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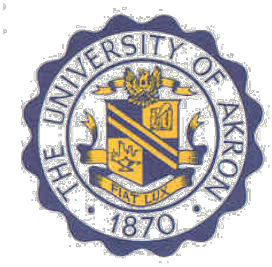

Electoral Systems And Income Inequality

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Abstract

This paper analyzes the effect, if any, that electoral systems have on within-country income inequality, as measured by the Gini index. The variable of interest being analyzed is the degree of disproportionality of electoral systems, as measured by the Gallagher Index. An economic theory of multi-party proportional representation, formulated by Austen-Smith (2000), is tested. I hypothesize that more proportional electoral systems produce more equal incomes in a society. A panel data set examining 42 democratic countries from around the world between the years 1984 to 2013 is analyzed. Results indicate that a one unit increase in disproportionality, as measured by Gallagher's Index, results in a 0.003 increase in the Gini index. Therefore, electoral systems do, in fact, contribute to within-country income inequality, where countries attain relatively more equal income distributions the more proportional the respective electoral system.

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I. Introduction and Motivation

Income inequality is not a new phenomenon; throughout American history public intellectuals from Thomas Jefferson to Walter Whitman have expounded on the potential consequences and causes of income inequality. Today, the American media largely focuses on a wide variety of economic and social variables—including, for example, marginal and effective tax rates, rates of redistribution, inflation rates, the changing dynamic of the modern family, work ethic, or education— advertising them, in some instances, as both the causes and solutions to income inequality. However, very little attention has been put toward analyzing the political institutions that first determine or influence the economic and social variables in question. The most prominent of these political institutions are electoral systems, the mechanism through which politicians reach public office and public policy is created and implemented.

There is now a sparse body of economic literature investigating the relationship between electoral systems (sometimes called voting systems) and within-country income inequality. Economists and political scientists have studied how this institutional structure affects income inequality; however, the literature has mainly investigated the impact electoral systems have on variables indirectly affecting to income inequality, but often not income inequality itself.

Therefore, the question I seek to answer is this: how do electoral systems affect within-country income inequality? This research has important implications in public policy, political science, economics, and the electorate at large. It may turn out that a country's respective electoral system inherently produces higher or lower measures of income inequality relative to others, indicating a certain amount of within-country income

inequality may be a byproduct of a natural, politically structured and incentivized phenomenon.

II. Understanding Electoral Systems

Individual electoral systems are as unique as the countries that implement them; nonetheless, while all electoral systems share common, foundational characteristics, they differ in important and meaningful ways. Below, two primary components of electoral systems are discussed, along with three common categorizations of electoral systems, which all systems fall under. Understanding the relationship and mechanism between each is essential for understanding and interpreting the purpose, theory, and analysis of this paper.

II.A. District Magnitude

First, an electoral district specifies a boundary or political subdivision, within which constituents elect candidates to hold seats in the legislature. Only residents within each electoral district may vote for their respective representative. District magnitude, therefore, signifies the number of candidates within an electoral district that are elected legislature. There are, for example, single and multi-member electoral districts. In single-member districts, constituents elect only one candidate to the legislature. In multi-member districts, more than one candidate is elected to legislature. Thus, the more candidates that are elected to the legislature within a given electoral district the larger the district magnitude. Moreover, political scientists agree that district magnitude is one of the primary determinants as to how votes get translated into seats in the legislature (Lijphart, 1999).

II.B. Proportionality

The degree of electoral system proportionality (or disproportionality) is another way to analyze the extent to which electoral systems differ. Proportionality is effectively a measurement reflecting how inclusive an electoral system is of political minorities and political party competition. Specifically, proportionality is the difference between the percentage of total votes cast for a political party and the percentage of seats that political party receives in the legislature, aggregated over all political parties. When proportionality is high (that is, when disproportionality is low,) the percentage of the total votes cast for a political party will be very close to the percentage of seats that party receives in the legislature. Conversely, when electoral system disproportionality is high, the differences between the vote-share and seat-share of political parties in the legislature will be relatively larger. For example, in the 1974 general elections in the United Kingdom, the Labor Party won a parliamentary majority by capturing 319 out of 635 seats while only winning 39.9 percent of the total vote; meanwhile, the Liberals only won 13 of the 635 seats with 18.6 percent of the total vote (Lijphart, 1999).

