et al., 2020; Hartung et al., 2022; Kintrea et al., 2015; Malin & Jacob, 2018; McNeal, 2011; Morris, 2025) has shown that differences in perceived local opportunities can have complex and counterintuitive consequences. Adolescents in disadvantaged local contexts do not necessarily have

lower aspirations (Kintrea et al., 2015), as a weak local labor market can be an incentive for adolescents to delay entering the labor market and to develop higher-status aspirations (Hartung et al., 2022), as well as reduce the risk of dropping out of school (McNeal, 2011). Conversely, in local labor markets with high labor demand, the transition into employment is more difficult due to longer job search periods (Morris, 2025). Research has also shown that adolescents consider the opportunities and competition in the local labor market (Malin & Jacob, 2018) and align their aspirations with the locally prevailing occupational structure (Flohr et al., 2020). However, these studies have focused on adolescents who are close to graduating from secondary education and are partly already involved in application processes (Flohr et al., 2020; Hartung et al., 2022; Malin & Jacob, 2018). Here, local labor market structures can be expected to influence aspirations through direct feedback from employers, teachers, or career counselors.

Yet, little is known about whether and how perceived local labor market structures affect adolescents' ideas and perceptions of their dream occupations before they are involved in application processes. Importantly, most previous research has not used gender as an analytical lens, so it is unknown whether the local gendered structure of STEM occupations has an impact on adolescents' STEM aspirations. Overall, these issues are important pieces of the puzzle in understanding the influence of local labor market structures on the persistent gender gap in STEM.

The present study was conducted in the context of Germany, which has several advantages. First, the German education system is characterized by early between-school tracking and pronounced vocational specificity, reflected in a highly developed apprenticeship system, which contributes to the attractiveness of non-academic careers as an alternative to tertiary education (Kleinert & Jacob, 2019; Protsch & Solga, 2016). Using Germany as a case study allows us to focus not only on aspirations for academic STEM careers, but also on those for non-academic STEM careers. Non-academically oriented adolescents are a highly interesting group to study, as they can be expected to be more sensitive to local labor markets than academically oriented young people (Hartung et al., 2022; Morris, 2025).

Second, in Germany, career choices are crucial decisions with lasting consequences, as the job entry is strongly linked to occupational qualifications and occupational mobility is comparatively low (Longhi & Brynin, 2010). This underlines the importance of studying adolescents' career aspirations as a key predictor of career choice.

Third, the German economy is characterized by a large and significant STEM sector, which is particularly evident in the high share of technical and industrial occupations (World Bank, 2023) and includes many non-academic STEM occupations (Anger et al., 2025). German industry is highly dependent on a skilled workforce and experiences a severe shortage of STEM workers (Anger et al., 2021, 2025; Lichtblau et al., 2013).

Fourth, the German economy shows a high regional heterogeneity in economic strength and prevalence of STEM-oriented firms (Anger et al., 2025; Wolf, 2016), while at the same time, the level of occupational gender segregation is relatively high (Bächmann et al., 2024; Leuze & Strauß, 2016).

Overall, the present study makes three contributions. First, by focusing on eighth graders (age 13–14), it examines the relevance of the local occupational structure in explaining adolescents' gendered career aspirations well before they are confronted with actual career decisions, application processes, and transitions. Second, our study opens a new angle in research on STEM aspirations by examining aspirations not only for academic but also for non-academic STEM occupations. Third, and most importantly, our study is one of the first to examine the extent to which the local prevalence of STEM workers has a gendered impact on adolescents' career aspirations. In a broader context, the findings contribute to understanding the reasons for the persistent gender gap in STEM.

Theoretical Background and Hypotheses

The Formation of Gender-Specific Career Aspirations

Sociological theory has emphasized the role of gender as a social structure that both constrains and perpetuates individual choices (Risman, 2004). Gender acts as a primary cultural frame that influences

individual behavior (Ridgeway, 2009; Ridgeway & Correll, 2004), beliefs about competences (Correll, 2001, 2004), and beliefs about affinities and interests (Cech, 2013). A prominent example of the pervasive structuring function of gender is the persistent pattern of occupational gender segregation (Bächmann et al., 2024; Charles & Grusky, 2005), which is particularly visible in STEM occupations (Thébaud & Charles, 2018). Empirical evidence consistently indicates that these cultural beliefs about gender are reflected early on in adolescents' career goals and aspirations (Busch-Heizmann, 2015; Chesters, 2023; Clemson, 1981; Schoon & Polek, 2011).

According to Gottfredson (1981), adolescents base their career aspirations on gendered occupational images and self-concepts. From an early age, children learn about gender roles and begin to differentiate between "male" and "female" occupations. Consequently, children evaluate their options in terms of whether they are perceived as suitable for their own gender. This process does not require the endorsement of traditional gender norms, but relies mainly on unconscious gendered self-presentation (Cech, 2013). STEM occupations represent "typically male" fields of work (O'Connor et al., 2018; Thébaud & Charles, 2018). Therefore, while boys learn that STEM occupations are compatible with their gender and later find that these occupations align with their perceived interests and personalities, girls rather learn that these occupations fit less into their set of acceptable occupations (Gottfredson, 1981) and often find these occupations to be incompatible with their self-conceptions (Cech, 2013).

STEM Aspirations and the Local Labor Market

The idea that the structure of the local labor market shapes the behavior and preferences of individuals goes back (at least) to the Chicago School of Sociology (Abbott, 1997). Blau (1960) and Coleman (1986) also refer to the *contextuality of social structure* and its effects on individuals. These ideas have been advanced and most frequently applied empirically by sociological studies on regional and neighborhood effects. This strand of research has highlighted several transmission channels, three of which are particularly useful for explaining how local labor market structures can influence

adolescents' career aspirations at an early age (Bell et al., 2019; Flohr et al., 2020; Galster, 2012; Osikominu et al., 2020; Roberts, 1968).

First, local labor markets may influence adolescents' aspirations through *role model effects*. In STEM-intensive labor markets, adult role models are more likely to work in STEM fields and may convey specific occupational information and resources that increase adolescents' interest in STEM careers (Bell et al., 2019; Friedrichs & Nonnenmacher, 2014; Galster, 2012).

Second, *contagion effects* describe the idea that prevailing cultural norms in a particular local context are contagious (Galster, 2012). Through socialization processes, local cultural norms regarding the pursuit of STEM careers may influence the range of occupations that appear interesting to adolescents (Osikominu et al., 2020).

Third, *opportunity structure effects* (sometimes described as institutional resources in the literature) refer to the extent to which opportunity structures in the local labor market, such as access to particular vocational schools and types of firms, influence adolescents' access opportunities to particular occupations (Galster, 2012; Roberts, 1968). Adolescents may base their career aspirations on these perceived access opportunities, which vary depending on the prevalence of STEM occupations (Flohr et al., 2020; Malin & Jacob, 2018).

