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Article

Industry Context and Educational Returns: A Comparative Analysis of Wage Trajectories by Academic Major

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Abstract

This study examines the relationship between academic major selection and long-term earnings by examining wage trajectories across five broad fields using pooled cross-sectional data from the American Community Survey and Mincer-style wage modeling. While STEM degrees are commonly perceived as delivering the highest financial returns, our analysis of college graduates reveals that business degrees provide comparable and often more sustainable wage advantages across diverse industry contexts. Using regression models that control for labor market experience, demographic characteristics, and industry placement, we find that the initial STEM wage premium largely disappears when industry-fixed effects are introduced, suggesting that STEM advantages are primarily attributable to employment in high-paying specialized sectors rather than the degrees themselves. In contrast, business graduates maintain consistent earning premiums across all model specifications, indicating that business education provides transferable skills valued across multiple industries. The study also reveals persistent wage penalties for education, arts and letters, and behavioral and health sciences graduates, with education graduates earning approximately 15% less than business graduates even after controlling for relevant covariates. Significant demographic variation emerges in returns to different degrees, with female STEM graduates experiencing wage penalties while male graduates do not, and Black graduates receiving substantial STEM premiums compared to slight penalties for White graduates. These findings have important implications for career advising, curriculum design, and educational policy, suggesting that the cross-industry adaptability of business education may be increasingly valuable in dynamic labor markets, while persistent wage disparities in essential professions like education require targeted policy interventions to address systematic undervaluation of socially critical work.

Keywords: higher education returns; wage trajectories; academic major selection; labour market outcomes; demographic wage differentials

1. Introduction

Higher education continues to serve as a cornerstone of economic mobility, particularly as global labor markets evolve and professional specialization intensifies. Within this context, academic major selection has become a defining influence on long-term earnings, occupational sorting, and career progression. While STEM degrees are often positioned as delivering the highest financial returns, emerging evidence indicates that business graduates may experience comparable or even greater wage growth over time, especially when accounting for industry context and demographic variation. This study explores how academic disciplines influence career trajectories by examining wage patterns across five broad fields: business, STEM, behavioral and health sciences, education, and arts and letters. The analysis uses cross-sectional data from the American Community Survey (ACS) and a Mincer-style wage modeling framework to assess how earnings evolve across these fields. Regression models incorporate controls for labor market experience, industry placement, and key demographic characteristics to evaluate how these factors intersect with academic background to

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shape career mobility and wage outcomes. Particular attention is paid to selection effects such as gender representation and immigrant status that influence the field of study and subsequent occupational pathways. For instance, women are disproportionately represented in lower-paying disciplines such as education, while STEM fields continue to attract higher shares of men and immigrants. These structural patterns create differentiated wage outcomes and influence access to high-growth career opportunities. This study contributes to ongoing conversations around career development and employability in business education by centering business graduates within a comparative framework. As Tomlinson emphasized, understanding how graduates position themselves in the labor market is critical for designing responsive business curricula and international advising strategies. The findings offer actionable insights for global business schools seeking to enhance graduate outcomes, design data-informed academic interventions, and address equity challenges in the education-to-employment transition.

2. Relationship Between Education and Earnings

Numerous studies have examined the connection between education and income, and there is constant proof that a college education enhances long-term financial results. According to human capital theory, investing in education boosts lifelong earnings, financial resilience, and productivity.Rahimi et al. and Walker and Zhu found that individuals with postsecondary degrees earn significantly more than those with only a high school diploma, with lifetime earnings rising by percent for men and for women.

