Exploring Education in Brazil

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Research Design

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Abstract

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Introduction

In this article, I aim to examine the educational dynamics of Brazil, with a particular focus on effects of schools quality on national tests scores. The Brazilian case offers a compelling context for analysis.

The author aims to study the impact of the institutional settings on educational quality variables. The author will use the introduction of different laws and use them to assess the impact on variables that describe the marital and educational status of women.

This project uses the Brazilian School Panel to study how teacher quality shapes student learning and school progression.

My goal is to distinguish two channels: standardized test performance (**extensive margin**) and grade progression outcomes (**intensive margin**).

1 Literature Review and Historical Setting

Knowledge and insights on the historical context and institutional settings are drawn from Encyclopedia Britannica (Ball, James, et al., 2026; Ball, Schneider, et al., 2026), Glossario of Atlas Geográfico Escolar (CEON, n.d.) and Southey (2012).

These norms will serve as instruments to predict a changes in schools quality. They are expected to positively affect the outcome variables.

A preliminary analysis of the literature on education in developing countries, highlighted a study from Turmena and Bitencourt (2022). The journal article constitutes the milestone of this article and serves as main reference for the literature on education in Brazil. This paper suggests that the "Law No. 5.692/1971 (Reforma do Ensino de 1ř e 2ř Graus)" had a major effects on education. I will

exploit data related to this law.

2 Data

2.1 Data Collection

All projects begin with data collection, which is a crucial step. However it takes a lot of time and effort.

In order to select the best source, many datasets have been explored and many institutional websites have been visited. Potential data sources included IPUMS ("IPUMS Online Data Analysis System", n.d.) and the Instituto Brasileiro de Geografia e Estatística ("Portal Do IBGE", 1967). Additionally, aggregated data may be retrieved from (Instituto Brasileiro de Geografia e Estatística (IBGE), n.d.-a, n.d.-b, n.d.-c, n.d.-d, n.d.-e, n.d.-f, n.d.-g, n.d.-h, n.d.-i, n.d.-j, n.d.-k, n.d.-l, n.d.-m, n.d.-n, n.d.-o, n.d.-p, n.d.-q, n.d.-r, n.d.-s, n.d.-t, n.d.-u, n.d.-v, n.d.-w, n.d.-x, n.d.-y, n.d.-z, n.d.-aa, n.d.-ab, n.d.-ac, n.d.-ad, n.d.-ae; Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira (Inep), n.d.-a, n.d.-b, n.d.-c). Eventually, the article from Rubiane Daniele Cardoso de Almeida et al. (2023) offers panel data on some demographic aspects.

The Brazilian Education Panel Databases (Huberts et al., 2025), which covers the period from 1996 to 2015, was selected as main source of data.

2.2 Description of Data

3 Methodology

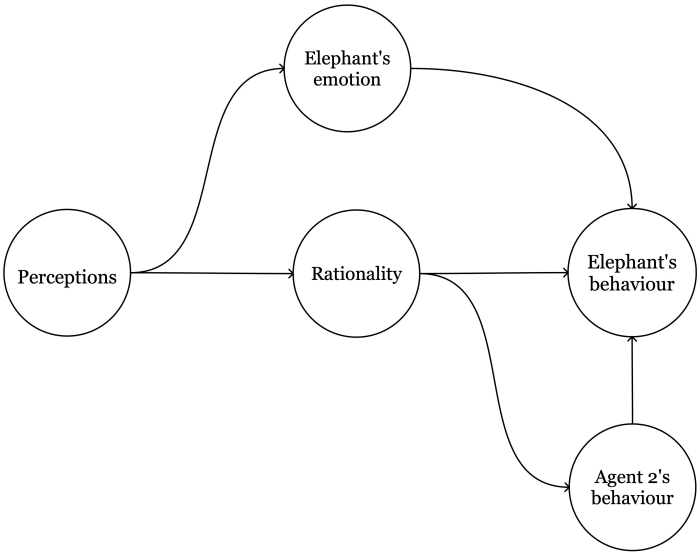

Figura 1: *Causal DAG.*

To establish causality between the dependent and independent variables, the analysis will employ causal inference techniques. As a possible solution to the identification problem the study will provide results from a Difference-in-Difference. This technique is able to isolate the effect produced by the introduction of the laws in the variables that approximate education quality. Nonetheless, without appropriate control variables no identification strategy is reliable. Following best practices of the political science field, only a deep analysis of the literature will provide for suitable control variables.

3.1 Extensive Margin

The first of the two regression presented in the paragraph looks at the extensive margin. Therefore, it investigates the relationship between teachers quality and

test scores. The equation used is the following:

$$Y_{smt}^{score} = \beta_0 + \beta_1 TQ_{smt} + \beta_2 INFRA_{smt} + \gamma X_{smt} + \mu_m + \lambda_t + \varepsilon_{smt}$$

Teachers quality is measured as number of students per class *or* as teachers education.

Identification also relies on:

-*Municipal FE*: this is a way to control for possible unobserved variables that might bias the analysis. To the eyes of statistitians this is a mere intercept that captures the mean value for a town.

-*State FE*: the same concern we had for the municipal level, motivates the use of FE at the state level. However, concern comes along with a great fortune. Cunningham (2021, chap. 2, p. 462) says: "I have a bumper sticker on my car that says "I love Federalism (for the natural experiments)". [...] United States is a never-ending laboratory. Because of state federalism, each US state has been given considerable discretion to govern itself with policies and reforms. Yet, because it is a union of states, US researchers have access to many data sets that have been harmonized across states, making it even more useful for causal inference."

-*Year FE*: since our dataset (Huberts et al., 2025) offers several years, we will exploit time variation too. The methodological solution to make use of panel data is again FE. In fact, thanks to this instrument, we are able to isolate the variation among years and discard the magnitude of variation in a signle year.

This strategy isolates the effect of teachers quality on students test scores, which is commonly refered to as *outcome variable*.

Controls: The vector of controls is X_{smt}, while γ is the vector of coefficients. It represents the effects of control variables on our outcome variable. The selected controls are:

3.2 Intensive Margin

The second regression presented in the paragraph looks at the intensive margin. Therefore, it investigates the relationship between teachers quality and rates of failure. The equation used is the following:

$$Y_{smt}^{failure} = \beta_0 + \beta_1 TQ_{smt} + \beta_2 INFRA_{smt} + \gamma' X_{smt} + \mu_m + \lambda_t + \varepsilon_{smt}$$

Teachers Quality is measured as number of students per class *or* as teachers education. Again, identification relies on municipal FE, state FE and year FE.

Conclusion

The puzzle motivating this paper was deliberately simple: two elephant-human encounters occur in broadly similar environments, yet they generate sharply different behavioural trajectories. In one occasion, the elephant's threat is forceful but calibrated; in the other, violence is followed by a striking form of care.

Acknowledgements

Artificial intelligence-based tools were employed solely to improve linguistic clarity and grammar. No AI system contributed to the development of the research questions, theoretical framework or conclusions presented in this paper.

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Books

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