While it can be difficult to identify these channels empirically, they help to build a theoretical understanding. They imply that a higher STEM prevalence in the local labor market is positively associated with the likelihood that adolescents aspire to STEM careers. However, considering how salient cultural beliefs about gender are in society and how they shape adolescents' behaviors, competence beliefs, self-perceptions, and interests (Correll, 2001; Ridgeway & Correll, 2004), it is reasonable to argue that the local STEM prevalence is not equally relevant to girls and boys.

Boys can be expected to be more receptive to STEM-oriented cultural norms and to reflect access opportunities to STEM, whereas girls, who perceive STEM occupations to be incongruent with their gendered self-conceptions (Cech, 2013), may be indifferent to the local prevalence of STEM. Similarly, it can be expected that the contact with adult role models in the local context who work in

STEM occupations mainly reinforces boys' positive images of STEM and STEM aspirations. Moreover, the literature suggests that boys are generally more responsive to local labor markets and structural contexts than girls, implying that boys give more weight to perceptions of the local labor market (Furlong et al., 1996; Hägglund & Leuze, 2021; Palffy et al., 2023). Altogether, we assume that the prevalence of STEM occupations in the local labor market is more strongly associated with boys' STEM aspirations than with girls' STEM aspirations (*Hypothesis 1*).

Hägglund and Leuze (2021) argue that despite the traditional view of STEM occupations as masculine, growing up in contexts where more women are visible in STEM occupations may contribute to STEM occupations being culturally perceived as less gender-incongruent and this may be consequential particularly for girls' career aspirations. Thus, apart from the general prevalence of STEM, the gender composition of STEM workers in the local labor market may affect adolescents' cultural beliefs about STEM work and its gender appropriateness (Ridgeway & Correll, 2004). Additionally, women working in STEM can act as role models for girls, strengthening their competence beliefs (Correll, 2001) as well as their affinities (Cech, 2013) in STEM, and reducing perceived risks of discrimination (Ridgeway & Correll, 2004). These assumptions are supported by the findings of Bell et al. (2019), who show that girls are more likely to become inventors when the share of female inventors in their home region is high. In addition, González-Pérez et al. (2020) show in an experimental setting that counter-stereotypical role models can encourage girls to have STEM aspirations.

Conversely, boys' STEM aspirations may be reinforced when the local share of female STEM workers is low, as this reduces the visibility of women in STEM occupations and underlines the masculine image of STEM occupations (Hägglund & Leuze, 2021). Therefore, we expect the gender composition of the STEM workforce to have a gender-differential impact. Specifically, we assume that a higher share of female workers in the local STEM labor market increases girls' likelihood for having STEM aspirations and decreases boys' likelihood for having STEM aspirations (*Hypothesis 2*).

Due to Germany's highly stratified education system and the popularity of non-academic vocational training (Kleinert & Jacob, 2019; Protsch & Solga, 2016), it is reasonable to expect that

career aspirations differ based on adolescents' academic orientation. This can also be accompanied by varying degrees of dependence on the local labor market. Previous research has suggested that adolescents with non-academic occupational prospects and corresponding career aspirations are more sensitive to structural conditions than their academically oriented peers, as they are more likely to seek and find training and employment opportunities within their local context (Hartung et al., 2022; Morris, 2025). This is because training positions are typically more available across local contexts (BIBB, 2022). In contrast, students with academic aspirations plan to enroll in tertiary education, and studying often requires leaving the local context (Krabel & Flöther, 2014; Mulder & Clark, 2002), especially since opportunities for tertiary education are often limited locally (Weßling & Bechler, 2019). High-tech and knowledge-intensive occupations, such as academic STEM occupations, are also more spatially concentrated and depend less on industrial structures (Barbour & Markusen, 2007), suggesting that adolescents aspiring to these occupations may expect to become mobile.

In addition, adolescents often embark on non-academic occupations before they reach adulthood, making it harder to imagine careers outside the local context (BIBB, 2022). By contrast, tertiary education typically begins in adulthood and comes with greater freedom to move spatially and live independently (Weßling & Bechler, 2019). Taken together, we assume that boys' and girls' aspirations for non-academic STEM careers are more strongly affected by the prevalence of STEM in the local labor market and its gender composition than their aspirations for academic STEM careers (*Hypothesis 3*).

Data and Methods

Data

The study used data from Starting Cohort 3 of the German National Educational Panel Study (NEPS-SC3) (Blossfeld & Roßbach, 2019; NEPS Network, 2024). Based on a representative sample of grade 5-students in schools in Germany, data collection started in 2010 and was repeated at least annually

until 2022. Our target group were students in grade 8 (aged 13–14) from the fourth survey wave, which took place between fall 2013 and spring 2014. Of the original 6,718 students, we excluded students from special-needs schools (390 cases) and students without valid information on the district (617 cases) or on career aspirations (559 cases) (see Supplemental Material, Table A1). To avoid further sample restrictions due to missing data in the control variables, we applied multivariate imputation by chained equations (van Buuren & Groothuis-Oudshoorn, 2000). The final analysis sample comprised 5,152 students (2,543 boys, 2,609 girls).

NEPS-SC3 data were linked with administrative district-level data (NUTS-3)ⁱ from the Federal Employment Agency (BA) and the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR). The NEPS sampling strategy, which represents students in secondary schools throughout Germany (Steinhauer et al., 2015), ensured broad coverage of 298 out of 402 German districts.

Variables

To measure early *STEM aspirations*, we focused on idealistic aspirations, as these accurately reflect adolescents' desired career goals. Adolescents were asked: "Imagine you had all the opportunities to become what you want to be. What would be your ideal occupation?" The open-text responses were coded according to the German Classification of Occupationsⁱⁱ (KldB 2010, Paulus & Matthes, 2013). Based on the KldB STEM classificationⁱⁱⁱ, we created a dichotomous variable indicating whether career aspirations were within the field of STEM (=1) or not (=0). Because idealistic and realistic, more expectation-based STEM aspirations were highly correlated ($r = .71$), missing idealistic aspirations were supplemented by realistic ones for approximately 4% of the sample, when available. Additionally, available information on aspirations from fall/winter 2014 was used for approximately 10% of the sample. Overall, boys (36%) were more likely to aspire to STEM careers than girls (12%) (see Supplemental Material, Table A2).

