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The Economic Returns to Higher Education: Evaluating Wage Premiums and Labor Market Outcomes Across Disciplines in Punjab, Pakistan

Dr. Aabida Lateef
Head of Education Department,Kahuta Haveli Campus,University of Poonch Rawalakot
Muhammad Adnan Riaz*
Lecturer, Department of Education, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi. Corresponding Author Email: adnanriaz@uaar.edu.pk
Muhammad Usman Bhatti
MS Scholars ,Department of Management Studies, Business School, Bahira University Islamabad.
Yusra Irfan
PhD Scholar, Department of Education, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi
Azra Raza
PhD Scholar, Department of Education, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi

Abstract

This study examines the economic returns to higher education in Punjab, Pakistan, by evaluating wage premiums and labor market outcomes across various academic disciplines. Using primary survey data from 1,000 university graduates and secondary data from the Pakistan Bureau of Statistics (PBS) and the Higher Education Commission (HEC) of Pakistan, the study analyzes wage differentials and employment rates across STEM (Science, Technology, Engineering, and Mathematics) and non-STEM fields. The results indicate significant variations in wage premiums, with STEM fields consistently yielding higher returns compared to non-STEM fields. The findings also highlight the impact of demographic factors such as gender and location, as well as labor market conditions, on wage outcomes. This research contributes to the ongoing debate on the value of higher education and provides insights for policymakers, educators, and students in Punjab.

Keywords: Wage Premiums; STEM; Demographic Factors; Market Condition

Introduction

Higher education has long been regarded as a cornerstone of economic prosperity, social mobility, and personal development. In an increasingly knowledge-driven global economy, the value of a college degree extends beyond individual benefits to encompass broader societal and economic gains. However, the economic

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returns to higher education are not uniform across all fields of study, geographic regions, or demographic groups. This variability has sparked a growing debate about the value of higher education, particularly in light of rising tuition costs, student debt, and shifting labor market demands. This study focuses on Punjab, Pakistan, to evaluate the economic returns to higher education by examining wage premiums and labor market outcomes across different academic disciplines. By doing so, it seeks to provide insights into the factors that shape these returns and offer policy recommendations to enhance the value of higher education in the region.

The Global Context of Higher Education and Economic Returns

The relationship between higher education and economic outcomes has been a central focus of research in labor economics, sociology, and education policy. Becker's (1964) human capital theory provides the foundational framework for understanding this relationship. According to Becker, individuals invest in education to acquire skills and knowledge that enhance their productivity, thereby increasing their earnings potential. This investment is akin to physical capital investment, where individuals weigh the costs of education (e.g., tuition, foregone earnings) against the expected benefits (e.g., higher wages, better job opportunities). Empirical studies have consistently shown that higher levels of education are associated with higher earnings, with college graduates earning significantly more than those with only a high school diploma (Card, 1999; Psacharopoulos & Patrinos, 2004).

However, the relationship between education and earnings is not linear. Mincer (1974) expanded on Becker's work by developing the human capital earnings function, which models earnings as a function of years of schooling, work experience, and other factors. Mincer's model highlights the diminishing returns to additional years of education, suggesting that the wage premium for each additional year of schooling decreases as individuals attain higher levels of education. This insight has important implications for understanding the economic returns to higher education, as it suggests that the choice of field of study may be as important as the level of education in determining wage outcomes.

The Role of Field of Study in Shaping Economic Returns

While human capital theory provides a useful framework for understanding the general relationship between education and earnings, it does not fully account for the significant variations in wage premiums across different fields of study. A growing body of research has examined the role of field of study in shaping economic returns, with a particular focus on the disparities between STEM (Science, Technology, Engineering, and Mathematics) and non-STEM fields.

STEM vs. Non-STEM Fields

STEM fields have consistently been associated with higher wage premiums and stronger labor market outcomes compared to non-STEM fields (Carnevale et al., 2011; Roksa & Levey, 2010). This disparity is often attributed to the high demand

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for technical skills in industries such as information technology, engineering, and healthcare, which are at the forefront of innovation and economic growth (Autor et al., 2003). For example, a study by Carnevale et al. (2011) found that engineering and computer science graduates earn median wages that are significantly higher than those of graduates in fields such as education and the humanities. Similarly, Roksa and Levey (2010) found that STEM graduates are more likely to be employed in high-status occupations and experience faster wage growth over their careers.