Although STEM degrees are often presumed to deliver the strongest wage outcomes, recent analyses suggest that business graduates may experience comparable or superior wage growth when selection effects and demographic variables are considered. For example, gender disparities in STEM participation contribute to uneven outcomes, as male-dominated fields are often associated with stronger negotiation positions, greater job stability, and higher rates of wage progression. By incorporating industry-specific controls, the present study builds on existing research by evaluating how the field of study influences wage trajectories over time and across population groups. Broader structural factors also play a critical role. Kakembo et al. emphasized how sustainable public-private partnerships can address systemic barriers and promote economic resilience, particularly in under-resourced communities. These insights help contextualize demographic disparities in wage outcomes and career progression across academic disciplines. Recent scholarship has also called for reimagining higher education to support global career readiness through leadership development, intercultural competence, and applied learning opportunities. Academic major selection is a critical determinant of employment prospects and earnings capacity. Lawson et al. documented how business disciplines such as finance, marketing, management, and accounting foster highly specialized competencies aligned with sector-specific career pathways. Finance graduates typically develop advanced analytical and risk management skills, while accounting majors gain auditing, compliance, and reporting expertise. These skills translate into competitive career trajectories that may rival STEM fields. However, career outcomes are shaped by a combination of academic preparation and contextual influences. Zhao emphasized the importance of personal interests, market conditions, and familial expectations in shaping educational and occupational decisions. Parsons et al. observed that marketing students increasingly emphasize consumer behavior and digital platform expertise in shaping their early careers. Similarly, Qu advocated integrating psychological principles into business curricula to enhance motivation and promote workforce integration. While STEM graduates often begin in high-paying entry-level roles, business graduates may benefit from broader leadership development and cross-sector adaptability, contributing to long- term career mobility. This study builds on prior research by modeling wage trajectories across multiple disciplines while accounting for demographic variation and labor market sorting. Internships remain an essential bridge between academic study and career entry. Bayerlein found that prior professional experience significantly enhances learning in simulated internship environments. Adams et al. highlighted the effectiveness of internships in improving employability

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by fostering technical and interpersonal competencies. Galloway et al. noted that the quality of internship experiences is paramount in dynamic sectors such as technology and finance. Maertz Jr. et al. described internships as mutually beneficial mechanisms for student development and employer recruitment. Neill emphasized the role of internships in developing social capital and establishing professional networks. Business and STEM programs increasingly embed internships into curriculum structures, yet disparities in internship access and support across disciplines may contribute to uneven early career outcomes. Recognizing these differences is vital for institutions that enhance long-term employability through experiential learning. In addition to internships, entrepreneurship education has become an increasingly important pathway for career development and economic agency. Programs that foster entrepreneurial thinking support leadership, innovation, and adaptability. Ravichandran and Dixit demonstrated that access to incubation centers and innovation hubs strengthens entrepreneurial capacity and career confidence. Ogbuanya and Chukwuedo found that university-based incubators and startup competitions significantly improve the likelihood of successful venture creation. Sousa highlighted the role of structured decision-making frameworks in enhancing entrepreneurial resilience and long-term business sustainability. Boldureanu et al. emphasized how mentorship and peer networks contribute to entrepreneurial learning and retention. Together, these findings underscore the importance of entrepreneurship within business and interdisciplinary programs as a driver of workforce readiness and economic mobility. Ethics education is also essential in preparing graduates for decision-making in increasingly complex and globalized professional environments. Ritter argued that structured ethics instruction enhances students' ability to navigate workplace dilemmas. Christensen demonstrated the effectiveness of active learning strategies, such as case- based methods, over traditional lecture formats. Brown and Treviño linked ethical leadership development to improved organizational culture and employee engagement. Crane and Matten encouraged a broad interpretation of corporate responsibility, including environmental, social, and governance considerations. Brodeur emphasized that mentorship is formative in fostering ethical reasoning and long-term integrity during early career stages. As ethics becomes more integrated into business curricula worldwide, its influence on leadership identity and responsible decision-making will likely grow. Overall, the literature affirms the critical role of higher education in shaping career trajectories, earnings outcomes, and workforce readiness. While STEM degrees are often associated with high initial salaries, business degrees may offer more durable wage mobility and broader cross-sector value, particularly when considering demographic and labor market structures. Career readiness initiatives such as internships, entrepreneurship, and ethics training are key enablers of long-term professional development. This study builds on these insights by applying wage trajectory modeling and the Mincer framework to evaluate how academic pathways and identity characteristics jointly shape labour market outcomes.

