

Disciplinary Divides: Exploring the Development of Political Interest Across Academic Disciplines

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Abstract

Personal political interest is key to being an active citizen in a democracy, but not everyone develops it equally. Although higher education is often seen as a main factor in promoting political engagement, recent studies have questioned how much it really matters, pointing instead to self-selection and field-specific educational experiences. This study brought together several theories and applied growth curve analysis using data from the German National Educational Panel Study (NEPS) to examine how academic disciplines affect political interest over time. We found that political interest differed by discipline, but these differences changed only modestly over time. In terms of absolute levels, cultural fields showed the highest, followed by STEM and business fields, and lastly service fields. Regarding trajectories, cultural fields showed the greatest growth, followed closely by STEM and service fields. Business fields displayed a surprising U-shaped growth, suggesting a complex interplay between self-selection and discipline-specific socialization. Persistent gender gaps across disciplines further indicated that higher education alone did not overcome structural disadvantages. Overall, our findings challenge simplified assumptions about the politicizing role of higher education and highlight the importance of pre-college characteristics and context-specific pathways in individual political development.

Keywords: Political interest; Higher education; Academic disciplines; Self-selection; Political socialization; Longitudinal design

1. Introduction

Higher education, as a key institution in knowledge-based democratic societies, is considered as central in preparing individuals to become active and responsible citizens (Colby et al., 2010; Ro et al., 2022; Saltmarsh & Hartley, 2011; van de Werfhorst, 2014). Understanding if, and how, higher education nourishes individual political engagement has become increasingly urgent, as overall participation declines (Snell, 2010; Wattenberg, 2002, 2024) and ideological divides deepen (Applebaum, 2024). While previous research has often focused on educational attainment (higher vs. lower, see Stubager, 2008), emerging evidence points to the growing importance of the field of study in shaping political attitudes and behaviors (Hooghe, Marks, & Kamphorst, 2024), with a horizontal perspective. This reflects broader institutional changes in higher education: as higher education systems expand and specialize, disciplines have become more horizontally differentiated, providing distinct intellectual environments and socialization processes (Reimer & Thomsen, 2019; Triventi, 2013; van de Werfhorst & Kraaykamp, 2001). In this paper, we focus precisely on this second, horizontal dimension, considering that the field of education is rising back to prominence in the literature as a predictor of socio-political orientations (Hooghe, Marks, Kamphorst, et al., 2024).

Indeed, disciplinary differences shape not only individuals' skill sets but also their political outlook (Hooghe, Marks, Kamphorst, et al., 2024). They influence the intellectual puzzles individuals confront (SurrIDGE, 2016) the methods toolkit they have (Gross & Fosse, 2012; Lazarsfeld & Thielens, 1958), and their style of thinking (Ladd & Lipset, 1973; van de Werfhorst & de Graaf, 2004). We join this re-emerging field of research by focusing on a key characteristic for political citizenship: political interest. The latter is a core dimension of engagement, as it underpins a wide range of attitudes and behaviors (van Deth, 1990; Russo & Stattin, 2017). Yet

little attention has been paid to its development, and how it evolves and crystallizes (Prior, 2019, p. 3), and especially how these interest trajectories are influenced by the field of study. By examining how academic disciplines influence political interest, we can better understand the mechanisms through which higher education contributes to political socialization and how these effects vary across fields.

The main research question guiding this study is: Does political interest vary and develop differently across academic disciplines? Our research objectives are twofold: first, to assess cross-sectional variation in political interest across disciplines at a single point in time; second, to explore longitudinal variation in how specific disciplines contribute to its development. In doing so, we clarify how higher education may either bridge or deepen political disparities by highlighting the role of disciplines in shaping political trajectories.

In this paper, we first review existing studies and identify the research gap that motivates our analysis. Then, we develop a theoretical framework and derive a set of field-related hypotheses, including expectations regarding gender heterogeneity in political interest. We next introduce the longitudinal data we use, key variables, and empirical strategy, outlining how our approach captures both cross-sectional differences and changes over time. We subsequently present the main results, followed by a series of robustness checks to assess the stability of our findings. Finally, we conclude by discussing the broader implications of our results, acknowledging limitations, and how they may contribute to research at the intersection of education and politics.

2. Previous Studies and Theories

2.1. *Education and Politics*

A substantial body of research has documented a positive relationship between higher education attainment and political engagement across advanced democracies, with the majority of empirical evidence drawn from studies in advanced democracies (e.g., Campbell & Horowitz, 2016; Egerton, 2002; Hansen & Tyner, 2021; Hauser, 2000; Kim, 2023; Larcinese, 2009; Mayer, 2011; Milligan et al., 2004; Perrin & Gillis, 2019; Simmons & Lilly, 2010), and cross-national comparisons (e.g., Hoskins et al., 2008; Le & Nguyen, 2021). Nonetheless, some studies, mostly in the context of the United States, argued that these relationships between education and political engagement are at times weak and nonsignificant (Berinsky & Lenz, 2011; Dalton, 2018; Kam & Palmer, 2008; Mayer, 2011; Tenn, 2005).

As higher education has continued to expand, horizontal differences between academic fields have become an increasingly consequential axis of educational differentiation (Kraaykamp et al., 2013; Triventi, 2013; van de Werfhorst, 2004). Recent studies provided cross-national and longitudinal evidence from both the United States and European countries, demonstrating that educational fields emphasizing human-centered skills are associated with liberal attitudes and voting patterns (Hooghe, Marks, & Kamphorst, 2024; Hooghe, Marks, Kamphorst, et al., 2024). These influences were attributed not only to the most important effect of self-selection into fields, but also to the direct effect of fields during the educational process, continuing into post-education subsequent occupational effects. Valldor (2024) noted similar trends in Sweden. Graduates from sociocultural fields exhibited progressive shifts in their political attitudes and were less likely to support radical-right movements. In contrast, those who studied in technical, agricultural, natural science, business, and health fields showed greater support for the radical

right. They also found that these effects were partially influenced by horizontal labor market allocation. Goldstein & Kolerman (2025) further evidenced that in the U.S., studying social sciences and humanities fostered left-leaning attitudes and encouraged political activism, whereas economics and business studies tended to promote right-leaning attitudes and a focus on financial success. These results implied the influences operated through academic content and teaching methods rather than socialization or expectations regarding earnings. Together, these findings provide compelling new evidence that disciplinary specialization plays a significant role in shaping political attitudes across western contexts.

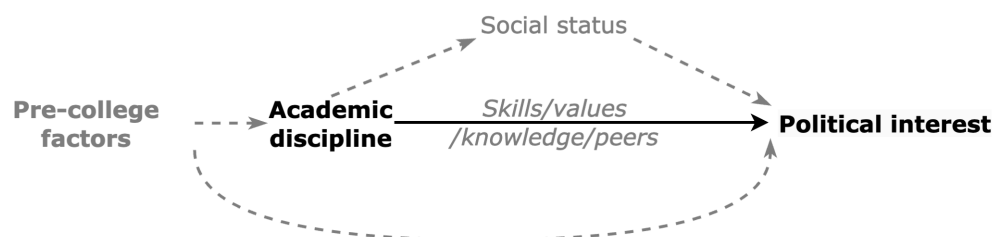
While these studies provide valuable insights into the substantive role of the field of education beyond attainment, they focus mainly on outcomes tied to ideological preferences and concrete participation. Political interest as a theoretical explanation resulting in these political outcomes has often been mentioned yet remains empirically understudied *per se*, might partially because both interest and participation may be driven by similar observed and unobserved characteristics (Denny & Doyle, 2008; Mühleck & Hadjar, 2023). Nevertheless, Prior (2019) offered a thorough analysis of education and political interest development in Britain, Switzerland, and Germany. He found modest, short-lived effects of education on political interest, with no clear evidence that fields focused on politics, history, or social sciences produced additional impact. However, his study on fields remained limited due to dichotomized categorization and small sample sizes, which resulted in fairly noisy estimates (Prior, 2019, pp. 232–233).

