# Gender Inequality in Education and Poverty Persistence in Brazil

**Group 50**

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**Introduction to the Economics of Development**

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## 1. Introduction

Despite substantial progress in poverty reduction since the early 2000s, poverty in Brazil has remained vulnerable to economic shocks and long-standing labor market structures (World Bank, 2020; World Bank, 2022). Brazil also continues to rank among the most unequal countries in the world, with high and persistent levels of income inequality (World Bank, 2023). These inequalities are strongly shaped by region, race, and gender, with clear regional differences between the poorer North and the wealthier South, as well as the overrepresentation of Afro-Brazilians and female-headed households among the poor (IBGE, 2022; World Bank, 2023). Education is widely seen as an important tool for breaking cycles of poverty by increasing human capital, productivity, and earnings (World Bank, 2018, 2025). However, evidence from Brazil suggests that improvements in education alone may not be enough to significantly reduce poverty and inequality within realistic time frames. This indicates that unequal access to education and unequal returns to education can contribute to the persistence of poverty (Medeiros et al., 2020). In addition, gender differences in multidimensional poverty remain visible, which highlights the importance of examining how education and poverty interact with gender (Tavares & Betti, 2024).

This paper examines the relationship between gender inequality in education and the persistence of poverty in Brazil, with a focus on whether differences in educational outcomes between men and women increase the risk of being trapped in poverty. Although education is often presented as a universal equalizer, women in Brazil continue to face structural disadvantages in their educational paths, access to the labor market, and income generation, which may limit the poverty reducing potential of education. These disadvantages include higher dropout rates related to early motherhood, unequal care responsibilities, and gendered patterns of labor market segmentation (Cruz et al., 2021; Faisal-Cury et al., 2017; Tavares & Betti, 2024). As a result, similar levels of educational attainment may not lead to the same economic outcomes for women and men, helping to sustain gendered patterns of poverty.

The main research question guiding this study is whether gender inequality in education contributes to poverty traps in Brazil by weakening the poverty reducing effect of education for

women compared to men. More specifically, the paper asks whether the relationship between educational attainment and poverty status differs by gender, and whether this difference helps explain the continued concentration of poverty among women.

The central hypothesis of this paper is that gender gaps in education do not simply reflect unequal opportunities, but also actively contribute to poverty traps by reducing the effectiveness of education as a pathway out of poverty for women. When women face obstacles to completing their education or receive lower economic returns for the same level of schooling, education becomes a less reliable means of escaping poverty. Over time, this can lead to self reinforcing processes in which low education, limited labor market opportunities, and poverty persist throughout the life course and may even extend across generations.

This study contributes to existing literature in two main ways. First, it builds on theoretical and empirical research on education driven poverty persistence. Maldonado et al. (2012) show that education choices in Brazil can lead to multiple long run outcomes, where low levels of schooling lock regions into long term underdevelopment. This perspective supports the present analysis by suggesting that unequal educational outcomes can help maintain low income equilibria, particularly for disadvantaged groups such as women. Second, the paper contributes to the literature on educational inequality in Brazil. While access to education has expanded, research shows that important inequalities remain in educational attainment, academic performance, and labor market returns (Heringer, 2024; Senkevics et al., 2024). This study adds to this literature by explicitly linking educational inequality to poverty persistence, rather than analyzing education and poverty as separate issues.

Finally, the analysis is informed by international evidence showing that reductions in gender gaps in education are associated with stronger poverty reduction. This includes studies from West Africa, Indonesia, and Pakistan, which find that improved educational parity between women and men is linked to lower poverty levels (Jadoon & Liaquat, 2025; Nabila & Susanti, 2025; Phillips et al., 2025). By focusing on Brazil, this paper extends these findings to a middle income country with relatively high educational coverage but persistent inequality, showing that

gendered links between education and poverty remain highly relevant beyond low income contexts.

Overall, this study argues that reducing poverty in Brazil requires not only expanding access to education, but also addressing the gender based inequalities that limit education's ability to break poverty traps.