3. Methodology

This study adopts a quantitative approach grounded in labor economics to investigate how college major selection and demographic characteristics influence earnings outcomes among higher education graduates. The analysis is structured around the Mincer earnings function, a widely used framework for estimating wage determinants based on education and labor market experience. This model enables the evaluation of earnings trajectories across academic fields while accounting for relevant individual and structural covariates. Wage regression models are estimated using pooled cross-sectional data from the ACS. The dependent variable is the natural logarithm of annual wages, regressed on years of potential labor market experience and its square to capture nonlinear wage growth patterns. The field of study is introduced through categorical indicators to estimate baseline differences in earnings across disciplines. Sequential model specifications incorporate additional demographic controls, including age, gender, race, marital status, immigration status, and number of children. Industry fixed effects are applied in the final models to account for occupational sorting into higher- or lower-paying sectors. All models are weighted to reflect the national representativeness of the data. The analytical sample is restricted to full-time, prime-aged workers

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between and years old who hold a bachelor's degree as their highest educational attainment and are not currently enrolled in school. These criteria ensure consistency and comparability among individuals fully engaged in the labor market. By integrating the Mincer framework with detailed demographic and industry-level controls, this methodology thoroughly examines how educational pathways and identity characteristics shape long-term wage outcomes.

4. Data Analysis

This study uses pooled cross-sectional data from the ACS Public Use Microdata Sample to analyse labor market outcomes across different fields of study. The ACS provides annual data on a representative sample of the U.S. population, including information on employment, income, education, and demographic characteristics. It is a widely used source for studying educational and occupational trends. The primary dependent variable in this analysis is WAGP, which refers to wages or salary income received over the past months and measures annual earnings from employment. All wage figures are adjusted to dollars using the Consumer Price Index for All Urban Consumers (CPI-U) from the Bureau of Labor Statistics to account for inflation over time. To examine differences in earnings across graduates from different fields, we use the Field of Degree variable from the ACS to classify individuals into five groups corresponding to the primary colleges at a University:

College of Business (Business): Accounting, Finance, Management, and Marketing.

Science, Technology, Engineering, and Mathematics (STEM): Biology, Chemistry, Computer Science, Engineering Technologies, and Mathematics.

College of Arts and Letters (CAL): Communications, Drama and Theatre Arts, English Language and Literature, Fine Arts, and History.

College of Behavioral and Health Sciences (BHS): Criminal Justice, Nursing, Political Science, Psychology, and Social Work.

College of Education (COE): Elementary, Secondary, and Special Education.

We impose several sample restrictions to ensure comparability across graduates from different disciplines. First, the analysis is limited to prime-aged workers between and years old to exclude younger graduates, who may still be transitioning into stable employment or pursuing additional education, and older workers, who are more likely to experience career changes, phased retirement, or labor force withdrawal. Additionally, we restrict the sample to full-time workers, defined as individuals working at least hours per week and weeks per year, to ensure consistency in earnings comparisons. Also, to mitigate the influence of extreme wage values, we trim the wage distribution by excluding the top and bottom % of earners. Individuals currently enrolled in school are also excluded, as they likely pursue advanced degrees and may not fully engage in the labor market. Furthermore, to focus on the labor market returns to a bachelor's degree, we restrict the sample to individuals who have completed a four- year degree but do not hold a graduate or professional degree. Finally, we exclude active-duty military personnel whose earnings and job classifications differ substantially from civilian labor markets. After imposing these restrictions, the final analytical sample comprises college graduates. Wage differences across fields of study are evident, with STEM graduates reporting the highest annual earnings at followed by Business graduates at Arts and Letters and Behavioral and Health Sciences graduates earn somewhat less, with average earnings respectively. Education graduates report the lowest wages. These wage differences suggest that the field of study plays a significant role in shaping labor market outcomes.