We adopt the theoretical models summarized in a review paper by Persson (2015), incorporating the theory of disciplinary subculture and field-related educational resources (Ladd & Lipset, 1975; Kraaykamp et al., 2013; van de Werfhorst & Kraaykamp, 2001). Our contribution is not to propose new explanations for disciplinary differences as many well-established theories already

exist, but to rigorously test existing theories and assess whether they hold in a specific context or require reconsideration in light of new evidence. Figure 1 illustrates this framework, with the solid black arrow indicating the core relationships we directly test, while gray dashed arrows and text represent underlying mechanisms. Individuals enter higher education with pre-college characteristics and aspirations (Campbell & Horowitz, 2016; Delli Carpini & Keeter, 1996, p. 193; Kraaykamp et al., 2013; Nicholls et al., 2007), after which their choice of field shapes campus socialization and subsequent political development. The further discipline-specific socialization process unfolds both horizontally, through daily interactions with peers, and vertically, through professors, who serve as role models and account for a great portion of a department's socializing power: they design and deliver professional training, transmit field-specific knowledge, uphold disciplinary norms and values, and can reward students who align with the departmental culture (Vreeland & Bidwell, 1966).

Figure 1.

Theoretical Model of the Relationship Between Discipline and Political Interest.



2.2. Field-Related Educational Resources and Political Interest

We categorize academic disciplines into four broader groups based on their dominating educational resources: cultural, economic, technical, and communicative (van de Werfhorst & Kraaykamp, 2001). First, the *culture-related disciplines*, rich in cultural resources, include fields such as Law, Social Sciences, and Humanities (LSSH), which provide and reward individuals

with expertise in artistic, literary, and critical expression. Individuals from LSSH culture-related disciplines, at baseline, tend to be more attuned to social and political discussions, events, and generally hold more liberal views compared to those in other fields (Valldor, 2024). Second, *STEM-technical disciplines*, rich in technical resources, encompass both traditional STEM (Science, Technology, Engineering, and Mathematics) fields and emerging fields in Computer Science, where academic training is structured around individuals' technical proficiency and reward problem-solving mindset. In contrast to LSSH fields, STEM fields often attract individuals who prioritize technical skills over engagement in political and societal objectives (e.g., U.S. case: Garibay, 2015; Hillygus, 2005; Niemi & Hanmer, 2010; Perrin & Gillis, 2019; Sax, 2004; Britain case: Paterson, 2009; Scott, 2024).

Hypothesis 1.1: Individuals from LSSH culture-related disciplines have the highest level of political interest in university.

Hypothesis 1.2: Individuals from STEM-technical disciplines have the lowest level of political interest in university.

The third is *business-centered disciplines*. In addition to the technical skills required, these fields are characterized by their abundance of economic resources, market strategies, and business networks. Individuals in these disciplines frequently engage in collaborative projects, internships, and applied problem-solving that connect them to corporate environments and organizational structures. Such experiences cultivate practical knowledge, strategic thinking, and an understanding of efficiency and resource allocation, which may alter their perspectives on societal and political issues, particularly those related to economic policy, government, institutional effectiveness, and global tensions. Fourth and last, *service-oriented disciplines*,

including fields like Services, Education, and Health. Besides specific technical competencies needed in these fields, interpersonal communication skills are highly appreciated and rewarded in practice. Interpersonal skills are relevant because they enable individuals to develop a deeper concern for the people around them and for broader society. As these skills enhance individuals' ability to communicate, empathize, and collaborate, they, therefore, naturally cultivate a greater awareness of social inequalities and political issues. This heightened awareness often leads them to engage more actively in discussions about community welfare, local governance, and global affairs, fostering a sense of responsibility and commitment to bringing positive change in the world around them (Hooghe, Marks, & Kamphorst, 2024; van de Werfhorst & Kraaykamp, 2001).

Beyond the LSSH-STEM divide, interdisciplinary fields have received limited attention, and little is known about pre-college political interest or its evolution within these disciplines, making our study necessarily exploratory. Our empirical analysis not only tests competing theoretical expectations but also generates evidence to inform more nuanced theorization in future research. In this context, we expect individuals in business and service fields to occupy an intermediate position in terms of political interest: they are unlikely to exhibit the high initial interest typical of culture-related disciplines, yet neither are they expected to mirror the lower interest observed in technical fields. This reflects greater heterogeneity of individuals in business and service programs, which (field) attract both pragmatically oriented individuals and those with broader social or organizational interests.

Hypothesis 1.3: Individuals majoring in business-centered disciplines exhibit moderate political interest in university, ranking lower than those in culture-related, but higher than those in STEM-technical disciplines.

Hypothesis 1.4: Individuals majoring in service-oriented disciplines exhibit moderate political interest in university, ranking lower than those in culture-related, but higher than those in STEM-technical disciplines.

While individuals tend to self-select into fields with like-minded peers, they also undergo continued socialization, known as accentuation (Valldor, 2024), through the transmission and internalization of field-specific domain knowledge, institutional norms, and intellectual rewards (Stubager, 2008; van de Werfhorst, 2020). Consequently, differences in political interest are likely to widen under departmental influences in higher education institutions (Guimond & Palmer, 1990; Hastie, 2007b; Hillygus, 2005; Perrin & Gillis, 2019; Scott, 2024; Vreeland & Bidwell, 1966).

Culture-related fields generally place greater emphasis on sociopolitical issues in their curricula, and individuals are likely to be rewarded for demonstrating interest and knowledge in these topics during their studies. By studying social, cultural, and historical subjects in these fields, students gain knowledge and develop the critical thinking needed to evaluate sources of information and consider multiple perspectives, fostering social awareness, inspiring interest and responsibility, which are crucial for thoughtful civic and political engagement. Although STEM students demonstrate no less cognitive brilliance, they appear less concerned with political and societal issues throughout the course of their studies. In certain instances, STEM professionals have also been dissuaded from engaging in politics due to the prevalent belief that science should be ideally neutral and to be “depoliticized” (Harding, 1992). Consequently, STEM environments and many of their educators and professionals tend to regard political interest and engagement as beyond the purview of their responsibilities or even potentially hazardous.

Hypothesis 2.1: Individuals from LSSH culture-related disciplines experience the greatest increase in political interest over time compared to individuals from other fields.

Hypothesis 2.2: Individuals from STEM-technical disciplines experience the least increase in political interest over time compared to individuals from other fields.

Individuals in business-centered fields tend to show more mainstream conservative political attitudes, similar to those observed in technical fields (Hastie, 2007a, 2007b; Valldor, 2024). However, the development of political interest in these fields remains unclear, and we argue that its trajectory may not align with the patterns seen in concrete political attitudes. Business programs typically expose individuals to institutional logics of markets, regulation, governance, and strategic decision-making, which are closely tied to politics such as internal policies, international regulations, and societal shocks. This exposure may gradually foster a more instrumental form of political interest, helping individuals understand market dynamics, manage risks, and boost their own economic success. In contrast, service-oriented fields, with strong human-centered and communicative competencies, are associated with more progressive political attitudes (Hooghe et al., 2024). Individuals engaged in these disciplines tend to develop a sense of care for others, acquiring interpersonal skills alongside technical knowledge and practical experience through community-oriented, value-driven practices. This encourages a civic form of political interest grounded in empathy and concern for public issues.

In sum, both business and service fields may cultivate political interest, but they do so for different reasons: one driven by calculated personal and professional gains, the other by socially embedded concerns.

Hypothesis 2.3: Individuals from business-centered disciplines experience a moderate increase in political interest over time that is faster than those in STEM-technical but slower than those in LSSH culture-related disciplines.

Hypothesis 2.4: Individuals from service-oriented disciplines experience a moderate increase in political interest over time that is faster than those in STEM-technical but slower than those in LSSH culture-related disciplines.

2.3. Gender Gap Among Educated: Politics—Still a Men's Game?

Verba et al. (1997) showed that accounting for political interest eliminated the gender gap in various forms of political activities, underscoring its central role in explaining broader gendered political disparities. Men are consistently found to be more interested in and knowledgeable about politics and tend to feel more efficacious (Bennett & Bennett, 1989; Burns et al., 2001; Campbell & Winters, 2008; van Deth, 1990; Verba et al., 1997). Despite full enfranchisement and a narrowing or even reversed turnout gap in contemporary western democracies (Norris, 2002), a substantial gender gap in psychological involvement with politics persists (Burns et al., 2001, p. 100; Ferrín et al., 2020; Fraile & Sánchez-Vítores, 2020), impeding women's capacity to act on their own interests (Kostelka et al., 2019). Accordingly, we expect gender differences in absolute political interest in our study across fields.

