

POVERTY TRENDS ACROSS BRAZILIAN STATES: THE IMPORTANCE
OF EDUCATION AND LEFT GOVERNANCE, 1987-2006

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ABSTRACT

SABRINA M. CARLSON: Poverty Trends Across Brazilian States: the
Importance of Education and Left Governance, 1987-2006
(Under the direction of Jonathan Hartlyn.)

It is no secret that Latin American poverty trends have long been troubling and Brazil is no exception to this pattern. In this study, I examine poverty trends in Brazil at the *subnational* level. To do so, I compiled cross-sectional time series data for the 27 Brazilian states for the years 1987-2006. Using OLS regression models, I examine the importance of left governance (at the national and subnational levels) and educational attainment for poverty reduction. Results indicate that both a leftist president and higher average years of educational attainment are negatively related to poverty trends. From this, I conclude that the placement of a left government in power at the executive level, as well as increasing the human capital of the population, are critical for the reduction of poverty.

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Introduction

The objective of this study is to examine poverty trends across the Brazilian states and subsequently identify its causal factors. Prior research holds that various political, structural, and geographic factors affect poverty trends, such as social spending, left party governance, education, GDP, unemployment, debt, inequality, healthcare, regime type, etc. Based on previously identified causal factors and effects, I am most interested in establishing the impact that educational attainment and left party governance can have on poverty trends at the subnational level. My first expectation with this research is that higher average years of educational attainment has a significant, negative impact on poverty trends as previous studies have shown that effective education policies can decrease poverty by ameliorating productivity through improving the skill sets, qualifications, and human capital of the population. In addition, previous studies have advanced the argument that long-term left incumbency is associated with a more generous welfare state; subsequently, I examine the importance of left parties for battling poverty. In this regard, I expect to find that left incumbency in state parliaments, at the state governor level, and in the federal presidency will have significant, negative effects on poverty. It is important to examine the power of left parties at these three levels of governance because Brazil has a high level of decentralization and all three levels of governance share legislative social policymaking responsibilities (Wilson 2006).

In particular, this study examines poverty trends across the Brazilian states from 1987 to 2006.¹ I perform an error correction model using OLS regression with structural, political, and geographic variables and find that, while left party governance at the state level is not significant, both higher average years of educa-

¹ The dataset used in this study was built by Sandra Chapman and I.

tional attainment and the presence of a left president are significant findings and the results indicate that they contribute to lower levels of poverty across Brazil. More specifically, I find that the presence of a left party in power at the executive level, not at the state (governors or legislatures) level, is what matters for direct poverty reduction; however, these findings might be specific to the current president Luiz Inácio Lula da Silva as he has implemented a massive, successful poverty elimination program (Bolsa Família) and therefore these findings might not be transferable to all leftist presidents in general. The education findings suggest that higher average years of schooling lead to lower poverty levels; more specifically, a positive change upward in educational attainment has a negative, significant relationship with poverty. This study reflects the growing awareness on the importance of redistributive policies for poverty reduction (illustrated with Lula's presidency), as well as the increasing understanding on the importance of improving the human capital of the workforce through increasing the average years of education obtaining by the population.

This paper is broken up into several sections. I begin with a literature review in which I discuss a brief history of Brazil and relevant information and arguments about poverty, education, and left governance. This is followed by the presentation of my hypotheses. I then turn to the methodology section, in which I detail the error correction model, as well as the variables, dataset, and methods employed in this study. The outline of the methodology is followed by the presentation and interpretation of results, and the paper is concluded with a discussion of the findings and suggested avenues for future research.

Brazil

During the 1980s, Brazil experienced a transition to democracy from a bureaucratic-authoritarian regime. The transition to democracy was completed in 1989,² with

² The exact date of Brazil's completed transition to democracy is somewhat disputed within the literature as it can be argued that Brazil reached a full democracy in 1988 with the establishment of a new constitution, or in 1986 with the first direct elections of state governors; however,

a direct presidential election, and after the establishment of the 1988 Constitution of Brazil. This was a slow transition, which is often attributed to veto points, a fragmented congress, strong and autonomous state governments, and a multi-party system alongside open-list proportional representation; however, Brazil is an interesting case in that, even in the midst of a weak and fragmented party system, a divided congress, and a near fiscal crisis, the country still managed to successfully impeach a corrupt president, resolve hyperinflation, and finally achieve macro-economic stability a mere post-authoritarian rule (Fenwick 2008).

Brazil can be characterized by two distinct phases of performance since its transition from authoritarian military rule. The first phase, from 1989 to 1993, was characterized by corrupt and unstable governance, weak macroeconomic performance, and severe hyperinflation. The second phase was inaugurated with the introduction of the Plano Real in 1994, former President Fernando Henrique Cardoso's anti-inflation/macroeconomic stability plan, which was successful in drastically reducing inflation and stabilizing the economy. The second phase was far more successful than the first; inflation was kept low, the party system began to consolidate, and political leadership became more stable (Power 2008). Moreover, there was a successful, peaceful transition from Cardoso to current President Lula Inácio da Silva (Lula) in 2003, whose administration has also been characterized by macroeconomic stability and successful social programs.

Brazil is an interesting case study for several additional reasons. First, Brazil is one of the world's most populous countries with almost 180 million people and is the largest country in Latin America (both geographically and demographically). Brazil is comprised of twenty-six states and one federal district and is typically cited as being a highly decentralized country; all three of its levels of government (federal, state, and municipal) have social policy legislating responsibilities (Wilson 2006). Also, in contrast to other Latin American federations, the state governments in Brazil have been significantly powerful (since the transition

I am using the date 1989 as this is when Brazil experienced a democratic presidential election.

to democracy), with a substantial amount of autonomy over fiscal policymaking (Borges 2008). Further, Brazil has the highest level of inequality in all of Latin America (Gini=.567 in 2005), which is the region with the highest inequality rates in the world. This matters for poverty because scholars and international financial institutions have consistently found inequality to be a serious constraint for poverty reduction. It follows that it is an important endeavor to examine the poverty levels in a country with an exceptionally high level of income inequality. Finally, it is theoretically interesting to analyze poverty changes over time at the subnational level in a country with autonomous and powerful state governments.

Latin American Poverty

Poverty is an ongoing problem and a severe setback to development in Latin America. This fact has been widely acknowledged within the literature; for example, the World Bank advances that “poverty has long been recognized as one of the more serious and lasting problems facing Latin America” (Pribble et al. 2009, 2). Various economists have indicated that the proportion of the Latin American population in poverty decreased in the 1990s, but has risen again in recent years (Wodon et al. 2001). However, while poverty levels did fall in the 1990s, this reduction was insubstantial; in fact, the average cross-national decline was only 4 percentage points, dropping from 43 percent to 39 percent throughout the decade. In an examination of household characteristics, the study “Poverty in Latin America: Trends (1986-1998) and Determinants” displayed unfortunate statistics on poverty trends in Latin America. They found that, in 1998, a third of the population in Latin America was poor, and one sixth was extremely poor. These numbers translate into 179 million poor people and 89 million extremely poor people. More recent figures from the United Nations’ Economic Commission on Latin America and the Caribbean indicate that in 2004, 41.7 percent of the population in Latin America lived in poverty and an additional 17.4 percent lived in extreme poverty (Pribble et al. 2009).

Negative Effects of Poverty

Poverty-stricken individuals face difficulties in countless ways. One facet concerns their ability to participate in the market, as the Inter-American Development Bank argues, “the ability of poverty-stricken individuals to participate fully in the economy is often very low as poverty is fundamentally linked to lack of access—by control or ownership—to productive and financial assets” (IADB 1998). Moreover, those with exceptionally low income are also disproportionately affected by, and less capable of withstanding, economic crises (IADB 1998). Aside from lack of income, other dimensions of poverty need to be considered and addressed as poverty affects the people confined to it in more ways than their economic well-being. Authors Alberto Minujin, Jan Vandemoortele, and Enrique Delamonica candidly describe the unfortunate situation of living in poverty: “each year, 11 million children under the age of five die as a result of preventable or easily treatable disease and most of them belong to poor households. This may be the greatest contemporary tragedy for humanity and a negation of the rights which we accept almost unconsciously. For many of those who survive, their lives are full of difficulties, occasionally condemning them to perpetual poverty” (Minujin et al 2002, 33). Further, those confined to urban slums in the region are more likely to be victims of violent crime than more wealthy individuals. That the lives of poverty-stricken individuals are negatively affected in considerable ways, it is all the more important to identify the causal factors influencing poverty trends.

Poverty in Brazil

Brazil has achieved success in battling poverty (defined in Brazil as the percentage of the population earning less than one-half of the minimum wage) in the past two decades, due in part to macroeconomic stabilization plans and conditional-cash transfers; however, poverty levels still remain uncomfortably high in the country (17.2 percent in 2007). Figure 1 depicts the poverty trend throughout Brazil as

a whole during the period 1987-2007. This figure shows that the poverty trend in Brazil remains high, but that the poverty level has been decreasing in recent years. This figure is unsurprising as it illustrates that the trend coincides with former President Cardoso's anti-hyperinflation Plano Real, and President Lula's Bolsa Família program.³

Prior to Presidents Cardoso and Lula, the 1980s were marked by tumultuous macroeconomic stability and widespread hyperinflation (Fenwick 2009). Figure 1 clearly illustrates this, as it shows poverty levels from 1987 to 1993 varying between 32 and 36 percent. Figure 1 also shows the direct effects of Cardoso's Plano Real. Plano Real, introduced in 1994, succeeded in dropping the poverty level within the country from 35.52 percent in 1993 to 26.54 percent in 1995 with a simultaneous decline in the level of extreme poverty from 19.5 to 14.5 percent. These figures translate into 10 million people being lifted out of poverty with another 6 million overcoming extreme poverty (IADB 2005). In general, the Plano Real was victorious in rapidly mitigating hyperinflation and in achieving macroeconomic stability, with poverty reduction following suit. Per-capita income, on average, also increased by 25 percent as a result of Plano Real; however, these rapid economic improvements drastically slowed after inflation was curtailed in 1995 and poverty reduction came to a halt for the time being. The poverty level (26 percent of the population) remained roughly the same between 1995 and 2002 (IADB 2005).