Beyond wage differences, there are notable demographic patterns. STEM and Business graduates are more likely to be male, whereas Education and Behavioral and Health Sciences graduates have a higher proportion of women. Racial and ethnic composition also varies across fields, with CAL and COE graduates having a higher share of White individuals, while STEM graduates include a more significant proportion of immigrants. Family and household characteristics further distinguish degree fields, as Business and Education graduates have the highest marriage rates, while Arts and Letters graduates have the lowest. Education graduates are also more likely to have children and report larger family sizes than those in other fields. Finally, state-year-level labor market

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indicators such as unemployment and poverty rates highlight additional disparities. Behavioral and Health Sciences and Education graduates face higher unemployment and poverty rates, suggesting greater labor market instability in these fields. These findings indicate that wage differences across degree fields may be influenced by labor market demand, demographic composition, and household circumstances. Business graduates are heavily concentrated in financial and managerial roles, with Accountants and Auditors as the most common occupation, followed by Financial Managers and Miscellaneous Managers. Sales-related occupations, such as Sales Representatives and Retail Supervisors, also feature prominently. STEM graduates are primarily employed in technology-related fields, with Software Developers representing the most frequent occupation, followed by Computer Programmers and Information Systems Managers. Arts and Letters graduates have a more diverse occupational spread. Elementary and middle school teachers are the most common occupations, followed by miscellaneous managers, retail supervisors, customer service representatives, and sales representatives. Behavioral and Health Sciences graduates are predominantly employed in health and social service occupations, with Registered Nurses accounting for a substantial share of employment. Other common occupations include Social Workers, Police Officers, and Elementary and Middle School Teachers. Finally, education graduates overwhelmingly enter teaching-related professions, with Elementary and Middle School Teachers as the dominant occupation, followed by Preschool and Kindergarten Teachers, Secondary School Teachers, and Special Education Teachers.

Following the discussion of occupational sorting, we lok at wages from 2009 to 2022 for graduates in each college. Over this period, earnings growth has been most vigorous for STEM and Business graduates, who have seen significant wage increases. By 2022, STEM graduates surpassed $100,000 in mean earnings, while Business graduates approached $90,000. In contrast, earnings for Arts and Letters and Behavioral and Health Sciences graduates have grown more moderately, reaching approximately $75,000 and $70,000, respectively. Education graduates, who started with the lowest earnings in 2009 at around $42,000, have seen slower wage growth and remain the lowest-paid group, barely exceeding $50,000 in 2022.

Cyclical wage patterns are noticiable with noticeable stagnation or declines during major economic downturns, such as the Great Recession (2008–2010) and the COVID-19 pandemic (2020–2021). While all fields experienced some degree of wage stagnation during these periods, the magnitude of these effects varied, with STEM and Business graduates demonstrating greater resilience than Education and Arts and letters graduates. Specific degree fields may be more sensitive to broader macroeconomic conditions. Furthermore, the wage gap between high- and low-earning fields has widened, suggesting that returns to education are increasingly diverging by field of study. For instance, in 2009, the earnings gap between STEM and Education graduates was approximately $40,000, but by 2022, this gap had expanded to over $50,000, reinforcing the growing divergence in labor market returns. Importantly, there is little evidence of wage convergence across fields of study, as Education and Arts and letters graduates continue to lag behind other groups in earnings growth. This persistent gap suggests that early-career earnings do not solely drive wage differentials but persist throughout the work lifecycle, potentially due to structural differences in industry wage growth and career progression opportunities.

Kernel density estimates were computed using an Epanechnikov kernel with optimal bandwidth selection following Silverman's rule of thumb. The densities were estimated separately for each degree field using a weighted approach to account for survey design features in the ACS. The densities are estimated separately for each degree field to represent wage distributions. We find that STEM and Business graduates exhibit the widest wage distributions, suggesting more significant variation in earnings potential, with longer right tails indicating the presence of high earners. This suggests that STEM and Business degree holders benefit from higher earnings variability, likely due to greater wage mobility, access to specialized industries, and opportunities for high-paying leadership roles. In contrast, Education graduates have the narrowest distribution, with a more compressed earnings range and fewer individuals in high-paying positions. This reflects the