Hypothesis 3.1: In each academic discipline, men exhibit higher absolute political interest.

It is less clear among the higher educated, where academic disciplines may relax gender expectations and attenuate related stereotypes around political engagement within a shared discipline environment. As higher education has expanded, the highly educated are no longer a

homogeneous group of mainly male-dominated elites (Burns et al., 2001): Women now outperform men in most educational pathways, fundamentally reshaping the group composition of the higher-educated (Buchmann et al., 2025; DiPrete & Buchmann, 2013). Recent research on gendered political socialization has shown that the development of women's political interest may depend on the gender composition of different professions, and women tend to develop greater interest in female-dominated fields and comparatively less in male-dominated fields (Bos et al., 2022). Therefore, higher education fields may partially offset early gendered disparities, creating more homogeneous conditions under which women's political interest could grow more rapidly and narrow the initial gender gap (Matthieu et al., 2024). This catch-up effect likely reflects socialization processes in university settings that enhance women's opportunities for political empowerment, particularly in cultural fields.

Hypothesis 3.2: In each academic discipline, the gender gap in political interest narrows over time, with women exhibiting a greater growth, especially in LSSH culture-related disciplines.

3. Methodology

3.1. Data

To address our research question on the relationship between academic discipline and the development of political interest, we need rich panel data that tracks individuals throughout their educational careers and includes repeated measures of political interest through and beyond higher education. Although such panel studies are scarce, the German National Educational Panel Study (NEPS) Starting Cohort 5 (SC5) met the criteria and was selected to test our hypotheses. While our analysis uses data from Germany, and the relationships studied may vary

across countries, the underlying theoretical framework is not context-specific, and our findings are still informative for research in other democratic societies.

The NEPS employed a stratified multistage sampling approach, and the SC5 has tracked first-year undergraduate students in Germany since the 2010/11 academic year. Note that the term “university” used in the surveys generally refers to various types of institutions, including general academic and art colleges, conservatories, sports colleges, teacher training and theology colleges, technical colleges, combined universities, etc. Therefore, in this paper, we use the terms “university” and “college” interchangeably to refer to various institutions of higher education.

For the analytical sample of the study, we first excluded respondents with extreme years of birth and limited them to those born between 1981 and 1992, given that NEPS SC5 is a cohort study. Next, we identified individuals who had never changed their academic subjects during their higher education experience. After conducting a descriptive analysis of university disciplinary trajectories, we excluded individuals who either changed their field of study at any point or had missing subject information. This exclusion affected a relatively small portion of the sample (13.5%), but it was a necessary step to reduce high complexity and heterogeneity when testing for disciplinary effects. It is also important to note that in NEPS SC5, the variable of political interest was first measured in wave 3, year 2012, which means we lack a crucial baseline measure in wave 1, conducted during the winter semester of 2010/11, when first-year students were initially surveyed upon college entrance. As a result, we do not have information on political interest at the time the respondents just entered university.

3.2. Variables

Political interest, measured on a four-point self-rating scale, with the values ranging from 0 to 3, is the outcome variable in this study. This self-report of interest is actually not as naïve as it may sound (Lazarsfeld et al., 1948, p. 41). By relying on participants' self-reports, we assume that our respondents can accurately assess and report their own interest levels, and their direct self-evaluation of the current interest is generally more reliable than recalled past or intended future behaviors (Prior, 2019, pp. 40–50). In brief, a straightforward self-reported scale is a valid and reliable measure of political interest.

Academic disciplines were classified using the ISCED-97 2-digit classification, which were then combined into four categories based on educational resources they typically provide: (a) cultural resources, where individuals were mainly from Law, Social Sciences, and Humanities (LSSH), with a few observations also from Arts, Journalism and Information; (b) technical resources in STEM; (c) economic resources in Business and Manufacturing; (d) communicative resources in Health, Services, and Teacher Education. The details on the classification can be found in Table 1.

Table 1.

Description of Original and Grouped Categories of Disciplines in Survey Wave 1.

Original category	Baseline obs.	Grouped disciplines
Agriculture, forestry and fishery	117	STEM-technical
Natural sciences	701	
Computer science	565	
Mathematics and statistics	874	
Engineering and technical professions	1543	
Architecture and building	398	

Arts	331	Culture-related
Humanities	2914	
Journalism and information	44	
Law	485	
Social and behavioral science	872	
Business and administration	1921	Business-centered
Manufacturing and processing	135	
Health	800	Service-oriented
Veterinary	41	
Life science	560	
Environmental protection	52	
Social services	449	
Personal services	99	
Transport services	42	
Teacher training and education science	830	

The analytical sample comprised 12,007 individuals observed across eight time points over a span of twelve years, totaling 51,656 observations. The median and mean individual study durations within each disciplinary category were similar, with culture-related fields having the relatively longest (5.76 years) and business fields the shortest (4.51 years) average durations; these are summarized in Table 2.

Table 2.

Mean and Median Durations of Study for Each Discipline.

Discipline (year)	Median	Mean
Culture-related	5.58	5.76
STEM-technical	5.42	5.47
Business-centered	4.33	4.51
Service-oriented	5.25	5.22

In the Supplementary Materials, the distributions of the outcome variable and gender composition are presented in Figures S1 and S2, respectively; then, a visualization of individual disciplinary trajectories is provided in Figure S3

3.3. Analytical Strategy

Given the longitudinal nature of the data, we employed Growth Curve Analysis (GCA) within a multilevel modeling framework to estimate between-individual differences in within-individual change using repeated measures of political interest. GCA is a specific application of multilevel regression designed to study how an outcome changes over time using longitudinal repeated measures (Mirman, 2016). In this framework, repeated observations are nested within individuals, and multilevel techniques provide the structure needed to model both the overall trend and individual deviations from it. This approach combines fixed and random effects to capture two complementary aspects of longitudinal change. The fixed effects capture the average developmental trajectory in the population, and in our case, the average level of political interest and its average rate of change over time within each academic discipline. The random effects allow these features to vary across individuals, and in our application, this means that each respondent can have their own intercept (baseline level) and, when supported by the data, their own slope (rate of change).

The combination of fixed and random effects is essential for modeling longitudinal development, because individuals rarely follow an identical pattern of change. By estimating both components, GCA with mixed-effects models captures average trends while also accounting for systematic individual differences in trajectories. In other words, it allows us to examine both the overall developmental patterns across academic fields and the ways in which individual trajectories vary

over time. It is also preferred for its high flexibility, as in our case, in handling partially missing data, unequally spaced time points, and discretely scaled measures (Curran et al., 2010). We have also considered alternative longitudinal specifications, namely fixed-effects panel models and hybrid (Mundlak) multilevel models, but neither is well aligned with our research question at hand. Fixed-effects panel models are appropriate when the aim is to estimate within-individual associations net of all time-invariant unobserved heterogeneity. As our focal explanatory variable, academic discipline, is itself time-invariant and measured at baseline, an individual fixed-effects specification would absorb precisely the disciplinary differences that motivate our analysis, while we want to retain both different baseline levels and different subsequent trajectories. Hybrid multilevel models, also referred to as Mundlak or within-between random-effects models, are instead appropriate when the aim is to separate the within-individual from the between-individual components of time-varying predictors, and would be the natural choice if our primary interest were to assess whether changes in a time-varying covariate, such as occupational class, are associated with changes in political interest. Our objective, however, is different: to describe and compare trajectories of political interest across academic disciplines, including differences in initial levels, in rates of change, and in nonlinear development over time. Growth curve analysis is therefore the more appropriate framework, as it explicitly models average developmental trajectories while allowing individuals to vary in their baseline levels and rates of change.

We fitted linear mixed-effects models using the restricted maximum likelihood (REML) method, as it produces less biased estimates of the random effects and more reliable standard errors (Snijders & Bosker, 2012, p. 141). The models were estimated in *R* software using the *lmer()* function from the “*lme4*” package (Bates et al., 2015). It included both fixed effects of time and

academic discipline, as well as random intercepts and slopes to account for individual differences in baseline levels and trajectories. Given our focus on how trajectories differ by discipline, we included interactions between discipline and time in the model.