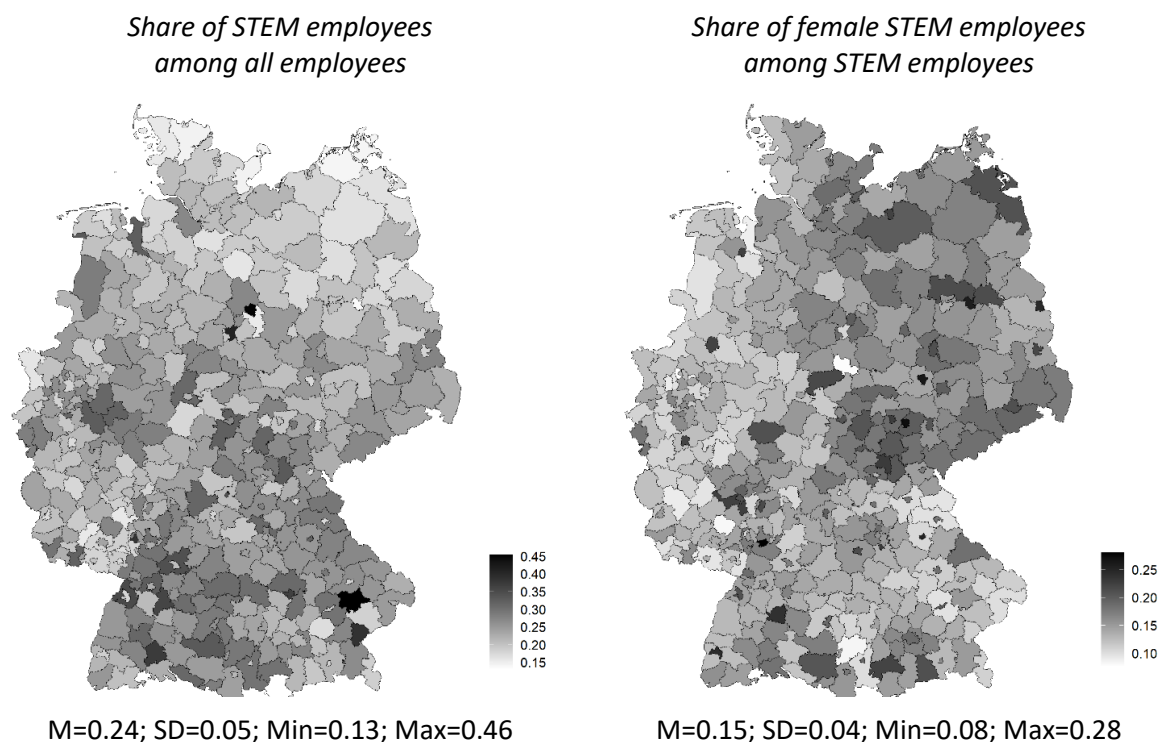
To distinguish non-academic from academic STEM aspirations, we contrasted STEM occupations for which vocational training was sufficient with STEM occupations that required tertiary education (Paulus & Matthes, 2013). As shown in Table A2 (Supplemental Material), most boys (78%) and girls (92%) aspiring to STEM careers were either academically or non-academically oriented. The remaining STEM occupations required a master craftsman, technician, technical college, or bachelor's degree. Because it was not possible to assess whether adolescents perceived these occupations as academic or non-academic, an intermediate category was used ("highly qualified non-academic STEM occupations"). To test Hypothesis 3, we contrasted clearly identifiable academic and non-academic STEM aspirations (see Supplemental Material, Tables A3 and A4 for detailed results on all three categories).

The *STEM prevalence in the local labor market* was measured by the share of employees in STEM occupations among all employees at the administrative district level (NUTS-3). We used the same STEM classification as for the dependent variable. For the *gender composition of STEM prevalence in the local labor market*, we used the share of female STEM employees among all STEM employees in the district. The data for both variables were from June 2013 and stemmed from employers' mandatory notifications to social security contributions.

On average, 24% of employees in the German local labor markets worked in STEM fields, 15% of whom were women (see Figure 1). STEM-intensive regions were more prevalent in southern Germany, reflecting a higher concentration of industries and better economic conditions (Wolf, 2016). In contrast, eastern and urban regions had higher shares of female STEM employees, which is consistent with other studies (Anger et al., 2021). The share of women working in STEM varied considerably between 8 and 28%, remaining a minority in all German regions. Furthermore, it was negatively associated with the overall share of STEM employees ($r = -.20$), indicating that STEM occupations were, on average, male-dominated in STEM-intense regions.

Figure 1

Spatial Distribution of the Prevalence of STEM Occupation and Its Gender Composition



Note: The share of STEM employees relates proportionately to the total number of employees in a district, and the share of female STEM employees relates proportionately to the total number of STEM employees in a district. Both indicators can potentially vary from 0 to 1.

We considered potential regional confounders that could affect both adolescents' aspirations and the share of (female) STEM employees. An east-west indicator was used to account for the still existing differences in occupational structures between the formerly separated parts of Germany. Local unemployment rates served as a proxy for labor market conditions, population density as a measure of local urbanity, and vote share for the conservative party (Christian Democratic Union, CDU) as a proxy for local conservativeness.

In addition, we used individual controls to account for relevant regional differences in students' composition. This included math grades coded from 6 (very good) to 1 (insufficient), migration background up to the third generation, and personality based on the Big Five inventory, using scores for extraversion, agreeableness, conscientiousness, neuroticism, and openness. Furthermore, the type of secondary school track (low, intermediate, or high) was taken into account,

as this determines eligibility for the subsequent educational pathway. To capture differences in socio-economic and STEM family backgrounds, the highest socio-economic status of parents' last reported occupation (Highest International Socio-Economic Index of Occupational Status, HISEI) was included, as well as whether at least one parent worked in STEM.

Analytical Strategy

We calculated logistic regression models to estimate the effects of the local prevalence of STEM and its gender composition on adolescents' STEM aspirations. The use of multi-level models that account for the hierarchical data structure was tested; however, the intra-class coefficient was close to zero, indicating that a parsimonious model without level-2 variance component at the district level was sufficient (Snijders & Bosker, 2011). Instead, cluster-robust standard errors at the district level were included in all analyses to account for potential similarities between adolescents within districts. We reported average marginal effects (AMEs) to simplify the interpretation of effect sizes and to ensure robustness to unrelated unobserved heterogeneity (Mood, 2010). All metric variables were standardized (mean = 0, standard deviation = 1).

The main models followed a three-step approach: (1) bivariate associations; (2) inclusion of regional controls; (3) inclusion of individual controls. This structure allowed us to assess the stability of associations between the (female) share of STEM employees and STEM aspirations across different model specifications. Separate models were estimated for the share of STEM employees and its gender composition to avoid problems of intercorrelation. We also estimated separate models for boys and girls, based on self-reported gender, to test our gender-specific hypotheses. Finally, we estimated separate models for non-academic and academic STEM aspirations to test Hypothesis 3.

Results

The Local Share of STEM Employees and Associations with STEM Aspirations

Table 1 shows the predicted average marginal effects of STEM employees in the local labor market on eighth graders' aspirations for STEM careers (see Supplemental Material, Table A5 for full models). The share of STEM employees was positively associated with boys' STEM aspirations. This association remained robust after controlling for potential regional and individual confounders (model 1–3, $AME = .02, p < .05$).