The higher economic returns to STEM fields are also driven by the scarcity of skilled workers in these areas. As technological advancements continue to reshape the labor market, the demand for STEM skills has outpaced the supply of qualified workers, leading to higher wages and better job prospects for STEM graduates (Abel & Gabe, 2011). This trend is particularly evident in the technology sector, where rapid innovation has created a persistent skills gap, with employers struggling to find workers with the necessary technical expertise (Burning Glass Technologies, 2014).

In contrast, non-STEM fields—such as the humanities, social sciences, and education—often yield lower wage premiums and less stable employment outcomes. This is partly due to the lower demand for these skills in the labor market, as well as the oversupply of graduates in certain fields (Altonji et al., 2012). For example, a study by Altonji et al. (2012) found that graduates in the humanities and social sciences are more likely to be underemployed (i.e., working in jobs that do not require a college degree) and earn lower wages compared to their STEM counterparts. These findings highlight the importance of aligning educational choices with labor market demand to maximize economic returns.

Variations Within STEM and Non-STEM Fields

While the distinction between STEM and non-STEM fields is useful for understanding broad trends in wage premiums, it is important to recognize that there is significant variation within these categories. For example, within STEM fields, engineering and computer science tend to yield the highest wage premiums, while fields such as biology and environmental science offer more modest returns (Carnevale et al., 2011). Similarly, within non-STEM fields, business and economics graduates often earn higher wages than those in the humanities and social sciences (Altonji et al., 2012).

These variations are driven by differences in labor market demand, the specificity of skills acquired, and the occupational pathways available to graduates. For example, engineering and computer science graduates often enter high-paying occupations in the technology and manufacturing sectors, where their technical skills are in high demand (Abel & Deitz, 2014). In contrast, biology and environmental science graduates may face more limited job opportunities, particularly if they do not pursue advanced degrees or specialized training (Roksa & Levey, 2010).

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Labor Market Conditions and Economic Returns

The economic returns to higher education are not static; they are influenced by broader labor market conditions, including economic cycles, industry trends, and technological change. For example, the Great Recession of 2008-2009 had a profound impact on employment rates and wage growth across all sectors, but the effects were not evenly distributed across fields of study (Hout et al., 2011). STEM graduates experienced relatively stable employment rates and wage growth during this period, while graduates in non-STEM fields faced higher unemployment rates and stagnant wages (Abel & Deitz, 2014). This suggests that the economic resilience of different disciplines is closely tied to their alignment with labor market needs and technological trends.

Technological change has also played a significant role in shaping the demand for skills and the economic returns to higher education. Autor et al. (2003) argue that technological advancements have led to a polarization of the labor market, with high-skill, high-wage occupations (e.g., software engineers, data scientists) and low-skill, low-wage occupations (e.g., retail workers, food service workers) growing at the expense of middle-skill, middle-wage occupations (e.g., clerical workers, factory workers). This polarization has increased the wage premium for high-skill occupations, particularly in STEM fields, while reducing opportunities for middle-skill workers, many of whom hold degrees in non-STEM fields.

Demographic Disparities in Economic Returns

In addition to field of study and labor market conditions, demographic factors such as gender and race play a critical role in shaping the economic returns to higher education. Despite the overall higher returns to STEM fields, women and minorities often earn less than their male and white counterparts, even within the same discipline (Blau & Kahn, 2017; Carnoy, 1994). These disparities are driven by a combination of factors, including occupational segregation, discrimination, and differences in negotiation skills (Blau & Kahn, 2017).

For example, women are underrepresented in high-paying STEM fields such as engineering and computer science, and are more likely to be concentrated in lower-paying fields such as education and the health sciences (Corbett & Hill, 2015). This occupational segregation contributes to the gender wage gap, as women are less likely to enter occupations that offer the highest wage premiums. Similarly, racial and ethnic minorities face barriers to entry and advancement in high-paying fields, resulting in lower wages and fewer opportunities for career progression (Carnoy, 1994).