³ Bolsa Família is the flagship program of the Lula Administration. This social program replaced four previously social existing programs: Bolsa Escola, Bolsa Alimentação, Auxílio Gás, and Cartão Alimentação; the government unified all four programs under Bolsa Família to expand poverty-reduction effects through providing monetary benefits to qualifying families each month. The national government reached its 2003 goal of 11.1 million poor families in 2006 (Fenwick 2009). Very unfortunately, the Bolsa Família data is unavailable; therefore, it is difficult to discern whether these findings are due to a left president in general or the Bolsa Família program. The data for this program is held by the Ministério do Desenvolvimento Social e Combate a Fome; however, the only data available to the public for Bolsa Família is for the year 2005. Contact has been made with the Ministério do Desenvolvimento Social e Combate a Fome, but the data has not yet been received and will not be received in sufficient time. Furthermore, without this data, it is difficult to parse out whether the effect that I am finding with a left president (since there has only been one during the period under which this study takes place) can be attributed to having a left president in power in general, or whether this finding is specific to President Lula and his flagship poverty alleviation program Bolsa Família.

Ending inflation, however, provided to be only a short-lived, one-time benefit for socioeconomic issues. In order for Brazil's high levels of both poverty and inequality to continue in their decline, regular improvements in wages, employment, education, and social policy need to be achieved and/or maintained (Kingstone and Power 2008). Fortunately, President Lula assumed office in 2003 post-Cardoso and immediately advocated a poverty-reduction agenda. From 2003 to 2006, Lula and his administration made it their principal objective to augment the purchasing power of Brazilians through increasing the minimum wage and implementing targeted social policies. Lula won the 2003 general presidential election with 61.3 percent of the vote; equipped with this electoral support, Lula was able to push for social policy reform to address issues of poverty and disparate other social needs (Fenwick 2009). Lula's success in combating poverty can also be seen in Figure 1 as it is clearly shown here that poverty was reduced from a level of 26.67 percent in 2003 to 17.21 percent in 2007, coinciding directly with Lula's first administration and therefore his trademark poverty alleviation program Bolsa Família.

Figure 2, in turn, depicts poverty trends across a sample of six Brazilian states, three of which have the highest average levels of poverty throughout the period 1987-2007 (Alagoas, Maranhão, and Piauí), while the remaining three have had the lowest average levels of poverty throughout the same time period (São Paulo, Santa Catarina, Rio de Janeiro). Figure 2 helps to illustrate that poverty trends do vary across the states. For example, the three states with the highest average poverty rates from 1987-2007 are currently at the following levels: Alagoas 48.74 percent, Maranhão 48.24 percent, and Piauí 43.32 percent, whereas the three states with the lowest average poverty rates are currently at the following levels: São Paulo 10.61 percent, Santa Catarina 7.03 percent, and Rio de Janeiro 13.26 percent.