Equation 1 represents the within-individual part of the model:

$$y_{it} = \pi_{0i} + \pi_{1i} \cdot time_{it} + \pi_{2i} \cdot time_{it}^2 + \eta Z_{it} + \epsilon_{it}, \quad \epsilon_{it} \sim N(0, \sigma^2) \quad (1)$$

Equation 1 is the level-one model describing the outcome for each individual i at time t , where π_{0i} is the individual-specific intercept and π_{1i} is the individual-specific linear rate of change, both of which are allowed to vary across individuals; π_{2i} is added to account for the individual-specific quadratic rate of change; Z_{it} represents the time-varying control variable, which in our case captures changes in individual occupations measured by the EGP (Erikson-Goldthorpe-Portocarero) schema (Rose & Harrison, 2007). Finally, ϵ_{it} denotes the residuals for individual i at time t , assumed to be normally distributed with mean zero and variance σ^2 , where σ^2 captures the within-individual variance not explained by the model.

Then, we include the disciplines as the fixed effects at the level-two between-individual random parts. We use STEM-technical disciplines as the baseline category, and obtain the level-two equations modeling growth parameters denoted as π_{0i} , π_{1i} and π_{2i} .

First, π_{0i} corresponds to the random-intercept model:

$$\pi_{0i} = \beta_0 + \beta_3 \cdot business_i + \beta_4 \cdot culture_i + \beta_5 \cdot service_i + u_{0i}, \quad u_{0i} \sim N(0, \tau_{00}) \quad (2)$$

Then, π_{1i} corresponds to the random-slope model that captures individual variation in the linear rate of change:

$$\pi_{1i} = \beta_1 + \beta_6 \cdot \text{business}_i + \beta_7 \cdot \text{culture}_i + \beta_8 \cdot \text{service}_i + u_{1i}, \quad u_{1i} \sim N(0, \tau_{11}) \quad (3)$$

Finally, π_{2i} corresponds to the random-slope model for the additional quadratic change rate, allowing for individual differences in the second-order rate of change in political interest:

$$\pi_{2i} = \beta_2 + \beta_9 \cdot \text{business}_i + \beta_{10} \cdot \text{culture}_i + \beta_{11} \cdot \text{service}_i + u_{2i}, \quad u_{2i} \sim N(0, \tau_{22}) \quad (4)$$

In Equations 2, 3, and 4, u_{0i} , u_{1i} and u_{2i} are error terms, which represent individual random effects. They describe how an individual deviates from the group-level fixed effect. Specifically, u_{0i} is the random intercept, showing the difference between the individual and group-level intercepts for the i^{th} individual; u_{1i} and u_{2i} are random slopes, indicating the variation between the individual and group-level linear and quadratic slopes for the i^{th} individual. The variances of these random effects are denoted as τ_{00} , τ_{11} , and τ_{22} , respectively, where τ_{00} represents the variance of individual intercepts around the grand mean, τ_{11} captures the variance in the linear slopes, and τ_{22} reflects the variance in the acceleration of slopes.

The group-level intercept is indicated by β_0 , representing the value of the outcome variable, political interest, when it was measured for the first time ($t = 0$) for the reference group of discipline, STEM. The group-level linear slope is represented by β_1 , showing the change in the mean of the outcome variable for each unit increase at time t for the reference group of discipline. The disciplinary differences of the outcome variable at $t = 0$ is represented by β_3 , β_4

and β_5 , and the slopes of disciplines are indicated by β_6 , β_7 , and β_8 . Last, given the linear trend is unlikely to be the case, we extended the model to introduce a quadratic term for time (time²). This specification enables us to assess the acceleration of trajectories depending on both time and discipline. While π_{2i} captures the potential nonlinear change in political interest, β_2 indicates the overall quadratic effect of time, and β_9 , β_{10} and β_{11} account for discipline-specific differences.

Then, we fitted separate mixed-effects models for male and female respondents to assess whether the effect of academic discipline on political interest over time varies by gender, without overcomplicating the model through higher-order interaction terms. Given the low proportion of missing values in political interest across the survey waves (totaling 3.9%), we excluded these cases from the analysis, as their omission was unlikely to introduce substantial bias. However, panel attrition posed a serious concern, and we addressed it in the following section by conducting a series of robustness checks to evaluate the potential impact of selective dropout over time.

4. Results

4.1. Field-Specific Patterns

This section presents the results from the main linear mixed-effects model estimated. For clarity and conciseness, we focus on interpreting the key outputs and visualizing the predicted trajectories of political interest by academic discipline. The complete regression table is provided in the Supplementary Materials, Table S4.

The random-effect estimates offered insight into the variation in political interest across individuals and over time. The residual variance ($\sigma^2 = 0.16$) reflected within-individual

fluctuations not explained by the model, likely due to unobserved time-varying factors or measurement error. The random intercept variance ($\tau_{00} = 0.49$) indicated substantial between-individual differences in baseline political interest, while the random slope variances for year ($\tau_{11} = 0.03$) and year² ($\tau_{22} = 0.00$) suggested that individuals followed largely similar trajectories. The intraclass correlation coefficient (ICC = 0.70) confirmed that most of the variance lies between individuals. The marginal R^2 of 0.02 showed that fixed effects alone explain little variance, whereas the conditional R^2 of 0.70 demonstrated that including random effects substantially improved model fit. This underscored the importance of between-individual variability, supporting the idea that political interest is mainly shaped not by academic disciplines but by individual characteristics, which is consistent with the self-selection hypothesis.

The fixed-effect estimates revealed the relationships between political interest, time (both linear and quadratic), and discipline. These effects should be interpreted jointly, and to aid interpretation, we present them in Figures 2.1, 2.2, and Figure 3.

Figure 2.1 shows the predicted average levels of political interest across different academic disciplines, with 95% confidence intervals. We see that individuals enrolled in culture-related disciplines exhibit the highest predicted political interest, supporting *Hypothesis 1.1*, as those with greater interest are more likely to be drawn to fields that provide broader exposure to public and political affairs. However, *Hypothesis 1.2* was not supported: although individuals enrolled in STEM-technical fields showed lower interest than those in culture-related disciplines, their levels were not the lowest, exceeding those in service-oriented fields and matching those in business. These results, therefore, neither support *Hypotheses 1.3* and *1.4*, in which we predicted

that both business and service-oriented individuals would demonstrate moderate levels, falling between those in culture-related and STEM-technical disciplines.

Figure 2.1.

Predicted Average Value of Political Interest by Discipline, With 95% CIs.

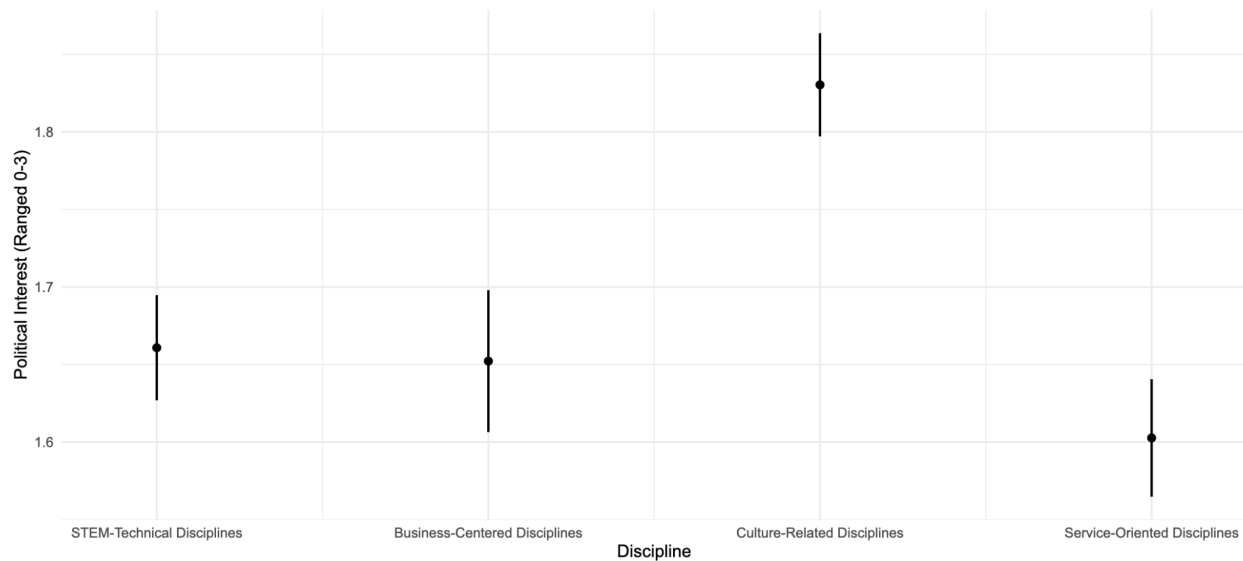


Figure 2.2 presents the growth of political interest over time by discipline. It displays the predicted trajectories of political interest over the years following college entrance by academic discipline, starting from year 2 (i.e., survey wave 3), when political interest was first measured. We observed largely parallel upward trends in political interest among individuals in STEM-technical, culture-related, and service-oriented fields. This indicated that the rate of growth in political interest was comparably similar across these groups. However, individuals in business-centered disciplines demonstrated a distinct U-shaped trajectory: their political interest declined during college, then recovered in the years after.

