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THREE ESSAYS ON THE POLITICAL ECONOMY OF DEVELOPMENT

A DISSERTATION APPROVED FOR THE
DEPARTMENT OF ECONOMICS

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Esta disertación se la dedico a mis queridos padres.
Con tu apoyo todo es posible

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Abstract

In Chapter 1: Research has shown that government spending can affect GDP growth rates, yet there is no comprehensive study that looks at how a country's choice of political institutions affects government spending. Using a panel of 92 democracies, this paper focuses on how the choice of regime type (presidential, parliamentary or mixed), legislative chamber structure (bicameral or unicameral), legislative chamber size, and electoral rules affect the level of government spending. The results show that the relationship between legislative chamber size and government spending is linear in unicameral countries but non-linear in bicameral countries, plurality electoral rule is always associated with less spending than any other type of electoral rule, and unicameral and bicameral countries should not be modeled together.

In Chapter 2: In a panel of 18 Latin American countries from 1900-2007, we test the degree to which institutions and geography affect country income. Using a new instrument, we find strong evidence that both institutions and geography are important determinants of country income. However, the penalty for economically unfavorable geography is much smaller than the potential benefits from good institutions. The coefficient estimates do not vary significantly when there are changes in the number of countries included in the analysis; the results for institutions are robust to the inclusion of country fixed effects.

In Chapter 3: Latin America's turbulent political history and marked dependence on commodity exports naturally raises questions about their

interdependence. Constructing a new panel dataset from 1919-2000, I examine how international prices for Latin America's principal exports influence national political stability. The data show a significant effect of commodity prices on political instability. This significance holds when disaggregating each country's commodity price index into point source commodities (e.g. natural resources and plantation crops) and diffuse commodities (e.g. small farm production and livestock) and these results are consistent when using a count model. Further disaggregation reveals that the point source effect is primarily driven by increases in mineral prices.

Chapter 1: Legislatures, Leaders, and Leviathans: How Constitutional Institutions Affect the Size of Government Spending

1.1 Introduction

The level of government spending has been shown to have negative effects on per capita GDP growth in many contexts – in both rich and poor countries and at both the state and national levels (Barro, 2003; Engen and Skinner 1992; de la Fuente 1997; Fölster and Henrekson 2001; Afonso and Furceri 2008; Cooray 2009; Ghosh Roy 2009).[1] The persistence of this relationship between government spending and growth highlights the importance of understanding the determinants of the level of government spending. One obvious group of determinants of government spending is the set of political institutions (and their characteristics) a country has in place. In an effort to better understand these factors, I study how various political institutions in a panel of 92 democracies affect the size of government spending. Understanding how political institutions can affect economic growth (directly or indirectly) is an important topic as countries are establishing new political institutions (e.g. South Sudan and Libya). These countries stand to benefit from knowing what types of institutions are conducive for growth.

[1] My measure of government spending is government consumption as a percentage of real GDP per capita taken from the Penn World tables (Heston et al., 2009). Government spending and government consumption are not the same thing, however, data on government spending is limited and, because the data on government consumption is available for a greater number country-years, the literature on government size typically uses government consumption as a proxy of government spending.

Previous literature has examined how the structures of political institutions affect the level of government spending. Regime type (presidential versus parliamentary), electoral rules (plurality versus proportional representation), legislative structure (unicameral versus bicameral) and legislature size are among the political institutions and characteristics that have been studied in relation to level of government spending (Persson and Tabellini 1999, 2002, 2003; Bradbury and Crain 2001; Milesi-Ferretti et al., 2002; Ricciuti 2004; Gilligan and Matsusaka 1995, 2001). However, there has yet to be a comprehensive investigation of how all of these institutions considered together affect the level of government spending.

In this paper, I incorporate a broad range of political institutions/ institutional characteristics – regime type, electoral rules, legislative size, and legislative structure – into my analysis. I also allow for a greater degree of heterogeneity in these political institutions and characteristics than the existing literature. When looking at electoral rules for the legislature, the existing literature ignores the possibility that the upper chamber may have a very different set of electoral rules than the lower chamber. I include both lower chamber and upper chamber electoral rules to see what effects the electoral rules of each chamber have on government spending. I also take into account the existence of a third regime type that lies between presidential and parliamentary systems – mixed presidential-parliamentary systems. Lastly, I allow for the possibility that the effect of legislative chamber size on the level of government spending may be non-linear.

The results show that there is a distinct non-linear relationship between the government share of real GDP and legislative chamber sizes in bicameral countries. More specifically, the relationship between the lower chamber size and government share of real GDP is cubic while the relationship between upper chamber size and government share is quadratic. However, the relationship between unicameral chamber size and government share of real GDP is linear which corroborates the existing literature (Weingast et al., 1981; Bradbury and Crain 2001). The results consistently show that plurality electoral rule is associated with lower government shares of GDP than any other type of rule. There is also statistical evidence that unicameral and bicameral countries have different estimated coefficients and therefore should be estimated separately.

The rest of the paper is organized as follows. Section 1.2 reviews the literature on the effect of political institutions on government spending. Section 1.3 outlines the definition of democracy chosen for this paper and presents the model and the data. The main results are presented in Section 1.4, and Section 1.5 presents the results of some robustness checks. Lastly, Section 1.6 concludes.

1.2 Literature on Political Institutions

1.2.1 Chamber Size and Structure

Much of the literature dealing with legislative chamber size is centered on the law of 1/n which was formally laid out by Weingast et al. (1981). The intuition is that if there are n electoral districts, each represented by one legislator, then the tax burden, or cost, of any project to each district is one n^{th} of the total cost.

However, the full benefit from each project goes to one district. So the benefit, which is concentrated, is larger than the cost, which is spread over all of the districts. More formally the benefit to district *i* from project *x,* $b_i(x)$, is greater than the 1/nth cost that it bears, $\frac{1}{n}c_i(x)$. As a result, each legislator will favor spending up to the point where the marginal benefit to his or her district equals the marginal cost to that district: $b_i^{'}(x) = \frac{1}{n}c_i{'}(x)$. From this rule we can see that the optimal level of spending for each legislator increases with n, the number of electoral districts.

This idea suggests that for every additional legislator, the level of government spending should increase linearly (i.e. steadily). However, there is no research that I am aware of, on the particular functional form of this relationship. Is the relationship always constant, increasing at a decreasing amount, or at an increasing amount?

There are a few papers that test the law of 1/n, especially focusing on US state legislatures. Gilligan and Matsusaka (1995, 2001) find that in US states, the level of government spending in the 20th century increases with the size of the legislature. Additionally, they find that the size of the upper chamber is the source of the strongest positive effect on spending. Bradbury and Crain (2001) point out that the underlying assumption of the law of 1/n is that there is one chamber making the spending decisions (i.e. unicameral legislature). If this is the case, the use of US states is not truly testing the law of 1/n as 49 of the 50 states have bicameral legislatures. They, instead, test the theory using a cross country panel of

35 countries, roughly 2/3 of which are bicameral and 1/3 which are unicameral, by including the size of each chamber in the bicameral countries and the size of the only chamber in the unicameral countries all together in their analysis. They find that the size of the lower and unicameral chamber has a positive (linear) effect on spending but that the size of the upper chamber in the bicameral structure has a negative (linear) effect on spending thereby lessening the effect of the law of 1/n present from the lower chamber. However, they still use bicameral legislatures in their specification and assume that bicameral and unicameral countries can be grouped together.

None of the papers testing the law of 1/n have considered the possibility of a non-linear effect between legislature size and government spending. The implication of a linear relationship is that for every additional legislator, the subsequent increase in government spending is always the same and that spending is always increasing. However, there is reason to believe that this relationship cannot hold indefinitely. It is more likely that there is a limit to the increase in spending as a result of an increase in the size of the legislature. Once a certain size in reached, the level of spending either stays constant or decreases. With this kind of relationship, there is also the likelihood that increases in spending as a result of additional legislators do not increase at a constant rate. In other words, instead of a linear relationship, we would expect to see a non-linear relationship between legislature size and government spending that has a maximum point at the larger end of the chamber sizes in lower or unicameral chambers.

1.2.2 Electoral Rules

There are different types of electoral rules in place throughout the world. Since I am interested in legislatures that are accountable to the population, I only consider democratic countries (as defined by Przeworski et al., 2000) that have free, fair, and competitive elections for the legislature and the executive. This means that at the very least, the lower chamber in a bicameral system and the only chamber in a unicameral system must be elected by the people. However, the upper chamber can be filled either through appointment, direct or indirect elections[2]. The executive (i.e. president or prime minister) has to be either directly elected (as in some presidential systems) or indirectly elected by elected officials (as in parliamentary systems or the Electoral College in the US).

Research focusing on the electoral rules of the legislative chamber(s) looks at the different types of constituencies and their effect on different types of government spending (Persson and Tabellini, 1999, 2002, 2003; Milesi-Ferretti et. al., 2002; Scartascini and Crain, 2002). Different electoral rules create different constituencies for politicians. Proportional representation (hereafter PR) electoral rules create nationwide constituencies that are unified either by social class, age, ethnicity, or other types of overarching characteristics, while plurality electoral rules create geographically defined constituencies. As a result, politicians in PR systems target specific subgroups of the national population, while those in plurality systems target groups within a pre-defined geographical area (Milesi-

[2] Appointments to upper chambers can be made by presidents, prime ministers, minority groups, and lower levels of government to name a few of the ways.

Ferretti et al., 2002). Based on the difference in constituencies, we would expect to see that in PR systems, the level of demographic specific government spending – such as transfers – would be increasing as the number of legislators increases. Similarly, in plurality system, we would expect the level of geographically targeted governments spending – such as goods and services – to be increasing with legislature size. Milesi-Ferretti et al. (2002) and Scartascini and Crain (2002) find evidence that countries with PR electoral rules have higher spending on transfers while countries with plurality electoral rules have higher spending on public goods.

However, the literature that focuses on the electoral rules of the legislature only look at the unicameral or lower chamber electoral rules, either ignoring the existence of an upper chamber or assuming that the upper chamber has the same electoral rules as the lower chamber. In reality, the rule used for the upper chamber is often different than the rule for the lower chamber. For instance, there are many upper chambers that are not directly elected by the people but are instead indirectly elected by state legislatures, minority groups, or appointed – as in many Commonwealth countries. The literature on bicameralism stresses the fact that the upper chamber serves as a check on the lower chamber (Riker 1992; Bradbury and Crain 2002). However, not all upper chambers work the same way. Depending on the type of constituency, which is influenced by the electoral rules, the upper chamber may have different types of influence on the lower chamber. It may indeed check the lower chamber, by having completely different constituents, or it may not work as a check at all and instead support the lower chamber, by having the same

set of constituents. Because of their disparate nature, it is important to allow for this discretion when examining the effect that upper chamber electoral rules have on the lower chamber's legislative powers.

The existing literature only tests the effects of different types of lower chamber electoral rules and do not account for upper chamber electoral rules, chamber structure, or legislature size which, as mentioned above, also have effects on government spending.