Figure 1: Percentage of Brazilian Population Living in Poverty

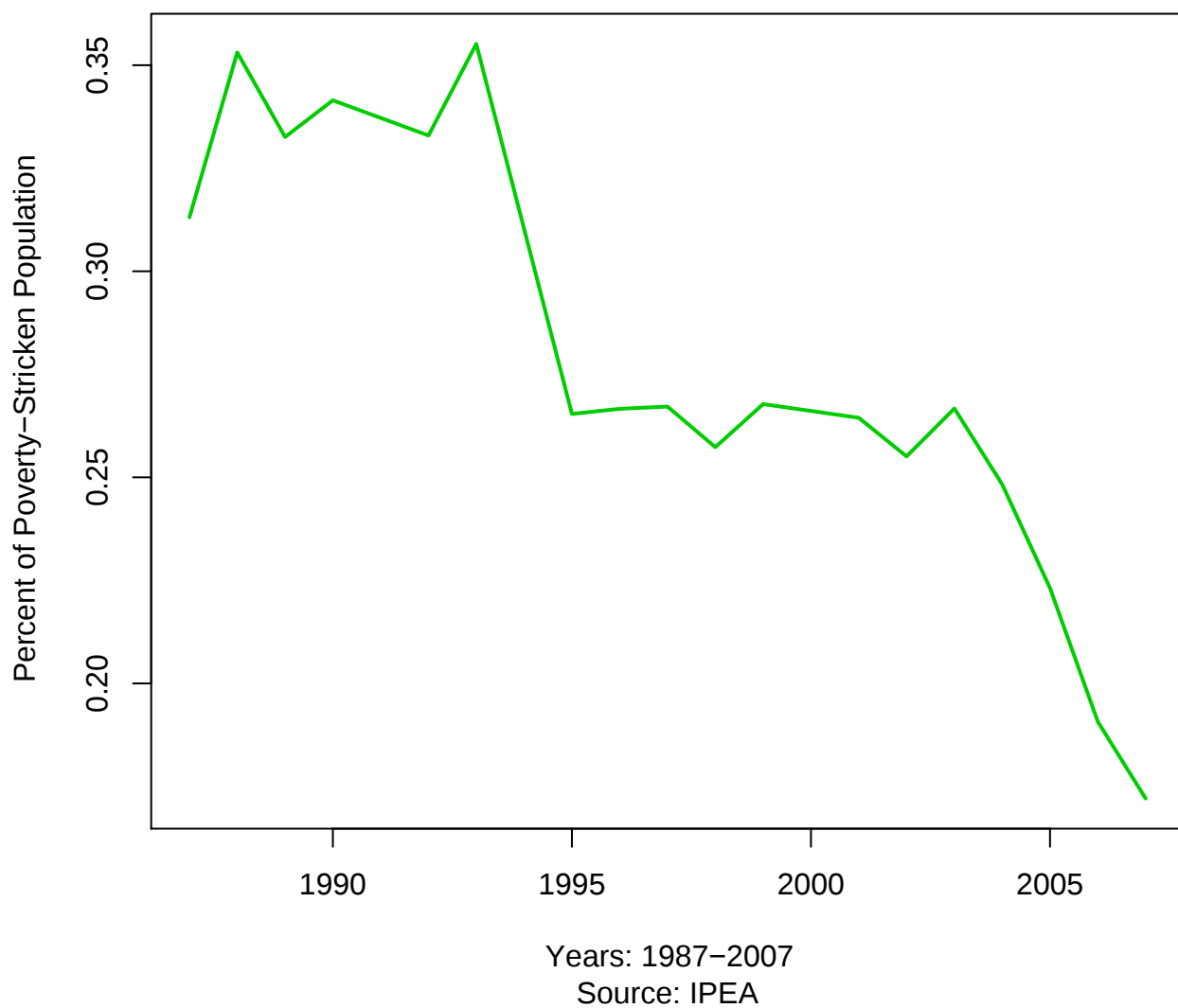


Fig. 1: Percentage of Brazilian Population Living in Poverty

Figure 2: Poverty Across Brazilian States

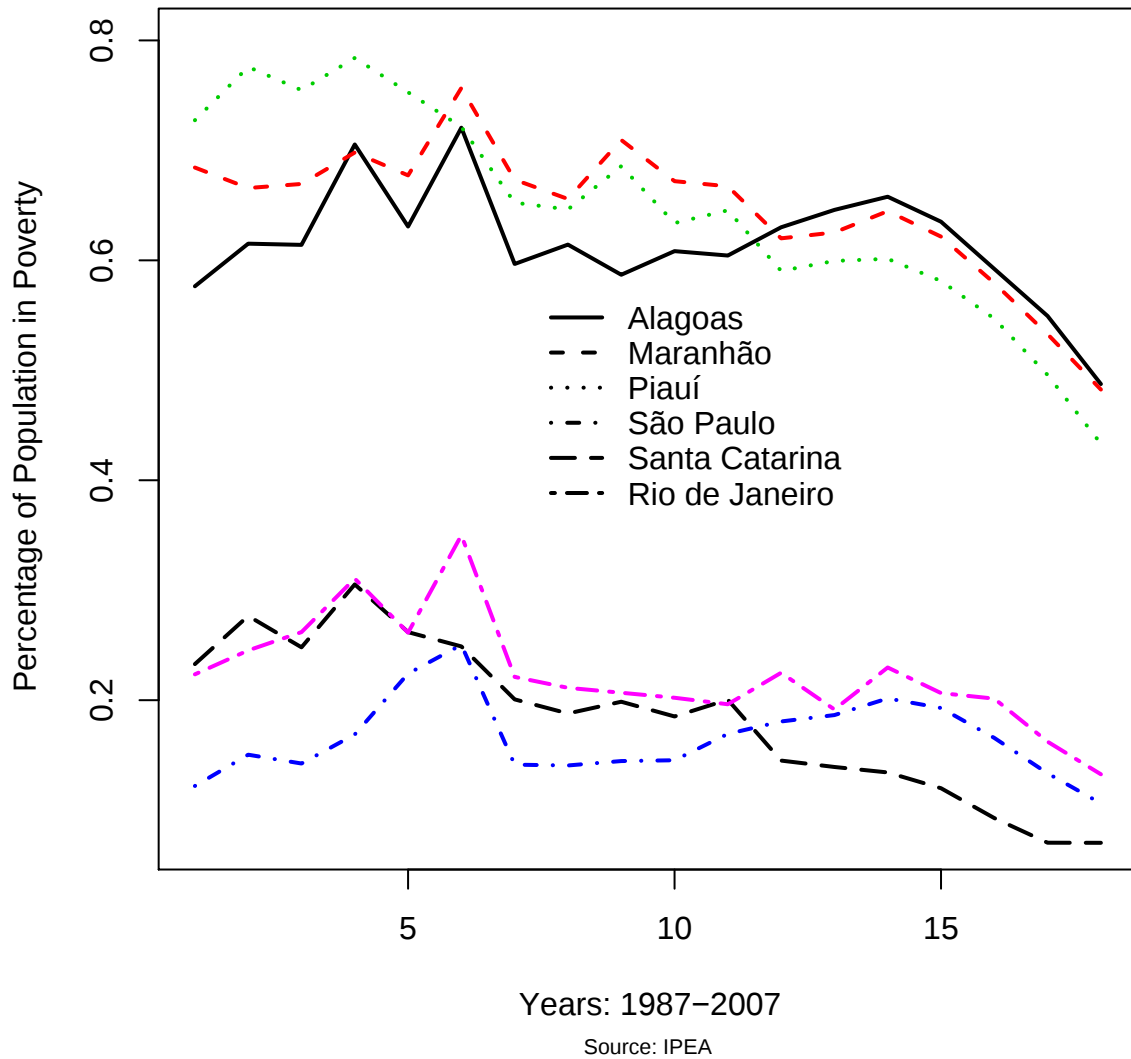


Fig. 2: Poverty Across Brazilian States

Decentralization

One of my expectations with this study is that Brazil's federal system would enable left parties to have a significant impact on poverty reduction at both the federal and state levels.⁴ The existing theoretical frameworks advancing the ar-

⁴ It is my expectation that the municipal level in Brazil can be important for poverty reduction; however, the exploration of this is beyond the scope of this study.

gument that left parties are linked to generous welfare states are typically applied to the national level; therefore, this macro-level theory cannot be readily transferred to the subnational level without further investigation into Brazil's system of decentralization.

The inner-workings of Brazil's decentralization lend credence to the idea that left parties can be effective at both the federal and state levels. Brazil is typically cited as having a high level of decentralization with exceptionally autonomous states (Fenwick 2009). In Brazil, the federal, state, and municipal governments share social policymaking responsibilities, yet no one level is *specifically* charged with authority over these matters (Wilson 2006). The 1988 Constitution devolved substantial policy and resource control to the lower levels of government, in reaction to the previous centralized system under the military rule. It has been argued that Brazil's strong federalism allows powerful state governors to constantly compete with the national government to continuously push for both additional political and fiscal autonomy (Fenwick 2008, Borges 2008). The 1988 Constitution devolved administrative and functional responsibilities to the subnational governments. Further, it called for a new tax system wherein the subnational governments were given both new tax powers and a larger share of federal tax revenues (IADB 2006).

On the other hand, while the 1988 Constitution did initiate further decentralization post-authoritarian rule, the Constitution also concentrated additional social policymaking responsibilities in the executive. In the 1990s, President Fernando Henrique Cardoso encouraged the recentralization of macroeconomic policymaking. Also, the Brazilian president has a great deal of authority over the budgetmaking process (Rodden and Arretche 2004). Further, Figueiredo and Limongi argued in 2000 that Brazilian presidents have been very successful in enacting their legislative agendas. For instance, between 1989 and 1997, 78 percent of the bills introduced by the president were approved and later enacted (Figueiredo and Limongi 2000).

In terms of poverty alleviation in particular, Article 23 of the 1988 Constitution clearly mandates a role for the federal government, the states, and municipal levels of government, yet this is also stipulated as common power between three disparate levels of governance (IADB 2006). Clearly, as described above, the Brazilian system is neither fully decentralized nor centralized. The IADB states this phenomenon best, “the Brazilian political system can be characterized neither as purely decentralized nor as a purely concentrated system. While some features such as electoral rules, a multiparty system, and federalism act towards decentralizing the political system, other features such as the internal rules of the decision-making process in Congress, the constitutional powers of the president, and his capacity to selectively distribute policy and financial resources...act towards centralizing it” (IADB 2006, 17). Consequently, Brazil’s strong federalism suggests that the possibility exists for both the federal and state governments to effectively influence poverty trends.

Education

As discussed, I expect that educational attainment is important for poverty reduction. In addition to the Pribble et al. 2009 study, countless additional research has advanced arguments for the importance of education for poverty reduction (see Borgess 2008, Brown and Hunter 2004, IADB 2002, IADB 2005, Wodon et al. 2001). Consequently, it is a serious matter that Latin American countries lag behind most regions in educational attainment. For instance, in 2002, “the average years of schooling attained by the population aged older or 25 in Latin America was approximately 6 years of schooling. With averages over 11 years in the United States, Canada, and Sweden, attainment in these countries is twice the Latin American average” (IADB 2002, 8). Though Latin America does lag behind in educational progress, the countries in this region *have* made gains since 1980 in ensuring higher school attendance; in recent years (2000-2004), the majority of children in the region enroll and complete primary school, while post-primary ed-

ucation has also increased, to almost one-third of the region's population (Damon and Glewwe 2007).

Some Latin American countries have been more successful with education than others; unfortunately, Brazil has been one of the less-successful countries in the region, especially with the education of its poor population. As of 2005, more than two-thirds of the poor in Brazil have attained only four years of education or less (IADB 2005). Throughout the entire Brazilian population, the average years of education completed by adults aged 25 or older is 6.5 years (again, considerably lower than the average of 11 years in the United States, Canada, and Sweden). The Inter-American Development Bank author Carlos Herrán has found an inverse relationship between poverty and the education level of the head of household; he explains “the probability of being poor is 50 percent for households where the head has less than four years of education, this probability is drastically reduced (to less than 25 percent) when the household head has completed primary education (eight years) and is practically zero for household heads with post-secondary education” (IADB 2005, 15).

The strongest argument advocating the importance of education for poverty reduction is a human capital one. Numerous studies and reports for decades have cited the significant impact education has on poverty reduction. An influential report prepared by the World Bank in 1995 entitled “Poverty and Income Inequality in Latin America during the 1980s” advanced the notion that educational attainment has the greatest relationship with both income inequality and poverty. This report illustrates well the importance of education for suppressing poverty. The argument is that educational attainment has indirect effects on poverty as higher average levels of education increases human capital and subsequently reduces income inequality, increases productivity, increases the probability of the poor acquiring better-paid jobs, etc. Further, this report holds that labor productivity is the main determinant of poverty, and that education (through its ability to augment productivity) may well be the most powerful tool for reducing poverty,

increasing economic growth, decreasing income inequality, and improving Brazil's position in the world market (IADB 2002).

Education in Brazil

The reasons for examining education at the subnational level in Brazil are twofold. First, average levels of educational attainment vary across states. For instance, the average years of education in 2005 was 4.23 in Alagoas, 4.48 in Maranhão, 7.14 in Santa Catarina, and 6.44 in Mato Grosso. Second, Brazil has a strong tradition of subnational control over schooling as states and municipal governments have the main responsibility for providing basic education. The 1988 Constitution decentralized Brazil's education system by delegating both fiscal and administrative educational authority to the state and municipal levels (Gordon and Vegas 2005). As a result, as early as the mid-1990s, states and municipalities were responsible for 80 percent of total education expenditures (Borges 2008, IADB 2006).⁵ The argument is made that Brazil lags behind its Latin America neighbors strictly because its educational system lacks intergovernmental coordination and because the national government has retreated from the center of the education system (Borges 2008). It follows from this line of logic that strong subnational control over the educational system and lack of intergovernmental coordination has contributed to a Brazilian trend of policy fragmentation in the field of education and subsequent variation in educational attainment across states. Accordingly, it is not surprising that average years of education varies across Brazilian states, underlining the importance of including data for each state in this study.

Figure 3 depicts a sample of six Brazilian states to highlight the variation in

⁵ There is one important federal educational mandate, which is the Fundo para Manutenção e Desenvolvimento do Ensino Fundamental e Valorização do Magistério (Fund for Maintenance and Development of the Fundamental Education and Valorization of Teaching) or simply the FUNDEF as it is widely known. The FUNDEF is a federal mandate, established in 1998, which stipulates the creation of a common state fund into which both states and municipalities are required to contribute a portion of their tax revenues. This state fund is then redistributed to the state and municipal governments on the basis of the number of students enrolled in the basic educational systems. Accordingly, the primary intent of this reform is to address spending inequalities *within* states, not necessarily across the entire country (Gordon and Vegas 2005).

educational attainment across the country. Alagoas, Piauí, Maranhão are shown because they are the three Brazilian states with the lowest average levels of educational attainment across the country, while Amapá, São Paulo, and Rio de Janeiro are the three states with the highest average levels of educational attainment. Figure 3 highlights numerous facts concerning Brazilian education. First, it is clear from this figure that average years of education have been consistently increasing throughout the country since 1987 (from an average level of 4.5 in 1987 to 6.74 in 2006). Second, even though education has indeed been increasing, educational attainment is still considerably low. Third, it is clear from Figure 3 that average educational attainment varies across the Brazilian states. For instance, in 2006, the level of average years of schooling was 4.69 in Piauí, 4.81 in Maranhão, 4.678 in Alagoas, 7.57 in Amapá, 7.80 in São Paulo, and 8.01 in Rio de Janeiro.