The Context of Punjab, Pakistan

Punjab, the most populous province of Pakistan, serves as the study area for this research. With a population of over 110 million people, Punjab is not only the economic hub of Pakistan but also the center of its educational infrastructure. The province is home to a significant number of public and private universities,

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producing a large proportion of the country's graduates each year. However, despite its prominence in education, Punjab faces challenges such as high youth unemployment, skill mismatches, and disparities in wage outcomes across different fields of study. These issues make Punjab an ideal setting for examining the economic returns to higher education, particularly the wage premiums and labor market outcomes across disciplines.

Punjab's labor market is characterized by a mix of traditional and modern industries, including agriculture, manufacturing, services, and information technology. The province has seen rapid urbanization and technological advancements in recent years, particularly in cities like Lahore, Faisalabad, and Rawalpindi, which are home to growing IT and services sectors. However, the benefits of these developments have not been evenly distributed, with significant disparities in employment opportunities and wage outcomes between urban and rural areas, as well as across different fields of study. This study aims to provide a detailed analysis of these disparities, focusing on the economic returns to higher education in Punjab.

Research Questions and Objectives

This study seeks to answer the following research questions:

- What are the wage premiums associated with different academic disciplines in Punjab, Pakistan?
- How do labor market outcomes, such as employment rates, vary across disciplines in Punjab?
- What factors contribute to the observed variations in wage premiums and labor market outcomes, including demographic characteristics and labor market conditions?

By addressing these questions, the study aims to provide insights into the economic returns to higher education in Punjab and offer policy recommendations to enhance the value of higher education in the region.

Literature Review

The literature on the economic returns to higher education is vast and multidisciplinary, encompassing contributions from labor economics, sociology, and education policy. This section reviews the existing literature, focusing on three key themes: (1) the theoretical foundations of human capital and wage premiums, (2) the role of field of study in shaping economic returns, and (3) the impact of labor market conditions and demographic factors on wage outcomes.

Theoretical Foundations: Human Capital and Wage Premiums

The concept of human capital, introduced by Becker (1964), serves as the theoretical foundation for understanding the economic returns to education. According to human capital theory, individuals invest in education to acquire skills and knowledge that enhance their productivity, thereby increasing their earnings potential. This investment is akin to physical capital investment, where individuals weigh the costs of education (e.g., tuition, foregone earnings) against

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the expected benefits (e.g., higher wages, better job opportunities). Becker's framework has been widely applied to explain wage differentials between individuals with different levels of education, with empirical studies consistently showing that higher levels of education are associated with higher earnings (Card, 1999; Psacharopoulos & Patrinos, 2004).

However, the relationship between education and earnings is not linear. Mincer (1974) expanded on Becker's work by developing the human capital earnings function, which models earnings as a function of years of schooling, work experience, and other factors. Mincer's model highlights the diminishing returns to additional years of education, suggesting that the wage premium for each additional year of schooling decreases as individuals attain higher levels of education. This insight has important implications for understanding the economic returns to higher education, as it suggests that the choice of field of study may be as important as the level of education in determining wage outcomes. More recent research has critiqued the human capital framework for its narrow focus on individual investment decisions, arguing that it overlooks structural factors such as labor market institutions, technological change, and social inequality (Bowles & Gintis, 1976; Goldin & Katz, 2008). For example, Goldin and Katz (2008) emphasize the role of technological change in shaping the demand for skills, arguing that the wage premium for higher education is driven by the interaction between technological advancements and the supply of skilled labor. This perspective underscores the importance of considering broader economic and institutional contexts when analyzing the economic returns to higher education.

The Role of Field of Study in Shaping Economic Returns

While human capital theory provides a useful framework for understanding the general relationship between education and earnings, it does not fully account for the significant variations in wage premiums across different fields of study. A growing body of research has examined the role of field of study in shaping economic returns, with a particular focus on the disparities between STEM and non-STEM fields.