1.2.3 Regime Type

Regime type refers to the system of government – presidential, parliamentary, or mixed presidential-parliamentary. Presidential systems have a head of government that is elected separately from the legislative branch creating a distinct separation of powers where the executive's ability to stay in office is not subject to continued support by a majority of the legislative chamber (Cheibub et al., 2004). In this system, the legislative body is forced to bargain with the president in order to assure the passage of legislation (Kunicová and Rose-Ackerman, 2005).[3] In contrast, in parliamentary systems the head of the government is elected by the winning coalition within the parliament and his or her ability to stay in power is subject to continued support of the legislature. In this system there is no clear separation between the head of the government and the legislative branch, as the head of the legislative body is also the head of the government and has considerable power to initiate and push legislation forward (Persson and Tabellini, 2003).

[3] Unless there is a supermajority that can overturn a presidential veto as in the US.

The middle ground between these two systems is a mixed presidential-parliamentary system (e.g. the French Fifth Republic). In this system, there is typically both a president that is not subject to continued approval by the legislative branch and a prime minister elected by the winning coalition in the parliament, whose tenure is contingent upon continued support from the parliament. Within this category there are different degrees of power sharing with some presidents having the ability to dissolve the parliament while in other cases the president is elected by the parliament. However, there is still a separation of power with the president often having the ability to veto legislation (Persson and Tabellini, 2003).

In presidential systems, as opposed to parliamentary systems, there is a good possibility that the president is from a different party than the majority coalition or party in the legislative branch. Even if they are from the same party the agenda of the executive branch and the legislative branch may not be the same. This can lead to less government spending as the legislative chamber takes time in writing spending legislation that will not be vetoed by the president. In parliamentary systems, the prime minister is essentially the leader of the winning coalition and, as mentioned above, has considerable power to initiate legislation (Persson and Tabellini, 2003). This makes the passage of legislation easier in stable parliamentary systems than in presidential systems. This reasoning suggests that presidential systems will have lower levels of spending than parliamentary systems. Persson and Tabellini (1999, 2002, 2003) find support that presidential systems, ceteris paribus, always have lower levels of government spending.

The literature, however, places mixed system countries into either the parliamentary country grouping or the presidential country grouping (Scartascini and Crain 2002; Kunicová and Rose-Ackerman 2005; Ricciuti 2004; Persson and Tabellini 1999, 2002, 2003). Persson and Tabellini (2003) argue that the classification of mixed systems is a difficult task and beyond the scope of their study due to the many manifestations of mixed systems and the difficulty in finding information to accurately classify them. Since their work, however, there has been work done on the classification of mixed systems (Cheibub et al., 2010).

1.3 Data and Model

In this paper, I focus on democratic institutions. In order to identify countries that are democratic, I must first choose a single definition of democracy from the multitude that exist in the literature. I choose the dichotomous measure of democracy laid out in Przeworski et al. (2000) and recently updated by Cheibub et al. (2010).[4] According to this measure, a country is classified as a democracy provided that: (1) the chief executive is popularly elected or elected by a body that was popularly elected, (2) that the legislature is popularly elected, (3) the elections have more than one party participating (i.e. contestation), and (4) that there is alternation of power under the electoral rules (Przeworski et al., 2000; Cheibub et

[4] Cheibub, Gandhi and Vreeland (2010) expanded the 2000 dataset up to 2008 and reclassified a few countries based on the political events that occurred in the country after 2000. The complete dataset can be found on Cheibub's website.

al., 2010). This dichotomous definition of democracy is the most appropriate for this work because it specifically focuses on electoral requirements and outcomes.[5]

My sample is comprised of democratic countries for the years 1975 through 2007. In order to be included in the sample, a country must have been classified as a democracy for any eight consecutive years within the 33 years the dataset covers.[6]

I estimate an unbalanced panel regression using pooled ordinary least squares (POLS) for the 92 countries that comprise the sample for a total of 2,115 country-years.[7] To begin with, I estimate the following model which is a modified version of Bradbury and Crain's (2001) main specification.

$$G_{it} = \beta_1 Nuni_{it} + \beta_2 Nlower_{it} + \beta_3 Nupper_{it} + \theta HouseElect.Rules_{it} + \gamma SenateElect.Rules_{it} + \varphi RegimeType_{it} + \phi X_{it} + \alpha_0 + \tau_t + \epsilon_{it} \qquad (1)$$

The dependent variable, G_{it}, is the government share of real GDP from the Penn World Tables version 6.3 (Heston et al., 2009). $Nuni_{it}$ is the size of the unicameral chamber and $Nlower_{it}$ and $Nupper_{it}$ are the sizes of the lower and upper chambers (and their squares and cubes in the non-linear cases).[8] For unicameral

[5] Other measures of democracy that have been used in the literature include using a cutoff value to denote democracy in the Polity IV democracy variable, the Polity score, or the Gastil index (Persson and Tabellini, 2003). The lists of countries that qualify as democracies using these alternative measures of democracy (and a reasonable cutoff value) are similar to the list of countries classified as democratic using the Przeworksi et al. (2000) measure.

[6] One very notable omission is the United Kingdom. It meets the requirement for democracy and all of the other economic and political data is available except for the size of the upper chamber – The House of Lords. That is, the House of Lords has not had a set number of seats historically.

[7] A list of all the data sources used can be in an earlier version of the paper that can be found in the author's website.

[8] A full list of the countries included along with the starting and ending year for each, whether they are unicameral, bicameral or switched between and the average size of each chamber for the period of inclusion can be found in an earlier version of the paper that can be found in the author's website

countries, $Nlower_{it}$ and $Nupper_{it}$ are equal to zero. For bicameral countries, $Nuni_{it}$ is equal to zero.

$HouseElect.Rule_{it}$ is a dummy which equals one if fifty percent or more of the house is elected through a plurality rule and zero if it is elected through proportional representation. $SenateElect.Rule_{it}$ contains four dummy variables, controlling for the rule that fills fifty percent or more of the upper chamber and one controlling for unicameral countries with no upper chamber. The included electoral rules are plurality, appointed, indirectly elected, PR and the excluded category is no upper chamber. The vector $RegimeType_{it}$ contains three dummy variables controlling for the system of government. The three regime types are presidential, parliamentary, and mixed presidential-parliamentary systems.[9] Presidential and mixed presidential-parliamentary are included in the regression and the excluded regime category is parliamentary systems.

The vector X_{it} is a set of control variables. It includes the log of real GDP per capita lagged one period, log of population, population growth, log of trade openness, military expenditure, percentage of population under 15 years of age, percentage of population over 65 years of age, and a set of dummy variables denoting the country's legal origins. GDP per capita is included to control for Wagner's law which states that government spending increases with GDP (Persson

[9] There is concern that the selection of constitutional structure is not a random choice. There is a concentration of presidential countries in the Americas and parliamentary countries in former British colonies. Persson and Tabellini (2002) compare the results from conventional regresssions against the results using quasi-experimental matching methods and find that the results do not change. Therefore, I do not try to control for this potential problem of endogeneity. In addition, I control for legal origin which is heavily determined by colonial origin (La Porta et al., 2008)

and Tabellini, 2003). Openness, calculated as exports plus imports divided by GDP, is included to control for Rodrik's (1998) finding that more open economies have larger governments in the form of increased government safety net. The log of population is included to control for country size and economies of scale in the production of government services (Alesina and Wacziarg, 1998). Population growth is included to control for the short-run demand for goods and services, such as highways, that are needed to accommodate rapid growth (Gilligan and Matsusaka, 1995). Military expenditure, percentage of the population under the age of 15, and over the age of 65 are included to control for other forms of government services. Countries that spend large amounts on their military tend to have larger government shares of government spending. The age of the population also has an effect on the types and amount of government services that need to be provided. If there is a large young population, more spending on schools is needed while a larger elderly population means that more spending on health care is needed. The last controls are a set of dummy variables denoting the country's legal origins. There are four legal origins: English Common Law, French Civil Law, German, and Scandinavian.[10] Legal origin has been shown to affect external finance which is likely to affect the amount of government spending and is also highly correlated with colonial origin (La Porta et al., 2008).[11] The regression also

[10] In the regressions, English Common Law is the excluded dummy.
[11] Instead of using regional dummies, I use Legal Origins which are correlated with colonial origin. In the sample of 92 countries, 45 have French Legal Origins (Latin American countries, former Spanish and French Colonies and a few former Soviet States), 15 have German Legal Origins, 5 have Scandinavian Legal Origins, and 27 have English Legal Origins (mostly former British Colonies and Common Wealth Countries).

includes time fixed effects, τ_t, to control for time specific effects. Country fixed effects are not appropriate in this specification because some of the regressors are time invariant.

I first estimate the model and test whether unicameral and bicameral countries can be pooled together by running a Chow test for the appropriateness of grouping.[12] The results of the tests reject the hypothesis, at the one percent significance level, that bicameral and unicameral countries share the same set of coefficients.[13] In other words, the results of the Chow test suggest that bicameral and unicameral countries should not be grouped together. The majority of the variation between unicameral and bicameral countries is mainly coming from the control variables in the specification. Table 1.1 shows summary statistics separated by chamber structure. Unicameral countries tend to be poorer, more open to trade, and smaller in terms of population. They also tend to have higher levels of government spending than bicameral countries.

Following the results of the Chow test, I estimate equation (1) separately for unicameral and bicameral countries. The separate equations are:

For Unicameral:

$$G_{it} = \beta_1 Nuni_{it} + \theta_1 HouseElect.Rule_{it} + +\varphi RegimeType_{it} + \phi X_{it} + \alpha_0 + \tau_t + \epsilon_{it} \quad (2)$$

For Bicameral:

[12] I also test the quadratic (in chamber size) specification of this model and find the same results.
[13] The results from this test are available upon request. I ran the test for the linear specification, the quadratic specification and the combination of terms that I use later on in the paper. In all cases, the test rejects the null that the coefficient for unicameral are zero (i.e. that unicameral and bicameral countries have the same coefficients).

$$G_{it} = \beta_1 Nlower_{it} + \beta_2 Nupper_{it} + \theta_1 HouseElect.Rule_{it} + \gamma SenateElect.Rules_{it} + \varphi RegimeType_{it} + \phi X_{it} + \alpha_0 + \tau_t + \epsilon_{it} \quad (3)$$

The included variables are defined the same as for equation (1). The major difference here is that the unicameral equation does not include any bicameral variables and the bicameral equation does not include any unicameral variables.[14]

The next step is to select the optimal specification in terms of legislative chamber size. That is, to see if the models are linear or non-linear in chamber size. To test for this, I use the Bayesian Information Criterion (BIC) which allows me to compare models in order to find the model that best fits the data.[15] According to the criterion, the optimal unicameral model is squared in the size of the legislative chamber and the optimal model for bicameral model is cubic in the size of the lower chamber and linear in the size of the upper chamber.[16] In what follows I report only the results for the optimal model (i.e. linear for unicameral and cubic-squared for bicameral)

[14] Keep in mind that in the bicameral equation, *SenateElect.Rule*$_{it}$ now has one less dummy variable, as the dummy for no upper chamber is no longer valid for this vector. The excluded category in this estimation is upper chambers elected through PR.

[15] For the unicameral specification, I compare the linear, quadratic, and cubic models in chamber size and find that the linear model is the optimal choice (i.e. the model with the smallest BIC value). For the bicameral grouping, I compare the 9 models that comprise the possible combinations of lower and upper chamber sizes raised up to the third power.
BIC is also known as the Schwarz Information Criterion (SIC) after the author Gideon Schwarz. The optimal dimensionality of the model is the specification that yields the lowest BIC value. For more detail on the test refer to Schwarz (1978).

[16] These results hold up even when I reduce the sample by averaging the dependent variable in order to try to smooth out the business cycle which I do in the robustness section later in the paper.