Table 1

Average Marginal Effects (AMEs) of the Share of STEM Employees Predicting Idealistic STEM Aspirations for Boys and Girls

Effect	Boys						Girls					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
<i>Share of STEM employees</i>	.02*	.01	.02*	.01	.02*	.01	.00	.01	-.00	.01	-.00	.01
<i>Regional controls</i>			✓		✓				✓		✓	
<i>Individual controls</i>					✓							✓
<i>N</i>	2,543		2,543		2,543		2,609		2,609		2,609	

Note: 20 Imputations. Regional controls: East Germany, population density, unemployment, conservativeness. Individual controls: math grades, intermediate school track (ref. low), high school track (ref. low), extraversion, agreeableness, conscientiousness, neuroticism, openness to experience, migration background, parent working in STEM, parents' SES. + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

The magnitude of the association was not negligible: The likelihood of boys having STEM aspirations increased by two percentage points with a one standard deviation increase of the share of STEM employees in the local labor market. In local labor markets with the highest STEM prevalence, boys were 13 percentage points more likely to have STEM aspirations than in local labor markets with the lowest STEM prevalence. In contrast, girls' STEM aspirations were not associated with the local share of STEM employees. Hence, the results supported Hypothesis 1.

The Local Share of Female STEM Employees and Associations with STEM Aspirations

Table 2 shows the predicted average marginal effects of the share of female STEM employees in the local labor market on STEM aspirations (see Supplemental Material, Table A6 for the full models). For boys, a negative association was found, indicating that boys were less likely to have STEM aspirations in local labor markets with a higher share of women working in STEM. When controls were included, this association was significant only at the 10%-level, but its magnitude remained substantial (model 2–3; $AME = -.02$; $p < .10$). For girls, the association did not reach significance in models 1 and 2, but was found to be marginally negative in model 3, after adding individual controls ($AME = -.01$; $p < .10$).

Based on our results, we could reject Hypothesis 2 for girls: Contrary to the expectations, a higher share of women in STEM occupations was not associated with girls' STEM aspirations. However, in line with our expectations, a higher share of women in STEM occupations tended to be negatively associated with boys' STEM aspirations, but this association was only marginally significant.

Table 2

Average Marginal Effects (AMEs) of the Share of Female STEM Employees Predicting Idealistic STEM Aspirations for Boys and Girls

Effect	Boys						Girls					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
<i>Share of female STEM employees</i>	-.02*	.01	-.02 ⁺	.01	-.02 ⁺	.01	-.00	.01	-.01	.01	-.01 ⁺	.01
<i>Regional controls</i>			✓		✓				✓		✓	
<i>Individual controls</i>					✓						✓	
<i>N</i>	2,543		2,543		2,543		2,609		2,609		2,609	

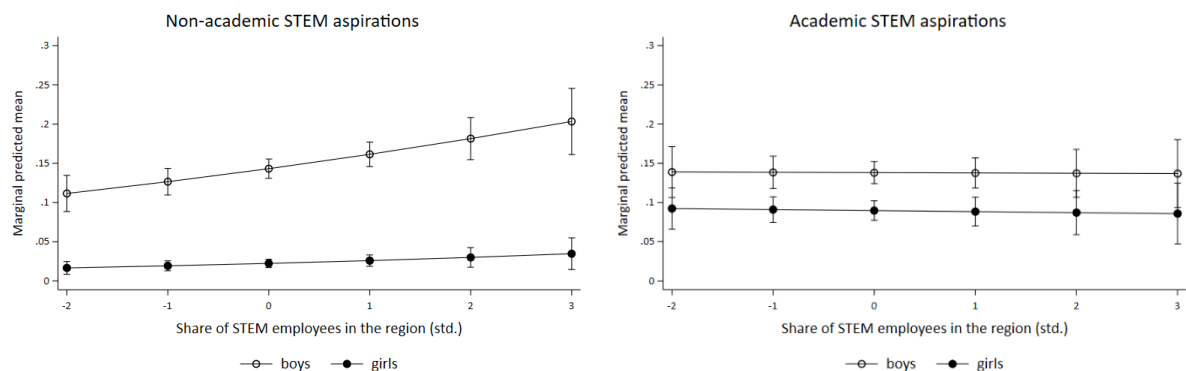
Note: 20 Imputations. Regional controls: East Germany, population density, unemployment, conservativeness. Individual controls: math grades, intermediate school track (ref. low), high school track (ref. low), extraversion, agreeableness, conscientiousness, neuroticism, openness to experience, migration background, parent working in STEM, parents' SES. ⁺ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Contrasting Academic with Non-Academic STEM Aspirations

Figure 2 shows the predicted means of boys' and girls' non-academic (left) and academic (right) STEM aspirations by the share of STEM employees in the local labor market. The figure was based on the full model including all regional and individual controls (see Supplemental Material, Table A5 for detailed results). The positive association with STEM employees in the local labor market was only evident for boys with non-academic STEM aspirations. In local labor markets with the highest share of STEM employees, boys were 11 percentage points more likely to aspire to non-academic STEM careers than in local labor markets with the lowest share of STEM employees. This shows that the majority of the overall increase in the likelihood of boys having STEM aspirations is due to non-academic STEM aspirations.

Figure 2

Comparison of Non-Academic and Academic STEM Aspirations and Their Association With the Share of STEM Employees for Boys and Girls



Note: 20 Imputations. Regional and individual controls included.

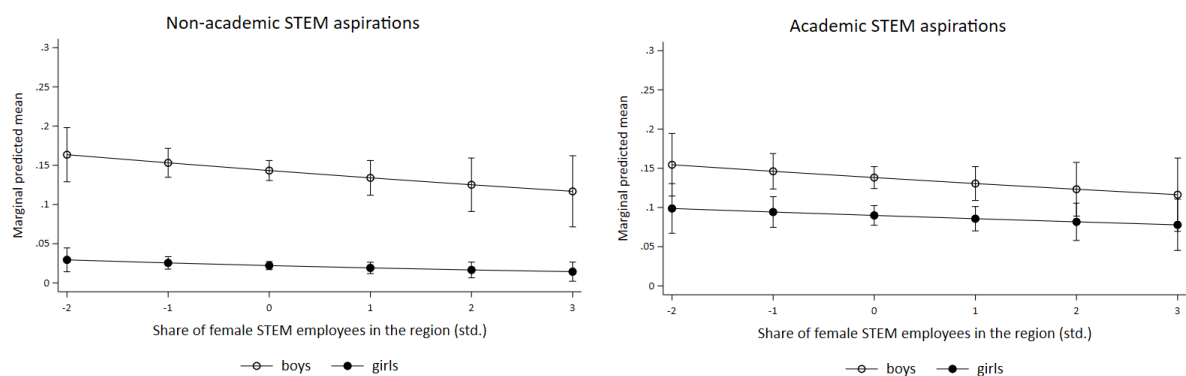
Girls were much less likely than boys to aspire to non-academic STEM careers (see Figure 2). The association with the STEM prevalence in the local labor market was positive for girls as well, yet small and insignificant. Compared to non-academic STEM aspirations, girls were more likely to have

academic STEM aspirations, although their likelihood remained at a lower level than for boys. Both boys and girls with academic aspirations were not significantly affected by the local STEM prevalence.