Figure 3: Average Years of Education Across Brazilian States

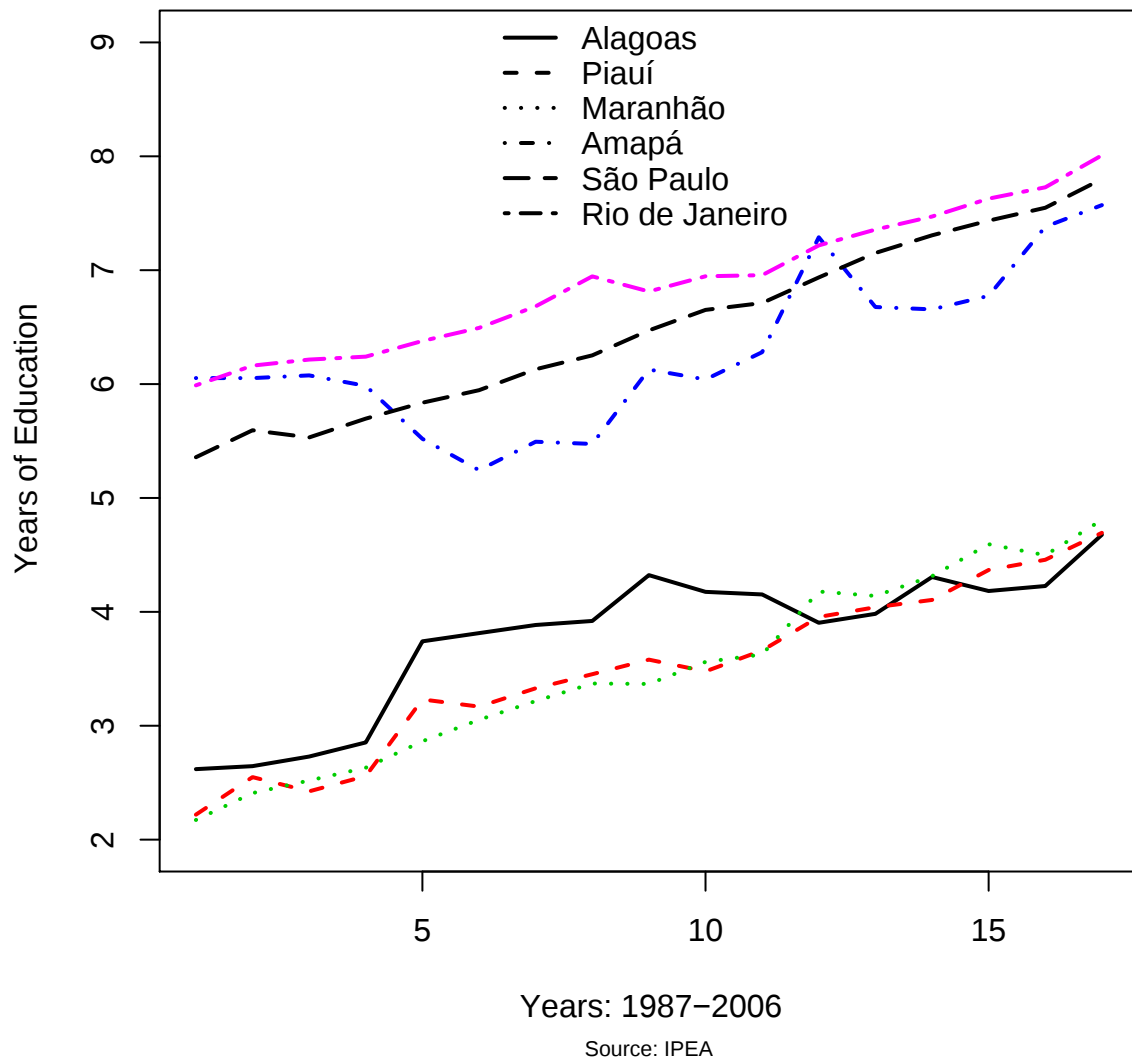


Fig. 3: Average Years of Education Across Brazilian States

Left Governance

As previously delineated, prior research has underlined the importance of left governance for the welfare state; accordingly, I want to ascertain whether or not left party power has a negative and significant relationship with poverty both at the federal and subnational level in Brazil. Several studies have previously established a connection between left party governance and a more generous welfare state and a subsequent decline in poverty. A clear example is that of Pribble et al. in which the authors cite evidence suggesting that left parties structure welfare policies to benefit specifically those people in lower-income brackets. In addition, left parties favor such social programs as investment in primary and secondary education, as well as universal healthcare. Upon examining left party weight in legislatures across 18 different Latin American countries, the authors find support for their hypothesis as they conclude that the weight of long-term left incumbency in the legislature has a negative, significant effect on poverty (Pribble et al. 2009). In general, previous scholars have underscored the importance of left parties in government for engendering a generous welfare state through a greater commitment to social programs, addressing social needs, etc. As such, I want to explore whether or not left power (federal and subnational, as discussed) has a significant and negative effect on poverty as the left is found to favor investments in human capital, improving education, progressive policies, etc.

Hypotheses

The first hypothesis in this study is that higher average years of educational attainment will have a negative and significant relationship with poverty. I expect that education will matter at the subnational level because Brazil is typically cited as having a highly decentralized education system (Borges 2008). The second basic hypothesis is that left governance has a significant, negative effect on poverty; more specifically, I hypothesize that the presence of left parties at the

state level (legislatures and governors) and in the federal presidency negatively impact poverty. As described above, the inspiration for these expectations comes from a 2008 study by authors Huber, Pribble, and Stephens wherein the authors performed a cross-national comparison of 18 Latin American countries and found that democracy, left party weight, and investment in human capital had significant, negative effects on poverty (Pribble et al. 2009). I have become interested in determining whether or not these findings can be transferred to the subnational level in Brazil. It is my expectation that long-term left power⁶ in Brazil's state legislatures, as well as leftist governors, will lead to a reduction in poverty as numerous scholars have pointed to Brazil as being a highly decentralized country (Stepan 2001, Souza 1997, Kingstone and Power 2008, Hunter and Power 2007, Fenwick 2009). However, I also expect a leftist *president* in Brazil to be important for poverty reduction throughout the years 1987-2006 as this time period saw the successful implementation of a federal poverty-alleviation program Bolsa Família. Accordingly, my expectation in regard to left parties is that long-term left governance at the state level (legislatures *and* governors) and/or in the federal presidency will have a negative, significant effect on poverty trends in Brazil.

Methods

For this paper, I use cross-sectional time series data for the 27 Brazilian states for the years 1987-2006 to test changes in poverty rates over time. With pooled data of this sort, there are commonly cited methodological problems, such as autocorrelation (as there can be systematic variation across states or years), bias, and inefficient estimates. One of the most common fixes offered to resolve these problems is the incorporation of fixed effects into the model. Proponents of fixed-effects models make the argument that it is utterly essential to include unit dummies so

⁶ By long-term, I necessarily mean beginning in 1987 as this is the first year included in the dataset. The measure for left power I use is an accumulated measure of the proportion of seats held by left parties in state legislatures, thereby gauging both duration and weight of left party power. Hereafter, I will refer to this as 'left power' for simplicity's sake.

as to hold every unit constant in order to avoid spuriousness and instead be sure that the ‘true’ effect of each explanatory variable on the variable of interest has been identified (Beck and Katz 1995). However, those opposing this method insist that these unit dummies eliminate far too much variation across units; this results in a serious problem, especially in the subfield of comparative politics where the interest typically lies exactly in the variation across units.

The use of fixed effects may be appropriate in some research; however, this approach is not always either necessary or desirable. Plümper et al., in their 2005 piece “Panel Data Analysis in Comparative Politics: Linking Method to Theory,” make the argument that the inclusion of unit dummies is *not* always necessary. The authors maintain that theory needs to be linked to method in that “if the theory says something about level effects on levels or on changes, a fixed effects specification is not the model at hand. If a theory predicts level effects, one should not include unit dummies. In these cases, allowing for a mild bias resulting from omitted variables [i.e. omitting unit dummies] is less harmful than running a fixed effects specification” (Plümper et al. 2005, 334) as the fixed effects completely absorb cross-unit variation. I am convinced by the argument advanced by Plümper et al. and accordingly have decided upon an error-correction model for this study which uses panel-corrected standard errors and allows for the examination of short and long-term effects without the inclusion of fixed-effects. Upon considering that the goal of this paper is to identify causal patterns and variation across states, it makes little sense to include dummies which hold all states constant and eliminates variation across states.

Error Correction Model

The error correction model (ECM) is not widely used, though it is becoming more so.⁷ An ECM uses OLS regression with panel data, and uses panel-corrected stan-

⁷ The argument has recently been made that the ECM is appropriate for both stationary and cointegration data. Keele and DeBoef, among others, have demonstrated a proof of the equivalence between the Autoregressive Distributed Lag (ADL) and the ECM. It follows from

dard errors to correct for correlation across units. The panel-corrected standard errors help the researcher to be more conservative in their inferences about the results as panel-corrected standard errors are larger than regular standard errors (and therefore it is more difficult to achieve statistical significance with panel-corrected standard errors). ECMs are extremely useful for cross-sectional time series data as they allow for a tighter link between theory and model in allowing researchers to test for both short and long term effects of causal processes (De Boef and Keele, 2008). The most basic understanding of this model is the following: “the term error correction model applies to any model that directly estimates the rate at which Y changes to return to equilibrium after a change in X (which can be either a short- or long-term effect)” (De Boef and Keele 2008, 9).