1.4 Results

1.4.1 Unicameral

Column 1 in Table 1.2 shows the results for the unicameral model.[17] The coefficient on legislature size is positive and significant. This result is in line with the law of 1/n and the literature's findings that additional legislators increase the size of government spending (Weingast et al., 1981; Bradbury and Crain 2001). For example, if the size of the legislature increases by one standard deviation, government share of real GDP increases by 1.2%, ceteris paribus.

The presidential and house electoral rule coefficients, both negative and significant, support the existing literature (discussed in the previous section). That is, in comparison to parliamentary systems and PR systems, both presidential and plurality systems have lower government shares of real GDP. More specifically, presidential systems' government share of real GDP is smaller than parliamentary systems' share by 2.9% and plurality electoral rule results in 4.7% smaller government share of real GDP than PR electoral rule. The coefficient on mixed presidential parliamentary systems is not significantly different from zero for the full sample of unicameral country years. This suggests that mixed systems, in unicameral countries, have similar levels of government spending as parliamentary systems.

As for the control variables, the lagged log of real GDP per capita is negative and significant. However, the literature suggests that it should be positive

[17] I only report the optimal equation based on the BIC in the unicameral and bicameral results. The results for other specifications are available upon request.

based on the idea that demand for government goods and services increases with income. The coefficient on the log of population is negative and significant showing that as population increases, the government share of real GDP decreases. This result follows Gillian and Matsusaka's (1995) argument that there are economies of scale which appear as a negative coefficient on log of population. Openness and military expenditure are both positive and significant as expected. That is, more open countries have higher levels of government spending due to a higher demand for a government provided safety net and higher levels of military spending naturally translate into higher levels of government spending (Rodrik, 1998). Percentage of the population under 15 and over 65 years of age are both positive and significant. While the coefficients are not similar, a one standard deviation increase in each variable increases government spending by similar amounts (3.2% for a one standard deviation increase in the % of population under 15 and by 3.3% for a one standard deviation increase in the % of population over 65). The last set of controls, the dummy variables for legal origin, are all negative and significant. This means that in comparison to English Common Law (the excluded variable), having French, German, or Scandinavian legal origins decreases the share of government spending. The largest result is for French Civil Law origins; countries that have French Civil Law origins have 4.9% less government spending than countries that have English Common Law.

1.4.2 Bicameral

Column 2 in Table 1.2 shows the results for the bicameral model. The coefficients on the lower chamber size show that there is a non-linear relationship between the size of the lower chamber and government share of real GDP per capita. Panel A in Figure 1 depicts the results of lower chamber size against government spending holding everything else at their mean values, and varying the size of the lower chamber.

From the image, we can see that there is a maximum and a minimum spending point within the range of real world chamber sizes. The maximum is reached at 469 seats and the minimum at 129 seats, ceteris paribus. It is interesting to note that almost all of the country years that would fall on the downward sloping part of the curve (at the lower end of the chamber sizes) are small countries and/or island nations. Smaller countries tend to have lower levels of government spending and may be what is driving the initial downward sloping part of the curve.[18]

The maximum point is well above the average lower chamber size of 235 seats and outside the one standard deviation band (both of these are depicted in Figure 1). Most countries have lower chambers that are smaller than this maximum and, most countries fall between the minimum and maximum point on the upward sloping part of the curve. Although the slope of the curve is positive for this section, there is an inflection point at 300 seats. The increase in government spending as a result of an additional legislator, ceteris paribus, increases more than proportionally after the minimum of 129 seats up to 300 seats and then increases at

[18] The list of country –years based on chamber sizes can be provided upon request.

a decreasing rate until it hits the maximum point of 469 seats. This result suggests that, while for most countries there is a positive relationship between lower chamber size and government spending, the relationship is not always constant nor is it always increasing. The nonlinear specification and the resulting inflection points tell a different story than the results for the unicameral chamber. Recall that the law of 1/n supports a linear relationship (i.e. always increasing at the same rate) and the findings in the unicameral specification followed this relationship. However, in the bicameral setting, there is a very strong non-linear relationship and the increase in government share of real GDP is not constant.

The results for the upper chamber also show a non-linear relationship which is depicted in Panel B in Figure 1. The government share of real GDP decreases as the size of the upper chamber increases up to a point and then increases. However, most of the upper chambers in the sample lie on the downward sloping part of the graph. There are only five countries that lie above the minimum part of the graph.[19] This result supports Bradbury and Crain's (2002) finding that the upper chamber dampens the spending behavior of the lower chamber.

The electoral rules in this specification are slightly more complicated than in the unicameral case because there are two chambers to account for and there are more upper chamber rules. Lower chambers can be elected either through PR or through plurality. The included dummy for the lower chamber is plurality. Upper chambers can be appointed, indirectly elected, or directly elected through PR or plurality electoral rules. The excluded dummy variable is PR. The coefficient for

[19] Spain, France, India, Italy, and Japan

the lower chamber confirms the literature's finding that plurality electoral rule yields lower levels of government spending, ceteris paribus, than PR electoral rules. I find a similar and stronger result in the upper chamber. The coefficient shows that, holding everything else constant, plurality electoral rule for the upper chamber results in 8.3% less government share of real GDP than with PR electoral rule. Of all the electoral rules, PR upper chambers (along with appointed upper chambers) appear to be the worst in terms of limiting government share of real GDP.

The coefficients on the regime type are not really significant. While the coefficient on presidential regime type is negative it is not significantly different from the parliamentary systems. The addition to the literature is that the mixed presidential-parliamentary system is significantly different than the presidential and parliamentary systems (albeit the coefficient is only significant at the 10% level). In terms of government share of real GDP, mixed systems have lower shares than the other two systems. The existing literature, due to complications in the classification of mixed systems, ignores the presence on this third regime type by grouping the countries into either the presidential or the parliamentary groups. The results here show that mixed systems are actually different than the other two groups and should be considered separately.

Log of real GDP per capita is, once again, negative and significant and contrary to what the literature predicts. Openness is positive and significant supporting the ideas that more open countries have higher levels of government

spending due to a higher demand for a government provided safety net (Rodrik, 1998). Log of population has the expected negative sign but population growth is negative and significant in this specification which is contrary to the literature. Unlike with unicameral countries, military spending and percentage of the population over 65 are both statistically and economically insignificant. However, percentage of the population under 15 years of age is negative and significant suggesting that a younger population reduces the share of government spending. The legal origin dummies are mostly insignificant with German legal origin only slightly statistically significant but not economically significant.

The results in this section suggest that the law of 1/n appears to apply to unicameral countries. Bradbury and Crain (2001) made the argument that the underlying assumption behind the law of 1/n is that one legislative chamber makes the spending decisions. In other words, that the law of 1/n requires the legislative structure to be unicameral. The results here confirm that in unicameral chambers, the law of 1/n does hold. For bicameral countries, however, the relationship between legislative chamber and government share of real GDP is not linear. In fact, the relationship between the size of the legislative chambers and government spending is significantly non-linear. So the law of 1/n does not apply to bicameral chambers. The results do show that upper chambers do work to dampen the effects of the lower chambers' spending.

The results in this section may be driven by extreme values in the data (i.e. countries with large legislative chambers). In the next section I perform some

robustness checks to see if the results are robust to the removal of outlying chamber sizes.

1.5 Robustness Checks

To test for the possibility of extreme values influencing the results, I re-estimate the unicameral and bicameral models dropping country years whose legislative chamber sizes are larger than two standard deviations from the mean.

1.5.1 Unicameral

The results in the previous section show that there is a strong positive linear relationship between legislature chamber size and government share of real GDP. However, there are a wide range of chamber sizes in the sample with extreme values in the upper end of the chamber sizes. Column 2 in Table 1.3 shows the results when estimating the unicameral model for only the country years with chamber sizes within two standard deviations of the average chamber size (i.e. unicameral sizes less than 378 chairs).[20] For these country years, the coefficient for unicameral chamber is no longer significant. Almost all of the other variables in the model increased in absolute magnitude.

It appears that the coefficient on unicameral chamber size is sensitive to extreme values in the sample. This really calls into question the validity of the law of 1/n. Not only does it not apply to bicameral chambers it does not appear to be robust to the exclusion of extreme chamber size values.

[20] Excluded countries – Hungary, Turkey, Ukraine and Indonesia.

1.5.2 Bicameral

Dropping extreme values for bicameral countries is a bit more complicated since it has to be done for the lower and upper chambers. Columns 3 through 6 in Table 1.3 show the results for the various estimations of the bicameral model.

I first address the extreme values in the lower chamber. Column 4 shows the results when estimating the bicameral model for only the country years with lower chamber sizes within two standard deviations of the average lower chamber size (i.e. lower chamber sizes below 655 chairs).[21] Notice that all of the lower chamber size coefficients are still significant and have similar (slightly larger) magnitudes as the original specification (shown in Column 3). A notable difference is that the coefficients on presidential and mixed systems are now highly significant suggesting that countries with presidential and mixed systems spend 2.4% and 2.5% less, respectively, than parliamentary systems.

Column 5 shows the results of the bicameral model when removing all the country years with upper chamber sizes larger than two standard deviations past the average upper chamber size (i.e. excluding chamber sizes greater than 267 chairs).[22] Similar to the results so far, all of the coefficients on the chamber sizes remain significant and have similar magnitudes to the original specification. The rest of the coefficients also maintained their significance in this subset of the data.

The last robustness check is to drop extreme values in the both chambers at the same time to see if the results still hold up. Column 6 shows the results when

[21] Excluded country – Germany.
[22] Excluded countries – France and Italy.

dropping the lower and upper chambers that are larger than two standard deviations from the average. The results are very similar to the original results. Overall, it appears that the results are robust to the exclusion of extreme values in bicameral countries.

1.6 Conclusion

In this paper I undertake a comprehensive study of the relationship between political institutions and level of government spending. I incorporate both the political institutions that have been used in the literature and go further by accounting for: 1) differences in upper chamber electoral rules, 2) the existence of mixed presidential parliamentary systems, and 3) the possibility of a non-linear relationship between legislature chamber size and spending. The results show that there is a linear relationship between unicameral chamber size and level of government spending in unicameral countries. However this result is not robust to the exclusion of extreme values in legislative chamber sizes. The results also show that there is a non-linear relationship between lower chamber size and level of government spending in bicameral countries and the results are robust to the exclusion of extreme values. In both types of legislative structures, plurality electoral rule is always associated with lower levels of government share of GDP. Lastly, when testing to see if bicameral and unicameral countries should be grouped together, I find that they should not.

The results presented here suggest that the political structure and the characteristics of the legislative chamber have a significant effect on the level of

government spending. While countries that have long standing political institutions are less likely to change the characteristics of those political institutions in order to change the level of government spending, countries that are establishing new political institutions (e.g. South Sudan and Libya) stand to benefit from knowing what types of institutions are conducive for growth.