Figure 3 shows the associations with the share of female STEM employees in the local labor market, conditioning on regional and individual controls (see Supplemental Material, Table A6 for detailed results). Both boys' and girls' non-academic and academic STEM aspirations were largely unaffected by the share of female STEM employees. While the associations tended to be negative, they were not statistically significant.

Figure 3

Comparison of Non-Academic and Academic STEM Aspirations and Their Association With the Share of Female STEM Employees for Boys and Girls



Note: 20 Imputations. Regional and individual controls included.

Thus, we found that boys with non-academic aspirations were affected by the share of STEM employees in the local labor market, while girls and boys with academic STEM aspirations were largely unaffected. These findings supported Hypothesis 3. In contrast, the share of female STEM employees did not significantly change either the non-academic or academic STEM aspirations of boys and girls.

Robustness Checks

A series of robustness checks was conducted to test the generalizability of our results. To examine differences between adolescents' idealistic and realistic aspirations, the main analyses were repeated

for realistic STEM aspirations (see Supplemental Material, Tables A7 and A8). Furthermore, we included both independent variables—the share of STEM employees and the share of female STEM employees—in a joint model predicting boys’ non-academic STEM aspirations (see Supplemental Material, Table A9). This model was also run with additional controls for the following characteristics of local labor markets: the share of large firms, the share of filled apprenticeship positions, total gross value added, secondary sector gross value added, and the share of unskilled workers (see Supplemental Material, Table A9). Overall, the robustness checks produced similar results to the ones presented above.

We conducted additional heterogeneity analyses along three structural dimensions: East and West Germany, urban and rural contexts, and the unemployment in the local labor market. The results suggested that the local STEM prevalence was more relevant to boys’ non-academic STEM aspirations in East German labor markets and in local labor markets with high unemployment, whereas urbanity played a less decisive role (see Supplemental Material, Figure A1).

Discussion

Contributing to the literature on the gender gap in STEM aspirations, this study examined whether the prevalence and gender composition of STEM occupations in the local labor market affect adolescents’ STEM aspirations. Based on German panel data, we found that the local STEM prevalence affects boys’—but not girls’—STEM aspirations, particularly for non-academic careers. The local gender composition of STEM workers, however, showed no clear associations with STEM aspirations of either boys or girls.

Local labor markets were not expected to outweigh other established influencing factors, such as familial socialization (Chesters, 2023; Hardie, 2015) or internalized personal interests (Ochsenfeld, 2016). Yet, our findings show that the local STEM prevalence exerts non-negligible influences on boys. Our results also indicate that such contextual influences are observable already in grade eight (age 13-

14), earlier in the educational trajectory than previously documented (Flohr et al., 2020; Hartung et al., 2022; Malin & Jacob, 2018).

That the local STEM prevalence matters only for boys' STEM aspirations, highlights the role of stereotypical male occupational images of STEM that make boys much more likely than girls to consider STEM occupations as an acceptable career option (Thébaud & Charles, 2018). It is also consistent with prior research showing that boys align their aspirations more explicitly with contextual structures than girls (Hägglund & Leuze, 2021; Malin & Jacob, 2018; Palffy et al., 2023). Two different mechanisms may explain this: First, boys and girls may anticipate traditional work and family roles (Bass, 2015; Combet, 2024), although other studies suggested that work norms or family plans do not play a role in young people's study choices (Cech, 2016; Ochsenfeld, 2016). Second, male-dominated (STEM) occupations may be more location-dependent and less evenly distributed across local contexts than female-dominated occupations, such as care, clerical and trade occupations that are needed everywhere (Hausmann & Kleinert, 2014). This may increase the relevance of local labor market structures for boys.

By addressing Germany's stratified education system (Protsch & Solga, 2016), our results suggest that boys with non-academic STEM aspirations are most likely to be influenced by the local STEM prevalence. This supports previous research highlighting that non-academically oriented adolescents are more susceptible to local labor market conditions due to their limited mobility (Hartung et al., 2022; Morris, 2025). It is also consistent with the argument, recently refreshed by Chesters (2023), that boys from lower educational backgrounds have a more pronounced desire to pursue their careers in typically male occupations. Moreover, further analyses showed that non-academically oriented boys living in East Germany and in high-unemployment areas were most influenced by the local STEM prevalence. In line with previous research (Hartung et al., 2022), this suggests that adolescents in disadvantaged regions are more strongly oriented toward labor market conditions. While STEM occupations generally offer good career prospects and good pay (Anger et al.,

2025; Fayer et al., 2017; Webber, 2014), such an orientation also carries the risk of reinforcing local dependencies on the labor market.

Contributing to the public debate on how to encourage girls to consider STEM careers as a viable option (European Commission, 2023), our study cannot provide support to the assumption that same-gender role models in the local labor market help to steer girls towards STEM. This is consistent with country-level research, where no effect of gender composition in STEM was found for girls either (Hägglund & Leuze, 2021). The low visibility of women in STEM occupations, who represent a minority of less than 30% compared to men across local contexts in Germany (Anger et al., 2021), may explain the absence of these effects.

Despite offering novel insights, our study is not without limitations. Spillover effects from neighboring regions were not testable, as not all German districts were represented in the NEPS survey data. Moreover, it was not possible to empirically identify the exact transmission channels with the available data. Future research could test different context sizes of regions to get a better idea of whether smaller local units, such as neighborhoods, or larger regional settings are more important in shaping adolescents' career aspirations. Investigating the prevalence of female-dominated occupations and their gendered impact on adolescents' career aspirations would be also informative to gain deeper insights into girls' orientation to local labor market structures.

Conclusions

It is widely known that boys' and girls' career aspirations reflect global cultural beliefs about gender and thus correspond to patterns of occupational gender segregation (Charles, 2017; Chesters, 2023). Our study has demonstrated that these beliefs are flavored by local contexts and their occupational structures. Local labor markets with a strong presence of STEM workers particularly influence the group of non-academically oriented boys by increasing their aspirations to pursue a career in STEM at an early age. This suggests that local labor market structures not only manifestly influence adolescents

through the supply and demand for training places and jobs, but also reflect local occupational cultures and beliefs about career options. Given the relevance of career aspirations for career choices (Nießen et al., 2023; Schels et al., 2022; Weeden et al., 2020), these findings have practical implications for vocational schools and training firms, which recruit apprentices predominantly from the local area (BIBB, 2022).