The ECM is *extremely* useful for dynamic specifications as it allows the researcher to include short and long term effects. If an independent variable has a short-term effect on Y, this impact can be captured immediately in an ECM; if an independent variable has a long-term effect on Y, this effect will be distributed across future time periods and this will also be captured in the model. In general, the error correction model is the superior one to use for this study because it allows me to correct for correlation across units, and to estimate the dynamics of both short- and long-run effects on poverty.

To use an ECM, one regresses a ‘differenced’⁸ dependent variable on a lagged level of the dependent variable, and a lag *and* differenced variable for *every* independent variable.⁹ An example: I regress the first difference of poverty on one lagged level of poverty (X1), one lag of the gini coefficient (X2), and the first difference of the gini coefficient (X3). Let’s say the coefficients are as follows: .2X1, .4X2, .3X3. The coefficients are interpreted as follows: a one unit increase in the gini coefficient will result in an *immediate* change in the poverty level in the

their argument and proof that the ECM need not be limited to cointegration data, but that it is indeed well-suited for stationary data as well. This is relevant to this paper as I incorporate both stationary and integrates series into the ECM (Keele and DeBoef 2006).

⁸ ‘Differencing’ calculates the change in a variable from the previous period to the current period

⁹ The structure of the error correction model is $\Delta Y = \alpha_0 - \alpha_1(Y_{t-1} - \beta X_{t-1}) + \beta_0 \Delta X_t + \epsilon_t$

amount of .3. This one-unit increase in the gini coefficient also has a long-term effect; however, the interpretation of this effect is not as straightforward. The interpretation of the coefficient for X2 involves a long-run multiplier, which is the total effect of X2 on Y at a rate of $1 - \alpha_1$ (β_1 / α_1). The long-run multiplier itself is the ratio of two coefficients: X2/X1 (or, in this case, it is a ratio of the gini coefficient lag/poverty lag). Thus, the total effect of X2 on Y (as a result of a one-unit change in the gini coefficient) is $2 (.4X2/.2X1)$, which is distributed over future time periods at a rate of .8 ($1 - .2X1$), which is the speed of adjustment ($1 - \alpha_1$).

It makes both theoretical and statistical sense for me to use an ECM. As described above, the ECM is extremely useful for modeling dynamics. This is appropriate for this study as the relationship between poverty and many of its causal factors is inherently dynamic and as such it makes theoretical sense that certain independent variables would have both short and long term effects on poverty trends. I have also included an OLS regression model with panel-corrected standard errors in order to demonstrate the robustness of my results. As I will describe in more detail later in the paper, the significant findings produced from the ECM maintain their significance in both models. Finally, it makes statistical sense to employ an ECM since several of my variables are integrated time series.¹⁰

Variables

The measure of poverty used in this analysis is an estimate of the percentage of the population living in poverty, which is defined by the Brazilian government as

¹⁰ An integrated time series is one in which old shocks, impacts, effects, etc. never leave the system; instead, their effect will persist throughout time. Educational attainment is an integrated time series because this measure is expected to continuously increase and never retract; each of the four left measures are integrated series because they are accumulated and necessarily will never retract. Integrated time series data can only be handled by ‘differencing’ the variable, meaning that the only way to employ an integrated time series is to measure the change from one period to the next in the variable. However, most of my variables actually do pass standard Dickey-Fuller tests for integration, yet because of the cumulative nature of many of my variables, it is best to that they are near-integrated at best.

making 50 percent or less than the minimum wage.¹¹ The independent variables included in the error correction model are comprised of various social, economic, and structural factors that are likely to affect poverty. The error correction model contains social security/welfare spending as a percentage of GDP, a measure of federal funding in the form of FPE (a redistributive measure from the federal to state governments) as a portion of GDP, percentage of the labor force in industry, left party weight in the state parliaments, accumulated years of left majorities in state legislatures, measures of the presence of left governors and left presidents, average years of education, the percentage of the rural population, gini coefficients for each of the Brazilian states, and per capita household income as independent variables. The panel-corrected standard error model uses these same explanatory variables, as well as two additional social spending variables (education¹² and health/sanitation spending as percentages of GDP) and a measure of GDP itself.¹³ There are certain variables that were excluded from both models.¹⁴

It is important to include measures of social spending so as to capture the economic commitment the Brazilian states have to different sorts of social needs. Furthermore, “spending patterns and the design of social welfare programs have an impact on poverty levels in Latin America” (Pribble et al 2009, 7). In order to estimate the social spending levels, the raw spending data from the Ministerio

¹¹ This is the only measure of poverty available. Unfortunately, there is not an available measure of relative poverty (such as purchasing power) at the state level in Brazil.

¹² The education spending measures includes spending on ‘culture,’ and there is not an obvious way to disaggregate the two that I have come across.

¹³ These additional variables were excluded from the error-correction model for multicollinearity purposes. In performing a VIF (variance inflation factor) test for the full error-correction model, the education spending, healthcare spending, and GDP growth variables exceeded the standard cut-off point for multicollinearity (a VIF of 10) and were subsequently dropped from the model. Excluding these variables from the model did nothing to change the results. Multicollinearity was not a problem in the panel-corrected standard error model (as their VIF numbers were within the accepted standard of the discipline), thus education and health spending and GDP were also included in this model. Tables 5 and 6 in the Appendix display the VIF scores for both the ECM and the PCSE.

¹⁴ A measure for race was also not included. Unfortunately, the only data available for race is census data for the years 1991 and 2000. These are not enough data points to confidently interpolate missing data. In the future, there are several additional variables that I hope to include, such as national inflation rates, additional measures of federal transfers, state debt, and of course Bolsa Família.

de Fazenda was first collected for each state and two different measures of spending were subsequently calculated. The first measure gauged constant currency spending per capita, which enabled the comparison of spending per capita in different regions over time. To ensure constant currency, the International Monetary Fund Brazilian GDP deflator was applied, which is the method that the Instituto de Pesquisa Econmica Aplicada utilizes in constructing measures of GDP. There is a necessary assumption made in using this method-that inflation is constant across all states. This is probably untrue, but the assumption must be made in this research paper because calculating a deflator for each individual state is an exceptionally difficult task.

The second measure constructed is social spending as a percentage of GDP, which also uses the constant currency measure of spending because state GDP is only available in constant currency units.¹⁵ This measure is important to include because it gives a rough estimate of the proportion of market productivity of the state that is allocated to social spending. With this measure, it is possible to compare effort exerted by the different states in that states with lower levels of GDP will have less to spend on social programs, but it is possible that they are applying the same level of effort. In examining the proportion of their GDP that is allocated to social spending, it is possible to which states dedicate a higher percentage of their GDP to social programs.

Pribble et al. extend the idea of using years of education as a proxy for a measure for the effectiveness of education policy. Their argument is that Latin American policies are often criticized for being corrupt and ineffective, and that even if a large amount of social spending money is dedicated to education spending in particular, it might not actually make a difference in education policies or programs. In order to gauge the effectiveness of educational provisions and policies, the authors measure years of education instead of education spending. Years

¹⁵ As health and education are long-term investments in infrastructure, I use an accumulated average (instead of raw spending) as a percentage of GDP for each of these two measures (Pribble et al. 2009).

of education can act as a proxy for policy effectiveness because, as the authors explain, the average amount of years of education indicates whether or not a program or policy has been effective. Accordingly, one can measure the effectiveness of education policies (increasing subsidies, investing in training for teachers in low-income schools, improving the quality of education in numerous ways, etc.) by whether or not they increase the average years of education (Pribble et al. 2009). Further (and most importantly), measuring years of education is the best fit for the argument of this paper as I am advancing the notion that higher average years of education in a population will lead to a reduction in poverty. The measure in this study gauges the average years of education achieved among the population aged 25 years or older, in each state.

The Fundo de Participação dos Estados (FPE) is a redistributive measure from the federal Brazilian government to the state governments. The central government takes 21 percent of the federal incomes taxes and redistributes it to the different states, which is allocated based on the population and economic need of the specific state (Samuels 2003, IADB 2006). This is *the* most important measure of federal funding as an entire fifth of federal income taxes is redistributed to the states through this FPE;¹⁶ further, the states have a substantial amount of discretion in how they spend this funding, as only 10 percent of FPE transfers are mandated to be specifically allocated to certain programs (Mainwaring and Samuels 1999). The measure in this model calculates the FPE as a portion of a state's GDP. This estimate gauges how much of the total public spending of the state comes from need-based funds from the federal government. The expectation is that states with higher percentages of FPE to GDP will be poorer states in that a larger portion of their GDP is dependent upon money from the federal

¹⁶ It is also the most feasible federal funding data for me to use in this study. Ideally, I would have exact measures of *total* federal funding to states; however, this data is incredibly difficult to parse out. There seem to be several smaller disparate sources of federal funding; however, as of yet, it is unclear to me as to how these are allocated, on which bases they are allocated, for what purposed are they redistributed, etc. Thus, I have only included a measure of FPE. However, I am confident that this measure accurately gauges federal funding to states as an entire fifth of federal income tax is redistributed to the states in this way.

government, which is based on the socio-economic needs of the population. Table 3 in the appendix displays federal FPE funding to the states as a percentage of the states' GDP. Keeping in mind the three states with the highest average poverty rates (Alagoas, Maranhão, and Piauí) and the three states with the lowest average poverty rates (Rio de Janeiro, Santa Catarina, and São Paulo), it is evident that FPE funding varies across states, and that FPE as a percent of GDP is higher among the poorest states than the more wealthy ones.