There are multiple methods of calculating proportionality and each method produces results that are dissimilar from each other.[1] Each method is different based on assumptions about what proportionality actually means (Gallagher, 1991; Lijphart, 1999). The Gallagher Index (Gallagher, 2015), which measures disproportionality not proportionality, is used in this paper. Moreover, Gallagher (1991) and Lijphart (1999) note that proportionality is affected by other elements, including the impact of district magnitude. Other main attributes influencing measures of proportionality include the possibility of

[1] For example, the Sainte-Lagye Index, the Loosemore-Handby Index, and the Gallagher Index.

malapportionment[2], the implementation of electoral thresholds[3], and the number of representatives in the corresponding legislature.

II.C. Majoritarian Systems

If electoral systems could be classified on a spectrum, majoritarian systems would represent one extreme of the spectrum. In this system, there are many electoral districts and each district elects one candidate to the legislature. Therefore, the district magnitude is one[4]. In this system a simple majority of votes is needed to for a candidate to win[5]. It has been noted that this system, coupled with single-member districts, incentivizes two-party, rather than multi-party systems[6]. This occurrence is called Duverger's Law[7].

II.D. Proportionally Representative Systems

Proportionally representative systems[8] represent the other extreme of the electoral system spectrum. The district magnitude in this system is inherently larger than majoritarian systems; district magnitude can range from a two-member district, to a nationwide, multi-member district from which all candidates are elected. Since more than one candidate is elected per electoral district, a majority of the vote-share does not

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[2] Malapportionment takes place when electoral districts have a relatively unequal number of constituents. Sometimes this may be intentionally, as is the case with gerrymandering.

[3] Electoral threshold specifies the minimum percentage of the total vote share a political party must receive in order to be represented in the legislature. Thresholds are used to eliminate smaller political parties from competition, and also to limit extremist parties (who often carry small percentage) from also being represented in the legislature.

[4] However, while very rare, there have been majoritarian systems with multi-member districts. Lijphart (1999, page 151) notes that, "By 1970, however, all of these two-member districts had been abolished [in the United Kingdom, Canada, the United States, Barbados, and India]."

[5] Majoritarian systems are often coupled with plurality systems. A plurality system acts as a single-district majoritarian system; however, a plurality of the total vote-share, rather than a majority of the total vote-share, determines the winner.

[6] The simplest example of this phenomenon is in the United States, where the Democratic and Republican Parties have dominated the electoral system for over 100 years.

[7] Although, some political scientists hesitate to call this a "law" as there are some countries where this is not true. For example, India currently has 38 political parties represented in parliament, despite being a majoritarian system like the United States.

[8] In the literature this system is most often referred to as a proportional system, or PR system. However, because (dis)proportionally will be examined in this paper, I refer to this electoral system as a proportionally representative system to avoid possible confusion.

determine the winner. Rather, there are at least two winners from each district. In this system, the seat-share of individual political parties in the legislature, when is aggregated over all districts, tends to be more equal to the percentage of their vote-share, relative to majoritarian systems[9]. In other words, proportionally representative systems, on average, produce considerably less disproportional results than majoritarian systems (Lijphart, 1999). Hence, because of the existence of multi-member districts, proportionally representative systems, by their inherent nature, strive to decrease disproportionality as much as possible.

II.E. Mixed Systems

Most electoral systems fall into the two pervious categories. However, there are some countries that attempt to combine positive elements of majoritarian and proportional systems into a hybrid system, called a mixed system. In this system, certain constituent votes are applied in a majoritarian fashion, while other constituent votes are applied in a proportionally representative fashion. These two systems run alongside each other. For example, in Germany, constituents vote for a candidate and a political party. The candidate is decided by the voters in single-member districts and thus acts as a majoritarian system. Meanwhile, votes for political parties are decided in multi-member districts and are calculated as if it were a proportional system. While it is important to note that this system exists, it is not of central importance in this paper.