Local labor market structures appear to be particularly influential when the occupations that predominate are perceived as compatible with adolescents' gender. This mechanism may contribute to explain the persistence of occupational gender segregation in local labor markets with a high prevalence of STEM occupations. To counteract the segregating dynamics in these labor markets, it is important that measures—such as gender-sensitive career counseling, STEM engagement programs for girls, or a more female-focused advertising by employers—reflect the local labor market, are gender-specific, focus on non-academic adolescents, and take place early in the educational career. In this way, such policies can serve as a relevant instrument to address work-related gender inequalities and growing labor shortages. Based on the slightly increasing share of women in STEM in recent years (Anger et al., 2021; NCSES, 2023), it will be valuable to explore with newer data whether women in STEM may serve as a possible compensatory resource for reducing gender gaps in adolescents' STEM aspirations in the future.

Disclosure Statement

The authors report there are no competing interests to declare.

Data Availability Statement

The individual-level data used for the research described in this article are available to the scientific community on request from the NEPS Research Data Center at the Leibniz Institute for Educational

Trajectories (RDC-LIfBi; <https://doi.org/10.5157/NEPS:SC3:13.0.0>). The regional data on the share of STEM employees and its gender composition are available upon request from the Federal Employment Agency (<https://statistik.arbeitsagentur.de/>). Further regional data are available in the “INKAR” database of the Federal Institute for Research on Building, Urban Affairs and Spatial Development (<https://www.inkar.de/>).

References

- Abbott, A. (1997). Of Time and Space: The Contemporary Relevance of the Chicago School. *Social Forces*, 75(4), 1149–1182. <https://doi.org/10.1093/sf/75.4.1149>
- Anger, C., Betz, J., & Plünnecke, A. (2025). *MINT-Frühjahrsreport 2025. Arbeitsmarktbericht. Gute Gründe für MINT.* German Economic Institute. https://www.iwkoeln.de/fileadmin/user_upload/Studien/Gutachten/PDF/2025/MINT-Frühjahrsreport-2025-Arbeitsmarktbericht.pdf
- Anger, C., Kohlisch, E., & Plünnecke, A. (2021). *MINT-Herbstreport 2021. Mehr Frauen für MINT gewinnen – Herausforderungen von Dekarbonisierung, Digitalisierung und Demografie meistern.* German Economic Institute. https://www.iwkoeln.de/fileadmin/user_upload/Studien/Gutachten/PDF/2021/MINT-Herbstreport_2021.pdf
- Bächmann, A.-C., Kleinert, C., & Schels, B. (2024). *In Ost wie West arbeiten Frauen und Männer häufig in unterschiedlichen Berufen* (3; IAB-Kurzbericht). <https://doku.iab.de/kurzber/2024/kb2024-03.pdf>
- Barbour, E., & Markusen, A. (2007). Regional occupational and industrial structure: Does one imply the other? *International Regional Science Review*, 30(1), 72–90. <https://doi.org/10.1177/0160017606296727>
- Bass, B. C. (2015). *Preparing for parenthood? Gender, Aspirations, and the Reproduction of Labor*

- Market Inequality*. 29(3), 362–385. <https://doi.org/10.1177/0891243214546936>
- Beckmann, J. (2021). Gendered career expectations in context: The relevance of normative and comparative reference groups. *British Journal of Sociology of Education*, 42(7), 968–988. <https://doi.org/10.1080/01425692.2021.1914547>
- Bell, A., Chetty, R., Jaravel, X., Petkova, N., & Van Reenen, J. (2019). Who becomes an inventor in America? The importance of exposure to innovation. *The Quarterly Journal of Economics*, 134(2), 647–713. <https://doi.org/10.1093/qje/qjy028>
- BIBB. (2022). *Datenreport zum Berufsbildungsbericht 2022. Informationen und Analysen zur Entwicklung der beruflichen Bildung*. Federal Institute for Vocational Education and Training (BIBB). http://datenreport.bibb.de/media2012/BIBB_Datenreport_2012.pdf
- Blau, P. M. (1960). Structural Effects. *American Sociological Review*, 25(2), 178–193. <https://doi.org/https://www.jstor.org/stable/2092624>
- Blossfeld, H.-P., & Roßbach, H.-G. (2019). *Education as a lifelong process: The German National Educational Panel Study (NEPS). Edition ZfE* (2nd ed.). Springer VS.
- Busch-Heizmann, A. (2015). Supply-side explanations for occupational gender segregation: adolescents' work values and gender-(a)typical occupational aspirations. *European Sociological Review*, 31(1), 48–64. <https://doi.org/10.1093/esr/jcu081>
- Cech, E. A. (2013). The Self-Expressive Edge of Occupational Sex Segregation. *American Journal of Sociology*, 119(3), 747–789. <https://doi.org/10.1086/673969>
- Cech, E. A. (2016). Mechanism or Myth? Family Plans and the reproduction of occupational Gender segregation. *Gender & Society*, 30(2), 265–288. <https://doi.org/10.1177/0891243215608798>
- Charles, M. (2017). Venus, mars, and math: Gender, societal affluence, and eighth graders' aspirations for STEM. *Socius: Sociological Research for a Dynamic World*, 3, 1–16. <https://doi.org/10.1177/2378023117697179>
- Charles, M., & Grusky, D. B. (2005). *Occupational ghettos: The worldwide segregation of women and men* (Vol. 200). Stanford University Press.

- Chesters, J. (2023). Gender attitudes and occupational aspirations in Germany: Are young men prepared for the jobs of the future? *Work, Employment and Society*, 37(3), 571–587. <https://doi.org/10.1177/09500170211017046>
- Clemson, E. (1981). Disadvantaged youth: A Study of Sex Differences in Occupational Stereotypes and Vocational Aspirations. *Youth & Society*, 13(1), 39–56. <https://doi.org/10.1177/0044118X8101300103>
- Coleman, J. S. (1986). *Social Theory, Social Research, and a Theory of Action*. 91(6), 1309–1335. <https://doi.org/https://www.jstor.org/stable/2779798>
- Combet, B. (2024). Women’s aversion to majors that (seemingly) require systemizing skills causes gendered field of study choice. *European Sociological Review*, 40(2), 242–257. <https://doi.org/10.1093/esr/jcad021>
- Correll, S. J. (2001). Gender and the career choice process: The role of biased self-assessments. *American Journal of Sociology*, 10(6), 1691–1730. <https://doi.org/10.1086/321299>
- Correll, S. J. (2004). Constraints into Preferences: Gender, Status, and Emerging Career Aspirations. *American Sociological Review*, 69(1), 93–113. <https://doi.org/10.1177/000312240406900106>
- Dietrich, J., Parker, P., & Salmela-Aro, K. (2012). Phase-adequate engagement at the post-school transition. *Developmental Psychology*, 48(6), 1575–1593. <https://doi.org/10.1037/a0030188>
- European Commission. (2023). *EU support to strengthen gender equality in STEM* (Issue January). <https://data.europa.eu/doi/10.2777/719121>
- Fayer, S., Lacey, A., & Watson, A. (2017). STEM Occupations: Past, present, and future. In *Spotlight on Statistics, US Bureau of Labor Statistics* (Issue January). <https://www.bls.gov/spotlight/2017/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future/>
- Flohr, M., Menze, L., & Protsch, P. (2020). Occupational aspirations in the context of regional occupational structures. *Kolner Zeitschrift Fur Soziologie Und Sozialpsychologie*, 72, 79–104. <https://doi.org/10.1007/s11577-020-00665-4>