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structured nature of the education sector, where salaries are often set by standardized pay scales rather than market-based fluctuations. The distributions for Arts and Letters and Behavioral and Health Sciences graduates fall between these two extremes, showing moderate dispersion. Additionally, the left tail of the distribution is more pronounced for Arts and Letters and Behavioral and Health Sciences graduates, suggesting a higher proportion of low-wage workers compared to other fields. This may indicate that graduates in these fields are more likely to enter occupations with lower earnings potential or part-time employment. Finally, we estimate wage growth by experience level for each field of study, using a Mincer-style earnings equation by regressing log wages on experience and experience squared separately for each degree field. These estimates are purely descriptive and do not control for additional observable characteristics. The results suggest that STEM and Business graduates experience the most wage growth over their careers, with earnings peaking higher than graduates from other fields. Arts and Letters and Behavioral and Health Sciences graduates also exhibit steady wage growth, though their peak earnings remain lower than those of STEM and Business graduates. In contrast, Education graduates have the slowest wage growth and the lowest peak earnings, likely reflecting the structured pay scales in the education sector where salaries are often set by standardized pay scales rather than market-based fluctuations. The distributions for Arts and Letters and Behavioral and Health Sciences graduates fall between these two extremes, showing moderate dispersion. Additionally, the left tail of the distribution is more pronounced for Arts and Letters and Behavioral and Health Sciences graduates, suggesting a higher proportion of low-wage workers compared to other fields. This may indicate that graduates in these fields are more likely to enter occupations with lower earnings potential or part-time employment.

5. Results

We find that demographic factors influence wages, providing insights into both baseline returns and how they shift with the inclusion of additional controls and fixed effects. We find patterns of rising wages with additional labor market experience, but at a diminishing rate. The wages increase as workers gain more experience. However, the returns experience tapers off over time, consistent with the standard human capital theory. This pattern reflects the intuition that early career investments in human capital yield the most significant returns. In contrast, later career wage growth slows as the marginal benefit of additional experience diminishes.

Generally speaking, Business degrees yield a wage premium over other degree types, except STEM. There is significant earnings differences across fields of study. For instance, the baseline specification shows that STEM graduates earn a statistically significant wage premium of approximately 5.1% relative to Business graduates. This premium remains significant at 1% when demographic factors are included but loses significance once industry placement is accounted for (Equation 4). In contrast, Education and Arts & Letters degrees exhibit substantial earnings penalties. The coefficient for Education degrees is -0.42 ($p < 0.01$) in the baseline model, indicating that these graduates earn roughly 42% less than their Business counterparts. Even after adjusting for additional controls and industry-fixed effects, the penalty for Education graduates remains large, at -0.15 ($p < 0.01$).

The STEM coefficient, which compares the STEM and Business degrees warrants further discussion. The coefficient associated with STEM transitions from being positive and statistically significant in Model 3 to statistically indistinguishable from zero in which includes industry-fixed effects. This suggests that the initial wage premium observed for STEM degrees may be mainly attributable to industry sorting rather than the degree itself. The coefficient indicates a meaningful wage advantage for STEM graduates relative to the baseline category (Business). However, once industry-fixed effects are introduced, that premium disappears, implying that STEM graduates are more likely to be employed in industries with higher average wages. When this industry-level variation is accounted for, the intrinsic wage advantage of a STEM degree diminishes, highlighting the critical role that occupational sorting plays in explaining wage differentials across fields of study. This shift underscores the importance of considering industry placement when interpreting the

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economic returns to specific degrees, as it demonstrates that a significant portion of the observed STEM premium can be attributed to the sectors where STEM graduates tend to work rather than the degree itself.

Unlike STEM degrees, where much of the initial wage premium is tied to industry placement, Business degrees appear to be more industry-agnostic. In other words, Business graduates may be distributed across a broader range of industries, many of which do not offer the highest average wages, yet they still experience consistent wage advantages. This suggests that the skills acquired in Business programs, such as management, finance, and general organizational knowledge, may be applicable and valued across multiple industry settings rather than confined to high-paying, specialized sectors. The relative resilience of the Business wage premium once industry effects are controlled highlights these degrees' flexibility and broad applicability, which likely helps sustain their earning potential across various occupational and sectoral contexts.