III. Literature Review

There is an existing body of literature examining the relationship between electoral systems and income distributions and inequality; although, conclusions about inequality

[9] See Footnotes 2 and 3 as to why perfect proportionality is impossible.

are often implied through linkage mechanisms (public spending, redistribution) and not tested forthright.

For example, Austen-Smith (2000) formulated a theoretical model based on the incentives of political agents. He predicted that proportional representative systems (which, by definition, have larger district magnitudes than majoritarian systems) have larger equilibrium redistributive tax rates than two-party, majoritarian systems. He formalized that when legislative bargaining of the redistributive tax rate is present, under proportional representation, politicians are incentivized to appeal to greater number of voters than they are under majoritarian systems. Therefore, redistributive tax rates should be relatively larger in proportional representative systems and relatively lower in majoritarian systems. By arguing that proportionally representative systems will favor larger redistributive taxes and more redistributive policies, he thereby suggests that proportionally representative systems should experience less income inequality.

Likewise, an important issue is to understand is whether different electoral systems prefer specific types of government spending. Milesi-Ferretti et al., (2002) categorize government spending in regards to size and composition, but also make distinctions between purchases of goods and services, and transfers, which they call “allegiance to geographic constituencies” and “allegiance to social constituencies,” respectively. A similar idea is highlighted in Lizzeri and Persico (2001) who concluded that proportionally representative systems will implement more transfers and redistributive programs (“appealing to social constituencies”) while majoritarian systems will experience more expenditures on local public goods (“appealing to geographic constituencies”). However, it is imperative to point out that local public goods are not redistributable by nature and

therefore Verardi (2003) asserts majoritarian systems will experience more unequal income distributions.

Several studies have recognized that not only the type of electoral system, but also the size of the district magnitude may impact income inequality. For example, Persson and Tabellini (1999) reveal that when a district magnitude is large, government spending policy will consist of mostly transfers; however, when the district magnitude is small, public expenditures will be spent mainly on the provision of localized public goods. The authors support their theory by articulating that larger district magnitudes incentivize increased political competition among parties and politicians to become elected. Thus, in order to get elected, politicians will advocate for more redistribution and transfers, thereby appealing to a broader coalition of voters than they would otherwise. Conversely, in single-member districts or districts with smaller district magnitudes the incentive to advocate for these programs is not as strong because there is less competition for votes. Furthermore, a study by Verardi (2005), examining district magnitude and income inequality, corroborated these theoretical predictions. By analyzing 28 highly democratic countries for an average of 4 years for each country, the author found that a 100 percent increase in the average district magnitude across a country lowered the Gini index by more than 3 points. When using 90/10 percentile ratios[10] of income in place of the Gini index, results were robust.

The impact of electoral systems on public spending also seem to differ from country to county. Milesi-Ferretti et al., (2002), compared countries from the Organization for Economic Co-operation and Development (OCED) to Latin American Countries from

[10] That is, how much richer the highest 10 percent of income earners are compared to the bottom 90 percent of income earners.

1960 to 1994. Electoral systems were categorized according to different attributes, including existence of multiple election tiers and electoral thresholds. Their results indicated that there was a positive relationship between proportionality and government transfers in OCED countries, but not for Latin American countries. Goni et al., (2011) compared the redistributive performances of Western European and Latin American countries and their effect on income inequality. Their research reveals three key findings: first, different combinations of taxes and transfers widen differences in income inequality between the two country groups; second, this happens because the redistributive impact of the welfare system provides more transfers to larger percentages of people in Europe than in Latin America; and third, fiscal redistribution is most achieved through transfers and not taxes, which is why Europe's income distribution is more equal. Therefore, the predictions of Milesi-Ferretti et al., (2002) may have been incorrect because, as a group, Latin American countries lack a comprehensive welfare system as expansive as Western Europe and not because of electoral system components.