Table 1.1- Summary Statistics by Chamber Structure

	Unicameral N = 1065				Bicameral N = 1050			
VARIABLES	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Government Share of real GDP	19.27	7.91	4.2	47.58	15.44	4.87	4.12	30.92
Presidential	0.3	0.46	0	1	0.28	0.45	0	1
Mixed Presidential-Parliamentary	0.22	0.41	0	1	0.17	0.38	0	1
Parliamentary	0.48	0.5	0	1	0.54	0.5	0	1
log of Real GDP per capita	8.62	1.02	6.06	11.29	9.06	0.86	5.95	10.69
log Openness	4.39	0.44	2.83	5.75	4.1	0.62	2.43	5.22
log population	15.2	1.49	11.7	19.27	16.172	2.2	11.4	20.85
Population Growth	1.25	1.21	-2.5	5.64	1.047	0.89	-1.1	3.43
Military Expenditure	136.39	280.48	0	2658.8	1415.34	5221.17	0	55256.8
% Pop. Below 15 years	29.36	10.34	13.5	47.43	27.77	9.16	13.6	47.17
% Pop. Above 64 years	8.83	4.89	1.9	18.48	9.34	4.65	2.12	20.91
British Legal Origin	0.25	0.43	0	1	0.39	0.49	0	1
French Legal Origin	0.5	0.5	0	1	0.43	0.5	0	1
German Legal Origin	0.12	0.32	0	1	0.18	0.38	0	1
Scandinavian Legal Origin	0.14	0.35	0	1	0.02	0.12	0	1
Unicameral Chamber Size	155.63	111.81	35	550	-	-	-	-
House Electoral Rule: Plurality	0.35	0.48	0	1	0.47	0.5	0	1
House Electoral Rule: Proportional Rep.	0.66	0.47	0	1	0.53	0.5	0	1
Lower Chamber Size	-	-	-	-	235.01	184.26	15	674
Upper Chamber Size	-	-	-	-	90.43	86.5	8	326
Senate Electoral Rule: Plurality	-	-	-	-	0.32	0.47	0	1
Senate Electoral Rule: Appointed	-	-	-	-	0.23	0.42	0	1
Senate Electoral Rule: Indirect	-	-	-	-	0.16	0.37	0	1
Senate Electoral Rule: Proportional Rep.	-	-	-	-	0.28	0.45	0	1

Table 1. 2: Main Results

	(1)	(2)
VARIABLES	Gov Share of real GDP	
Size Unicameral Chamber	0.0107***	
	(0.0033)	
Size Lower Chamber		-0.0609***
		(0.0117)
(Size Lower Chamber)^2		0.0003***
		(0.0000)
(Size Lower Chamber)^3		-0.0000***
		(0.0000)
Size Upper Chamber		-0.0400***
		(0.0132)
(Size Upper Chamber)^2		0.0001***
		(0.0000)
House Electoral Rule Plurality	-4.6652***	-3.1455***
	(0.5529)	(0.3309)
Senate Electoral Rule Plurality		-8.3359***
		(0.4923)
Senate Electoral Rule Appointed		-0.6314
		(0.6286)
Senate Electoral Rule Indirect		-2.3125***
		(0.6247)
Presidential	-2.8553***	-1.2813
	(0.6931)	(0.8322)
Mixed Presidential-Parliamentary	0.7195	-1.3884*
	(0.5520)	(0.7140)
lagged log of Real GDP per capita	-4.8356***	-2.5358***
	(0.3904)	(0.2980)
log Openness	1.7857*	1.2322***
	(0.9213)	(0.4343)
log Population	-2.3597***	0.4422*
	(0.3378)	(0.2676)
Population Growth	-0.6908*	-0.4002*
	(0.3642)	(0.2113)
Military Expenditure	0.0043***	0.0000
	(0.0009)	(0.0000)
% Pop. Below 15	0.3112***	-0.0901**
	(0.0591)	(0.0452)
% Pop. Above 65	0.6689***	-0.1462
	(0.1246)	(0.0955)
French Legal Origin	-4.8474***	0.4399
	(0.6194)	(0.7486)
German Legal Origin	-1.7934*	0.9465*
	(0.9695)	(0.5021)
Scandinavian Legal Origin	-2.3346***	-0.2442
	(0.7768)	(0.9226)
Constant	76.6601***	37.6634***
	(10.3428)	(5.7515)
N	1,065	1,050
R^2	0.3431	0.5142

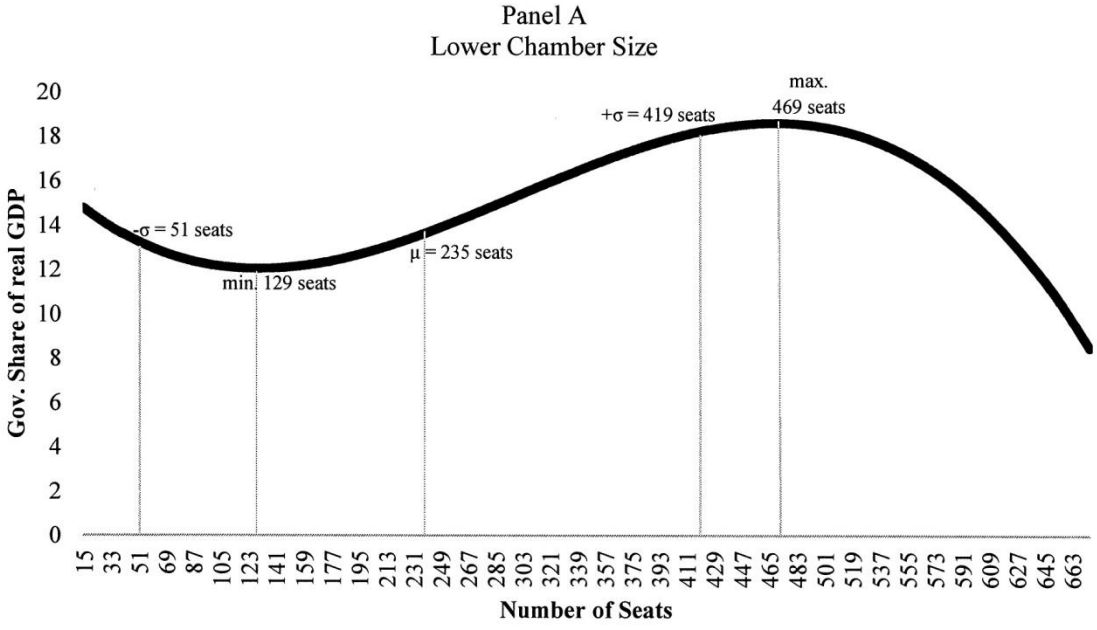
Note: Year dummies not reported to save space. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

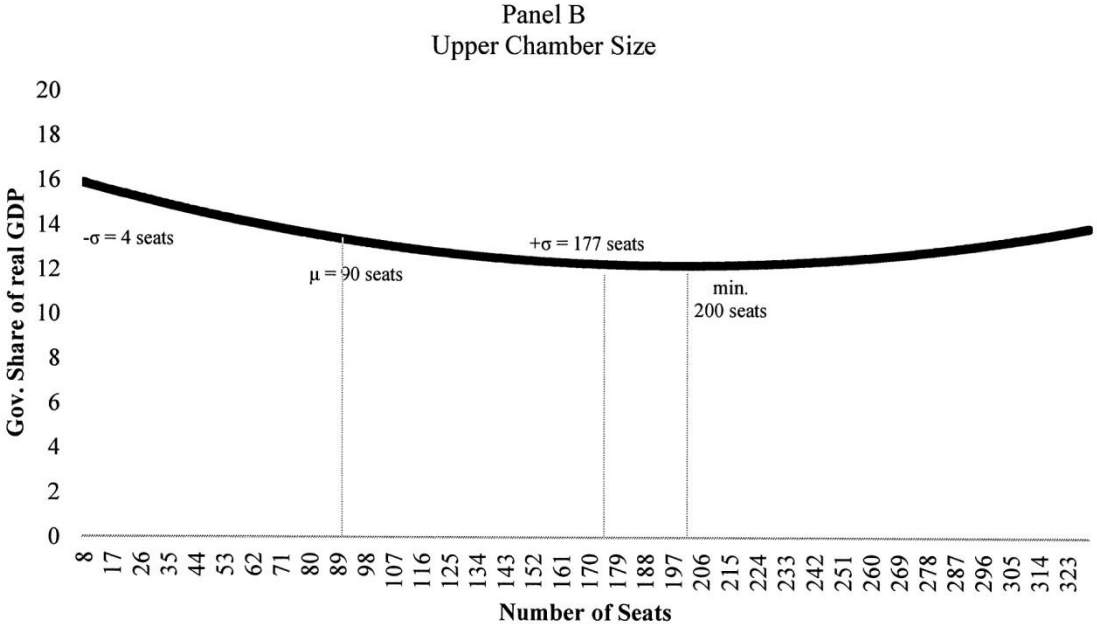
Table 1.3: Bicameral Results Excluding Extreme Chamber Sizes

	(1)	(2)	(3)	(4)	(5)	(6)
	Gov Share of real GDP					
	Unicameral Results		Bicameral Results			
	All UNI (Table 2)	±2σ uni Size ONLY	All BI (Table 2)	Minus Lower Chamber Extreme Values	Minus Upper Chamber Extreme Values	Minus Lower and Upper Chamber Extreme Values
				(Extreme Values = 2σ away from mean)		
Size Unicameral Chamber	0.0107***	-0.0055				
	(0.0033)	(0.0045)				
Size Lower Chamber			-0.0609***	-0.0687***	-0.0592***	-0.0606***
			(0.0117)	(0.0118)	(0.0120)	(0.0195)
(Size Lower Chamber)^2			0.0003***	0.0004***	0.0003***	0.0003***
			(0.0000)	(0.0000)	(0.0000)	(0.0001)
(Size Lower Chamber)^3			-0.0000***	-0.0000***	-0.0000***	-0.0000***
			(0.0000)	(0.0000)	(0.0000)	(0.0000)
Size Upper Chamber			-0.0400***	-0.0811***	-0.0459**	-0.0825***
			(0.0132)	(0.0155)	(0.0198)	(0.0199)
(Size Upper Chamber)^2			0.0001***	0.0002***	0.0001**	0.0002***
			(0.0000)	(0.0000)	(0.0001)	(0.0001)
House Electoral Rule Plurality	-4.6652***	-5.6168***	-3.1455***	-3.5729***	-3.0847***	-3.6326***
	(0.5529)	(0.5848)	(0.3309)	(0.3325)	(0.3861)	(0.3606)
Senate Electoral Rule Plurality			-8.3359***	-9.4567***	-8.4057***	-9.3801***
			(0.4923)	(0.5069)	(0.5494)	(0.5675)
Senate Electoral Rule App			-0.6314	-1.6261***	-0.6099	-1.4400*
			(0.6286)	(0.6299)	(0.6431)	(0.7523)
Senate Electoral Rule Indirect			-2.3125***	-2.8556***	-2.3204***	-2.9392***
			(0.6247)	(0.6166)	(0.6517)	(0.6579)
Presidential	-2.8553***	-3.7291***	-1.2813	-2.3711***	-1.2459	-2.3624***
	(0.6931)	(0.6879)	(0.8322)	(0.8611)	(0.8083)	(0.8244)
Mixed Pres.-Par.	0.7195	-0.0387	-1.3884*	-2.4613***	-1.2165	-2.4208***
	(0.5520)	(0.5829)	(0.7140)	(0.6968)	(0.8872)	(0.8876)
log of Real GDP per capita$_{t-1}$	-4.8356***	-5.0649***	-2.5358***	-2.4131***	-2.4988***	-2.4073***
	(0.3904)	(0.3991)	(0.2980)	(0.2965)	(0.3393)	(0.3296)
log Openness	1.7857*	0.4875	1.2322***	1.8491***	1.2627***	1.8377***
	(0.9213)	(0.9659)	(0.4343)	(0.4103)	(0.4214)	(0.4242)
log Population	-2.3597***	-2.1487***	0.4422*	0.7281***	0.4487*	0.6861**
	(0.3378)	(0.3408)	(0.2676)	(0.2697)	(0.2673)	(0.2692)
Population Growth	-0.6908*	-0.6126	-0.4002*	-0.6291***	-0.4019*	-0.6687***
	(0.3642)	(0.3848)	(0.2113)	(0.1996)	(0.2144)	(0.2053)
Military Expenditure	0.0043***	0.0060***	0.0000	-0.0000	0.0000	-0.0000
	(0.0009)	(0.0010)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
% Pop. Below 15	0.3112***	0.3145***	-0.0901**	-0.0405	-0.0872*	-0.0306
	(0.0591)	(0.0640)	(0.0452)	(0.0438)	(0.0493)	(0.0470)
% Pop. Above 65	0.6689***	0.6663***	-0.1462	-0.0874	-0.1363	-0.0688
	(0.1246)	(0.1384)	(0.0955)	(0.0944)	(0.1005)	(0.0954)
French Legal Origin	-4.8474***	-4.9876***	0.4399	0.7271	0.5309	0.7252
	(0.6194)	(0.6313)	(0.7486)	(0.7360)	(0.8290)	(0.8615)
German Legal Origin	-1.7934*	-1.4696	0.9465*	1.4771***	0.8768	1.3260***
	(0.9695)	(1.0557)	(0.5021)	(0.5280)	(0.5355)	(0.5064)
Scandinavian Legal Origin	-2.3346***	-1.5855**	-0.2442	-0.2753	-0.3861	-0.2613
	(0.7768)	(0.7604)	(0.9226)	(0.9169)	(1.0390)	(0.9742)
Constant	76.6601***	83.9778***	37.6634***	30.2027***	36.8625***	30.0000***
	(10.3428)	(10.6593)	(5.7515)	(5.8589)	(6.3224)	(6.2897)
Observations	1,065	1,001	1,050	1,018	984	952
R^2	0.3431	0.3667	0.5142	0.5439	0.5093	0.5396