## 2. Methodology

To analyze whether gender inequality in education contributes to differences in poverty risk, the paper estimates two generalized linear models (GLMs) with a binomial distribution and a logit link function. The dependent variable, poverty status, is binary, taking the value 1 if an individual is poor and 0 otherwise. The logit model estimates the odds of being poor as a function of individual characteristics. All analyses were performed using R (Posit team, 2025).

Model 1 - Baseline model:

Model 1 provides a baseline specification that estimates the association between gender, education, and poverty, while controlling for a set of demographic and labor market characteristics. The model is specified as:

$$log(\frac{P(poverty_i=1)}{1-P(poverty_i=1)}) = \beta 0 + \beta 1 \, woman_i + \beta 2 \, education_i + \gamma X_i$$

In this model, *woman* is a binary indicator equal to 1 for women and 0 for men, and *education* measures educational attainment on a seven-level scale, rendering $\beta 2$ a vector of length 6 (reference category is no schooling). The vector $X$ includes several control variables: age, employment sector, urban residence, metropolitan area, work permit, and race. Since some of these controls (may) lie on the causal pathway between education and poverty (e.g. employment sector, work permit, urban residence), the model doesn't estimate the total relationship between education and poverty but instead answers the question: Among people with the same employment situation, does education still matter for poverty?

Model 2 - Interaction model:

Model 2 extends the baseline specification by including an interaction term between education and gender:

$$log(\frac{P(poverty_i=1)}{1-P(poverty_i=1)}) = \beta 0 + \beta 1 \, woman_i + \beta 2 education_i + \beta 3 \, (education_i \, x \, woman_i) + \gamma X_i$$

The interaction term allows the effect of education on poverty to vary between men and women. In this specification, β2 represents the effect of education on the odds of being poor for men (the reference group), holding all other characteristics constant, while β3 captures the additional or differential effect of education for women relative to men. Again, the question the model answers is: Among people with the same employment situation, does education still matter for poverty, and does it matter differently for women?

Interpretation of coefficients:

Estimated coefficients are reported as odds ratios (OR), obtained by exponentiating the logit coefficients:

$$ORj = e^{\beta j}$$

All confidence intervals (95%) are based on HC1 robust standard errors to account for potential heteroskedasticity.

## 3. Data

This analysis makes use of a processed *Kaggle* database characterizing poverty in Brazil (Gomes, 2020). This dataset includes information on over 20,000 individuals in Brazil, covering the years 2016 to 2019, along with their demographic and personal characteristics. The dataset was derived from Brazil's PNAD (Pesquisa Nacional por Amostra de Domicílios) survey, a nationally representative household survey conducted by the Brazilian Institute of Geography and Statistics (IBGE). In Gomes's dataset, education is measured on a seven-level scale ranging from no schooling to completed higher education. The employment sector is categorically split up in 12 different sectors. Three work permit possibilities are included: does not have a work permit, has a work permit, or is employer/civil servant. Poverty is defined as having a monthly income below 457 BRL in 2020. The dataset also distinguishes between male or female, urban or rural residence, metropolitan location or not, and white or non-white.

# 4. Results & Discussion

*Table 1: The regression results of the logit model that estimates the odds of being poor as a function of individual characteristics.*