Other studies have examined income inequality by testing other types of government classifications in tandem with electoral variables. For example, the type of political regime (that is, the extent to which governments are extractive, redistributive, or reinvestment-oriented) is a significant determinant of income distributions, as are levels of social inhomogeneity and historical factors (Kemp-Benedict, 2011). Feld and Schnellenbach (2014) examine the effect government decision making structure, fiscal decentralization, and electoral systems have on (re)distribution of incomes, where (re)distribution was measured as differences in Gini coefficients before and after transfers and taxes. Results indicate a statistically significant, positive association between

presidential governments and income inequality. Most importantly, however, Feld and Schnellenbach (2014) found that majoritarian systems did not result with more income inequality than proportional representative systems. This finding contradicts the empirical, and theoretical, literature on this subject (Persson and Tabellini, 1999; Lizzeri and Persico, 2001; Austen-Smith, 2000; Milesi-Ferretti et al., 2002; Verardi, 2005).

Likewise, there is very little to no literature examining the proportionality of an electoral system and levels of income inequality. Therefore, in this paper I build upon the literature by directly examining and empirically testing the effect disproportionality has on within-country income inequality. Thus, I hope to fill a gap in the literature by providing another measure as to how electoral systems and income inequality are linked.

IV. Theoretical Model

Prior to Austen-Smith (2000), the theoretical literature for determining the redistributive tax rate mainly studied a two-party, majoritarian political system. Austen-Smith, however, formulated a theoretical three-party, proportionally representative system based on the incentives of political agents.

Austen-Smith differentiates his theoretical model from previous models based upon the assumption that political parties are "ideological," in that they seek to maximize the average consumption of members of particular economic groups. Austen-Smith then notes individuals separate themselves into varying "occupation" statuses: either, employers, employees, or the (voluntarily) unemployed, each of which has different endowments of labor ability. An informed polity will support parties that have their economic interests in mind; taken to its logical extreme, there is then one political party per occupation and party

preferences are defined and fixated on the economy. However, Austen-Smith notes two things: first, that in reality, not all occupations have distinct parties that represent their exclusive economic interests; and second, not all political parties are based upon economic groupings of individual endowments of labor ability or occupation. Rather, it is important to note the empirical existence of multiple parties, rather than the direct (exclusive) matching of parties to occupation status. Some political parties capture respective economic preferences better than others, but no one political party only captures the economic preferences of a single occupation status.

Austen-Smith notes there are two stages of the political process that will eventually determine the redistributive tax rate. In the first stage, political parties attempt to secure support and compete for votes in an election. In the second stage, the redistributive tax rate is chosen as an equilibrium outcome of a non-cooperative bargaining game in the legislature. The more successful individual parties are in stage one, the more respective influence they have in altering, but not determining, the equilibrium redistributive tax rate in stage two.

In a two-party, majoritarian system, the median voter determines the winner in both stage one and stage two. This voter is defined as the person with the median income of the entire eligible electorate, regardless of that voter's occupation status. However, under a proportionally representative system with legislative bargaining, the pivotal voter is the person with the average employee income "among only those types who choose to be employees" post-election (Austen-Smith, 2000, page 1239). Therefore, because this pivotal voter in the proportionally representative system is endogenous, it is not apparent if this voter represents a redistributive tax rate that is higher or lower than the median type. Then,

once the redistributive tax rate is set, individuals (re)sort into respective occupation and income is redistributed.

When comparing this model to the traditional two-party majority rule system, several key conclusions are reached: first, if the cost of entering the labor force is sufficiently low, proportionally representative systems tend to adopt higher redistributive tax rates than two-party, majoritarian systems. Second, this implies—given the starting assumptions of output and distribution tradeoffs—that proportional representative systems result in a lower national income (GDP), higher unemployment, and a more equal distribution of post-tax income.

Thus, redistributive tax rates should be larger in proportional representative systems relative to majoritarian systems. Moreover, by asserting that proportionally representative systems will favor larger redistributive taxes and thus more redistributive policies, Austen-Smith thereby implies that proportionally representative systems should experience less income inequality relative to majoritarian systems.

Furthermore, because proportionally representative systems inherently try to minimize disproportionality, and proportionally representative systems favor larger redistributive policies, it should follow that as disproportionality increases, so does income inequality. Therefore, the testable hypothesis that I hope to answer is as follows: if proportionally representative systems lead to more redistribution than majoritarian systems, then income distributions should become more equal the less disproportional (more proportional) the electoral system.