STEM vs. Non-STEM Fields

STEM fields—encompassing science, technology, engineering, and mathematics—have consistently been associated with higher wage premiums and stronger labor market outcomes compared to non-STEM fields (Carnevale et al., 2011; Roksa & Levey, 2010). This disparity is often attributed to the high demand for technical skills in industries such as information technology, engineering, and healthcare, which are at the forefront of innovation and economic growth (Autor et al., 2003). For example, a study by Carnevale et al. (2011) found that engineering and computer science graduates earn median wages that are significantly higher than those of graduates in fields such as education and the humanities. Similarly, Roksa and Levey (2010) found that STEM graduates are more likely to be employed in high-status occupations and experience faster wage growth over their careers.

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The higher economic returns to STEM fields are also driven by the scarcity of skilled workers in these areas. As technological advancements continue to reshape the labor market, the demand for STEM skills has outpaced the supply of qualified workers, leading to higher wages and better job prospects for STEM graduates (Abel & Gabe, 2011). This trend is particularly evident in the technology sector, where rapid innovation has created a persistent skills gap, with employers struggling to find workers with the necessary technical expertise (Burning Glass Technologies, 2014).

In contrast, non-STEM fields—such as the humanities, social sciences, and education—often yield lower wage premiums and less stable employment outcomes. This is partly due to the lower demand for these skills in the labor market, as well as the oversupply of graduates in certain fields (Altonji et al., 2012). For example, a study by Altonji et al. (2012) found that graduates in the humanities and social sciences are more likely to be underemployed (i.e., working in jobs that do not require a college degree) and earn lower wages compared to their STEM counterparts. These findings highlight the importance of aligning educational choices with labor market demand to maximize economic returns.

Variations Within STEM and Non-STEM Fields

While the distinction between STEM and non-STEM fields is useful for understanding broad trends in wage premiums, it is important to recognize that there is significant variation within these categories. For example, within STEM fields, engineering and computer science tend to yield the highest wage premiums, while fields such as biology and environmental science offer more modest returns (Carnevale et al., 2011). Similarly, within non-STEM fields, business and economics graduates often earn higher wages than those in the humanities and social sciences (Altonji et al., 2012).

These variations are driven by differences in labor market demand, the specificity of skills acquired, and the occupational pathways available to graduates. For example, engineering and computer science graduates often enter high-paying occupations in the technology and manufacturing sectors, where their technical skills are in high demand (Abel & Deitz, 2014). In contrast, biology and environmental science graduates may face more limited job opportunities, particularly if they do not pursue advanced degrees or specialized training (Roksa & Levey, 2010).

Labor Market Conditions and Demographic Factors

In addition to field of study, labor market conditions and demographic factors play a critical role in shaping the economic returns to higher education. This section reviews the literature on the impact of economic cycles, technological change, and demographic disparities on wage premiums and labor market outcomes.

Labor Market Conditions

The economic returns to higher education are not static; they are influenced by broader labor market conditions, including economic cycles, industry trends, and

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technological change. For example, the Great Recession of 2008-2009 had a profound impact on employment rates and wage growth across all sectors, but the effects were not evenly distributed across fields of study (Hout et al., 2011). STEM graduates experienced relatively stable employment rates and wage growth during this period, while graduates in non-STEM fields faced higher unemployment rates and stagnant wages (Abel & Deitz, 2014). This suggests that the economic resilience of different disciplines is closely tied to their alignment with labor market needs and technological trends.

Technological change has also played a significant role in shaping the demand for skills and the economic returns to higher education. Autor et al. (2003) argue that technological advancements have led to a polarization of the labor market, with high-skill, high-wage occupations (e.g., software engineers, data scientists) and low-skill, low-wage occupations (e.g., retail workers, food service workers) growing at the expense of middle-skill, middle-wage occupations (e.g., clerical workers, factory workers). This polarization has increased the wage premium for high-skill occupations, particularly in STEM fields, while reducing opportunities for middle-skill workers, many of whom hold degrees in non-STEM fields.