Among male graduates, the coefficient for STEM degrees is 0.0(not significant), while for females, the coefficient is -0.011, which is statistically significant at the 1% level. These results suggest that men and women experience different returns from STEM degrees, with women facing a slight penalty that does not appear for men. The STEM premium also shows stark heterogeneity across racial groups: Black graduates enjoy a significant STEM premium (0.046, $p < 0.01$), while White graduates experience a minor, statistically significant penalty (-0.018, $p < 0.01$). This suggests that Black graduates see more substantial earnings benefits from STEM fields than White graduates, potentially reflecting differences in occupational opportunities or sorting patterns. For Arts & Letters degrees, both men and women incur significant penalties, though the penalty is more prominent for men (- 0.16) than for women (-0.09), and both coefficients are highly significant ($p < 0.01$). Immigrant status also influences returns to major fields. Foreign-born graduates experience a statistically significant wage premium for STEM degrees (0.09, $p < 0.01$), compared to a slightly negative return for native-born graduates (-0.010, $p < 0.01$). The coefficients on Arts & Letters and Education degrees remain consistently negative and statistically significant for both groups, indicating that the penalties associated with these fields are mainly universal, regardless of nativity. These variations highlight the importance of examining how demographic factors intersect with the field of study to shape wage outcomes, offering a more nuanced understanding of the returns to college degrees.

Overall, the results highlight that earnings differentials across fields of study are not uniform. While STEM and Business graduates consistently achieve the highest earnings, the magnitude of these premiums and the severity of penalties for other fields vary by gender, race, and immigrant status. These patterns emphasize the importance of considering demographic heterogeneity when evaluating the economic returns of different college degrees.

6. Discussion

Even after adjusting for labour market experience and demographic traits, the analysis shows that salary disparities among college majors remain. The average salary of graduates with degrees in business and STEM fields is consistently higher than that of graduates with degrees in education, the arts and letters, and the behavioural and health sciences. Both regression-adjusted models and descriptive comparisons show these earnings premiums. STEM graduates often report the greatest yearly salaries, with business graduates coming in second. Education graduates, on the other hand, make far less money and have slower pay growth. These differences are consistent across experience levels, suggesting that pay disparities reflect long-term structural differences across disciplines rather than being restricted to early career stages.

The regression models provide further insight into the sources of these wage differentials. While STEM degrees are initially associated with a significant wage premium, this advantage diminishes and becomes statistically insignificant when introducing industry-fixed effects. This pattern suggests that the observed STEM premium is mainly attributable to the industries in which these graduates are employed, such as technology and engineering, rather than the degree itself. In contrast, the wage premium associated with business degrees remains relatively stable all model specifications. This

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indicates that business education may offer more transferable skills and cross-industry value that support sustained earnings over time.

The analysis also highlights consistent wage penalties for graduates in education and arts and letters. These fields display negative and statistically significant coefficients across all models, even after accounting for demographic variables and industry placement. This persistence suggests systemic factors such as rigid pay scales, limited promotional opportunities, and labor market segmentation contribute to lower earnings in these disciplines. The more compressed wage distributions observed for these graduates reinforce this conclusion, indicating fewer opportunities for high-wage advancement. In contrast, business and STEM graduates exhibit wider wage distributions, reflecting broader access to high-paying roles and greater potential for upward mobility.

Demographic variation adds further nuance to these patterns. The wage differentials associated with college majors vary meaningfully across gender, race, and immigration status. For example, male STEM graduates do not receive a statistically significant wage premium after controlling for industry, while female STEM graduates experience a slight but significant wage penalty. This suggests gendered barriers in accessing high-paying technical roles or promotion opportunities within those sectors. Racial disparities are also evident. Black graduates benefit from a substantial STEM premium, while White graduates experience a slight penalty, indicating differences in occupational sorting or labor market access. Similarly, immigrant graduates earn more from STEM degrees than native-born graduates, possibly reflecting alignment between STEM credentials and specialized labor market demands or visa policies that reward technical expertise.