V. Econometric Model and Data

The purpose of this paper is to determine if electoral systems, but specifically electoral disproportionality, affects levels of within-country income inequality. The dependent variable being tested is the Gini index[11] which compares percentiles of population and corresponding income. The data includes 42 democratic countries from Europe, North America, South America, Asia, and Oceania, with observations ranging from the years 1984 to 2013. Additionally, an unbalanced panel dataset is used because different years were applied to each country based upon the availability of data.

The first model used in this paper is a pooled OLS, which was also used by Verardi (2005), Kemp-Benedict (2011), and Feld and Schnellenbach (2014) who investigated similar relationships. Panel corrected standard errors are applied to the pooled OLS model to account for possible autocorrelation, considering the data for some countries covers many years. A second model, a fixed effect estimator, is also used. In the fixed effect model, the political structure variables are dropped because the variables remain constant over time. A random effects model is not utilized because the assumption of independence between the exogenous variables and the unobserved heterogeneity is most likely violated. Moreover, I should not have issues with endogeneity and therefore more advanced methods controlling for this do not need to be used. Therefore, I will utilize a pooled OLS and a fixed effect estimator to estimate the results.

[11] Where a value of 0 represents perfect equality and a score of 1 represents perfect inequality.

The pooled OLS model is below:

$$GINI_{it} = \alpha_0 + \beta_1 Disproportionality + B_2 Presidential_i + \beta_3 Semi\_presidential_i + B_4 Percent\_Elderly_{it} + \beta_5 Secondary\_Schooling_{it} + \beta_6 LogGDP\_cap_{it} + \beta_7 LogGDP\_capS_{it} + \beta_8 Economic\_openness_{it} + e_{it}$$

The fixed effect model is as follows:

$$GINI_{it} = \alpha_i + \beta_1 Disproportionality_{it} + B_2 Percent\_Elderly_{it} + \beta_3 Secondary\_Schooling_{it} + \beta_4 LogGDP\_CAP_{it} + \beta_5 LogGDP\_CAPS_{it} + \beta_6 Economic\_openness_{it} + e_{it}$$

The primary variable of interest is the level of disproportionality resulting from elections, which is measured by Gallagher's Index (Gallagher, 2015). Specifically, the computation of Gallagher Index values is as follows:

$$G = \sqrt{\frac{1}{2}\sum (Vi - Si)^2}$$

Where V_i represents an individual political party's percentage of total votes and S_i represents an individual political party's percentage of seats attained in the legislature. Lijphart (1999) defends use of this index by highlighting that this index does not sum the absolute differences of vote-shares and seat-shares; doing so would not distinguish between a few large and serious deviations and a lot of smaller deviations. Rather, by squaring differences between vote-shares and seat-shares, Gallagher's Index weighs deviations by their own values and therefore makes larger deviations account for a greater

total than smaller deviations, which Lijphart believes lends a more accurate account of disproportionality.[12]

Once more, lower values indicate less disproportional (more proportional) election results and larger values indicate more disproportional results. Again, I can expect that proportionally representative systems have less disproportional results, relative to majoritarian systems.[13] I expect the sign of disproportionality to be positive.

There are several control variables included in this paper. First, Kuznets (1995) and Lewis (1954) attest that the relationship between economic development and inequality is quadratic (inverted U-shaped). As under developed countries become more developed inequality increases; however, at a certain level of development an apex is reached. From then on inequality should decrease as economic development continues. Gross Domestic Product per capita and GDP per capita squared are typically used as proxies to capture this relationship, as in Verardi (2005). However, I log these variables to show percent changes in each. The sign of these variables in my analysis are ambiguous because both developing and developed countries are included in this analysis. Furthermore, Timbergen (1975), Lodono (1990), and Li et al., (1998), all predict that higher levels of educational attainment in a county should cause a decrease in income inequality due to the relationship between human capital and income. Therefore, an education variable, measured as the percentage of the population over the age of 25 with a bachelor's degree or higher, is included. I predict the sign to be positive. A third control variable, the percentage of the population over the age of 65, is included because Deaton (1997) attests that younger adults have similar

[12] There are other methods of disproportionality that do not account for this, including Rae's Index, Loosemore-Hanby's Index, and Grofman's Index.