Left party weight is an important variable in the dataset and is used to estimate the weight of left party governance in each state's parliament for each year. As previously described, prior research suggests that the welfare state is more generous when left parties control government for longer periods of time, and thus I want to see how this relates to poverty. This measure was constructed using Huber and Stephens' measure of party codings, following Coppedge (Pribble et al. 2009). To estimate left party weight, the number of seats held by left or center left parties as a percentage of the total number of seats for each year (in each state's parliament) was calculated. State parliament elections are held in October, so this measure calculates left party weight from the outcome of the October elections, and applies this number to the beginning of the following year. The final measure for left party weight was a cumulative estimate for the left party weight from each year. This final, accumulated measure enables me to capture both relative weight and length of left governance in the state legislatures. I have an additional measure for left governance in the state legislatures, which is a cumulative measure of left *majorities* in state legislatures. In this regard, I thought it important to determine whether or not the left must have a majority (as opposed to simply being represented) in order to have a substantial impact in policymaking. This measure then estimates the number of years total in which the left has had a majority in the legislatures in a given state.

I include a measure for state governors, which estimates whether a left governor was in power in a given state, which was then accumulated in order to measure

the total number of years a state has been represented by a left governor. The final measure of left governance is for the executive level. To estimate this, I include a dichotomous variable gauging whether or not a left president was in office.¹⁷

I include an estimate of the percent of the labor force in industry, as this is a commonly used variable in poverty studies. The logic is such that industry workers tend to earn higher wages and are less likely to be in poverty than are agricultural workers. The gini coefficient (a calculation of income inequality) is included in the model to gauge inequality across Brazil. This is a measure of the gini coefficient calculated for each state in each year.¹⁸ It is important to include a measure of inequality when examining poverty because countless studies conclude that inequality causes poverty. It is commonly argued that inequality is a constraint to economic growth and poverty reduction (IADB 2005) and as such, it is necessary to incorporate a measure of income inequality into the model.

The variable for income is per capita household income, which is measured in constant currency units. This is calculated from household surveys, wherein the income level for each household is gathered and then divided by the total number of working adults in the household. Thus, this gives an average measure of income for each state based on household surveys. Including a measure of income is important because it estimates how well off individuals are in each state, and higher income levels are typically associated with lower poverty levels. The variable for GDP is a measure of each state's economic performance. GDP is often included as an explanatory variable in poverty studies as scholars have typically associated better economic performance with lower levels of poverty.

The final variable included in the model is a measure of rural population.¹⁹ It

¹⁷ This estimate is synonymous with a measure for Lula, as he is the only left president Brazil has seen since 1987.

¹⁸ However, it is unknown if the gini coefficient for each state was calculated by the state itself or if the different gini coefficients were calculated by a common source. It could be problematic if the ginis were calculated by each state as they might be biased, or some states might be better equipped to measure income inequality more accurately than others. However, every gini coefficient comes from the same datasource (IBGE microdata) and as such it seems likely that they were all calculated from this source.

¹⁹ There is a good deal of missing population data, which was handled with data interpolation. The first step to measuring the rural population in each state was to gather census data. The

important to include rural population as “poverty tends to be higher in rural than in urban areas. The headcount of extreme poverty is three times higher in rural than in urban areas. For total poverty, the headcount is twice higher in rural areas” (Wodon et al. 2001, 135). Moreover, World Bank statistics indicated that, in 2001, approximately 50 percent of the poverty-stricken population resides in rural areas; the Bank contributes rural poverty to poor resources, a poorly developed agricultural system, limited technology use, and low productivity rates, among other factors. The rural population in Brazil typically depends on traditional agriculture, livestock, and cash crops for their income; moreover, workers in rural areas are primarily small landholders, tenants, sharecroppers, or landless workers (World Bank March 2001). Further, as of 2001, “90 percent of rural households lacked adequate water supply, 57 percent lacked proper sanitation facilities, and 73 percent of rural heads of households earn one minimum salary or less per month” (World Bank 2001, 2).

Data

Brazil has excellent data at the subnational level and the data for this study comes from numerous places: the Census Bureau, Huber and Stephens, IPEA, IBGE, AND TSE. The Census Bureau was utilized to measure the population and proportion of rural population in each Brazilian state. Huber and Stephens’ party codings, an extension of Coppedge’s project, were used to measure left party weight. Coppedge’s work questioned country experts in 11 Latin America to categorize the parties that challenged elections in the lower house or constituent assemblies as far back as 1912. Upon considerations of social and economic policy

population census took place in 1983, 1987, 1991, 1996, and 2000, so there is technically missing data on the population size for the years the census did not take place. However, interpolation was a simple fix to this problem. For the years between 1983 and 1987, an average was taken from the population size of 1983 and 1987 and interpolated for the missing years in between. This same calculation was applied to the all of the missing years throughout the dataset. Next, the rural population data was divided by the population data in order to obtain a measure of the percentage of people living in rural areas in each state so as to be able to compare across states.

positions, Coppedge classified parties along a left-right ideological range; this categorization was then further divided into five disparate groupings: left, center-left, center, center-right, and right. Huber and Stephens adopt Coppedge's method and coding and extend it to include present-day parties and parties in lower-house elections (Pribble et al. 2009 13-14).

The Instituto Brasileiro de Geografia e Estatística (IBGE) and the Instituto de Pesquisa Econômica Aplicada (IPEA) are two government websites that contain data on various economic, demographic, and social characteristics, which were used to gather data on spending, income, poverty, inequality, water, and funds from the federal government. The Tribunal Superior Eleitoral (TSE) is a Brazilian government website that was used to collect data on the outcome of elections. For any years that were missing from TSE, data was collected from Jairo Nicolau. Nicolau has compiled a dataset on party affiliations in Brazilian state elections.

Results

Table 1: ECM with Measures of all Left

	Estimate	PCSE	t value	Pr(> t)
(Intercept)	-.0247477	.047901	-0.52	0.605
Lagged Poverty Level	-.0838104	.0249281	-3.36	0.001
Educational Attainment Δ	-.0256016	.0093168	-2.75	0.006
Educational Attainment Lag	.0014757	.0036588	0.40	0.687
Left in Legislature Δ	.0228301	.0200322	1.14	0.254
Left in Legislature Lag	-.0036697	.0039698	-0.92	0.179
Left Governor Δ	-.0066552	.0048528	-1.37	0.170
Left Governor Lag	.0008059	.0008747	0.92	0.357
Left Majority Δ	.0015945	.0062849	0.25	0.800
Left Majority Lag	.0000509	.0009788	0.05	0.958
Lula Δ	-.0051978	.0065408	-0.79	0.427
Lula Lag	-.0071802	.0029179	-2.46	0.014
Gini Δ	.3498687	.0558425	6.27	0.000
Gini Lag	.1550996	.0662941	2.34	0.019
SS/GDP Δ	.0027124	.0239553	0.11	0.910
SS/GDP Lag	-.0564408	.1861383	-0.30	0.762
FPE/GDP Δ	.153218	.0918062	1.67	0.095
FPE/GDP Lag	.0252525	.0292725	0.86	0.388
Industry Δ	-.3370915	.1279515	-2.63	0.008
Industry Lag	.0107466	.0513409	0.21	0.834
Rural Δ	.3025336	.3382536	0.89	0.371
Rural Lag	.0092672	.0254853	0.36	0.716
Income Δ	-.000761	.000068	-11.20	0.000
Income Lag	-.0000931	.0000458	-2.03	0.042

Observations 334; R-Squared 0.5476

Table 2: PCSE Model with Measures of all Left

	Estimate	PCSE	t value	Pr(> t)
(Intercept)	.13377	.1425685	0.94	0.348
Educational Attainment Δ	-.0858629	.0235761	-3.64	0.000
Left in Legislature Δ	.0509541	.0414845	1.23	0.219
Left Governor Δ	-.0243887	.0195712	-1.25	0.106
Left Majority Δ	.0102239	.0161434	0.63	0.527
Lula Lag	-.0321644	.0108753	-2.96	0.003
Gini Δ	.3507552	.1917968	1.83	0.067
Gini Lag	.8281082	.2353169	3.52	0.000
SS/GDP Lag	2.099287	.4762956	4.41	0.000
Education Spending/GDP Lag	-1.063728	.4413688	-2.41	0.016
Health Spending/GDP Lag	2.815469	.6910119	4.07	0.000
FPE/GDP Lag	.0067581	.1673328	0.04	0.968
Industry Δ	-.2656417	.2414661	-1.10	0.271
Rural Population Lag	.2822671	.0420993	6.70	0.000
Income Lag	-.0011908	.0000533	-22.36	0.000
GDP Lag	2.66e-10	6.24e-11	4.27	0.000

Observations 334; R-Squared: 0.8409

Table 1 displays the results from the full error correction model; as previously outlined, there are two estimates produced for each independent variable: both short and long-term effect coefficients. As indicated by this table, four disparate measures of left governance were included in this model,²⁰ only one of which is significant (a lagged Lula estimate). The first measure for left, ‘Left in Legislature,’ is an accumulated measure of the proportion of seats held by left parties in each state parliament throughout 1987-2006. ‘Left Governor’ is a cumulative measure gauging the number of years a left governor was in power during the time period. The measure for ‘Left Majority’ is also an accumulated measure of the number of years the left experienced a majority in the state legislature. Finally, the variable ‘Lula’ is a dummy variable measuring whether or not Lula was in the executive.