**Gender and Education Determinants of Poverty**

| | Dependent variable: | |
|---|---|---|
| | Poverty (1 = was poor in 2020 interview) | |
| | Baseline Model (1) | Education x Woman (2) |
| Woman = 1 | 1.138*** | 0.744 |
| | (1.039, 1.248) | (0.419, 1.320) |
| Incomplete elementary or equivalent | 0.479*** | 0.459*** |
| | (0.385, 0.596) | (0.361, 0.584) |
| Complete fundamental or equivalent | 0.322*** | 0.299*** |
| | (0.252, 0.410) | (0.228, 0.393) |
| Incomplete high school or equivalent | 0.317*** | 0.309*** |
| | (0.245, 0.409) | (0.231, 0.413) |
| Complete high school or equivalent | 0.229*** | 0.211*** |
| | (0.182, 0.288) | (0.164, 0.271) |
| Incomplete higher or equivalent | 0.133*** | 0.104*** |
| | (0.099, 0.178) | (0.072, 0.149) |
| Superior complete | 0.062*** | 0.046*** |
| | (0.047, 0.081) | (0.033, 0.065) |
| Incomplete elementary or equivalent x Woman | | 1.336 |
| | | (0.743, 2.403) |
| Complete fundamental or equivalent x Woman | | 1.508 |
| | | (0.808, 2.813) |
| Incomplete high school or equivalent x Woman | | 1.312 |
| | | (0.696, 2.475) |
| Complete high school or equivalent x Woman | | 1.552 |
| | | (0.864, 2.789) |
| Incomplete higher or equivalent x Woman | | 2.171** |
| | | (1.097, 4.295) |
| Superior complete x Woman | | 2.149** |
| | | (1.127, 4.098) |
| Observations | 20,751 | 20,751 |
| Log Likelihood | -8,955.989 | -8,948.673 |
| Akaike Inf. Crit. | 17,961.980 | 17,959.350 |

*Note:* *p<0.1; **p<0.05; ***p<0.01

The estimates are all odds ratios (ORs). An OR > 1 indicates a higher probability of being poor, while an OR < 1 indicates a lower probability. Control variables were omitted to simplify the table. Education reference group = No education and less than 1 year of study. Data source: Determinants of Poverty in Brazil (Kaggle).

The data confirms a fundamental principle of development. Education is a very significant factor against poverty. The baseline model identifies two broad trends (Table 1): first, that women are generally more vulnerable, with the odds of living in poverty being 13.8% higher for women than for men (OR=1.138); and second, that every educational milestone achieved leads to a drastic reduction in that risk.

Figure 1 presents predicted probabilities of poverty by education level and gender, holding all other characteristics constant and without conditioning on job type. As educational attainment increases, the predicted probability of poverty declines sharply for both men and women, confirming the strong protective role of education. However, across all levels of education, the predicted probability for women remains consistently higher than for men. This indicates that although education reduces poverty risk for both genders, it does so less effectively for women, pointing to persistent structural gender inequalities that education alone does not eliminate.
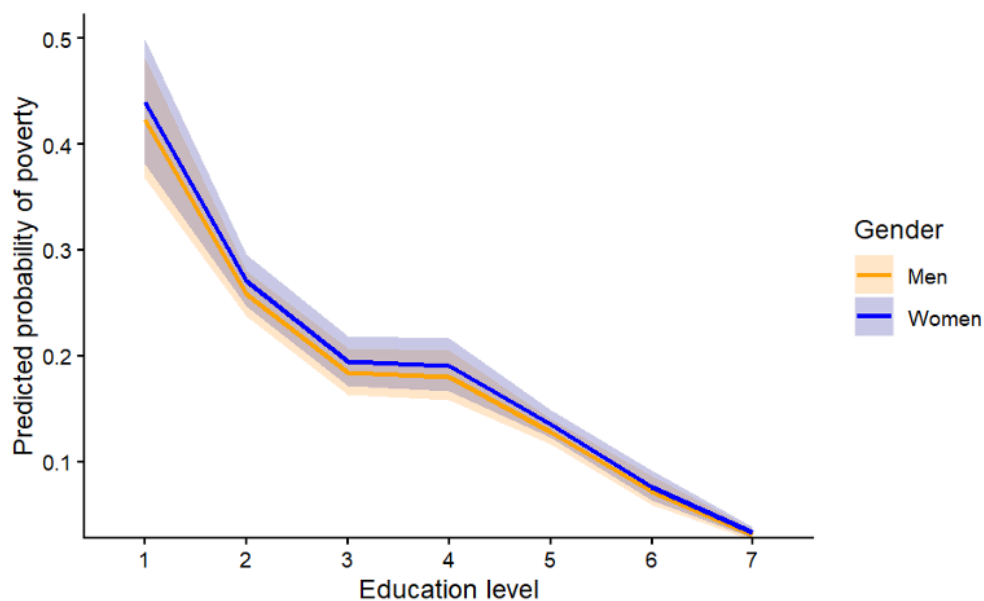