Note: Year dummies not reported to save space. Robust standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Figure 1.1: Illustration of Effect of Lower and Upper Chamber Size on Government Share of real GDP





Chapter 2: Electoral Experience, Institutional Quality, and Economic Development in Latin America

2.1 Introduction

Two hundred and fifty years after the arrival of the Europeans, per capita income in parts of the Caribbean and South America actually exceeded per capita income of the colonies that would later become Canada and the United States (Coatsworth, 2005).[23] However, in the 19th century, Latin American economies fell behind the US and Canada and have never fully recovered. For example, during the 1800s national income grew so much slower in Mexico that by 1900, average per-capita income was only 33% of that in the US. While Mexican income began to make up ground in the 20th century, such progress came to a halt with the 1980s debt crisis. There is a large literature arguing that the Spanish and Portuguese colonial legacies must be part of the explanation for the region's slow growth and authors have pointed to factors as diverse as religion, culture, economic ideology, and overall institutional development.[24]

While many of these factors could explain the divergence in development between the US and Canada on the one hand and the rest of the Western Hemisphere on the other hand, the arguments are harder to make when trying to

[23] According to Maddison's (2009) figures, Mexico's per-capita income was 108% of US per-capita income in 1700.

[24] Among other reasons, the different economic paths of the US and Latin America have been attributed to cultural differences (MacKay 2006; Andreski 1966), institutions (Coatsworth and Tortella 2002; Coastworth 2008; Acemoglu et al. 2001, 2002; North 1989, 1990), economic ideology (Lange et al. 2006), initial endowments (Engerman and Sokoloff 1997; Nunn 2008), religion and culture (Grier 1997, 1999; Macauley 1848).

explain differences among Latin America countries. For example, in 1900 Brazil and Peru had similar levels of per capita GDP. In 1956, Peru's per capita GDP was 45% larger than Brazil's. However, by 2000, average per-capita income in Brazil was 45% larger than average income in Peru.[25] These two countries share a similar colonial heritage, religion, and culture. So what caused Peru's income growth to outstrip Brazil's in the early part of the century and what enabled Brazil to not only catch up but also surpass Peruvian average income by the year 2000? There is a long-standing debate in the growth and development literature about whether institutions or geography are more important to income levels. We investigate this question in the Latin American context to try to better answer the question about Brazil and Peru that we posited above.

In this paper, we test how much institutions and geography can explain income differences across 18 Latin America countries from 1900 to 2007. We make use of a new instrument based on the history of suffrage expansion that allows us to use a panel framework.[26]

We find several interesting results. First, we show that institutions, measured as the level of political constraint on the chief executive, have a positive and significant effect on per-capita GDP. This result is robust to the inclusion

[25] Estimates based on Maddison's (2009) data.

[26] The instrument is the depreciated number of years that a country has experienced a particular type of suffrage under the conditions of both competitive elections and secret ballots. Since many of our countries have experienced periods of no elections (or non-competitive ones), the instruments are not merely a point and a time trend. During these periods, there is no new data being added and the value of the instruments decreases until a new competitive election takes place. At that point, the instrument starts to increase again.

country fixed effects and to changes in the number of countries in the sample.[27] The effect of improving institutions by one standard deviation above the regional average is an increase in a country's per-capita GDP of about $2150. Using an alternative measure of institutions, we find that the same exercise raises per-capita GDP by about $2550. Thus, institutions are not only a statistically significant determinant of income, they also have a large, quantitative effect as well.

Second, we find that geographic factors also play an important role in determining per-capita incomes in the region. Countries that are landlocked, or tropical, or are closer to the equator have significantly lower per-capita incomes than countries that have coastal access, are more temperate, and are further away from the equator. More specifically, we find that the per capita income penalty from being landlocked averages $755, the penalty for being tropical averages around $1876, and the penalty for moving one standard deviation from the mean absolute latitude closer to the equator is around $500. Based on these estimates, it appears that geography has a smaller effect on per-capita income than institutions. Thus, in our case at least, we can say that the answer to whether geography or institutions are more important to development is that they both play a role but institutions play a bigger role.

The remainder of the paper is organized as follows: Section 2 discusses the literature on institutions, geography, and growth in general and also with respect to Latin America. Section 3 explains why we think Latin America is a perfect laboratory in which to study the questions of income, institutions, and geography.

[27] Refer to Appendix 1 for definitions of each of these institutional measures.

Section 4 presents the data and the methodology. In Section 5 we discuss the main results as well as the jackknife results and Section 6 concludes.

2.2 Literature Review

The effect of geography and institutions on income has been hotly debated in the development literature in the last couple of decades. Przeworski (1993), Brunetti (1997) and Jütting (2003) survey the political institutions and growth literature and find the results to be inconclusive. Some studies find that political institutions have a positive effect on income growth, while others find a negative effect. Others find that political institutions do not significantly affect income at all.[28] More recently, Brunnschweiler (2008) finds that the quality of institutions positively affects economic growth and Catrinescu et al. (2009) find that places with higher quality of political and economic institutions are more likely to see long term growth from remittances than places with with lower quality of instituitons.

The literature studying the link between geography and country income finds that landlocked countries and countries with tropical climates have lower income levels on average than coastal, temperate countries (Gallup et al., 1999; Bloom, et al. 1998; Mellinger, et al. 2000; Sachs 2001). However, once institutions and geography are included in a single regression, the results again become less conclusive. For example, Acemoglu, et al. (2001) and Rodrik, et al. (2004) show

[28] From these surveys Barro (1989), Scully (1988), and Pourgerami (1991) and Decker and Lim (2008) are examples of works that find a positive relationship, Barro (1991), Knack and Keefer (1995) and Alesina, et al. (1996) find a negative relationship and Levine and Renelt (1992), Easterly, et al. (1993), Helliwell (1994) and de Haan and Siermann (1995) find no relationship between political institutions and economic growth.

that, once they instrument for institutions, the effects of geographic variables are no longer significant and in some cases have unexpected signs. On the other hand, McArthur and Sachs (2001) and Naudé (2004) show that both institutions and geography are important determinants of growth.

Another argument in the literature is about the persistence of historical institutions and their effect on current economic outcomes. Acemoglu et al. (2001, 2002) argue that colonial institution have an influence on the quality of current institutions, where quality is measured as the risk of appropriation of private property by the government. Areas where colonizers set up extractive institutions are more likely to have poor contemporary institutions. Regions that were settler colonies, where Europeans brought their families and constructed good institutions, are less likely to suffer from arbitrary government expropriation.

Along the same lines, Dell (2010) finds that the forced labor system of mining in colonial Peru, called the *mita*, has had a long-run effect on development. Areas that were strongly affected by the *mita* now have lower education levels than the national average, more subsistence agriculture, and are generally less integrated into the national road network. Other works have found a similar link between colonial legacies and economic outcomes in other parts of the world. Nunn (2008) finds that the slave trade has negative persistent effects on the countries where slaves originated. Banerjee and Iyer (2005) find that British colonial land tenure rules have present day effects on the level of investment in different areas of India. While some of the historical institutions literature is region specific, much of the

literature on institutions and income focuses on a large-N cross section of countries from around the world. In the next section we discuss why a regional focus is beneficial.

2.3 Why Latin America?

In any empirical estimation, the ideal sample is one where the observations come from the same data generating process and there is enough variation in the independent variables to be able to correctly estimate their effects. Large-N studies pool data from very heterogeneous countries and there is a possibility that the data do not share a common set of coefficients. Grier & Tullock (1989), for instance, demonstrate that countries from different geographic regions do not share a common set of coefficients in growth regressions.

Limiting the sample to a single region that shares a similar colonial background increases the possibility that the observations come from the same data generating process. It also helps to control for a multitude of other factors that have been shown to affect income such as religion (Catholicism is the dominant religion in the region) and legal origin (all countries in our analysis have French legal origins (La Porta et al., 1997)). Of course, the risk of focusing on a single region is the possibility that there is no interesting variation in the explanatory variables. However, we believe that Latin America is sufficiently varied, both geographically and institutionally, to make it a good laboratory. For instance, the region covers a large north-south range, starting with Tijuana, Mexico at the north-most point of 32 degrees latitude down to Ushuaia, Argentina, located at -54.8 degrees latitude.

There is also large variation in climate zones, ranging from temperate Argentina and Chile to the rainforests of Venezuela and Central America.

The region is also institutionally diverse, both across countries and across time. One common measure of institutions is the level of executive constraint, a variable measured on a 7-point scale (ranging from 1 to 7, with higher numbers representing higher levels of constraint).[29] In 1900, Chile and Costa Rica both earned the highest marks in the region for executive constraint (each scoring 7 out of 7). Guatemala, Honduras, Nicaragua, and Paraguay, on the other hand, all scored 1s. By 2000, there were more countries at the top of the scale. Bolivia, Chile, Costa Rica, Nicaragua, Paraguay, Peru, and Uruguay all received the highest score for executive constraint (7 of 7), while Ecuador and Venezuela had the lowest scores (4 of 7).

The common background of the region as well as the the institutional and geographic diversity makes Latin America a good region to test whether institutions and/or geography have an effect on country income.

2.4 Data and Methodology

In order to study the effect of institutions and geography on income in Latin America, we first need to define our measures of institutions and geography.

