Spatial Analysis of Education Inequality in Brazilian Municipalities, 2000-2010

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The study

The aim of this poster is to spatially examine municipal education inequality in Brazil in 2000 and 2010 to understand regional development patterns (Frankema and Bolt, 2006 and Frankema and Bolt, 2008). This time period was characterized by public policies that increased the number of children in K-12. However, it is unclear whether municipalities that needed those initiatives the most were appropriately targeted.

We operationalized education inequality as follows. First we identified the "ideal number of schooling years" for people aged seven to 17 years by municipality using data from the Brazilian Demographic Census of 2000 and 2010. This variable was derived from total population data as if all school age people attended school in a normal K-12 sequence without dropping out or repetition. Then, we calculated the observed number of schooling years for seven to 17 year olds by municipality also using Census data. Finally we computed the absolute difference between ideal and observed number of schooling years and used this to calculate a Gini education coefficient for each municipality. The Gini adds an important dimension by measuring whether decrease in the mean absolute difference is spread among the whole population (lower Gini), or restricted to only part of it (higher Gini).

Figure 1 explains the framework of educational development on which we based our analysis. Higher educational development can be achieved with low absolute difference and low inequality; Intermediate educational development can be achieved with intermediate absolute difference and low inequality; and Lower educational development can be achieved with high absolute difference and low ine-

quality. As shown below, most Brazilian municipalities showed an increase in the Gini simultaneous with a decrease in the absolute difference over the decade. This indicates that only a portion of the population had more years of schooling than previously.

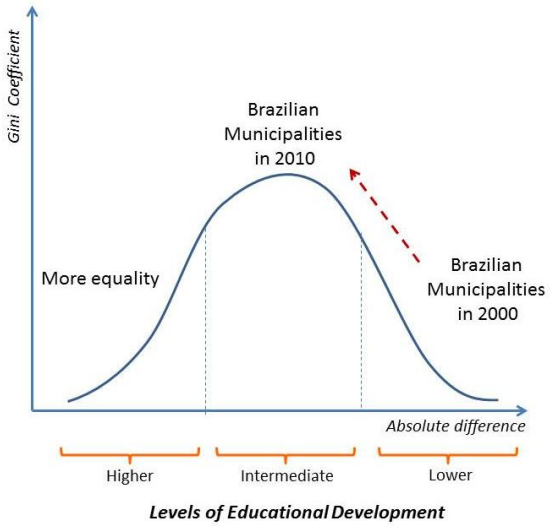

Figure 1: Framework of Educational Development

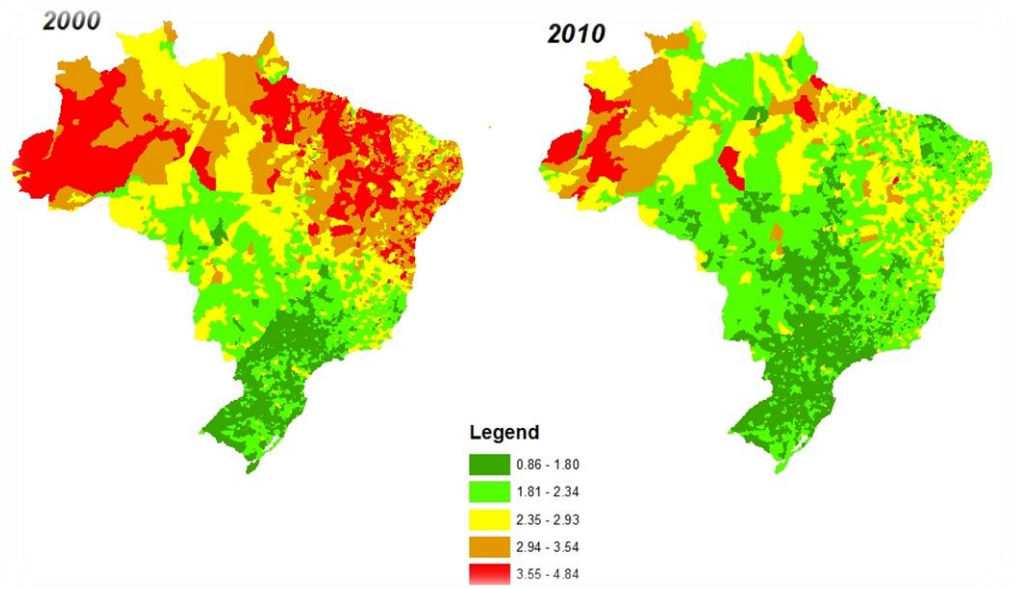

Figure 2: Absolute difference between ideal and observed number of years of schooling

Figures 2-4 show the spatial distributions of these two variables in 2000 and 2010. In Figure 2, one can observe that the absolute difference decreased in most municipalities from 2000 to 2010. Therefore, most municipalities showed overall improvements in the level of educational achievement of school aged children.