Demographic Factors

Demographic factors such as gender and race also play a significant role in shaping wage premiums and labor market outcomes. Despite the overall higher returns to STEM fields, women and minorities often earn less than their male and white counterparts, even within the same discipline (Blau & Kahn, 2017; Carnoy, 1994). These disparities are driven by a combination of factors, including occupational segregation, discrimination, and differences in negotiation skills (Blau & Kahn, 2017).

For example, women are underrepresented in high-paying STEM fields such as engineering and computer science, and are more likely to be concentrated in lower-paying fields such as education and the health sciences (Corbett & Hill, 2015). This occupational segregation contributes to the gender wage gap, as women are less likely to enter occupations that offer the highest wage premiums. Similarly, racial and ethnic minorities face barriers to entry and advancement in high-paying fields, resulting in lower wages and fewer opportunities for career progression (Carnoy, 1994).

Gaps in the Literature

While the existing literature provides valuable insights into the economic returns to higher education, there are several gaps that this study seeks to address. First, much of the research on field of study and wage premiums has focused on broad categories (e.g., STEM vs. non-STEM), with limited attention to variations within these categories. This study provides a more nuanced analysis by examining wage premiums and labor market outcomes across specific disciplines, including both STEM and non-STEM fields.

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Second, while the impact of labor market conditions and demographic factors on wage premiums has been widely studied, there is limited research on how these factors interact with field of study to shape economic outcomes. This study addresses this gap by analyzing the interplay between field of study, labor market conditions, and demographic factors in determining wage premiums and employment rates.

Finally, much of the existing research relies on data from specific time periods or regions, limiting the generalizability of the findings. This study utilizes nationally representative data from the U.S. Bureau of Labor Statistics (BLS) and the National Center for Education Statistics (NCES), providing a more comprehensive and up-to-date analysis of the economic returns to higher education.

Data and Methods

Study Area: Punjab, Pakistan

Punjab, the most populous province of Pakistan, serves as the study area for this research. With a population of over 110 million people, Punjab is not only the economic hub of Pakistan but also the center of its educational infrastructure. The province is home to a significant number of public and private universities, producing a large proportion of the country's graduates each year. However, despite its prominence in education, Punjab faces challenges such as high youth unemployment, skill mismatches, and disparities in wage outcomes across different fields of study. These issues make Punjab an ideal setting for examining the economic returns to higher education, particularly the wage premiums and labor market outcomes across disciplines.

Punjab's labor market is characterized by a mix of traditional and modern industries, including agriculture, manufacturing, services, and information technology. The province has seen rapid urbanization and technological advancements in recent years, particularly in cities like Lahore, Faisalabad, and Rawalpindi, which are home to growing IT and services sectors. However, the benefits of these developments have not been evenly distributed, with significant disparities in employment opportunities and wage outcomes between urban and rural areas, as well as across different fields of study. This study aims to provide a detailed analysis of these disparities, focusing on the economic returns to higher education in Punjab.

Data Sources

This study utilizes primary and secondary data to analyze wage premiums and labor market outcomes across disciplines in Punjab, Pakistan. The primary data source is a survey conducted among university graduates in Punjab, while secondary data is obtained from government reports and educational institutions.

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Primary Data: Graduate Survey

A structured survey was conducted among 1,000 university graduates from public and private universities in Punjab. The survey collected data on the following variables:

Field of Study: The academic discipline in which the respondent earned their bachelor's degree, categorized into STEM (Science, Technology, Engineering, and Mathematics) and non-STEM (Humanities, Social Sciences, Business, and Education) fields.

Wage Premiums: The difference between the respondent's current monthly wage and the average monthly wage of individuals with only a high school diploma in Punjab.

Employment Status: Whether the respondent is employed full-time, part-time, or unemployed.

Demographic Information: Age, gender, marital status, and location (urban vs. rural).

Job Characteristics: Industry, occupation, and job satisfaction.

The survey was conducted in both urban and rural areas of Punjab to ensure a representative sample. Stratified random sampling was used to select respondents from different fields of study and geographic locations.

Secondary Data

Secondary data was obtained from the following sources:

Pakistan Bureau of Statistics (PBS): Provided data on average wages by education level and employment rates in Punjab.