2.4.1 Institutions

We use two different measures of institutions in our analysis, both of which try to determine the extent that the chief executive is constrained in his or her

[29] Executive constraint is the xconst variable from the Polity IV dataset and is one of the institutional variables we use in our analysis (Marshall & Jaggers, 2009).

actions. The first variable, called EXCONST, is "the extent of institutionalized constraints on the decision making powers of chief executives" and ranges from 1 to 7, with 7 being the most constrained (Marshall & Jaggers, 2009, p. 23).[30] We normalize it to range between 0 and 1, with 1 representing the most constrained. In our sample, Costa Rica has the highest average level (averages a 1 out of 1), while Paraguay and Nicaragua have the lowest average levels (0. 20 and 0. 25, respectively). As these numbers suggest, there is wide variation in the sample. For example, in 1950 Argentina, Bolivia, Colombia, the Dominican Republic, Nicaragua and Paraguay had the lowest value of 0.14 while Costa Rica and Brazil had the highest values at 1 and .71 respectively.

Our second institutional variable, called POLCON, is similar to the EXCONST variable in that it tries to measure the extent to which policymakers are constrained in their actions. That is, do political actors have virtual discretion to enact policies unilaterally, or are they constrained by an institutional system of checks and balances? Henisz (2000) constructs the POLCON variable through a "simple spatial model of political interaction that incorporates information on the number of independent branches of government with veto power and the distribution of preferences across and within those branches." This variable ranges from 0 to 1, with a 1 indicating the highest level of political constraint. In our

[30] This variable, "xconst" in the dataset, measures the effective level of executive constraint, regardless of what the written laws dictate. Note that there are some coding interruptions in the measurement of EXCONST. Years of "foreign interruption" are coded as -66, years of anarchy is coded -77, and years of transition as -88 (Marshall and Jaggers, 2009, p. 16). It is difficult to recode these years without making some potentially controversial assumptions. Therefore, we drop them from the dataset.

sample, Costa Rica and Uruguay have the highest average level (0.36 and 0.33, respectively), while Mexico and Paraguay have the lowest average levels (0.09 and 0. 10, respectively). There is also a lot of variation in any given year. For example, in 1950 the countries with the lowest level of political constrains were Argentina, Bolivia, Colombia, the Dominican Republic, Honduras, Mexico, Nicaragua, Paraguay, Peru, and Venezuela (all which had a value of 0). During the same year, Brazil and Uruguay had the highest levels of political constraint (0.43 and 0.41, respectively). Table 2.1 shows the descriptive statistics for the institutional variables.

It is important to note that EXCONST and POLCON are similar but do not measure exactly the same phenomenon. While both variables incorporate the existence of checks on the executive, POLCON takes into account the preferences of the individuals who make up the bodies, such as the legislative and the judicial branches, which are supposed to act as checks on the executive. This additional component tries to account for the existence of effective checks. For example, if the executive stacks the judiciary with friendly judges, then the judicial branch of that government is not an effective check on the chief executive.

To illustrate some of the differences between these two measures, Figure 1 plots both institutional measures through time for Chile (Panel A), Peru (Panel B), and Venezuela (Panel C). Looking at the evolution of these two variables for Chile, we can see that there is a decrease in both of them in 1973. This marks the coup d'état against Salvador Allende and the installation of the subsequent Augusto

Pinochet regime. After some time, both variables start to increase, but POLCON lags behind EXCONST and is also more variable, especially towards the end of the sample. The increase in the POLCON variable is timed with Pinochet's exit from power in 1990 while the increase in the EXCONST variable is timed with the plebiscite on whether Pinochet should remain in power for eight more years in 1988. So the timing is a bit different. The variability in the POLCON measure after 1990 coincides with subsequent legislative and presidential elections, which would definitely have affected the distribution of preferences in the various branches of government.

For Peru (seen in Panel B of Figure 1), both EXCONST and POLCON fall drastically in the early 1990s due to Fujimori's *autogolpe.* However, the subsequent improvement in EXCONST is not as strongly matched by the POLCON variable. This is due to the fact that while both measures register the existence of checks on the executive, POLCON also takes into consideration the preferences of those individuals who make up the bodies that check the executive power. Legislative elections in 1992 and 1995 gave Fujimori's party the majority of the seats which effectively gave him control of the legislative branch. [31] That is the why there is not a strong increase in either of the institutional variables. Both measures increase in 2001 after Fujimori impeachment and subsequent presidential and legislative

[31] After Fujimori's *autogolpe*, he called for elections in 1992 to fill an interim parliament to rewrite the constitution. *Cambio 90 Nueva Mayoría*, Fujimori's party, won 44 of the 80 seats (Inter-Parliamentary Union, 2012). In the 1995 elections, Fujimori and his party won the presidency and an outright majority in the legislature (67 out of 120 seats).

elections.[32] POLCON does not increase as dramatically as EXCONST because the makeup of the legislative chamber favors the president's party.[33]

Venezuela's institutional variables are depicted in Panel C of Figure 1. In general the EXCONST variable is more stable than the POLCON variable. However, they both register a decline towards the end of the sample that can be traced to the same source – Hugo Chavez. After taking office in 1999, Chavez increased the power of the president, which decreased the constraints on the executive. Additionally, by the end of the sample, his party was also in control of the legislature, which also contributes to the decrease in POLCON.

2.4.2 Geography

We use three different variables to capture the effect of geography on income. The first measure is a dummy for landlocked countries. We include this measure to capture any negative effects on trade from not having easy coastal access.[34] However, as can be seen from Figure 2, there are only two landlocked countries in our sample, Bolivia and Paraguay, so the results for this variable should not be given too much weight.

[32] Fujimori ran for a third term in 2000 with a new party – *Perú 2000*. This time around he won the presidency, but only 41.8% of the seats in the legislature (Inter-Parliamentary Union, 2012). There were allegations of voter fraud and he was impeached late in 2000. New elections for both the presidency and the legislature were held in 2001 (Inter-Parliamentary Union, 2012).

[33] Alejandro Toledo won the presidency and his party, *Perú Posible*, won 26.3% of the seats in the legislature. While not a majority, still the single largest party in the chamber. In 2006, Alan Garcia was elected president and while his party, *Alianza Popular Revolucionaria Americana* (APRA), did not win the majority of the seats, three other parties joined together and allied themselves with the President's party (Inter-Parliamentary Union, 2012).

[34] Using mean distance from the nearest coastline instead of the landlocked dummy does not change our results.

The other geographic variables try to capture how tropical the country is. The literature on geography and development has found that temperate climates are more conducive to development. This is due in part to the types of agricultural crops that can be grown and to the fact that winter freeze helps to kill disease carrying insects (Sachs, 2001). The first of these measures is the absolute latitude of the approximate geographic center of each country (Central Intelligence Agency, 2009). This is a simple variable that measures the distance of the country from the equator and is often used in the growth and geography literature (AJR 2001; Hall and Jones 1999; Rodrik, et al. 2004).[35] Figure 2 shows the latitude for each country. The common practice is to express latitudes north of the equator as positive and those south of the equator as negative. As can be seen, the further away from the equator, the larger the latitude in absolute terms.

The second variable is a tropical dummy equal to one if the country has more than 45% of its area in the tropics as defined by the Köppen-Geiger (KG) classification. [36] This determination is based on the type of vegetation and does not rely on the country's latitude. Figure 2 lists each country's tropical percentage. As can be seen, the countries with the largest tropical percentages tend to be closer to equator. However, since the KG classification relies on vegetation, it correctly accounts for non-tropical climate in countries close to the equator due to higher altitudes or deserts. For example, Ecuador, a country right on the equator, only has

[35] We follow the literature and standardize the absolute latitude to range between 0 and 1. This is done by dividing the absolute latitude by 90.

[36] When using a higher percentage as the cutoff to build the tropical dummy, the magnitude of the coefficient is slightly smaller but still significant. This is also true when using the actual percentage instead of a dummy.

51% of its land in the KG tropics. The rest of the land is at higher elevations and as a result has a more temperate climate. On the other hand, the Dominican Republic is further away from the equator but has 100% of its territory in the KG tropics. As these two examples show, absolute latitude is not a precise indicator of tropicality but it is strongly correlated.[37] In our analysis, we will use either the absolute latitude or the tropical dummy but not both simultaneously.

2.4.3 Methodology

With the institutions and geography variables defined, we now turn to the methodology. We use five year averages of the data in order to mitigate any potential problems of autocorrelation. The basic model is:

$$Y_{it} = \alpha_0 + \beta_1 Institutions_{it} + \delta Geography_i + \varepsilon_{it} \quad (1)$$

Where Y_{it} is the log of the GDP per capita and comes from Angus Maddison's historical statistics (Maddison, 2009). $Institutions_{it}$, are executive constraint (EXCONST), and political constraints (POLCON) and $Geography_{it}$ is a vector of geography variables which always includes the dummy for landlocked countries as well as either the absolute latitude of each country or the dummy for tropicality.

[37] The correlation between our tropical dummy and absolute latitude is -0.89.

2.4.3.1 Identification

One of the statistical difficulties of studying the impact of institutions on income is the possibility that the two factors are simultaneously determined.[38] That is, do good institutions promote economic growth or are richer countries just able to afford better institutions? Of course, both claims could be true and there could be a feedback loop whereby richer countries adopt better institutions, which in turn increases their wealth, and so on. If we fail to control for this possibility econometrically, then the coefficient relating institutions to income will be biased. Therefore equation (1) needs to be estimated using an instrumental variable framework.

There are a number of variables that are widely used as instruments for institutions. Mauro (1995) uses a measure of ethno-linguistic fractionalization to instrument for corruption, while Hall and Jones (1999) use distance from the equator and the fraction of the population speaking English and other European languages to instrument for their social infrastructure measure. Neither of these measures is appropriate for a panel of Latin American countries. The ethno-linguistic fractionalization variable is measured in a single year and absolute latitude is time invariant, so using either as an instrument means that only cross-

[38] Measuring institutions is problematic in other ways. First, there could be omitted variables that are correlated with institutions. For example, many cultural variables, such as a country's work ethic, which is hard to measure, can be correlated with institutions. Second, there could be a problem with the measurement of the institutional variables themselves. All measures of institutional quality are indexes created by researchers, who construct the variables based on their own judgment as well as observed outcomes. As a result, these variables may be measured with error due to the bias of the researcher (Acemoglu, et al. 2001). To reduce these problems, we use several different measures of institutions and include country fixed effects to capture unobserved country specific effects in our robustness tests.

sectional estimations are possible. Both distance from the equator and percentage of the population speaking a European language are supposed to be proxies for Western influence.[39] All of the countries in our sample are former colonies of Western European countries, which means that they all were influenced by Western Europe whether they are located near the equator or not. As for the fraction of people speaking a European language, Spanish or Portuguese is the official language in all Latin American countries in our sample, which means that the instrument would include most of the population.[40] While in a larger sample of countries this variable may be an appropriate instrument, the small amount of variation in this variable for the Latin American region makes this a poor instrument for institutions in our sample.

