Gendered Labor Outcomes among STEM Professionals in Mexico: Educational Expansion and Structural Inequalities, 2005–2023

SHORT ABSTRACT

At the international level, STEM education has been promoted as a key strategy to foster innovation, productivity, and competitiveness, and Mexico has followed this trend through public policies aimed at increasing the number of STEM professionals, especially women. The growing proportion of tertiary-educated individuals requires a closer examination of internal heterogeneities, such as those defined by educational fields. This research describes and analyzes the heterogeneity of labor conditions among tertiary-educated individuals aged 25–39 between 2005 and 2023, examining how educational expansion and policies to promote STEM training have interacted with persistent gender and structural inequalities. Using microdata from the National Survey of Occupation and Employment (ENOE), the study adopts a quantitative approach that combines logistic regression models and quantile regressions. The former are estimated to identify the factors associated with the correspondence between education and occupation, while the latter explore wage distribution patterns related to field of study (STEM, social sciences, and others) and sociodemographic characteristics. Results indicate that being male, holding a postgraduate degree, being single, childless, and older within the age group increases the odds of job–education matching; however, STEM graduates show a higher probability of mismatch compared to others. Quantile regressions reveal persistent wage gaps both across and within fields, particularly between men and women. Furthermore, a temporal contraction in real income (from 2005 to 2023) reflects structural weaknesses in the Mexican labor market to provide sustained economic advantages for individuals with higher qualifications.

Keywords: *STEM education; gender inequalities; educational expansion; labor market segmentation; Mexico.*

EXTENDED ABSTRACT

INTRODUCTION

In Mexico, the population with tertiary education has grown steadily in the context of an advanced demographic transition and efforts to harness the demographic dividend. In 2023, approximately 22% of the population aged 25 and older had completed higher education; among those aged 25 to 39, the proportion reached 31%, making it the predominant educational level within that age group. This increase reflects progress in educational attainment and gender equity, but also raises new challenges for understanding internal heterogeneities within this group amid educational expansion and labor market transformation.

At the international level, STEM education (science, technology, engineering, and mathematics) has been promoted as a key strategy to foster innovation, productivity, and competitiveness. Mexico has followed this trend through public policies aimed at increasing the number of professionals in these fields, particularly women. Within this framework, the sustained growth of the tertiary-educated population calls for a closer examination of its internal heterogeneities, especially those defined by field of study, gender, and associated labor conditions.

This study analyzes the diversity of labor conditions among tertiary-educated individuals aged 25–39 between 2005 and 2023, examining how educational expansion and policies promoting STEM training have interacted with persistent gender inequalities, labor market structures, and the dynamics of demographic transition. The research is structured around two analytical axes: gender, to identify disparities and their relation to family and occupational characteristics, and field of study, to examine if STEM professionals maintain advantages compared to those with other academic backgrounds. The analysis combines logistic regression and quantile regression models, using microdata from the National Survey of Occupation and Employment (ENOE) for 2005 and 2023.

THEORETICAL FOCUS

Within the knowledge economy and the broader context of productive globalization, several multilateral organizations have promoted an international agenda positioning STEM education as a strategic component of economic development and technological innovation (UNESCO, 2005). However, one of the main challenges of this agenda has been the limited participation of women in science and technology fields, reflecting the persistence of gender-based educational and occupational segmentation. In Mexico, despite public policies aimed at strengthening technological education and expanding women's participation (Mendoza, 2015; Ruiz-Larraguivel, 2011; Silva-Laya, 2012), female representation remains low. These dynamics highlight how gender inequalities intersect with educational fields and employment opportunities, reproducing horizontal segregation patterns within the labor market.

Higher education continues to serve as a central mechanism for social mobility and occupational differentiation, although the opportunities it offers vary by disciplinary field, type of institution, and conditions of labor insertion. From the perspective of social stratification, this differentiation constitutes a form of horizontal inequality that unequally distributes social groups across disciplines and programs with different symbolic and economic value (Solís, 2015). Such inequalities reinforce academic and cultural hierarchies while shaping professional trajectories and future well-being.