Higher Education Commission (HEC) of Pakistan: Supplied data on the number of graduates by field of study from public and private universities in Punjab.

Punjab Skills Development Fund (PSDF): Offered insights into labor market demand and skill gaps in Punjab.

Variables

The key variables used in this study are as follows:

Dependent Variables

Wage Premium: The difference between the monthly wage of a university graduate and the average monthly wage of individuals with only a high school diploma in Punjab.

Employment Status: A categorical variable indicating whether the respondent is employed full-time, part-time, or unemployed.

Independent Variables

Field of Study: Categorized into STEM (e.g., engineering, computer science, natural sciences) and non-STEM (e.g., humanities, social sciences, business, education) fields.

Demographic Variables: Age, gender (male, female), marital status (single, married), and location (urban, rural).

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Job Characteristics: Industry (e.g., IT, manufacturing, services), occupation (e.g., engineer, teacher, manager), and job satisfaction (measured on a 5-point Likert scale).

Methodology

The analysis employs a mixed-methods approach, combining descriptive statistics, regression analysis, and qualitative insights from open-ended survey questions. The methodology is designed to provide a comprehensive understanding of the economic returns to higher education in Punjab, Pakistan.

Descriptive Statistics

Descriptive statistics are used to summarize the wage premiums and employment rates across different fields of study. The analysis also examines variations in wage premiums and employment outcomes by demographic characteristics (e.g., gender, location) and job characteristics (e.g., industry, occupation).

Regression Analysis

Regression analysis is conducted to estimate the impact of field of study on wage premiums and employment outcomes, controlling for demographic and job-related variables. Two regression models are specified:

Model 1: Wage Premiums

Wage Premiumi=β0+β1Field of Studyi+β2Demographic Variablesi+β3Job Characteristicsi+ϵiWage Premium$_i$=β0+β1Field of Study$_i$+β2Demographic Variables$_i$+β3Job Characteristics$_i$+ϵ_i

Model 2: Employment Status

Employment Statusi=β0+β1Field of Studyi+β2Demographic Variablesi+β3Job Characteristicsi+ϵiEmployment Status$_i$=β0+β1Field of Study$_i$+β2Demographic Variables$_i$+β3Job Characteristics$_i$+ϵ_i

Where:

- Wage PremiumiWage Premium$_i$ is the wage premium for individual i$_i$.
- Employment Statusi Employment Status$_i$ is a categorical variable indicating the employment status of individual i$_i$.
- Field of Studyi Field of Study$_i$ is a categorical variable indicating the field of study of individual i$_i$.
- Demographic Variablesi Demographic Variables$_i$ include age, gender, marital status, and location.
- Job Characteristics iJob Characteristics$_i$ include industry, occupation, and job satisfaction.
- ϵ_i is the error term.

Qualitative Analysis

Open-ended survey questions are analyzed to gain qualitative insights into the challenges and opportunities faced by graduates in different fields of study. Themes such as skill mismatches, job satisfaction, and barriers to employment are identified and discussed.

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Data Collection Process

The data collection process involved the following steps:

Survey Design: A structured questionnaire was developed, incorporating both closed-ended and open-ended questions.

Sampling: Stratified random sampling was used to select 1,000 graduates from public and private universities in Punjab, ensuring representation across fields of study and geographic locations.

Data Collection: The survey was administered through face-to-face interviews and online platforms, depending on the accessibility of respondents.

Data Cleaning: The collected data was cleaned and coded to ensure accuracy and consistency.

Ethical Considerations

The study adhered to ethical guidelines for research involving human subjects. Informed consent was obtained from all participants, and confidentiality was maintained throughout the data collection and analysis process. Participants were informed of their right to withdraw from the study at any time.

Limitations

While this study provides valuable insights into the economic returns to higher education in Punjab, it has some limitations. First, the sample size of 1,000 graduates, while representative, may not capture the full diversity of experiences across the province. Second, the reliance on self-reported data for wages and employment status may introduce measurement errors. Finally, the study focuses on Punjab and may not be generalizable to other provinces in Pakistan.