[13] For example, in the Netherlands, the entire country is a single-member district. Therefore, its high district magnitude, along with its proportionally representative system, produces very proportional results.

incomes to the elderly. A fourth variable, economic openness, measured as imports plus exports divided by GDP, is included to capture the predicted link between trade openness and income inequality. All of the aforementioned control variables were obtained from the World Bank Indicators. Fifth, three dummy variables are added to account for the political structure of decision making processes; the variables are a presidential government, a parliamentary government, and a semi-presidential government.[14,15] Feld and Schnellenbach (2014), include only presidential and parliamentary governments in their research, but because semi-presidential governments are included in my research the latter variable is added as well. In my analysis parliamentary governments are the reference group. Feld and Schnellenbach (2014) found that presidential systems are equated with higher levels of income inequality, and I predict the same. My prediction of a semi-presidential government is ambiguous. Lijphart (1999) also includes these political structure variables in his analysis of comparative electoral systems. See Table 1 for variable sources and description; see Table 2 for descriptive statistics.

[14] In a parliamentary government, the cabinet selects the prime minister, who is not democratically elected. The prime minster and his cabinet then have the option, at any time, to dissolve the legislature and declare new elections to take place. In this way, whatever political party controls the legislature also controls the cabinet and the prime minister, meaning laws are relatively easier to pass than in a presidential government because, as Huber (1996) notes, a president is not able to threaten a vote of confidence as a method of attaining political support. In a Presidential government the legislature does not select the cabinet or the president. Instead, both the legislature and president are democratically elected. It is then the president who selects the cabinet. Furthermore, terms of office are for fixed time periods and coalition governments cannot be formed. In a semi-presidential government, there exists both a president and a prime minister. The president and the legislature are elected by the voters but the president then appoints the prime minster who is approved by the legislature. The president is responsible for foreign affairs and the prime minister is responsible for domestic affairs.

[15] The distinction is important. In a parliamentary system, it can be said that because the legislature elects the prime minister, who signs bills into law, parliamentary systems have easier times passing laws, relative to presidential systems which are more likely to have divided government. Therefore, these variables are included to account for this effect.

VI. Results

VI.A. Pooled OLS Results

The pooled OLS results can be seen in Table 3 which is located in the Appendix. The key variable of interest, disproportionality is both positive and statistically significant at the 1 percent level, as expected. Accordingly, a 1 unit increase in the disproportionality of an election, as measured by Gallagher's Index, results in a 0.003 increase in the Gini index, meaning income inequality increases the more disproportional the electoral system. While this coefficient may seem small, it is important to mention two things: first, that the Gini index only has values ranging from zero to one; and second, that the average value of disproportionality among tested countries is six, with the maximum value of disproportionality being 25.25. Therefore, this variable can have a noteworthy effect. Moreover, the results suggest that a presidential government increases the Gini index by 0.113, relative to a parliamentary government. This was also significant at the 1 percent level. In contextual terms, this variable also resulted in the second largest change in the Gini index. This variable roughly matches the coefficient obtained by Feld and Schnellenbach (2014).

Moreover, in this model, all variables except the percentage of the population that is over 65 years of age and economic openness are significant at the 1 percent level. The former variable is significant at the 5 percent level and the latter is not statistically significant at all. What is concerning is that level of secondary schooling, also while significant, has the opposite predicted sign. Additionally, the log of GDP and the log of GDP per capita squared yield different signs. The former is positive and the latter is negative. The R-squared is .82, meaning the variables in my model explain roughly 82 percent of the variation in the Gini index.

VI.B. Fixed Effect Results

The fixed effect results can also be seen in Table 3, which is located in the Appendix. All variables in this model are statistically insignificant. Disproportionality is the closest variable to being significant, with a P-value of .1596. The coefficient is less economically significant, as the coefficient drops to 0.000925. Additionally, compared to the pooled OLS the level of secondary schooling now has the predicted positive sign. The presidential and semi-presidential variables were dropped from this model so that a fixed effect could be used. The R-squared in this model is larger than the pooled OLS and is .94[16].