Figure 2.2.

Predicted Political Interest Since College Entrance by Discipline, With 95% CIs.

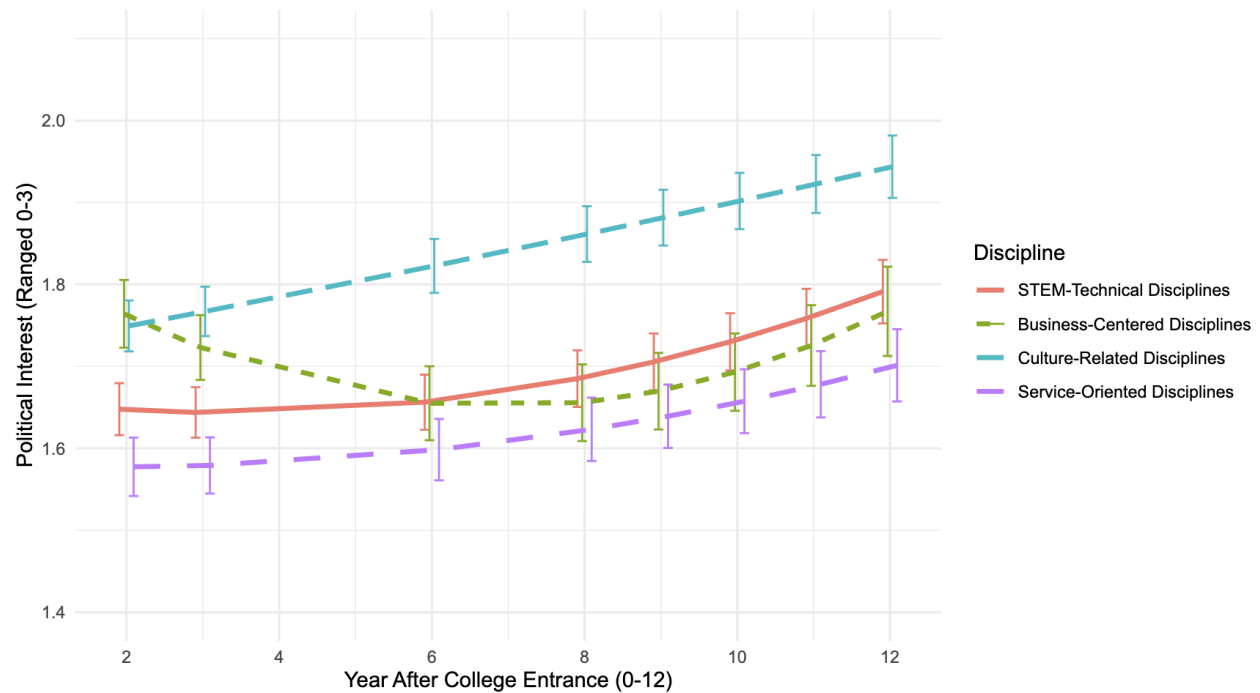


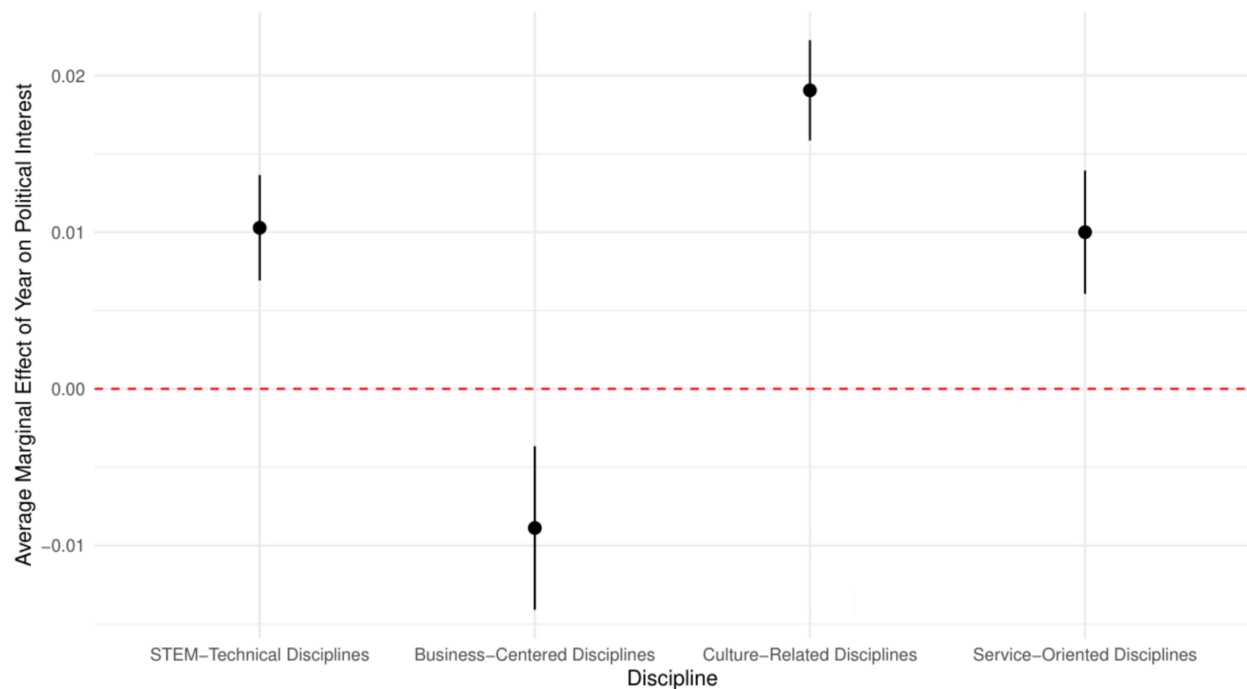
Figure 3 presents the average marginal effects (AMEs) of year on political interest by discipline, providing a summary of growth by field. The figure shows that individuals in culture-related disciplines experienced the most pronounced growth in political interest, lending support to *Hypothesis 2.1*: individuals from culture-related disciplines exhibited the most pronounced average growth in political interest, although the overall magnitude of change was not substantial. Contrary to *Hypothesis 2.2*, individuals from STEM-technical disciplines did not demonstrate the slowest growth: the rate of increase was comparable to that of service-oriented disciplines. This also challenges *Hypothesis 2.4*, in which we expected an intermediate increase among those from service-oriented disciplines, positioned between culture and STEM fields.

Lastly, business-centered disciplines discovered a slightly negative average effect, indicating a small net decline in political interest during the observation period, contrary to *Hypothesis 2.3*. However, as shown in Figure 2.2, it exhibited a more complex U-shaped trajectory, with an

initial decline in interest followed by a later rebound: this early disengagement and subsequent reengagement signaled more nuanced dynamics.

Figure 3.

Average Marginal Effects of Year on Political Interest by Discipline, With 95% CIs.