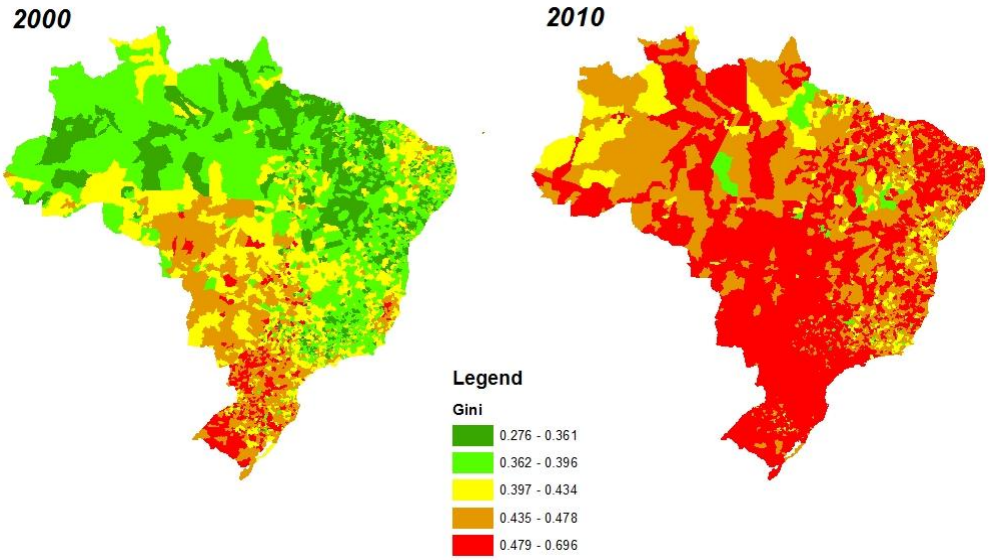

Figure 3: Gini Coefficient

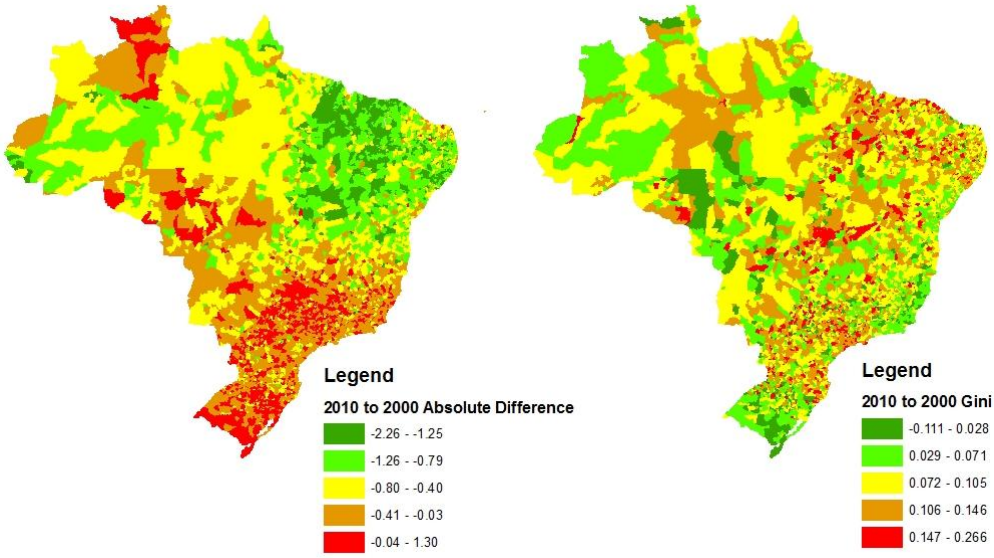

Figure 4: Change in absolute difference and Gini coefficient from 2000 and 2010 (Natural breaks)

Figure 3 shows that most municipalities were more unequal (higher Gini) in 2010 than in 2000, suggesting that Brazil had an Intermediate level of educational development in 2010. Figure 4 shows a clear north-south pattern for change in the absolute difference from 2000 to 2010. Northeast municipalities apparently improved more with regards to years of schooling. On the other hand, the difference between the 2010 and 2000 Gini does not show a clear pattern, and should be studied further.

Spatial dimensions of municipal inequality will be further analyzed using Exploratory Spatial Data Analysis (ESDA, Anselin, 2010). Based on an assumption that the public sector effectively allocated resources to minimize inequality, we hypothesize that municipalities with higher absolute difference in 2000 will show greater decreases in absolute difference in 2010 relative to municipalities with lower absolute difference in 2000. Applying ESDA methods, and using a queen spatial weight matrix, we will test our hypothesis as follows: 1) test the 2000 absolute difference for local spatial autocorrelation and identify high-high and low-low clusters; 2) calculate the change between the 2010 and 2000 absolute differences, test it for local spatial autocorrelation, and identify high-high and low-low clusters; and 3) overlay the results from steps 1 and 2 and identify where clusters coincide. If there is a coincidence of high clusters from step 1 and high clusters from step 2, then we will accept our hypothesis. The same steps will be applied for the Gini coefficient to understand the level of municipal education development.

In addition, we will propose a municipal typology that identifies spatial municipal clusters based on high/low differences between ideal and observed years of schooling, and high/low change in inequality. These two variables measure important aspects of education achievement on which public policies should focus. We expect that the typology will provide a basis for future advances in understanding educational public policies that took place in Brazil over the past decade.

References

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