These findings carry important implications for students, educators, and policymakers in the global business education landscape. Although STEM degrees are often promoted as the most lucrative option, this advantage heavily depends on access to specific industries. Advising students to pursue STEM solely for wage potential may be incomplete without addressing employment access and sector fit. In contrast, business degrees offer more consistent returns across sectors, reinforcing the value of business education in equipping graduates with adaptable and widely applicable skills. This supports the case for flexible, career-oriented curricula within international business programs.

Overall, these results demonstrate that while higher education enhances labor market outcomes, the magnitude and sustainability of those benefits depend significantly on the field of study and broader economic and social conditions. Demographic disparities and occupational sorting continue to influence wage trajectories in important ways. These findings align with research in career development, which shows that earnings and professional satisfaction are shaped not only by qualifications but also by career pathways and contextual factors

The findings of this study offer important insights for students, educators, career advisors, and policymakers who influence academic and career development. First, the results highlight the importance of transparent and data-informed career planning. Although STEM degrees are commonly perceived as the most financially rewarding, the evidence suggests that business degrees provide comparable and often more consistent wage advantages across industries and over time. Students should be encouraged to consider a broader range of academic disciplines, especially those emphasizing transferable skills and adaptability across sectors. Career advising should go beyond average salary reports and include more profound insights into industry placement, long-term earning potential, and alignment with individual goals.

For educators and curriculum designers, the findings reinforce the need to embed workforce readiness into all academic programs. Fields such as education, arts and letters, and behavioral and health sciences can benefit from expanded access to career development resources, stronger relationships with industry partners, and greater opportunities for experiential learning. High-impact practices such as internships, mentorship, and applied learning are especially valuable in disciplines where wage growth has traditionally been limited. Integrating leadership development, communication training, and entrepreneurial thinking into the curriculum can enhance graduates' career mobility and long-term earning potential. Building students' psychological capital, including

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optimism, resilience, self-efficacy, and hope, has been shown to improve engagement and job performance over time. Similarly, promoting a growth mindset, transformational leadership, and proactive personality traits supports adaptability and success in the early stages of a career.

Policymakers should take note of the consistent wage penalties faced by education graduates, even after accounting for experience and industry placement. These findings raise important concerns about pay equity in professions vital to society's functioning. Addressing these disparities may involve increasing compensation for educators, offering incentives for continued professional development, and revising inflexible salary structures that limit career advancement. In addition, the wage gaps observed by gender and race point to the need for strategies that ensure fair access to high-paying roles and eliminate systemic barriers to career growth.

This research also offers a valuable framework for guiding institutional and public investment in higher education. Understanding how academic pathways influence labor market outcomes can help universities and policymakers better allocate resources, improve the design of career-relevant programming, and reduce disparities in economic opportunity. When educational programs are purposefully aligned with workforce realities, graduates from all backgrounds are more likely to achieve meaningful and sustainable career success.

7. Conclusion

This comprehensive analysis of wage trajectories across academic disciplines reveals that the relationship between higher education and earnings is far more nuanced than conventional wisdom suggests. While the popular narrative positions STEM degrees as the unequivocal pathway to financial success, our findings demonstrate that business graduates achieve comparable and often more sustainable wage advantages across diverse industry contexts. The data challenges simplistic assumptions about academic major selection by revealing that wage differentials persist throughout career lifecycles and are significantly influenced by demographic characteristics, industry placement, and broader structural factors within labor markets.

The evidence presented here underscores that business education provides graduates with a distinctive combination of transferable skills and cross-sector adaptability that translates into consistent earning premiums regardless of industry context. Unlike STEM degrees, where wage advantages are largely attributable to employment in high-paying specialized sectors, business graduates maintain their earning potential across a broader range of occupational pathways. This finding has profound implications for how we conceptualize the value proposition of different academic disciplines and suggests that the flexibility inherent in business education may be increasingly valuable in dynamic labor markets characterized by rapid technological change and evolving professional requirements.