The most widely used of the instruments in the income and growth literature is Acemoglu, Johnson, and Robinson's (hereafter, AJR) (2001; 2002) settler mortality variable. As discussed earlier, AJR (2001) argue that in places where European colonists faced low mortality rates, they settled and set up good institutions with checks and balances, while in places where Europeans suffered high mortality rates, they set up extractive institutions with few checks and balances. Therefore, high settler mortality at the time of colonization translated into

[39] The idea behind these measures is that countries that were strongly influenced by Western Europe were more likely to adopt favorable institutions. Hall and Jones (1999) argue that immigrants from Western Europe settled in areas of the world that were sparsely populated and had similar climates, such as the US, Canada, Australia, and New Zealand which have similar absolute latitudes to Western Europe. However, Sachs (2001) points out that there are many countries on the same latitude that have had wide-ranging levels of Western influence.).

[40] An exception would be portions of the indigenous population that still actively speak their native languages. For example, in Bolivia, Aymara and Quechua, along with Spanish, are the official languages of the nation. However, Spanish is necessary to fully participate in the national economy.

poor institutions that persisted through time and affected current institutions. While the settler mortality instrument is one of the most popular in the literature, there has also been a fair amount of criticism of its construction.[41] Even apart from any data construction problems, if we focus only on Latin American countries, AJR's sample size is significantly reduced (from 64 to 18) and, in such a small sample, the settler mortality instrument is no longer significant.[42] In order to determine how Latin American institutions affect income through time, we need an instrument that both moves over time and is not correlated with income levels.

2.4.3.2 Constructing a New Instrument

We believe that suffrage expansion is an appropriate instrument for institutions in Latin America. For starters, suffrage expansion has been a long and varied process in the region, which means that there should be sufficient variation in the variable both over time and across countries. Some countries, like Uruguay, granted universal suffrage early in the 20th century, while others, such as Brazil, did not achieve universal suffrage until much later (Nohlen, 2005, p. 12).[43]

[41] See Albouy (2008) and Olsson (2004).
[42] We re-estimated AJR's basic model in our sample of countries and failed to reject the hypothesis that the coefficient of settler mortality is zero in the first stage regression. Fielding and Torres (2008) propose an instrument based on factor endowments of colonial economies. However, like AJR's instrument, their instrument only allows for a cross-sectional analysis.
[43] Appendix 2 lists the various dates of suffrage expansion for each country.

In addition, historical data on suffrage should not have any direct effect on the country's current level of per capita GDP.[44] With each successive expansion, more citizens have the right to vote for their preferred institutions and policies, thereby directly affecting the institutions and indirectly affecting the level of per capita GDP.

Finally, suffrage can have an important effect on institutions by allowing different segments of society to vote. These groups may have very different institutional and policy preferences. For instance, Meltzer and Richards (1981) argue that any expansion of suffrage that moves the median voter (i.e. the decisive voter) to one whose income is below the average income will result in increased redistribution (and taxation since they model a balanced budget). Building on this idea, Abrams and Settle (1999) show that the extension of suffrage to women moves the median voter towards one that is "more likely to favor welfare spending." Increased redistribution and welfare laws are two possible manifestations of institutional change that can occur as a result of extending the right to vote to other segments of society.

[44] Engerman and Sokoloff (1997) argue that countries that initially had favorable factor endowments were also slow to expand suffrage rights. If there is also a correlation between initial factor endowments and current GDP per capita, then the history of suffrage is not an appropriate instrument. However, when we examine the various suffrage expansion dates in the region, the richly endowed countries that Engerman and Sokoloff mention (Mexico, Peru, and Brazil) are not necessarily the last ones to expand suffrage and in some cases were some of the first to do so. In fact, in our sample, Mexico is the leader in the removal of economic and literacy requirements and the second to implement secret balloting. On the expansion of suffrage to women, however, they come in 13th place. On the other hand, Brazil was 16th in the region to remove economic requirements, last in removing literacy requirements, but 2nd in granting suffrage to women. These two countries followed very different patterns in their suffrage expansions, casting doubt on the argument that initial factor endowments significantly influenced the expansion of suffrage.

To construct our instrument, we register the initial date of suffrage expansion as well the passage of time since the expansion took place. Based on historical voter turnout patterns, the new median voter that results from the expansion will have the strongest effect through the first couple of elections after the expansion, as newly enfranchised voters head to the polls in droves to express their preferences. However, after these "founding elections," there tends to be a decline in voter turnout over time (O'Donnell and Schmitter, 1986). Kostadinova and Power (2008) study voter turnout in Latin America and find that it consistently falls in the four elections after the founding election.[45] This suggests that as voter turnout declines, the median voter may be changing yet again. Based on this movement in the median voter, it is important to account not just for the initial date of suffrage expansion but also for the passage of time.

The effect of suffrage expansion on voting participation was very strong in many Latin American countries. For example, within a few years of removing economic requirements, Chile's proportion of registered voters more than tripled. In Argentina after the passage of the Sáenz Peña Law in 1912 (law requiring secret ballot and universal male suffrage), there was a three to fourfold increase in voter turnout for the parliamentary elections of 1912, 1913, and 1914 and an even higher increase in the presidential elections of 1916 (Engerman and Sokoloff, 2005). The expansion of suffrage definitely increased the number of voters and seems to have also shifted the median voter. Elections before the passage of the Sáenz Peña Law were by the elites – primarily the landed oligarchs. The law expanded suffrage to

[45] Note that four elections is the maximum number they study.

all male citizens, which changed the median voter from being part of only the landed elite to now including the working class. The law is credited with bringing about the defeat of the National Autonomist Party (PAN) that had long held power. The opposition candidate, Hipólito Yrigoyen, won the election in 1916, making him the first non-PAN president in more than three decades (Engerman and Sokoloff, 2005). This change in the control of both the executive and legislative branches of the Argentine government had the potential to influence policies and political institutions.

Not only is there a wide variation in the expansion of suffrage across countries in Latin America, there are also different types of expansion, such as female enfranchisement, and the elimination of economic and literacy requirements. We construct several different measures of suffrage expansion to take these waves into account. In the construction of all of the instruments, we only consider effective suffrage by requiring that there be competitive elections as well as the use of secret ballots.[46] The existence of regular elections and universal suffrage does not guarantee that a country has a consolidated democracy with free and competitive elections. Authoritarian regimes and one-party states commonly rig elections, a practice which prevents people's true preferences from being translated into institutions. For that reason, we do not count such elections as valid

[46] We use the Polity IV variable XRCOMP to determine whether a country is has competitive elections. The variable measures the "competitiveness of executive recruitment" and a value of 2 or 3 is considered competitive. In the Polity IV dataset, a value of 2 is given for transitional arrangements, or dual executives where one is chosen through competitive elections, and a value of 3 is given when the chief executive of the country is chosen through competitive elections (Marshall and Jaggers, 2009, p. 20).

in our instrument construction.[47] Limiting the sample to periods with secret balloting ensures that citizens are able to vote their true preferences. Elections using secret ballots are likely to have a different effect on institutions than public voting, where voters may feel coerced to vote according to elite preferences (Baland and Robinson, 2006).

After identifying the years that meet the criteria of competitive elections and the use of secret ballot, we construct the various suffrage instruments by adding the number of years that all requirements have been met and depreciating previous years by 5%. This reduces the importance of the earlier years, causing the marginal increase in the variable to be positive but decreasing over time.[48] We depreciate past years in order to account for the fact that the experience with suffrage in the more distant past is not as important as suffrage experience more recently. In other words, the stock of suffrage experience should be depreciated to account for the reduction in importance of suffrage experience over time. As we discussed above, the importance of the initial suffrage experience on policy and institutions is likely to diminish over time. Additionally, the depreciation also reduces the value of the instrument (once the instrument is non-zero) during years when there are no competitive elections. This depreciation could cause the suffrage

[47] Examples of dictatorships with elections that are not counted in our instrument are Trujillo in the Dominican Republic (1930-1961), Pinochet in Chile (1973-1989), and Somoza in Nicaragua (1936-1956) while the longest-lived one party system that held periodic elections is Mexico under the PRI (Institutional Revolutionary Party).

[48] Gerring, et al. (2005) and Persson and Tabellini (2009) depreciate the number of years a country has been democratic and use depreciation rates between 1% and 6%. We chose 5% because it was within that range and seemed a reasonable estimate. Our results are robust to using a non-depreciated instrument (i.e. a 0% depreciation rate). These results are available upon request.

instruments to fall to zero if competitive elections are not re-instated quickly enough.

Table 2.2 provides the summary statistics and basic descriptions of the instruments. The first, called *Male*, is the depreciated number of years a country has had competitive, secret, male suffrage without economic requirements (literacy requirements were still in place). The second, called *Male_All*, is the depreciated number of years the country has had competitive, secret, universal male suffrage (with no economic or literacy requirements). The third, called *Female*, is similar to the first variable but voting now includes females (although literacy requirements are still in place). The last is called *Universal* and is equal to the depreciated number of years with competitive, secret, universal suffrage.[49]

Figure 3 plots the evolution of different types of suffrage for Argentina, Costa Rica, and Chile (more on each type of instrument below). In each case we have depreciated the suffrage instruments. The Costa Rican case is perhaps the easiest to interpret. In all four panels, the different suffrage instruments rise smoothly with the only difference being the starting date. This pattern is due to Costa Rica's long democratic history. Once suffrage was expanded, there have been continuous competitive elections in which all groups get an opportunity to exercise that right.

The Chilean example is not nearly as smooth. The depreciated instruments increase until 1973, when there was a coup d'etat that brought Augusto Pinochet

[49] In constructing the voting variable, we start with the year of independence for each country in order to capture the full history of suffrage. However, the analysis is constrained by the data availability of other variables and that reduces the sample size considerably.

into power. After that point, there were no competitive elections until 1989, at which point the value of the instruments start to increase again. In both Panel B and Panel D, the initial increase does not begin until 1970, when Chile finally granted suffrage to the illiterate population. As a result, the *Male_All* and Universal plots (Panel B and Panel D) only start increasing in 1970 and then decline during Pinochet's regime. In Argentina's case, there are lots of dips that coincide with periods of non-competitive elections (coups and military regimes).The final dip coincides with the military take-over that ended Isabel Martínez de Perón's short-lived presidency and it recovers once competitive elections are re-instated in the early 1980s.

From the list of possible instruments in Table 2.2, we chose the variable that is most highly correlated with our institutional measures.[50] In this case, depreciated universal suffrage, which we call *Universal*, is the instrument most highly correlated with the executive constraint variable and the second most highly correlated with the political constraints variable.[51] Using this instrument, we estimate in the next section the effects of institutions on county income in our panel setting.

[50] While the rest of the data is averaged over a five-year period, the instrument used in the value for the year before the average and these correlations are based on this timing.
[51] For comparison's sake, we use the same instrument for both of our institutional measures. Appendix 3 presents the correlation coefficients for each of the institutional variables and all of the possible instruments.

2.5 Results

2.5.1 Main Results

We estimate our model for each of the two institutional measures for 18 Latin American countries from 1900 to 2007 using five-year averaged data (the instrument is the value for year before the 5 year average). Tables 3 and 4 report the results using EXCONST and POLCON, respectively. The standard errors reported in parenthesis are clustered robust standard errors. The last two rows in both tables report the p-values for the Hausman test and the F-test on the instrument. The F-test results show that there is a statistically significant relationship between the suffrage instrument and the institutional variables while the Hausman test results indicate that the instrumental variable results presented in the tables are preferred over ordinary least squares.

The first two columns in Table 2.3 present the results of using both institutions and geographic variables, while the third column shows the results using country fixed effects. We find that the EXCONST coefficients are always significant and of similar magnitude even when using country fixed effects. An increase from the average level of EXCONST to one standard deviation above the average level results in an increase in GDP per capita of around $2,150.