*Figure 1: The predicted probabilities of being poor by education level and gender.*

As shown in Table 1, completing high school ("complete high school or equivalent") reduces the odds of poverty with 0.229, which is an approximately 77% reduction in odds

compared to the reference group of individuals with no formal schooling. Attaining a university degree ("superior complete") results in even more protection, with an odds ratio of 0.062, meaning the odds of poverty for graduates are roughly 94% lower than those with no education. This finding is not new and aligns with established human capital theories suggesting that education enhances productivity and thus reduces poverty overall.

The most critical finding of this study is that the protective benefit of education is not distributed equally between genders. As the educational level increases within the model, a significant "relative penalty" for women becomes visible through the interaction terms at the bottom of the table. While education is beneficial to everyone, it is statistically less effective at lifting women out of poverty compared to men. At lower levels like 'incomplete elementary', the odds ratio is 1.336. This coefficient represents the relative increase in the odds of poverty for women compared to men at this specific educational level, using those with no formal schooling as the baseline model. While this interaction term is not statistically significant, nor is it considerably large, suggesting a relative parity in how education begins to protect both genders, the penalty becomes undeniable at the highest level. At the level of "superior complete", we observe a much higher and statistically significant interaction coefficient of 2.149. When combined with the baseline gender effect (OR = 0.744), this yields a total odds ratio of approximately 1.61. This indicates that while a university degree is protective for both genders, women face 61% higher odds of living in poverty than men with the same level of education, highlighting a significant gendered disparity in the Brazilian labor market.

Even though a university degree makes a woman less likely to be in poverty than an uneducated person, the odds of living in poverty are twice as high compared to a man with that exact same degree. This divergence at higher levels of education suggests that the Brazilian labor market contains structural barriers that education alone cannot dismantle.

5.  **Conclusion**

First, the findings confirm that higher educational attainment is strongly associated with a lower probability of being poor. Across both models, each successive level of education significantly reduces the odds of poverty, with the largest reductions observed at higher levels of schooling. These results are fully consistent with established human capital theory and with previous empirical work on Brazil, which shows that education increases productivity, earnings, and economic security (World Bank, 2018; Maldonado et al., 2012). Overall, the findings support existing evidence that education is a crucial factor in reducing the risk of poverty.

Second, the baseline model shows that women face a significantly higher risk of poverty than men when holding education and the control variables constant. This finding is consistent with earlier papers documenting significant gender inequalities in income, labour market outcomes, and multidimensional poverty in Brazil (World Bank, 2023). It suggests that gender remains an important structural determinant of poverty beyond differences in educational attainment alone.

However, the most important finding of this study emerges from the second model, which reveals that the poverty reducing effect of education differs systematically between men and women. While education lowers poverty risk for both genders, the interaction terms indicate that women experience a relative disadvantage at higher levels of education. Implying that women with a university degree face substantially higher odds of poverty than men with the same level of education. This result supports the central hypothesis of the study and earlier research by Tavares & Betti, 2024: gender inequality in education is not only about access or attainment, but also about unequal economic returns to education.

While international studies often find that reducing gender gaps in education strengthens poverty reduction (e.g. Phillips et al., 2025; Nabila & Susanti, 2025), this study shows that in a middle-income country like Brazil, educational expansion alone is insufficient if gendered labour market inequalities persist. In this respect, the results highlight a mechanism through which poverty traps can endure even among highly educated women.

These findings suggest that strategies aimed at reducing poverty through education must go beyond expanding access to schooling. While policies that lower financial and social barriers

to education remain crucial, they should be accompanied by measures that address gender inequality in the labour market. Such measures may include stronger enforcement of equal pay legislation, better access to childcare, and support for women's career continuity. By improving the economic returns to education for women, interventions can increase the effectiveness of education as a pathway out of poverty and contribute to more inclusive growth.