Results and Discussion

Descriptive Statistics

Wage Premiums by Field of Study

Table 1 presents the average wage premiums for graduates in different fields of study. The results show significant variations in wage premiums across disciplines, with STEM fields consistently outperforming non-STEM fields. Engineering and computer science graduates earn the highest wage premiums, followed by natural sciences and health sciences. In contrast, graduates in the humanities and education earn the lowest wage premiums.

Table 1: Average Wage Premiums by Field of Study

Field of Study	Average Wage Premium (PKR)	Standard Deviation
Engineering	45,000	5,000
Computer Science	42,000	4,800
Natural Sciences	35,000	4,200
Health Sciences	32,000	3,900
Business	28,000	3,500
Social Sciences	22,000	3,000
Humanities	18,000	2,800

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Field of Study	Average Wage Premium (PKR)	Standard Deviation
Education	15,000	2,500

Interpretation: The higher wage premiums for STEM graduates reflect the strong demand for technical skills in Punjab's labor market, particularly in industries such as IT, manufacturing, and healthcare. In contrast, the lower wage premiums for non-STEM graduates, especially in the humanities and education, highlight the challenges faced by these graduates in securing high-paying jobs. These findings align with previous studies that emphasize the economic advantages of STEM fields (Carnevale et al., 2011; Roksa & Levey, 2010).

Employment Rates by Field of Study

Table 2 shows the employment rates for graduates in different fields of study. STEM graduates have higher employment rates compared to non-STEM graduates, with engineering and computer science graduates experiencing the highest rates of full-time employment. Graduates in the humanities and education have the lowest employment rates, with a significant proportion working part-time or unemployed.

Table 2: Employment Rates by Field of Study

Field of Study	Full-Time Employment Rate	Part-Time Employment Rate	Unemployment Rate
Engineering	92%	5%	3%
Computer Science	90%	6%	4%
Natural Sciences	85%	8%	7%
Health Sciences	88%	7%	5%
Business	80%	10%	10%
Social Sciences	75%	12%	13%
Humanities	70%	15%	15%
Education	68%	16%	16%

Interpretation: The higher employment rates for STEM graduates reflect the alignment between their skills and labor market demand. In contrast, the lower employment rates for non-STEM graduates, particularly in the humanities and education, suggest a mismatch between the skills acquired during education and the requirements of the labor market. These findings are consistent with studies highlighting the challenges faced by non-STEM graduates in securing stable employment (Altonji et al., 2012; Abel & Deitz, 2014).

Wage Premiums by Demographic Characteristics

Table 3 presents the average wage premiums by demographic characteristics. Male graduates earn higher wage premiums than female graduates, and urban graduates earn higher wage premiums than rural graduates. These disparities highlight the role of gender and location in shaping economic outcomes.

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Table 3: Average Wage Premiums by Demographic Characteristics

Demographic Group	Average Wage Premium (PKR)	Standard Deviation
Male	35,000	4,500
Female	25,000	3,800
Urban	38,000	4,200
Rural	22,000	3,000

Interpretation: The gender wage gap reflects broader societal inequalities, including occupational segregation and discrimination (Blau & Kahn, 2017). The urban-rural wage gap highlights the uneven distribution of economic opportunities in Punjab, with urban areas offering better-paying jobs and more diverse employment opportunities.

Regression Analysis

Wage Premiums

Table 4 presents the results of the regression analysis for wage premiums. The model shows that field of study, gender, and location are significant predictors of wage premiums. STEM graduates earn significantly higher wage premiums than non-STEM graduates, even after controlling for demographic and job-related variables. Male graduates and urban graduates also earn higher wage premiums than their female and rural counterparts.

Table 4: Regression Results for Wage Premiums

Variable	Coefficient	Standard Error	p-value
STEM Field	20,000	1,500	0.000
Gender (Female)	-10,000	1,200	0.000
Location (Rural)	-15,000	1,800	0.000
Age	500	100	0.001
Job Satisfaction	2,000	500	0.002

Interpretation: The positive coefficient for STEM fields confirms the higher economic returns associated with these disciplines. The negative coefficients for gender and location highlight the persistent inequalities in Punjab's labor market, which require targeted policy interventions.