The persistent wage penalties observed for education, arts and letters, and behavioral and health sciences graduates point to deeper structural inequities within the labor market that extend beyond individual educational choices. These disparities reflect systemic undervaluation of professions that are essential to societal functioning, particularly in education and social services. The compressed wage distributions and limited upward mobility opportunities in these fields suggest that addressing these inequities will require comprehensive policy interventions rather than individual career adjustments. The finding that these penalties persist even after controlling for experience, demographics, and industry placement indicates that the problem lies not with the quality or dedication of graduates in these fields, but with broader societal and economic structures that systematically undervalue certain types of work.

Perhaps most significantly, this study reveals substantial demographic variation in the returns to different academic disciplines, highlighting how gender, race, and immigration status intersect with educational pathways to create differentiated labor market outcomes. The finding that female STEM graduates experience wage penalties while their male counterparts do not points to persistent barriers that prevent women from fully realizing the economic benefits of technical education. Similarly, the substantial STEM premium enjoyed by Black graduates compared to the slight penalty

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experienced by White graduates suggests complex dynamics related to occupational sorting, labor market access, and the role of technical credentials in overcoming other forms of discrimination. These patterns underscore that educational equity cannot be achieved simply through equal access to degree programs, but requires addressing the systematic barriers that prevent all graduates from achieving comparable returns on their educational investments.

The implications of these findings extend well beyond individual career planning to encompass fundamental questions about educational policy, workforce development, and social equity. For students and career advisors, the results suggest that decision-making about academic major selection should incorporate a more sophisticated understanding of how different degrees translate into career outcomes across various demographic groups and industry contexts. Rather than relying on aggregate salary data or popular perceptions about lucrative fields, prospective students need access to nuanced information about wage trajectories, industry placement patterns, and the specific skills that drive earning potential in different professional contexts.

For educational institutions, these findings highlight the critical importance of designing curricula that emphasize transferable skills, adaptability, and workforce readiness across all academic disciplines. The success of business programs in generating consistent wage premiums suggests that other fields could benefit from incorporating similar approaches to skill development, including leadership training, communication competencies, and practical problem-solving experience. High-impact practices such as internships, mentorship programs, and applied learning opportunities become particularly crucial for graduates in fields that have traditionally experienced wage penalties, as these experiences can help bridge the gap between academic preparation and career advancement.

The broader policy implications of this research are equally significant. The systematic undervaluation of education professionals revealed in our analysis raises important questions about societal priorities and the sustainability of essential public services. Addressing these disparities will likely require coordinated efforts to restructure compensation systems, enhance professional development opportunities, and recognize the true economic and social value of educational work. Similarly, the demographic variations in returns to different degrees point to the need for targeted interventions that address barriers faced by women, minorities, and other underrepresented groups in accessing high-paying career opportunities.

Looking toward the future, this study provides a foundation for understanding how educational pathways interact with evolving labor market conditions to shape career trajectories and economic mobility. As technological change continues to transform work across all sectors, the adaptability and cross-functional skills emphasized in business education may become increasingly valuable, while the industry-specific advantages currently associated with STEM degrees may prove more volatile. The demographic disparities revealed in our analysis also suggest that achieving true educational equity will require sustained attention to how different groups experience the transition from education to employment and ongoing efforts to dismantle the structural barriers that prevent all graduates from realizing their full potential.

Ultimately, this research demonstrates that higher education continues to serve as a powerful engine of economic mobility, but that the magnitude and sustainability of those benefits depend critically on the complex interplay between academic preparation, demographic characteristics, and labor market structures. By developing a more nuanced understanding of these relationships, we can work toward an educational system that better serves all students and contributes to broader goals of economic opportunity and social equity. The path forward requires not just better information about career outcomes, but fundamental changes in how we value different types of work and ensure that all graduates have access to meaningful and financially sustainable career opportunities regardless of their chosen field of study or demographic background.

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