As stated, Table 1 shows that, of the different measures of left governance, only a lagged value for Lula is a significant finding. This finding indicates that left representation in the federal presidency negatively (and significantly) affects poverty levels in the long-term, and that this effect is distributed over future time periods. As previously delineated, the coefficient for this lagged term cannot be interpreted directly; instead, it requires the use of a long-run multiplier (LRM). The LRM in this case (calculated with a ratio of the Lula lag/poverty lag, or (β_1 / α_1)) is .0857 and the speed of adjustment is .9162 (1-.0838), which is $(1 - \alpha_1)$. Substantively, this means that the presence of Lula in the previous year negatively affects poverty in the amount of .0857, which is distributed over future time periods at the speed of .9162. The finding that Lula is not significant in the short-term (indicated by Δ) is unsurprising as this simply suggests that Lula is not *immediately* impactful against poverty, which one should expect since his flagship anti-poverty program Bolsa Família is not likely to see *immediate* changes, which

²⁰ I also ran several models with various different combinations or exclusions of the different left variables; however, the results were always the same in that only Lula is a significant predictor. Therefore, I have included all four measures in this one model to be concise since it does not change the direction or significance level of any variable. In terms of multicollinearity issues, none of the variables for left governance have VIFs high enough to be a concern. I did also run models that included only one measure of state left power at a time, (the results of which are not included in this paper) and the same results displayed in Table 1 were upheld in each.

is required to achieve significance in the short-term.

Table 1 also shows educational attainment in the short-term to have a significant, negative impact on poverty trends.²¹ Interpreting the result for the short-term (or change in educational attainment) effect is very direct. This result can be taken to mean that for a one-unit increase in educational attainment, there will be an *immediate* change in the poverty rate in the amount of -.0256.

Table 1 also indicates that the gini coefficient is as significant, both in the long and short-term. The short-term effect (understood as a *change* in the gini coefficient) has an immediate impact on poverty in that a one-unit increase in the gini coefficient (along which higher values means greater inequality) results in an immediate change in poverty in the amount of .3499. Accordingly, any increase in income inequality will simultaneously increase poverty in the very short-term. Table 1 also shows the gini coefficient to have a significant, long-term effect on poverty trends. The LRM for the gini coefficient lag is 1.8506; substantively, this means that a one unit increase in the gini coefficient has a total effect on poverty in the amount of 1.8506, which is distributed over future time periods until the effect decays (at a rate of .9162). This finding is very telling as it suggests that a one-unit increase in the gini coefficient (i.e. an increase from .55 to .56) results in a 1.8506 percent increase in the poverty rate in the long-term. In general, we can take the results for the gini coefficient to mean that higher income inequality increases poverty both in the short and long-run.

Also shown in Table 1, the measure for FPE funding (as a percentage of GDP) is also a significant explanatory variable for poverty in the short-term.²² This

²¹ It is not worrisome that educational attainment is not seen to have a long-term effect on poverty reduction. As previously described in footnote 9, this variable is an integrated time series, which necessarily means that this measure is expected to continuously increase and never retract. As integrated series can only be handled when ‘differenced,’ which means that the most logical way to interpret the result of an integrated series is to measure the change from one period to the next in the variable, not to interpret its lagged level.

²² As spending on poverty reduction is typically associated with left governments, one might expect that this FPE funding would be more effective at reducing poverty if a left government were in place to control the spending. However, testing the possibility of a significant interaction effect between FPE/GDP and left governors, as well as FPE/GDP and left majorities, proved to be fruitless as in neither case was the effect significant.

indicates that an increase in federal FPE funding results in an immediate decrease in poverty in the amount of .1532. This is a very encouraging result, as it suggests that federal funding to states can actually be important poverty reduction measures.

Further, household income is shown to be a significant explanatory variable in both the long- and short-term. The short-term effect indicates that an increase in household income results in an immediate reduction in poverty in the amount of -.00076. It is unsurprising that this effect (though significant) is small as the variable income measures individuals' or households' income, whereas poverty is a measure of the entire poverty-stricken population in the entire state. For the long-term effect, the LRM for income is .0011, which substantively means that a one unit increase in household income has a total effect on poverty in the amount of .0011, which is then distributed over future time periods until the effect decays (at a speed of adjustment rate .9162). These are encouraging (though not surprising) findings as they underline that household income is directly related to one's likelihood of falling below the poverty line.

The estimate for industry (which is the percentage of the labor market in industry) is also shown as a significant determinant of poverty reduction in the short-term; this finding implies that a positive change upward in the percentage of the labor force in industry results in an immediate decrease in the poverty level in the amount of -.3371. This finding is not surprising as industry workers tend to earn higher wages and are less likely to be in poverty than are agricultural workers. Accordingly, as more and more people go into industry (and subsequently earn higher wages), the poverty rates will immediately begin to drop.

Finally, Table 1 shows that a lagged level of poverty, of course, has a significant impact on poverty; however, this effect is *negative*. My explanation for this finding lies in the fact that the dependent variable in an error correction model is itself a *change* in poverty. This suggests that higher poverty rates are linked to stronger efforts to reduce that poverty. In other words, this finding suggests that, if a state

has a high poverty percentage, efforts will be made to combat that poverty. Also, this could be a manifestation of Bolsa Família in that the higher the poverty level in a given state, the more poverty-stricken individuals there are to receive aid from this poverty-alleviation program.

Though I do think that an error correction model is the most appropriate for the purposes of this dataset and model, I also include a more conventional model. My reasons for doing so are twofold; on the one hand, it enables me to demonstrate that the results I found from the error correction model are maintained in a disparate model; also, it allows me to use change in *level* of poverty as opposed to a ‘differenced’ value of poverty for my dependent variable. This then enables me to examine whether or not my variables of interest explain both the trend in poverty levels, as well as a change in poverty from one period to the next (i.e. a ‘change in change’).

Table 2 displays the results from a more traditional panel-corrected standard errors model.²³ For this model, I had to ‘difference’ years of education and the left variables as both are cumulative measures. I also chose to ‘difference’ the gini coefficient (though I also include a lagged gini coefficient) and industry as I am interested in estimating the short-term effect for both. I included lags of the remaining variables²⁴ instead of including a ‘differenced’ and lagged measure for every variable as is required by the error correction model. Also, I include measures for education and health spending as a percent of GDP and a measure for state GDP.²⁵

²³ Panel-corrected standard error models correct for cross-correlation across units and adjust the standard errors accordingly (similar to the error-correction model, but not as involved.) This particular model does not include a lagged level of the dependent variable as an explanatory variable, as this is argued by some to soak up too much of the variance (Achen 2000).

²⁴ It makes theoretical sense to include lags of the variables because it is likely the case that there is a time lag before their impact takes place. For example, it is important to lag social spending because it probably takes at least one time period before the effect of spending on poverty can occur.

²⁵ As previously explained, these are variables which I would like to have used in the error-correction model but multicollinearity was a problem for each (with VIF scores greater than 10). However, multicollinearity was *not* found to be a problem for any variable in the second model. This is unsurprising as the error-correction model necessitates that each variable is included twice, thereby increasing the chances for multicollinearity problems. Finally, I have run both the error correction and panel-corrected standard error models with and without these

As demonstrated by Table 2, several additional variables jump in as significant explanatory variables. The most important finding from this model, for this study, is that the results for educational attainment and a leftist executive president were maintained. Also consistent with the error-correction model, none of the subnational left power variables are significant findings. This model provides more support for my findings, thus suggesting that my results are robust. In addition to educational attainment and Lula, income inequality (both in the short and long-term), social security/welfare spending, education spending, health spending, rural population, income, and GDP are all returned as significant in this model.

It is unsurprising that these variables are significant in one model and not the other, as the dependent variable for the disparate models are measuring different phenomenon. The dependent variable in the error correction model measures change in poverty, whereas the panel-corrected standard error model measures a change in the level of poverty. From the results between the two models, I conclude that the findings of most interest to me (educational attainment and Lula) are robust findings and explain both change in poverty and change in the level of poverty. To explain why several additional variables are significant in the second model, I assume that certain variables explain an immediate change in poverty whereas others explain change in level of poverty.

Discussion and Conclusion

The findings for education clearly support my hypothesis that a change upward in average years of education has a significant, negative impact on poverty. This is not a surprising result as prior research has established that investments in human capital of this sort can assist in lifting people out of poverty through increasing the productivity of the labor force and subsequently increasing wages (among other positive effects). The importance of education for the population's income levels,

three variables. In each case, the findings were maintained; however, it is best to exclude these variables from the error-correction model as protocol suggests a VIF of 10 is too high.

as well as economic growth in general, is further highlighted with the Bolsa Família program. Monetary benefits for this program were *conditional* on evidence that the children in the qualifying households had at least an 85 percent school attendance rate (Kingstone and Power 2008). This suggests that the Brazilian government is becoming aware that in order to sustain economic growth and continuously decrease poverty, investments in human capital are necessary.