- Friedrichs, J., & Nonnenmacher, A. (2014). Die Analyse sozialer Kontexte. *Kolner Zeitschrift Fur Soziologie Und Sozialpsychologie*, *66*(1), 1–16. <https://doi.org/10.1007/s11577-014-0260-y>
- Furlong, A., Biggart, A., & Cartmel, F. (1996). Neighbourhoods, opportunity structures and occupational aspirations. *Sociology*, *30*(3), 551–565. <https://doi.org/10.1177/0038038596030003008>
- Galster, G. C. (2012). The Mechanism(s) of Neighbourhood Effects: Theory, Evidence, and Policy Implications. In *Neighbourhood Effects Research: New Perspectives* (pp. 23–56). Springer Netherlands. https://doi.org/10.1007/978-94-007-2309-2_2
- González-Pérez, S., Mateos de Cabo, R., & Sáinz, M. (2020). Girls in STEM: Is it a female role-model thing? *Frontiers in Psychology*, *11*(2204), 1–21. <https://doi.org/10.3389/fpsyg.2020.02204>
- Gottfredson, L. S. (1981). Circumscription and compromise: A developmental theory of occupational aspirations. *Journal of Counseling Psychology*, *28*(6), 545–579. <https://doi.org/10.1037/0022-0167.28.6.545>
- Häggglund, A. E., & Leuze, K. (2021). Gender differences in STEM expectations across countries: How perceived labor market structures shape adolescents' preferences. *Journal of Youth Studies*, *24*(5), 634–654. <https://doi.org/10.1080/13676261.2020.1755029>
- Hardie, J. H. (2015). Women's work? Predictors of young men's aspirations for entering traditionally female-dominated occupations. *Sex Roles*, *72*, 349–362. <https://doi.org/10.1007/s11199-015-0449-1>
- Hartung, A., Weßling, K., & Hillmert, S. (2022). Interplay between family background and labour-market conditions in shaping students' occupational status expectations. *Journal of Education and Work*, *35*(4), 405–421. <https://doi.org/10.1080/13639080.2022.2073338>
- Hausmann, A.-C., & Kleinert, C. (2014). Berufliche Segregation auf dem Arbeitsmarkt: Männer- und Frauendomänen kaum verändert. *IAB-Kurzbericht*, 1–8. <http://hdl.handle.net/10419/158430>
- Kintrea, K., St Clair, R., & Houston, M. (2015). Shaped by place? Young people's aspirations in disadvantaged neighbourhoods. *Journal of Youth Studies*, *18*(5), 666–684.

<https://doi.org/10.1080/13676261.2014.992315>

Kleinert, C., & Jacob, M. (2019). Vocational education and training in comparative perspective. In *Research Handbook on the Sociology of Education* (pp. 284–307). Edward Elgar Publishing.

Krabel, S., & Flöther, C. (2014). Here Today, Gone Tomorrow? Regional Labour Mobility of German University Graduates. *Regional Studies*, 48(10), 1609–1627. <https://doi.org/10.1080/00343404.2012.739282>

Leuze, K., & Strauß, S. (2016). Why do occupations dominated by women pay less? How ‘female-typical’ work tasks and working-time arrangements affect the gender wage gap among higher education graduates. *Work, Employment and Society*, 30(5), 802–820. <https://doi.org/10.1177/0950017015624402>

Lichtblau, K., Matthes, J., Fritsch, M., Bertenrath, R., Grömling, M., & Busch, B. (2013). *Industry as a growth engine in the global economy. Final Report*. <https://www.iwkoeln.de/studien/karl-lichtblau-juergen-matthes-manuel-fritsch-roman-bertenrath-michael-groemling-berthold-busch-industry-as-a-growth-engine-in-the-global-economy.html>

Longhi, S., & Brynin, M. (2010). Occupational change in Britain and Germany. *Labour Economics*, 17(4), 655–666. <https://doi.org/10.1016/j.labeco.2010.02.001>

Malin, L., & Jacob, M. (2018). Gendered occupational aspirations of boys and girls in Germany: The impact of local VET and labour markets. *Journal of Vocational Education and Training*, 71(3), 429–448. <https://doi.org/10.1080/13636820.2018.1517128>

McNeal, R. B. (2011). Labor market effects on dropping out of high school: Variation by gender, race, and employment status. *Youth and Society*, 43(1), 305–332. <https://doi.org/10.1177/0044118X10363776>

Mood, C. (2010). Logistic regression: Why we cannot do what We think we can do, and what we can do about it. *European Sociological Review*, 26(1), 67–82. <https://doi.org/10.1093/esr/jcp006>

Morris, K. (2025). Getting a foot in the door: local labour markets and the school-to-work transition. *Journal of Youth Studies*, 28(1), 137–157. <https://doi.org/10.1080/13676261.2023.2248905>

- Mulder, C. H., & Clark, W. A. V. (2002). Leaving home for college and gaining independence. *Environment and Planning A*, 34(6), 981–999. <https://doi.org/10.1068/a34149>
- Mulvey, K. L., McGuire, L., Mathews, C., Hoffman, A. J., Law, F., Joy, A., Hartstone-Rose, A., Winterbottom, M., Balkwill, F., Fields, G., Butler, L., Burns, K., Drews, M., & Rutland, A. (2023). Preparing the Next Generation for STEM: Adolescent Profiles Encompassing Math and Science Motivation and Interpersonal Skills and Their Associations With Identity and Belonging. *Youth and Society*, 55(6), 1207–1230. <https://doi.org/10.1177/0044118X221085296>
- NCSES. (2023). Diversity and STEM: Women, minorities, and persons with disabilities 2023. In *Nsf 23-315*. <https://nces.nsf.gov/pubs/nsf23315/report/>
- NEPS Network. (2024). *National Educational Panel Study, Scientific Use File of Starting Cohort Grade 5*. Leibniz Institute for Educational Trajectories (LifBi), Bamberg. <https://doi.org/10.5157/NEPS:SC3:13.0.0>
- Nießen, D., Wicht, A., & Lechner, C. M. (2023). Aspiration–attainment gaps predict adolescents’ subjective well-being after transition to vocational education and training in Germany. *PLoS ONE*, 18(6 June), 1–26. <https://doi.org/10.1371/journal.pone.0287064>
- O’Connor, P., O’Hagan, C., & Gray, B. (2018). Femininities in STEM: Outsiders Within. *Work, Employment and Society*, 32(2), 312–329. <https://doi.org/10.1177/0950017017714198>
- Ochsenfeld, F. (2016). Preferences, constraints, and the process of sex segregation in college majors: A choice analysis. *Social Science Research*, 56, 117–132. <https://doi.org/10.1016/j.ssresearch.2015.12.008>
- Osikominu, A., Grossmann, V., & Osterfeld, M. (2020). Sociocultural background and choice of STEM majors at university. *Oxford Economic Papers*, 72(2), 347–369. <https://doi.org/10.1093/oep/gpz034>
- Palffy, P., Lehnert, P., & Backes-Gellner, U. (2023). Social norms and gendered occupational choices of men and women: Time to turn the tide? *SSRN Electronic Journal*, February, 1–31. <https://doi.org/10.2139/ssrn.4281259>