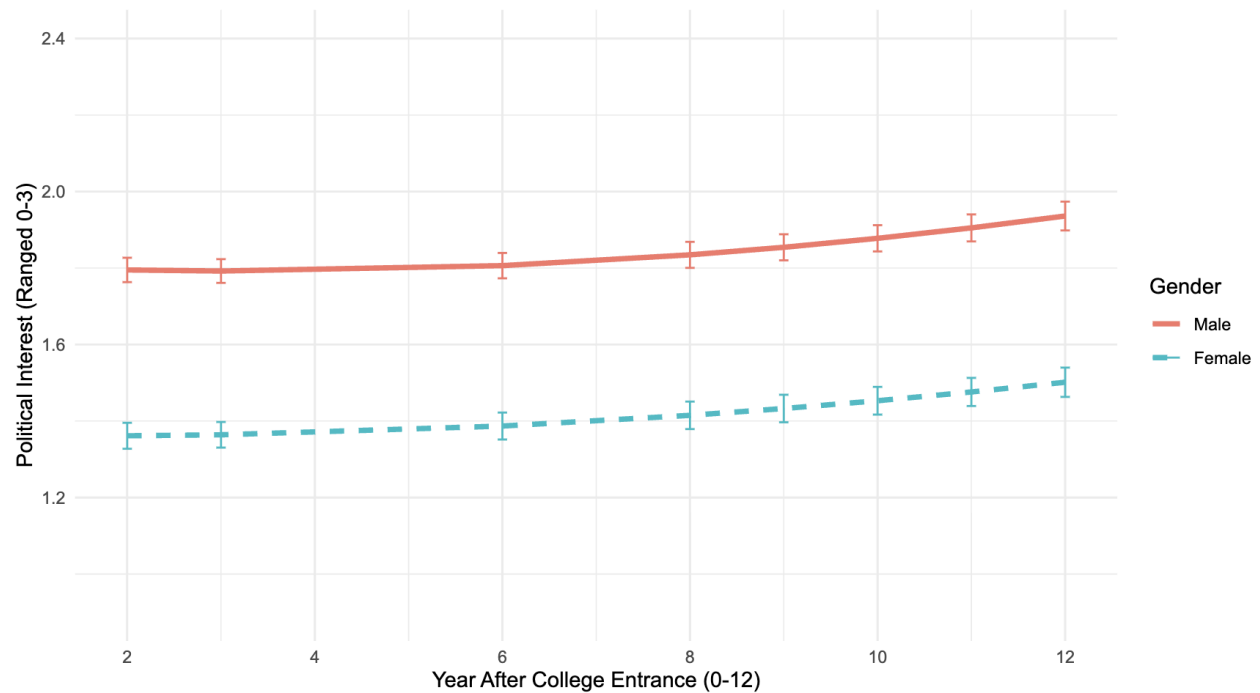


4.2. Gender Differences

Figure 4 presents overall trends in political interest by gender, showing a clear and persistent gap: men consistently reported higher levels than women, with largely parallel trajectories throughout the observed period. This is consistent with the absolute gender disparity in *Hypothesis 3.1*.

Figure 4.

Predicted Political Interest Since College Entrance by Gender, With 95% CIs.



To further examine gender-based heterogeneity, Figure 5 presents the predicted trajectories of political interest over time by academic discipline stratified by gender. Notably, men in culture-related disciplines showed the highest political interest, with a steady upward trend that largely paralleled that of men in STEM-technical and service-oriented fields. Among women, baseline levels were more similar across disciplines, with some overlapping values. Over time, women in culture-related fields displayed a distinct, faster growth in political interest than women in other fields, while women in business-centered disciplines followed a declining U-shaped trajectory. We also observed a shift in the relative positions of those in service-oriented fields: both women and men in these disciplines showed slightly higher levels of political interest than their counterparts in STEM-technical fields, although the 95% confidence intervals overlapped.

Figure 5.

Predicted Political Interest by Discipline Stratified by Gender, With 95% CIs.

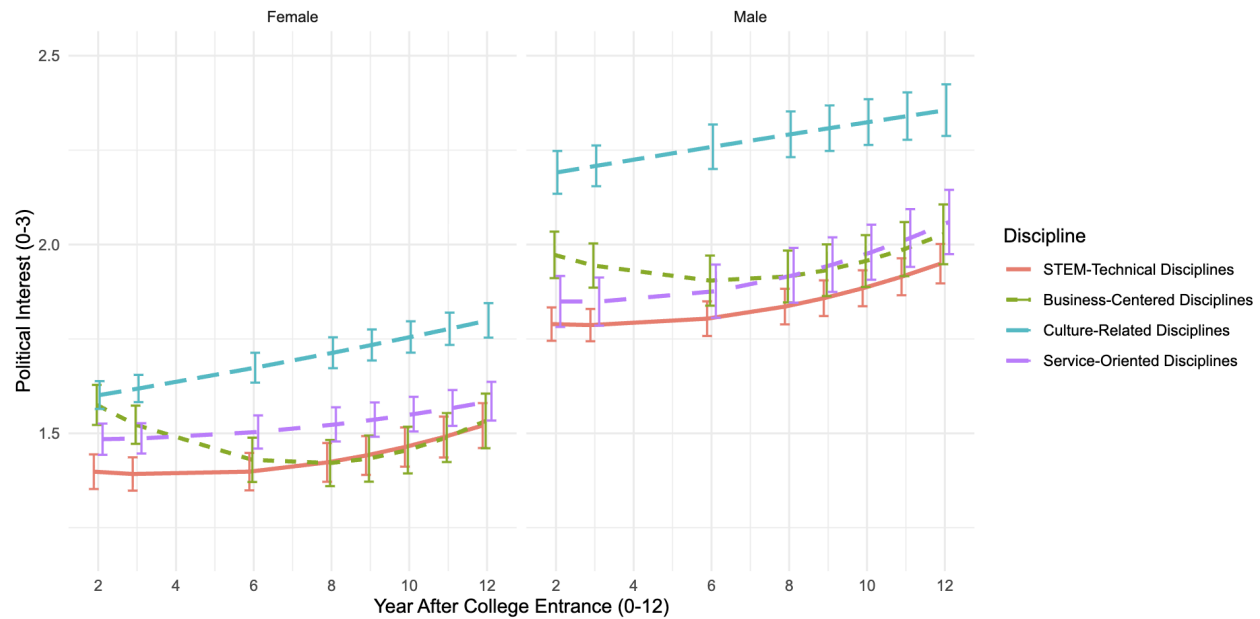
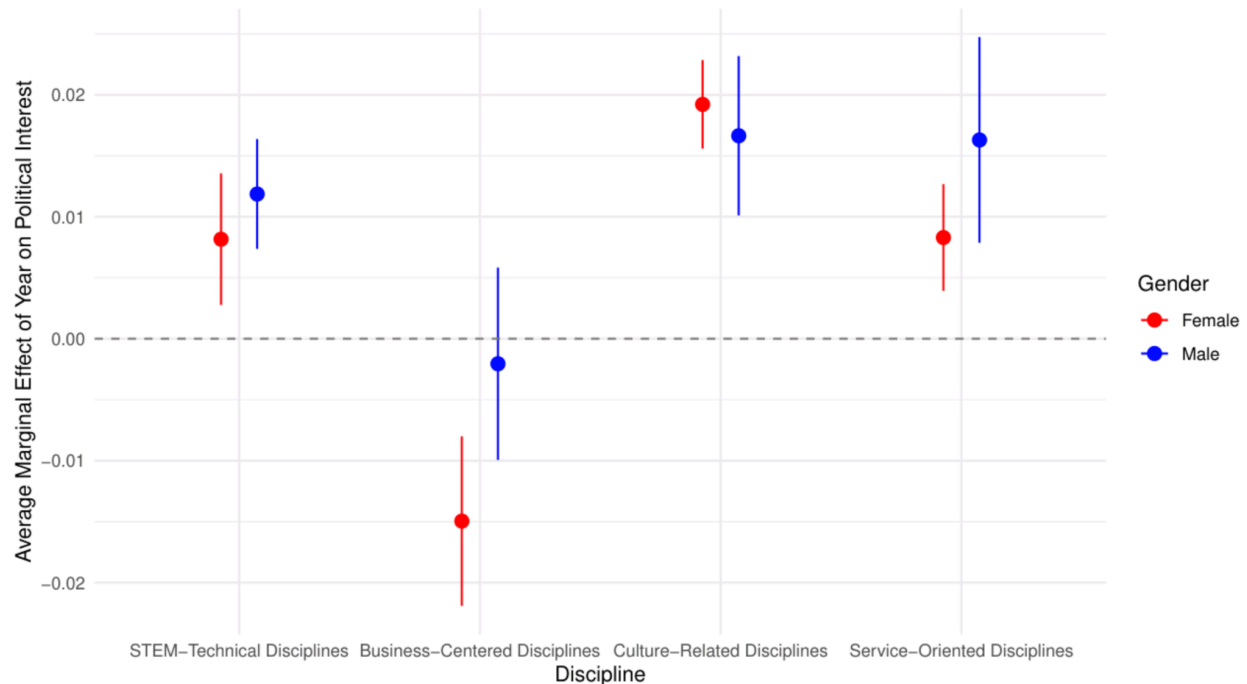


Figure 6 further presents the AMEs by discipline and gender. It revealed no significant difference in the average development of political interest between women and men in each field, as the 95% confidence intervals overlapped. While there was no clear gender-based heterogeneity in overall growth patterns, the effect of business-centered disciplines on political interest appeared significantly negative for women, with no significant effect for men.