VI.C. Discussion of results

There are two plausible reasons as to why the fixed effect model returns insignificant results. The first is that the pooled OLS is severely biased and the true effect of disproportionality is actually zero. This is highly unlikely however based upon theory and methodology used in previous research (Verardi, 2005; Feld and Schnellenbach, 2014).

In the context of this paper, the fixed effect model, also called the difference-in-difference, is analyzing changes in disproportionality over time for a specific country to changes in the Gini index over the same amount of time and for the same country. Therefore, because changes in disproportionality and especially the Gini index are relatively small over time for each specific country, it is plausible that the differences are not large enough for the fixed effect to capture this effect. That is, changes over time in the Gini index are too small, which erases or diminishes the significance of disproportionality. There is likely a relationship between disproportionality and the Gini index, as suggested

[16] The fixed effect model counts each individual country as a variable and therefore the R-Squared increases. This does not imply the fixed effect is more accurate or explains more.

by the pooled OLS, but the data is not sufficient enough to capture this in the fixed effect. One way to account for this would be to add more observations.

VII. Conclusions

The goal of this research was to determine if electoral systems, but specifically disproportionality, impacts income inequality; based on the pooled OLS results, I am inclined to believe that disproportionality of an electoral system does, in fact, effect within-country income inequality. Therefore, my testable hypothesis is confirmed: because proportionally representative systems lead to more redistribution than majoritarian systems, income distributions become more equal as election results become less disproportionality (more proportional). Hence, political institutions do in fact create a structural framework from which certain behaviors are incentivized and other behaviors are not. For example, the electoral system family, the district magnitude, existence and level of electoral thresholds, malapportionment of electoral districts, and the size of the legislature are all attributes of electoral systems that, when combined, influence levels of disproportionality. Thus, disproportionality is an all-encompassing measure reflecting how inclusive electoral systems are of other political parties. Likewise, when disproportionality is low, minority political parties are likely to hold relatively more seats in the legislature, and thus are more likely to have substantive impacts on public policy, including those relating to income inequality.

The policy implications of this study are straight forth: economic variables that impact income inequality are, to a certain degree, determined by political institutions, specifically the type of electoral system. If citizens in majoritarian governments want to decrease

income inequality they could petition various levels of government or form interest groups on their behalf to attempt to alter the electoral system to be more inclusive and less disproportional.

Furthermore, I believe there are limitations to this study. First, better, more comprehensive data should be accessed and tested, such as data from the Luxembourg Income Study (LIS) which provides cross-national microeconomic income and population data. Most academics who have studied comparative electoral systems and inequality have accessed this database. Second, further indices of income distributions, such as 80/20 and 90/10 percentile ratios of income, should be tested to account for the possible nuanced structure of income distributions. In the future it might be interesting to include more electoral system control variables to see how results change.

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VIII. Appendix

Table 1: Variable Definitions and Data Sources

Variables	Definition [Min, Max]	Source
Disproportionality	The difference between the vote percentages and seat percentages for each political party squared and then added; this total is then divided by two and then the square root of the value is taken. [0.6, 25.25]	Gallagher (2015)
Parliamentary	Dummy variable identifying countries with a parliamentary system [0,1]	Lijphart (1999); constitutional research
Presidential	Dummy variable identifying countries with a presidential system [0,1]	Lijphart (1999); constitutional research
Semi_presidential	Dummy variable identifying countries with a semi-presidential system [0,1]	Lijphart (1999); constitutional research
Gini	Gini index [0.249, 0.581]	World Bank Indicators
Economic_Openness	Exports plus imports, divided by GDP [0.153, 1.87]	Calculated from World Bank Indicators
Percent_Elderly	Percentage aged 65 years or older [4.3, 20.29]	World Bank Indicators
Second_S	Percentage aged 25 years or older with at least a secondary education degree [1.4, 79.1]	World Bank Indicators
LogGDP_cap	Logged GDP per capita [6.43, 11.124]	World Bank Indicators
LogGDP_capS	Logged GDP per capita squared [41.345,123.751]	Calculations based on above data

