

# Extension of Litschig and Morrison (2013): Heterogeneous RD Effects by Baseline Poverty

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December 2, 2025

## 1 Extension Description

The original paper estimates the causal effect of eligibility for Brazilian FPM transfers on municipal outcomes using a regression discontinuity (RD) design. In this extension, I investigate whether the RD treatment effect varies systematically with municipalities' initial poverty levels. Specifically, I use the 1980 poverty rate (`poverty80`) as a pre-treatment measure of economic deprivation, standardize it, and interact it with the RD treatment indicator (`aaa`). The outcome examined is years of schooling for individuals aged 19–28 in 1991 (`educ19_2891`), following the human-capital analyses in the original paper.

This approach allows the RD treatment effect to vary across municipalities that were poorer or richer before the transfers. If FPM transfers help poorer municipalities more, then the interaction between treatment and baseline poverty should be positive and significant.

## 2 Estimating Equation

Let  $Y_i = \text{educ19\_2891}$  denote years of schooling for municipality  $i$ . Let  $\text{aaa}_i$  be the treatment indicator for FPM eligibility, and let  $\text{poverty80\_std}_i$  be the standardized baseline poverty

rate in 1980. The running variable is `pscore` with slope break `pscore_a`, and quadratic terms are included following the authors.

The heterogeneous RD specification is:

$$Y_i = \alpha + \tau_1 \text{aaa}_i + \tau_2 (\text{aaa}_i \times \text{poverty80_std}_i) + \beta \text{poverty80_std}_i \\ + \gamma_1 \text{pscore}_i + \gamma_2 \text{pscore\_a}_i + \gamma_3 \text{pscore}_i^2 + \gamma_4 \text{pscore\_a}_i^2 + \varepsilon_i.$$

Here,  $\tau_1$  is the treatment effect for a municipality with average baseline poverty, and  $\tau_2$  captures how the treatment effect changes as baseline poverty increases.

### 3 Regression Results

#### Baseline RD Model (without heterogeneity)

Variable	Coefficient	Std. Error	p-value
aaa	0.377	0.260	0.147
pscore	0.026	0.086	0.762
pscore_a	-0.059	0.121	0.625
pscore_sq	0.0049	0.0085	0.545
pscore_a_sq	-0.0087	0.0116	0.457
constant	4.451	0.191	0.000
Observations		971	
R <sup>2</sup>		0.011	

Table 1: Baseline RD regression using `educ19_2891` as the outcome.

## Heterogeneous RD Model

Variable	Coefficient	Std. Error	p-value
aaa	0.244	0.155	0.117
aaa × poverty80_std	-0.004	0.052	0.936
poverty80_std	-1.115	0.036	0.000
pscore	-0.001	0.054	0.980
pscore_a	-0.046	0.074	0.532
pscore_sq	0.0016	0.0050	0.754
pscore_a_sq	-0.0020	0.0070	0.863
constant	4.475	0.117	0.000
Observations		971	
R <sup>2</sup>		0.619	

Table 2: Heterogeneous RD regression with interaction between treatment and baseline poverty.

## 4 Interpretation

Column (1) of the results shows the baseline RD estimate. The coefficient on the treatment variable `aaa` is positive (0.377) but statistically insignificant ( $p = 0.147$ ). This aligns with the original study's finding that FPM eligibility has limited effects on education outcomes.

Column (2) introduces heterogeneity by interacting the treatment with standardized baseline poverty. The direct treatment effect at average poverty is smaller (0.244) and remains statistically insignificant ( $p = 0.117$ ). The key term is the interaction coefficient, which is extremely small ( $-0.004$ ) and statistically insignificant ( $p = 0.936$ ). This indicates that the effect of FPM eligibility on education does *not* vary meaningfully with municipalities' initial poverty levels.

In substantive terms, poorer and richer municipalities exhibit similar education responses to FPM transfers within the RD window. The limited human-capital effect found in the original paper does not appear to be driven by heterogeneity across municipalities with differing baseline poverty.

## 5 Appendix: README for Replication Package

Replication Package | Extension of Lischig and Morrison (2013)

### 1. Overview

This replication package contains all materials for the heterogeneous RD extension testing whether the effect of FPM eligibility varies with baseline poverty.

### 2. Data

- FPM1980\_1991\_final.dta
- Key variables:  
educ19\_2891, aaa, pscore, pscore\_a, pscore\_sq, pscore\_a\_sq, poverty80

### 3. Code

- 02\_extension\_script.do  
Implements the heterogeneous RD regression used in the writeup.

### 4. How to Run

Run the following in Stata:

```
do code/02_extension_poverty_heterogeneity.do
```

### 5. Findings

No evidence of heterogeneous treatment effects by baseline poverty.

### 6. Software

Stata 14+ required.