Employment Status

Table 5 presents the results of the regression analysis for employment status. STEM graduates are more likely to be employed full-time than non-STEM graduates. Male graduates and urban graduates also have higher employment rates than their female and rural counterparts.

Table 5: Regression Results for Employment Status

Variable	Coefficient	Standard Error	p-value
STEM Field	0.25	0.05	0.000
Gender (Female)	-0.15	0.04	0.001
Location (Rural)	-0.20	0.06	0.000

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Variable	Coefficient	Standard Error	p-value
Age	0.02	0.01	0.005
Job Satisfaction	0.10	0.03	0.002

Interpretation: The positive coefficient for STEM fields reflects their strong labor market demand. The negative coefficients for gender and location underscore the need for policies that promote gender equality and rural development.

Qualitative Insights

The qualitative analysis of open-ended survey questions revealed several key themes:

Skill Mismatches: Many non-STEM graduates reported difficulties finding jobs that matched their qualifications, highlighting the need for curriculum reforms and skill development programs.

Job Satisfaction: STEM graduates expressed higher levels of job satisfaction, citing better pay and career progression opportunities.

Barriers to Employment: Female graduates and rural graduates faced additional barriers, including limited job opportunities and societal expectations.

Conclusion

This study provides a comprehensive analysis of the economic returns to higher education in Punjab, Pakistan, focusing on wage premiums and labor market outcomes across disciplines. The findings highlight the significant advantages of STEM fields, which offer higher wage premiums and better employment prospects compared to non-STEM fields. However, the study also reveals persistent inequalities based on gender and location, which require targeted policy interventions.

Key Findings

STEM Fields Yield Higher Returns: Graduates in STEM fields, particularly engineering and computer science, enjoy higher wage premiums and employment rates compared to non-STEM graduates.

Non-STEM Graduates Face Challenges: Graduates in the humanities and education face lower wage premiums and employment rates, reflecting a mismatch between their skills and labor market demand.

Gender and Location Disparities: Male graduates and urban graduates earn higher wage premiums and have higher employment rates than their female and rural counterparts, highlighting the need for policies to address these inequalities.

Job Satisfaction Matters: STEM graduates report higher levels of job satisfaction, while non-STEM graduates often face underemployment and low job satisfaction.

Policy Recommendations

- **Promote STEM Education**: Increase investment in STEM education and training programs to meet labor market demand and enhance economic returns.

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- **Reform Non-STEM Curricula**: Align non-STEM curricula with labor market needs by incorporating practical skills such as data analysis, digital literacy, and communication.
- **Address Gender Disparities**: Implement policies to promote gender equality in education and employment, such as scholarships for women in STEM fields and workplace diversity initiatives.
- **Support Rural Development**: Expand job opportunities in rural areas through infrastructure development, incentives for private sector investment, and access to high-quality education.
- **Enhance Career Counseling**: Provide career counseling and mentorship programs to help students make informed decisions about their field of study and career paths.

Future Research Directions

Long-Term Career Trajectories: Explore the long-term career trajectories of graduates in different fields of study to understand how economic returns evolve over time.

Impact of Policy Interventions: Evaluate the impact of policy interventions, such as curriculum reforms and skill development programs, on wage premiums and employment outcomes.

Regional Comparisons: Conduct comparative studies across provinces in Pakistan to identify regional variations in the economic returns to higher education.

Subjective Outcomes: Investigate the role of subjective outcomes, such as job satisfaction and work-life balance, in shaping the economic returns to higher education.

Final Thoughts

The economic returns to higher education are a critical issue for policymakers, educators, and students in Punjab, Pakistan. While STEM fields offer significant advantages, addressing the challenges faced by non-STEM graduates and reducing gender and location-based disparities are essential for promoting inclusive economic growth. By aligning education with labor market needs and implementing targeted policy interventions, Punjab can unlock the full potential of its higher education system and ensure that all graduates have the opportunity to achieve economic prosperity.

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