Brazil *is* a highly decentralized country as outlined previously; however, my findings indicate that the power of left parties at the governor and state parliament levels in the face of poverty is drastically reduced in this time period due to the presence of either a left president or Bolsa Família. The results indicate that a left president has a more significant impact on poverty reduction than accumulated left power in the state legislatures, rule by left governors, or the presence of left majorities in state legislatures. It might certainly be the case that the power of the federal government is weakened by the states in some policy arenas as a result of the decentralized nature of the country; however, this has not been the trend with poverty in recent years, as President Lula has been able to circumvent the state governments and implement a near-universal, successful policy reduction program (Bolsa Família). For example, Tracy Fenwick, in her article “Avoiding Governors: the Success of Bolsa Família,” advances the argument that President Lula was successful in his implementation of Bolsa Família *precisely* because he was able to circumvent the state governors and parliaments and instead fully enact the family stipend program directly to the municipal and individual level. The president defied existing theories of the serious constraints of Brazil’s decentralization and was able to establish a relationship between the federal government and the citizens by cutting out the participation of the states and instead direct Bolsa Família’s implementation at the municipal level (Fenwick 2009). Fenwick makes clear in this article that the “biggest losers in Bolsa Família were the twenty-seven states that the federal government cut out by building and expanding on federal poverty-alleviation without their involvement....Bolsa Família bypasses state-level

involvement” (Fenwick 2009, 117-118).

Though the findings indicate that left governance at the state level takes a backseat to Lula, it is probably the case that state legislators and governors are effective for poverty reductive in other ways. For instance, a simple correlation test reveals that the measures for educational attainment and legislative left power are correlated at a level of .5494.²⁶ This suggests that left parties at the state level might very well be important for education and subsequently indirectly important for poverty reduction. Regardless, though my hypothesis that left governance at the state level would have a powerful effect on poverty reduction is not supported, it is still a positive and encouraging finding that a left president in Brazil *can* have a significant impact on lowering poverty.

In conclusion, I have demonstrated with this paper that higher average levels of education are essential for poverty reduction efforts through improving the human capital of the population and subsequently increasing the productivity of the labor force. Also, left governance *is* important for decreasing poverty, though not directly at the state level. The results indicate that what has been important for poverty alleviation is a left *president* in power in Brazil. However, as previously outlined, it is difficult to decipher whether this finding is due to a left president in general or is specific to President Lula as he has implemented a successful poverty alleviation program which has reached its target of 11.1 million poor people. Also, Lula is the only president that can be coded as ‘left’ since Brazil’s democratization and as such there are not other left presidents to compare this result to. To conclude, it is essential for Brazil to “continue to strengthen the social safety net, as particularly targeted conditional cash transfers (Bolsa Família) can have a significant effect on poverty alleviation, improve the progressiveness of public transfers and income distribution in the short run, while emphasizing the importance of human capital investments for sustainable poverty reduction” (IADB 2005, 34).

²⁶ The correlation matrix for this model is not included as space was a concern with 15 variables; instead, the VIF scores for the disparate models are included in the Appendix in Tables 5 and 6.

Future Research

The findings from this study suggest several avenues for future research. Specifically, these results could only be enhanced with a more direct investigation of Brazil's decentralization structure. A more complete dataset including quantitative measures of total federal transfers to the states will strengthen any studies examining subnational Brazil. Additionally, the results from this study run counter to numerous arguments in the literature which maintain that Brazil's state governments have consistently constrained the center; subsequently, it would be interesting to push this study further in order to really examine subnational politics in Brazil. Finally, and most importantly, Brazil's decentralized education system deserves a closer examination. As detailed previously, Brazilian subnational governments have the largest responsibilities with education; however, "as a result of the *retreat of the center* and the lack of intergovernmental coordination, Brazil [has] continued to lag behind its neighbors in educational development; school failure and drop-out remained at very high levels, and, by the early 1990s, Brazil had one of the worst education performances in Latin America...only Haiti had a lower primary school completion rate" (Borges 2008, 238). This argument highlights negative effects of a decentralized education system and, as I have hopefully elucidated, education is exceptionally important for poverty reduction. These two arguments combined elicit future research on the effects of Brazil's decentralized education system.

Appendix

Table 3: Federal FPE Funding to States as a Percentage of States' GDP

	1985	1990	1995	2000	2005
Acre	0.12120	0.07439	0.26549	0.24478	0.22861
Alagoas	0.02953	0.07085	0.07958	0.08489	0.08839
Amapá	0.00000	0.08395	0.17152	0.23140	0.23437
Amazonas	0.01416	0.01860	0.01959	0.02679	0.02502
Bahia	0.01119	0.02537	0.02707	0.02096	0.03097
Ceará	0.02899	0.05498	0.04532	0.05055	0.05374
Distrito Federal	0.00121	0.00714	0.00584	0.00334	0.00257
Espírito Santo	0.00645	0.01098	0.00898	0.00999	0.00952
Goiás	0.01045	0.00699	0.01845	0.0188	0.01687
Maranhão	0.06143	0.10978	0.11009	0.1124	0.0855
Mato Grosso	0.02137	0.03355	0.02737	0.02468	0.01844
Mato Grosso do Sul	0.00969	0.01684	0.01471	0.01605	0.01839
Mi.s Gerais	0.00526	0.00582	0.00546	0.00602	0.00691
Pará	0.02197	0.02569	0.03837	0.04635	0.04683
Paraíba	0.04592	0.06875	0.06945	0.07429	0.08488
Paraná	0.00218	0.00551	0.00579	0.00626	0.00681
Pernambuco	0.02056	0.03149	0.03045	0.03398	0.04143
Piauí	0.06695	0.11690	0.10495	0.11621	0.11663
Rio de Janeiro	0.00192	0.00171	0.00181	0.00135	0.00186
Rio Grande do Norte	0.03307	0.07059	0.06825	0.06443	0.06992
Rio Grande do Sul	0.00256	0.00351	0.00339	0.00397	0.00489
Rondônia	0.0000	0.051701	0.07038	0.07174	0.06539
Roraima	.14214	0.01578	0.40807	0.27164	0.23375
Santa Catarina	0.00342	0.00416	0.00419	0.00433	0.00449
São Paulo	0.00032	0.00033	0.00034	0.00038	0.00041
Sergipe	0.02749	0.08771	0.09084	0.10059	0.09289
Tocantins	N/A	0.33307	0.27333	0.21626	0.15232

Table 4: Summary Statistics

	Observations	Mean	Standard Deviation	Minimum	Maximum
Poverty	560	.3822585	.1783312	.0135433	.7907487
Gini Coefficient	560	.5688629	.0421962	.3944586	.6664805
Left in Leg.	551	.3082008	.1708543	0	.7916667
Cum. Left in Leg.	551	2.776884	2.364442	0	11.06532
Cum. PT Weight	551	.6887246	.6988081	0	3.610942
Cum. Left Maj.	551	1.357532	2.83503	0	17
Left Governor	551	.3666062	.4823155	0	1
Income	560	291.6018	123.5657	90.28869	823.4935
SS/GDP	590	.0193205	.0546833	0	1.274805
Education/GDP	590	.0377215	.0559419	0	1.137979
Health/GDP	590	.0223917	.0354309	0	.6256148
Years of Ed.	533	5.072853	1.346823	2.031395	9.216916
Industry	560	.1006357	.046958	.0283074	.2805103
Percent Rural	641	.2742521	.1223554	.0259673	.6516445
Lula	648	.2083333	.4064302	0	1
FPE/GDP	590	.056409	.0753212	0	.4224022
Income	560	291.6018	123.5657	90.28869	823.4935
GDP	590	2.79e+07	7.66e+07	.0003201	8.03e+08

Table 5: VIF scores for ECM Model

	VIF	1/VIF
Income Lag	8.91	0.112171
Years of Education Lag	7.24	0.138140
Left in Legislature Lag	7.24	0.138182
Poverty Lag	6.70	0.149203
Left in Legislature Δ	4.59	0.217664
Left Governor Lag	4.02	0.248660
Lula Δ	3.45	0.290042
Rural Lag	3.19	0.313770
Lula Lag	2.79	0.358506
Left Majorities Lag	2.69	0.371206
Gini Lag	2.44	0.409808
Left Majorities Δ	2.38	0.420046
Left Governor Δ	2.11	0.473956
Industry Lag	2.10	0.476650
FPE/GDP Lag	1.86	0.537128
Gini Δ	1.72	0.581243
Income Δ	1.56	0.640097
Years of Education Δ	1.29	0.775772
SS/GDP Lag	1.26	0.791766
Rural Δ	1.23	0.810069
FPE/GDP Δ	1.13	0.882163
SS/GDP Δ	1.11	0.902050
Industry Δ	1.07	0.936195
Mean VIF 3.13		

Table 6: VIF scores for PCSE Model

	VIF	1/VIF
Health Spending/GDP Lag	7.46	0.133976
Education Spending/GDP Lag	6.24	0.160147
FPE/GDP Lag	5.27	0.189629
Left in Legislature Δ	3.53	0.283109
Rural Lag	2.77	0.360726
Income Lag	2.65	0.376765
Left Majorities	2.07	0.482839
Gini Lag	1.93	0.517420
Lula Δ	1.79	0.558374
Left Governor Δ	1.74	0.575792
GDP Lag	1.59	0.629588
Gini Δ	1.57	0.638114
SS/GDP Lag	1.18	0.846799
Years of Education Δ	1.07	0.933422
Industry Δ	1.03	0.972724
Mean VIF 2.79		

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