Table 2: Descriptive Statistics						
Variable	**Obs.**	**Mean**	**Standard Deviation**	**Min.**	**Max.**	**Expected Sign**
Disproportionality	281	6.338	4.249	0.6	25.25	+
Parliamentary	281	0.583	0.493	0	1	-
Presidential	281	0.355	0.479	0	1	+
Semi_presidential	281	0.06	0.238	0	1	Ambiguous
Gini	281	0.381	0.089	0.249	0.581	n/a
Economic_Openness	281	.840	0.357	0.153	1.87	Ambiguous
Percent_Elderly	281	11.838	4.487	4.3	20.29	-
Second_S	281	45.38	16.944	1.4	79.1	+
LogGDP_cap	281	9.026	1.087	6.43	11.124	Ambiguous
LogGDP_capS	281	82.652	19.701	41.345	123.751	Ambiguous

TABLE 3: Results Dependent Variable: *Gini index*		
	[1] **Pooled** **OLS**	**[2]** **Fixed Effects**
Disproportionality	0.003*** *6.41*	0.0009 *1.41*
Presidential	0.113*** *13.41*	
Semi_presidential	-0.041*** *8.4*	
Percent_Elderly	-0.002** *2.92*	0.003 *1.18*
Secondary_Schooling	-0.0007*** *4.95*	0.0001 *0.60*
LogGDP_cap	0.175*** *5.89*	0.016 *0.19*
LogGDP_capS	-0.0007** *5.84*	-0.002 *0.41*
Economic_Openness	0.007 *1.13*	0.004 *0.29*
R-Squared	0.827	0.947
observations	281	281
Note: *, **, ***, statistically significant at 10, 5, and 1 percent, respectively. Italicized numbers are t-statistics.		

IX. SAS CODE

```
Proc Import datafile ='F:\Spring 2015\Senior Project\world bank
indicators final dataset.csv'
out=Senproj.dataset
dbms= csv
replace;
getnames=yes;
run;

/*DATA AND TRANSFORMATIONS*/
Data senproj.data;
set senproj.dataset;
gini = (ngini)/100;
lGDPcap= log(GDP_cap);
lGDPcapS= lGDPcap*lGDPcap;
GDP_capS = (GDP_cap)*(GDP_cap);
if gini = '.' then delete;
if second_s = '.' then delete;
if Disproportionality = '.' then delete;
if GDP_cap = '.' then delete;
if econ_opp = '.' then delete;
if country = 'Trinida' then delete;
if country = 'South A' then delete;
if country = 'Bolivia' then delete;
if country = 'Germany' then delete;
if country = 'Hungary' then delete;
if country = 'lithuan' then delete;
if country = 'mexico' then delete;
if country = 'romania' then delete;
if gini = 0.2325 then delete;
if gini = 0.2347 then delete;
if gini = 0.2372 then delete;
if gini = 02406 then delete;
if gini = 0.2432 then delete;
if gini = 0.2448 then delete;
if gini = 0.2460 then delete;
if gini = 0.2463 then delete;
if gini = 0.6012 then delete;
if gini = 0.5989 then delete;
if gini = 0.5980 then delete;
if gini = 0.5961 then delete;
if gini = 0.5957 then delete;
if gini > 0.5816 then delete;
run;


/*POOLED OLS MODEL */
Proc panel data=senproj.data;
title 'Pooled OLS Model';
id country year;
model  Gini =  Disproportionality  Presid sem_pres LGDPcap  lGDPcapS
      Econ_opp    P_Elder     second_s    / pooled HCCME=3 ;
run;
```

```
/*FIXED EFFECT MODEL*/
Proc panel data=senproj.data;
title 'Fixed Effect Model';
id country year;
model  gini =     Disproportionality      LGDPcap lGDPcapS  Econ_opp
      P_Elder     second_s    / fixone ;
run;

/*DESCRIPTIVE STATISTICS*/
Proc means data=Senproj.data;
Var Gini Disproportionality  Presid sem_pres    LGDPcap     lGDPcapS
      Econ_opp    P_Elder     second_s;
Run;
```