- Paulus, W., & Matthes, B. (2013). The German Classification of Occupations 2010 – Structure, Coding and Conversion Table. In *FDZ-Methodenreport*. http://doku.iab.de/fdz/reporte/2013/MR_08-13_EN.pdf
- Polavieja, J. G., & Platt, L. (2014). Nurse or mechanic? The role of parental socialization and children's personality in the formation of sex-typed occupational aspirations. *Social Forces*, *93*(1), 31–61. <https://doi.org/10.1093/sf/sou051>
- Protsch, P., & Solga, H. (2016). The social stratification of the German VET system. *Journal of Education and Work*, *29*(6), 637–661. <https://doi.org/10.1080/13639080.2015.1024643>
- Raabe, I. J., Boda, Z., & Stadtfeld, C. (2019). The social pipeline: How friend influence and peer exposure widen the stem gender gap. *Sociology of Education*, *92*(2), 105–123. <https://doi.org/10.1177/0038040718824095>
- Ridgeway, C. L. (2009). Framed before we know it: How gender shapes social relations. *Gender and Society*, *23*(2), 145–160. <https://doi.org/10.1177/0891243208330313>
- Ridgeway, C. L., & Correll, S. J. (2004). Unpacking the Gender System. *Gender & Society*, *18*(4), 510–531. <https://doi.org/10.1177/0891243204265269>
- Risman, B. J. (2004). Gender As a Social Structure. *Gender & Society*, *18*(4), 429–450. <https://doi.org/10.1177/0891243204265349>
- Roberts, K. (1968). The Entry into Employment: An Approach towards a General Theory. *The Sociological Review*, *16*(2), 165–184. <https://doi.org/10.1111/j.1467-954X.1968.tb02570.x>
- Schels, B., Kleinert, C., Fischer-Browne, M., & Ahrens, L. (2022). Compromises between Occupational Aspirations and VET Occupations—a Contribution to the Reproduction of Social Inequalities? *Zeitschrift Fur Soziologie*, *51*(2), 154–173. <https://doi.org/10.1515/zfsoz-2022-0011>
- Schoon, I., & Polek, E. (2011). Teenage career aspirations and adult career attainment: The role of gender, social background and general cognitive ability. *International Journal of Behavioral Development*, *35*(3), 210–217. <https://doi.org/10.1177/0165025411398183>
- Skorikov, V. B., & Vondracek, F. W. (2011). Occupational identity. In *Handbook of identity theory and*

- research* (pp. 693–714). Springer.
- Snijders, T. A. B., & Bosker, R. J. (2011). *Multilevel analysis: An introduction to basic and advanced multilevel modeling* (Second Edi). Sage.
- Steinhauer, H. W., Aßmann, C., Zinn, S., Goßmann, S., & Rässler, S. (2015). Sampling and Weighting Cohort Samples in Institutional Contexts: The National Educational Panel Study cohort samples of Kindergarten children, students in Grade 5 and in Grade 9. *AStA Wirtschafts- Und Sozialstatistisches Archiv*, *9*(2), 131–157. <https://doi.org/10.1007/s11943-015-0162-0>
- Thébaud, S., & Charles, M. (2018). Segregation, stereotypes, and STEM. *Social Sciences*, *7*(111), 1–18. <https://doi.org/10.3390/socsci7070111>
- van Buuren, S., & Groothuis-Oudshoorn, C. G. M. (2000). Multivariate imputation by chained equations: MICE V1.0 user's manual. In *TNO report PG/VGZ/00.038*. <https://publications.tno.nl/publication/34618573/AMELNR/buuren-2000-multivariate.pdf>
- Wang, X. (2013). Why students choose STEM majors: Motivation, high school learning, and postsecondary context of support. *American Educational Research Journal*, *50*(5), 1081–1121. <https://doi.org/10.3102/0002831213488622>
- Webber, D. A. (2014). The lifetime earnings premia of different majors: Correcting for selection based on cognitive, noncognitive, and unobserved factors. *Labour Economics*, *28*, 14–23. <https://doi.org/10.1016/j.labeco.2014.03.009>
- Weeden, K. A., Gelbgiser, D., & Morgan, S. L. (2020). Pipeline Dreams: Occupational Plans and Gender Differences in STEM Major Persistence and Completion. *Sociology of Education*, *93*(4), 297–314. <https://doi.org/10.1177/0038040720928484>
- Weßling, K., & Bechler, N. (2019). Where do regional influences matter? The impact of socio-spatial indicators on transitions from secondary school to university. *Review of Regional Research*, *39*(2), 163–188. <https://doi.org/10.1007/s10037-019-00131-5>
- Wolf, A. (2016). Das wirtschaftliche Süd-Nord-Gefälle in Deutschland: Aktuelle Befunde und Ursachen. In *HWWI Policy Paper* (Issue 99). <https://hdl.handle.net/10419/146632>

World Bank. (2023). *World Development Indicators. Industry (including construction), value added (% of GDP)*. <https://data.worldbank.org/indicator/NV.IND.TOTL.ZS>

ⁱ In the reference year 2013, there were 402 districts (*Kreise*) in Germany, which are administrative units smaller than federal states (*Länder*) and larger than municipalities (*Gemeinden*). Districts had an average of 201,000 inhabitants.

ⁱⁱ The German Classification of Occupations (KldB 2010) is a widely used and up-to-date classification of occupational groups that reflects the structure of the German labor market. It is convertible to other occupational classifications, such as the International Standard Classification of Occupations (ISCO-08) (Paulus & Matthes, 2013).

ⁱⁱⁱ https://statistik.arbeitsagentur.de/DE/Statischer-Content/Grundlagen/Klassifikationen/Klassifikation-der-Berufe/KldB2010-Fassung2020/Arbeitsmittel/Generische-Publikationen/Berufsaggregate/MINT-Berufe-Aggregat.pdf?__blob=publicationFile&v=8