This study has several limitations that should be acknowledged. First, the analysis relies on cross-sectional data. As a result, the study cannot fully capture how poverty develops or persists over the long term. This limits the ability to draw strong causal conclusions about poverty traps, since it is not possible to observe whether individuals remain poor over time or move in and out of poverty. Second, the study focuses on income-based poverty and does not capture other dimensions of deprivation, such as health, housing quality, or time poverty, which may be particularly relevant for men and women.

Future research could build on these findings in several ways. Longitudinal data would allow for a more direct analysis of poverty persistence and intergenerational effects. Further research could also examine how policies such as free or subsidized higher education or gender-targeted labour market programs, both in Brazil and in comparable countries could provide valuable insights into which policies are most effective in breaking gendered poverty traps.

**Bibliography**

Cruz, E., Cozman, F. G., Souza, W., & Takiuti, A. (2021). The impact of teenage pregnancy on school dropout in Brazil: A Bayesian network approach. *BMC Public Health, 21*(1), 1850. https://doi.org/10.1186/s12889-021-11878-3

Faisal-Cury, A., Tabb, K., Niciunovas, G., Cunningham, C., Menezes, P., & Huang, H. (2017). Lower education among low-income Brazilian adolescent females is associated with planned pregnancies. *International Journal of Women's Health, 9*, 43–48. https://doi.org/10.2147/IJWH.S118911

Giannetti, B. F., do Nascimento, G. A., Ghelmandi Netto, L., Nascimento, R. A., Demétrio, F. J. C., Almeida, C. M. V. B., & Agostinho, F. (2025). Advancing the diagnosis of poverty traps: A regional application of Emergy Theory and the 5SEnSU model in Brazil. *Ecological Modelling, 510*, 111350.

Gomes, P. (2020). *Determinants of poverty in Brazil* [Dataset]. Kaggle. https://www.kaggle.com/datasets/patrickgomes/determinants-of-poverty-in-brazil

Heringer, R. (2024). Affirmative action policies in higher education in Brazil: Outcomes and future challenges. *Social Sciences, 13*(3), 132.

Instituto Brasileiro de Geografia e Estatística. (2022). *Social inequalities due to color or race in Brazil* (2nd ed.). IBGE.

Maldonado, W. L., Marques, I. M., & da Silva Filho, O. C. (2012). A dynamic model of education level choice: Application to Brazilian states. *Revista Brasileira de Economia, 66*, 225–245.

Marinho, E. L. L., de França, J. M. S., Campêlo, G. L., & Badagnan, T. F. (2025). The impacts of undernutrition on labor productivity: Empirical evidence for rural areas in Brazil. *Revista de Economia e Sociologia Rural, 63*, e293231.

Medeiros, M., Barbosa, R. J., & Carvalhaes, F. (2020). Educational expansion, inequality and poverty reduction in Brazil: A simulation study. *Research in Social Stratification and Mobility, 66*, 100458. https://doi.org/10.1016/j.rssm.2019.100458

Nabila, A., & Susanti, S. (2025). Gender inequality in education and its impact on poverty in Indonesia (2012–2021). *Edunity: Kajian Ilmu Sosial, 4*(6). https://doi.org/10.57096/edunity.v4i6.408

Phillips, J., et al. (2025). Gender disparities in education and poverty reduction: Evidence from Anglophone West African countries. *International Journal of Social Science and Management Research*. https://doi.org/10.61421/IJSSMER.2025.3202

Posit team. (2025). *RStudio: Integrated development environment for R* [Computer software]. Posit Software, PBC. http://www.posit.co/

Tavares, F. F., & Betti, G. (2024). Gender differences in multidimensional poverty in Brazil: A fuzzy approach. *Social Indicators Research, 175*(2), 385–422. https://doi.org/10.1007/s11205-024-03312-z

World Bank. (2018). *Human capital: A project for the world*. World Bank.

World Bank. (2020). *Brazil's poverty and inequality since the 2014–2016 domestic crisis*. World Bank.

World Bank. (2022). *Brazil poverty and equity assessment*. World Bank.

World Bank. (2023). *Brazil: Systematic country diagnostic update*. World Bank.

World Bank. (2025). *Education overview*. World Bank.