Figure 6.

Average Marginal Effects of Year by Discipline Stratified by Gender, With 95% CIs.



As the gender gap remained largely stable over time across disciplines, the predicted narrowing of the gap through political enlightenment in higher education, as outlined in *Hypothesis 3.2*, was not supported. Although women in culture-related disciplines demonstrated a slightly steeper increase in political interest than women in other fields, the average pace of change did not differ meaningfully between men and women.

4.3. Robustness Checks

Given our interest in examining selection effects as reflected in the intercepts, we did not include time-constant confounding variables in the analysis. These unconditional differences in the initial levels of interest were intended to test selection hypotheses, and omitting time-constant confounders did not bias the estimation of growth trajectories (i.e., the slopes), as these time-constant variables would affect only the intercepts in a mixed-effects model. To assess whether accounting for potential confounding and nonresponse would diminish differences in the

intercepts, we introduced these variables in alternative model specifications. This followed the inclusion of time-constant control variables related to selection into fields and initial interest levels, as well as controls recommended by the NEPS technical reports to account for nonresponse and attrition (Würbach, 2024). Indeed, the initial differences largely disappeared, and all confidence intervals overlapped, while the discipline-specific slopes remained similar to those in Figure 2.2. These model outputs and their visualization are provided in the Supplementary Materials, Table S5a and Figure S5b.

While the small amount of missingness in political interest among observed individuals was unlikely to introduce bias, panel attrition presented a more problematic issue. Previous research on political engagement has generally argued that individuals who are more likely to participate in surveys also tend to be more politically active (Goldberg & Sciarini, 2019; Sciarini & Goldberg, 2016). This might explain the overall increases in political interest we observed over time across fields: individuals who remained in the sample in the late waves were self-selected and more likely to be those who were more politically interested. Therefore, we first explored the patterns of missingness and attrition, and then conducted a dropout analysis by applying pairwise binary logit models to assess whether dropout in a given wave could be systematically predicted by individuals' political interest in the previous wave, and evaluated whether this might introduce substantial bias into the analysis. The missing pattern and the pairwise AMEs are presented in the Supplementary Materials, Figure S6 and Table S7, respectively. Indeed, in later waves, lower levels of political interest were significantly associated with a higher likelihood of dropout. However, the magnitudes of these effects were rather small (ranged from -0.029 to 0.003), suggesting that although attrition was not entirely random, it was unlikely to introduce substantial bias.

A remaining concern was that the scale of political interest could also affect the outputs. So we ran both linear and generalized linear mixed-effects models with the dichotomized binary response. We found that the results remained consistent and robust across these fitted models; the details are provided in the Supplementary Materials, Tables S8a, S9a, and Figures S8b, S9b.

Last, to evaluate the within-group heterogeneity, we fitted separate models for each of the four categories. Due to limited subsample sizes within the four disciplinary groups, we reduced the model complexity and fitted linear fixed-effects models. Our results showed that combining the disciplines into these four theoretical categories was effective, as we observed homogeneity in each group. Plots of the predicted political interest within disciplinary groups are provided in the Supplementary Materials, Figures S10a to S10d.

5. Discussion

This study examined the development of political interest over time among individuals from different academic disciplines. Conducting growth curve analysis using multilevel regression, we tested whether absolute levels and evolution of political interest systematically varied across academic disciplines, and whether these patterns reflected political socialization embedded in discipline-specific university experiences. Our results indicated that political interest varied systematically across academic disciplines, but changed only modestly over time. In terms of absolute levels, culture-related fields showed the highest, followed by STEM and business fields, and lastly service-oriented fields. Regarding trajectories, culture-related fields showed the greatest growth, followed closely by STEM and service fields. Business-centered fields exhibited a surprising U-shaped growth pattern, suggesting a complex interplay between self-selection and discipline-specific socialization.

Our theoretical expectations that STEM fields would show the lowest absolute level and growth are not met, and there are several potential explanations for this. First, much of the early research dichotomized fields into STEM and humanities, meaning that more interdisciplinary or intermediate disciplines have received less theoretical and empirical attention. While STEM fields do exhibit lower levels and slower growth of political interest than culture-related disciplines, they are comparable to other non-humanities fields, a nuance often overlooked in discussions of disciplinary differences. In addition, STEM fields are not politically neutral. As issues such as technology governance, climate change, and artificial intelligence increasingly enter public and political debate, individuals in STEM may be more aware and interested in politics, motivated by the desire to convince the public and influence society. STEM-selected and trained individuals may therefore be more active in political and public spheres than commonly assumed. This *post-hoc* reasoning suggests that the relationship between academic disciplines and political engagement is more complex than a simple hierarchical ordering, and that STEM may be less politically disengaged than has often been assumed.

Then, the U-shaped pattern observed in business-centered fields is also unexpected, which may reflect a more dynamic interplay between initial self-selection and discipline-specific socialization: individuals initially experience a decline in political interest, likely reflecting the discipline's emphasis on instrumental values and financial success (Goldstein & Kolerman, 2025). Over time, however, interest rebounds after college, potentially as career paths become clearer and individuals begin to recognize the relevance of political dynamics for long-term professional advancement and the safeguarding of achieved economic status. This trajectory suggests that disciplinary effects on political interest might be well delayed, becoming more evident as individuals assume more active roles in the labor market.

Furthermore, gender differences persist across disciplines, with women exhibiting lower political interest than men and little evidence of convergence over time, resonating with the idea that gendered political inequalities are rooted in early-life socialization (Bos et al., 2022). Higher education may marginally encourage or suppress political interest in certain disciplines, but it does not offset preexisting structural political advantages or disadvantages. This implies that the role of higher education in cultivating political engagement may be more limited than often assumed.

In relation to recent contributions (Hooghe, Marks, & Kamphorst, 2024; Hooghe, Marks, Kamphorst, et al., 2024; Valldor, 2024), which have documented positive associations between the human-centeredness index of fields and progressive political orientations, our findings both align with and extend them. We observe higher absolute levels of political interest among individuals in culture-related disciplines, particularly among men, yet this pattern does not extend to service-oriented fields, which also scored highly on this index. This divergence is partially hinted at by the study of Goldstein and Kolerman (2025), where they found that individuals in business and service fields tend to be more right-leaning, with field-specific experience further accentuating these tendencies. While higher political interest does not necessarily translate into more left-leaning orientations, comparisons with previous research imply that business and service fields, despite their strong interpersonal and communicative focus, are qualitatively distinct from culture-related disciplines. Building on this recent line of research, we argue that, compared to more fluid political attitudes among young people, disciplinary heterogeneity is reflected to a more limited extent in the development of political interest. This aligns with research suggesting that political interest is rather stable after early-life

family socialization and therefore more resistant to change, evolving more gradually than attitudinal dimensions of individual political outcomes (Neundorf et al., 2013; Prior, 2010).

Besides discipline and gender, we observe a general trend of growing political interest. However, this general increase does not necessarily imply a universal higher-education effect across fields, as we lack a control group of individuals who did not attend university. This upward trend we observe could also reflect broader “psychological aging” (van Deth, 1990) rather than an effect of higher education. Psychological aging argues that interest in politics rises with age through early adulthood. A lower level of interest in politics among young people largely stems from their perception that politics is not relevant to their lives. However, as they gain more general social experience over the years, they tend to develop more understanding of politics and its importance, leading to increased interest regardless of their specialized fields. This life-course perspective enhances our understanding of fluctuations in interest during the college years, followed by a period of stabilization in post-college years. However, we are unable to empirically test the aging hypothesis in this study, as the NEPS SC5 does not include individuals who did not pursue higher education, thereby limiting the possibility of comparison with the counterfactual group of those non-university peers. In addition to the absence of a counterfactual group, panel attrition may also threaten our inference. This concern is particularly relevant if politically disengaged individuals are more likely to drop out over time, resulting in a panel increasingly composed of more politically engaged respondents. We found that although a lower level of political interest was indeed statistically significantly associated with a higher likelihood of dropout in the later wave, the effect sizes were not substantively meaningful.