In addition, the education–employment mismatch—defined as the discordance between acquired skills and job requirements—remains a key feature of Mexico's labor market. Several studies have documented an underutilization of skills among the highly educated, a problem that affects professionals more severely than open unemployment (Hernández, Solís & Stefanovich, 2013; Lozano & Ramírez-García, 2015). This mismatch reflects both the inadequate absorption of qualified labor and the broader challenges of aligning education with employment demand.

Parallel to these trends, the expansion of higher education has been accompanied by growing wage dispersion among highly educated groups, suggesting that massification has not led to homogeneous economic returns (Prieto, Pestana & Vieira, 2008; Budría & Telhado, 2005). The STEM case is therefore paradigmatic for understanding how educational expansion can coexist with persistent vertical and horizontal segmentation that reproduces social and gender inequalities, revealing the limits of higher education expansion in Latin America.

DATA AND METHODS

This analysis draws on data from the National Survey of Occupation and Employment (ENOE), a key source for studying the evolution of Mexico's labor market and the insertion of tertiary-educated workers. Conducted continuously since 2005, the ENOE provides nearly two decades of nationally representative information on occupational structure, employment quality, and sociodemographic characteristics of the labor force.

Microdata from the third quarter of 2005 and 2023 were used to compare changes over time. The study focuses on the population aged 25 and older, emphasizing the 25–39 age group. Most individuals in this range have completed their studies and are active in the labor market; moreover, these cohorts entered higher education during the 1990s and 2000s, coinciding with the modernization and expansion of Mexico's tertiary education system.

The analysis combines two complementary methodological strategies. First, binary logistic regression models were estimated to identify factors associated with the probability of having a job matching one's educational qualifications. Models were estimated separately for men and women to better capture gender differences. Explanatory variables included field of study (STEM, social sciences, and others), age group, postgraduate studies, marital status, and presence of children (for women).

Second, quantile regression models were applied to analyze how the determinants of income operate along the wage distribution. Five quantiles were estimated ($\tau = 0.10, 0.25, 0.50, 0.75$, and 0.90), allowing assessment of effects across different segments of the labor market—from low-wage to high-wage strata. Additional variables related to job quality were incorporated, including education–occupation match, contract stability, and employment formality. This approach enables identifying whether the advantages or disadvantages associated with gender, field of study, or employment conditions are concentrated in the most precarious sectors or among those with greater mobility opportunities.

PRELIMINARY FINDINGS

Descriptive findings show that the distribution of tertiary-educated individuals aged 25–39 by field of study has changed little over the past two decades. In STEM fields, women have consistently represented less than one-third of all professionals, reflecting persistent horizontal segregation by gender.

Regarding job adequacy, about 60% of the tertiary-educated population held positions matching their level of education in 2005, declining to 55% in 2023. Logistic regression results confirm that the correspondence between education and occupation remains stratified by field of study: professionals in STEM and social sciences face greater challenges in securing jobs consistent with their training. Age, postgraduate education, and marital status also influence adequacy, with disadvantages associated with having children, particularly among women.

Overall, the findings indicate an underutilization of the highly educated workforce. Only about half of young professionals in STEM and social sciences work in positions aligned with their qualifications, confirming a growing mismatch between skill supply and labor demand.

Economically, the analysis reveals a significant contraction in real earnings among tertiary-educated workers: between 2005 and 2023, average wages lost roughly 15% of their real value. Gender wage gaps remain stable, with women earning about 80% of men's income across all fields of study. These results point to a devaluation of professional work and a weakening of the wage premium associated with higher education.

The quantile regression analysis, currently in progress, will provide further evidence on the magnitude and patterns of these inequalities across the wage distribution, shedding light on the mechanisms that sustain disparities within Mexico's highly educated population.

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