The gross tertiary enrollment ratio in Germany reached 78.6% in 2023, according to the World Development Indicators (World Bank, 2023). This figure highlights the growing social

importance of higher education in Germany and the need to contextualize our findings accordingly. The German education system is highly stratified, characterized by early school tracking and further differentiation between academic and vocational pathways (Müller & Schneider, 2013; Schindler & Reimer, 2011). Although educational expansion has reduced inequalities in secondary attainment, stratification has shifted to the post-secondary level, where access to higher education is increasingly influenced by social origin (Schindler & Reimer, 2011; Shavit & Müller, 2000). While German higher education has typically shown little hierarchy among universities, substantial differentiation persists across fields of study (Hillmert & Jacob, 2010). Taken together, this institutional context helps us explain the observed strong selection into fields and similar developmental trajectories across them, supporting the idea that preexisting inequalities play a crucial role in shaping political interest in Germany.

A key limitation constraining our ability to draw solid causal inferences regarding the effects of field-specific higher education is that political interest was measured for the first time in the third wave of the survey, rather than at the initial first wave. Consequently, we lack data on individuals' baseline political interest at the time they entered the cohort study and began their university education. This absence of pre-university information limits our ability to assess political interest prior to exposure to higher-education socialization. While we acknowledge this main limitation of the lack of a baseline measure of political interest before/upon higher education entrance, we argue that such absence of a baseline does not mean that there is no room for all meaningful inferences about intra-university socialization processes. First, existing socialization theory does not assume that attitudinal change is confined to the first years of university entry. Instead, it characterizes political development as a cumulative and gradual process that unfolds over sustained exposure to environments. Although longitudinal studies on

this topic are relatively scarce (so this study also indirectly contributes to this), recent research demonstrates that some changes in political attitudes occurred gradually or many stayed stable over the course of college, with no evidence of a drastic shift happening during the first year of exposure (Fryer, 2023). While the baseline socialization cannot be captured, our study still observes political interest and its changes over the subsequent years after the treatment. Therefore, meaningful insights into intra-university socialization can still be derived from our results, even without the baseline measurement.

6. Conclusion

Political interest is a key prerequisite for individual political sophistication and plays a vital role in sustaining a healthy democracy. Using representative longitudinal data from a recent cohort in Germany, this study examined whether academic disciplines in higher education differentially contribute to the development of political interest and how these patterns varied by gender.

Overall, our analysis reveals clear and persistent field-based disparities in political interest across higher education pathways. Much of this differentiation appears to originate from selection into academic disciplines, as individuals enter higher education with distinct orientations that continue to shape their trajectories. While the absence of baseline measures of political interest prevents us from isolating first-year socialization effects, the longitudinal evidence suggests that academic fields can indeed serve as powerful predictors of political interest over time, particularly those with a higher level of interest in culture-related fields. Nonetheless, it appears that this relationship may not be as significant and substantive as a causal factor in driving subsequent changes in engagement as theorized in the political socialization literature, if we assume that socialization on campus occurs gradually. This conclusion is considerably more

conservative than what common intuition and much of the previous literature would lead us to expect.

Is education endogenous? Our study contributes to this long-standing debate by tracing longitudinal trajectories of political interest at the individual level across academic disciplines. Following Prior's (2019) call to examine field differentiation more thoroughly using a longitudinal design, we provide exploratory evidence suggesting that field selection, rather than disciplinary socialization, may account for much of the observed variation in political engagement among highly educated young adults in Germany. Although we lack baseline measures of political interest upon university entry, our findings align with the perspective of the selectivity hypothesis and the idea of reciprocal causation in education (Prior, 2019, pp. 232–236). This perspective suggests that most differences across fields are already present when students enter higher education: individuals who are more politically interested are disproportionately more likely to pick politics-related fields of study. *“Humans must learn their political behavior early and well and persist in it”* (Hyman, 1959, p. 10). This highly selective group, when subjected to field political exposure, is unlikely to produce large increases in interest, and field-specific socialization in higher education contributes only a few additional changes. This interpretation supports the argument that political “returns” to higher education are limited once we account for preexisting disparities among individuals. In this sense, choosing culture-related studies is less a cause of heightened political interest in the discipline and more a reflection of preexisting inclinations. This is possible if we think that key elements of political socialization can occur well before field specialization in university, as also noted by the recent study on the field of education and political orientation (Hooghe, Marks & Kamphorst, 2024).

The implications of our findings should also be understood in the context of Germany's highly tracked and stratified education system. Academic selection in Germany often reflects systematic early-age differentiation, as students are stratified by achievement and background well before entering higher education and choosing fields. This educational selection is likely more pronounced in highly tracked countries such as Germany and the Netherlands (Kraaykamp et al., 2013; van de Werfhorst, 2004). Therefore, it is reasonable that, in Germany, field-specific experiences in higher education contribute little to the development of political interest, and much of the observed variation could be attributable to preexisting selection mechanisms rather than the “transformative” effects of higher education and its contents. Still, this may not hold true in other countries characterized by comprehensive educational systems, such as those in the United Kingdom. Therefore, further research in more comprehensive educational contexts could provide valuable comparative insights into how variations in educational systems may play a role in the relationship between higher education, fields, and the development of political interest.

This study makes meaningful contributions to the exploration and examination of longitudinal differences in political engagement, proxied by self-reported political interest, across various academic fields, presenting an initial picture of the dynamics at play when considering higher education with horizontal qualitative distinctions. While questioning the existing theories of field political socialization in higher education and its consequences for individual political development, we acknowledge that no dataset is perfect and that there is always potential for improvement. Therefore, we caution readers against overinterpreting this development pattern and highlight the need for future studies to collect more suitable data to draw more robust conclusions. Besides the need for more suitable data capturing baseline political interest when studying selection and socialization, we encourage future research to investigate horizontal

occupational allocation by academic discipline, which is also theoretically important but falls outside the scope of the present study. Educational fields extend into individuals' occupational trajectories, shaping their social status, degree of occupational closure, and the structure of their workplace networks (Hooghe, Marks, & Kamphorst, 2024; Kraaykamp et al., 2013). Taken together, these considerations highlight that understanding the relationship between higher education fields and political interest requires placing individual pathways within the broader context of institutional and occupational frameworks, an agenda that future research should pursue systematically.

AI Use Disclosure

No generative AI tools were used in the design, analysis, interpretation, or writing of this study. The manuscript was reviewed for spelling, grammar, and style using the writing assistant tool *Grammarly*.

Data and Code Availability

This paper used the remote data from the National Educational Panel Study (NEPS; see Blossfeld & Roßbach, 2019). The NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi, Germany) in cooperation with a nationwide network (NEPS Network, 2024).

The data used in this study are available at the National Educational Panel Study, Scientific Use File of Starting Cohort First-Year Students:

<https://www.neps-data.de/Data-Center/Data-and-Documentation/SC5-Students>

DOI: 10.5157/NEPS:SC5:19.0.0

Access to the remote data should be requested and is restricted to use through the RemoteNEPS virtual desktop: <https://www.neps-data.de/Data-Center/Data-Access/RemoteNEPS>

The replication package has been uploaded to the Open Science Framework (OSF). It includes all R scripts required for data preparation and analysis in order to reproduce the results presented in the paper. Link to the package:

https://osf.io/dhz4s/overview?view_only=9fa3dd15fcef4b61b9a919c0f9dccf3d

Declaration of Interest

No potential conflict of interest was reported by the authors.

Ethical Approval

This study is based on the secondary analysis of publicly available panel data accessed through formal application. All data access and use comply with the NEPS Data Use Agreement and the RemoteNEPS Supplemental Agreement:

<https://www.neps-data.de/Data-Center/Data-Access/Data-Use-Agreements>

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