Similarly, Table 2.4 shows the results using POLCON as the institutional measure. The first two columns include geographic variables and the last column includes country fixed effects. Here too the coefficients on the institutional measure are significant even when country fixed effects are included. While the coefficients

appear larger than the EXCONST coefficients, the one standard deviation changes are actually quite similar. An increase from the average level of POLCON to one standard deviation above the average results in an increase of about $2,550 in per capita GDP.

Even if the effect is the lowest number from these estimates for both types of institutions, the change is still very large considering that these are per capita figures and the smallest country in our sample had a population of more than 3 million in 2007. Our results indicate that Latin American countries have a lot to gain from improving their scores on institutional measures.[52]

The geography variables in columns 1 and 2 of both Tables 3 and 4 have the expected signs.[53] Depending on the specification, we find that being landlocked reduces per-capita GDP by $779 (Column 2 of Table 2.3) and $732 (Column 2 of Table 2.4). Absolute latitude is positive and significant, which indicates that countries that are further away from the equator have higher per-capita incomes on average. More specifically, if we move from the average absolute latitude to one standard deviation closer to the equator GDP per capita decreases between $419 (Table 2.4) and $579 (Table 2.3). This result reinforces the finding that being tropical has a negative effect on GDP per capita. Based on the tropical dummy coefficients, the penalty for being tropical is much larger than the absolute latitude

[52] There are two obvious caveats to this interpretation. One is that we should remember that our variable measures de facto, and not de jure, executive constraints. It is not simply a matter of passing the right laws but rather their enforcement, an issue that has been perennially troublesome for Latin American countries. Second, it is possible that the executive constraint variable is a partial proxy for some unknown third variable. If so, then just merely copying the formal constraints of a richer country will not guarantee higher per-capita income.

[53] Note that because the geography variables are time-invariant, they drop out of the estimation when country fixed effects are included.

results indicate. The GDP per capita penalty for being tropical ranges between $1784 (Table 2.4) and $1989 (Table 2.3).[54]

The results indicate that both institutions and geography have significant effects on country income in Latin America. However, the magnitude of the geographic penalties is much smaller than the potential benefit from improving institutions.

2.5.2 Jackknife Results

There may be some concern that our results are being driven by one country. To test whether this is true, we perform a country-by-country jackknife exercise by re-estimating each specification in Tables 3 and 4 eighteen times, each time excluding one country. This reduces the sample between 9 and 21 observations depending on how many years the country that is excluded enters the original dataset. Table 3.5 shows the coefficient distributions from this exercise. The means in all instances are very similar to the coefficient estimates reported in Tables 3 and 4. The signs are all consistent with the main results and the ranges for the institutional coefficients are within reasonable distance from our main estimates. The asterisks next the variables identify which results are statistically significant for all iterations. As is clear from the Table, all coefficients are significant except the landlocked variable. That is not surprising considering that there are only two landlocked variables in our sample. Based on these results we

[54] Using the actual percentage tropical instead of the dummy, yields smaller penalties but still larger than the absolute latitude results indicate. These results are available upon request.

conclude that our coefficient estimates for all but the landlocked variable are not sensitive to the exclusion of any particular country.

Overall, the results suggest that institutions have a positive and significant effect on a country's income per capita. While the geographic penalties are economically and statistically significant, they are smaller than the potential benefits from improving institutional quality. In any case, a country cannot easily change its geography but it can raise per-capita GDP by improving institutions. From this, we conclude that countries should take as given what they cannot change and focus on the factors that they can change.

2.6 Conclusion

Income differences across Latin American countries are quite large. In order to better understand what factors contribute to this disparity, we study the effect of institutions and geography on country income. Using a panel of 18 Latin American countries, we test the effects of institutions and geography on country income. To address the problem of endogeneity of institutions, we use a new instrument based on the history of suffrage expansion that allows us to use a panel framework. We find strong evidence that both institutions and geography are important determinants of country income. These results are robust to changes in the number of countries and the institutions results are robust to the inclusion of country fixed effects. From the results, the geographic penalties are smaller in magnitude than the benefits from improving institutional quality. It is important to remember that geography is not entirely about the physical location of a country but also refers to

climate, the vegetation, and the disease environment. So while a country cannot easily change these, it can mitigate the effects of tropical diseases like malaria, yellow fever, and dengue fever through vaccinations and education.

The biggest policy implication is that Latin American countries stand to benefit from improving executive and political constraints. Many countries in our sample have achieved a high level of both in the last decade and for those countries, it is important that they not slip backwards. Unfortunately, there are countries, such as Venezuela, that have moved in the wrong direction. Governments do have the potential to improve institutions and thereby to improve the country's outlook.

Table 2.1: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Executive Constraint (EXCONST)	0.460	0.344	0	1
Political Constraints (POLCON)	0.210	0.195	0	0.688
Landlocked	0.090	0.287	0	1
Absolute Latitude*	0.178	0.102	0.022	0.378
Tropical	0.613	0.488	0	1
Log of GDP per capita	7.984	0.596	6.743	9.286

Note: the data is five year averaged; N=266
*Absolute latitude is divided by 90

Table 2.2: Summary Statistics of Depreciated Suffrage Instruments

Voting Instrument	Description	Mean	Std. Dev.	Min	Max
Male	Depreciated number of years with male suffrage without economic requirements, with secret ballot, and competitive elections (literacy requirements still in place)	6.593	6.240	0	19.686
Male_All	Depreciated number of years with universal male suffrage (no economic or literacy requirements), with secret ballot, and competitive elections	5.354	6.088	0	19.686
Female	Depreciated number of years with male suffrage without economic or literacy requirements, female suffrage, with secret ballot, and competitive elections	5.146	5.970	0	18.925
Universal	Depreciated number of years with universal suffrage, with secret ballot, and competitive elections	4.195	5.675	0	18.925

Note: N = 266

Table 2.3: The Effect of EXCONST on Income in Latin America between 1900 and 2007

	(1)	(2)	(3)
	Log GDP per capita		
EXCONST	1.562***	1.580***	1.649***
	(0.211)	(0.214)	(0.17)
Landlocked	-0.25	-0.299***	
	(0.15)	(0.089)	
Absolute Latitude	2.163***		
	(0.675)		
Tropical		-0.584***	
		(0.147)	
Constant	6.904***	7.701***	7.225***
	(0.176)	(0.139)	(0.084)
Country Fixed Effects	no	no	yes
Hausman p-value	0.0000	0.0000	0.0000
Instrument F-Test p-value	0.0000	0.0000	0.0000

Note: N = 266
Cluster robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 2.4: The Effect of Political Constraints on Income in Latin America between 1900 and 2007

	(1)	(2)	(3)
	Log GDP per capita		
POLCON	3.197***	3.276***	3.145***
	(0.488)	(0.49)	(0.352)
Landlocked	-0.211	-0.279***	
	(0.149)	(0.094)	
Absolute Latitude	1.515*		
	(0.842)		
Tropical		-0.536***	
		(0.144)	
Constant	7.062***	7.703***	7.323***
	(0.192)	(0.145)	(0.081)
Country Fixed Effects	no	no	yes
Hausman p-value	0.0000	0.0003	0.0000
Instrument F-Test p-value	0.0000	0.0000	0.0000

Note: N=266
Cluster robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

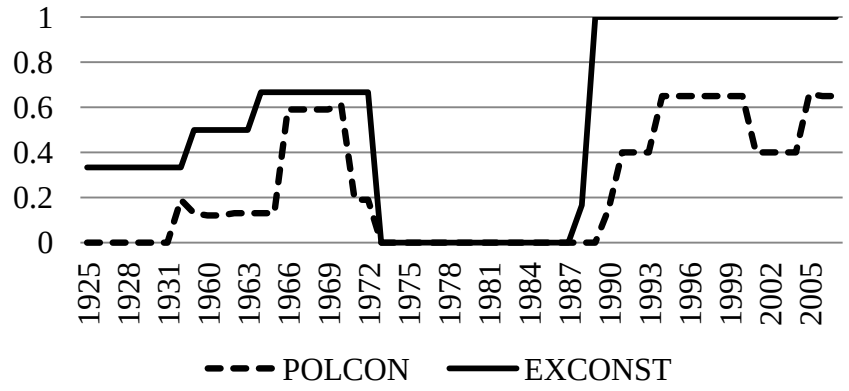
Table 2.5: Jackknife Coefficient Distributions

Table 2.3, Column (1)				
	Mean	**St. Dev**	**Min**	**Max**
EXCONST*	1.562	0.056	1.392	1.648
Landlocked	-0.250	0.064	-0.433	-0.073
Absolute Latitude*	2.154	0.198	1.563	2.587
Constant*	6.904	0.045	6.848	6.998
Table 2.3, Column (2)				
	Mean	**St. Dev**	**Min**	**Max**
EXCONST*	1.580	0.056	1.413	1.656
Landlocked	-0.299	0.028	-0.355	-0.244
Tropical*	-0.585	0.042	-0.669	-0.482
Constant*	7.702	0.041	7.614	7.816
Table 2.3, Column (3)				
	Mean	**St. Dev**	**Min**	**Max**
EXCONST*	1.650	0.079	1.394	1.759
Constant*	7.224	0.045	7.177	7.385
Table 2.4, Column (1)				
	Mean	**St. Dev**	**Min**	**Max**
POLCON*	3.197	0.126	2.911	3.426
Landlocked	-0.211	0.059	-0.365	-0.052
Absolute Latitude*	1.508	0.244	0.919	2.058
Constant*	7.062	0.050	6.960	7.146
Table 2.4, Column (2)				
	Mean	**St. Dev**	**Min**	**Max**
POLCON*	3.275	0.123	2.985	3.490
Landlocked	-0.278	0.032	-0.339	-0.197
Tropical*	-0.537	0.040	-0.642	-0.464
Constant*	7.704	0.039	7.635	7.810
Table 2.4, Column (3)				
	Mean	**St. Dev**	**Min**	**Max**
POLCON*	3.146	0.161	2.665	3.405
Constant*	7.322	0.039	7.277	7.442

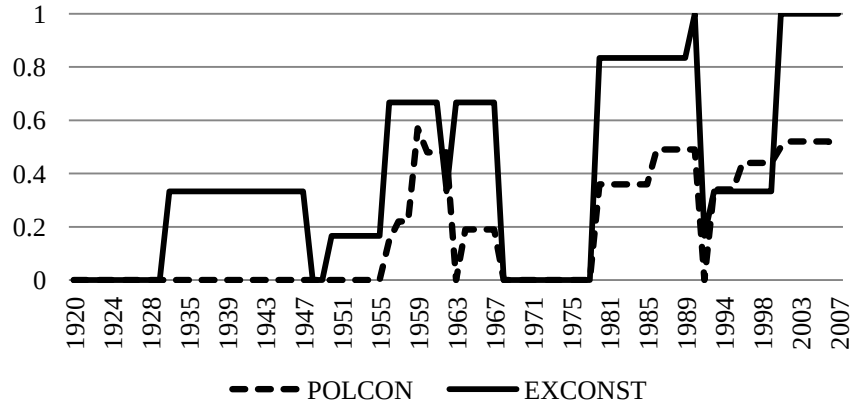
* consistently statistically significant for all 18 iterations

Figure 2.1: Comparison of Institutional Measures Through Time

Panel A: Chile



Panel B: Peru



Panel C: Venezuela

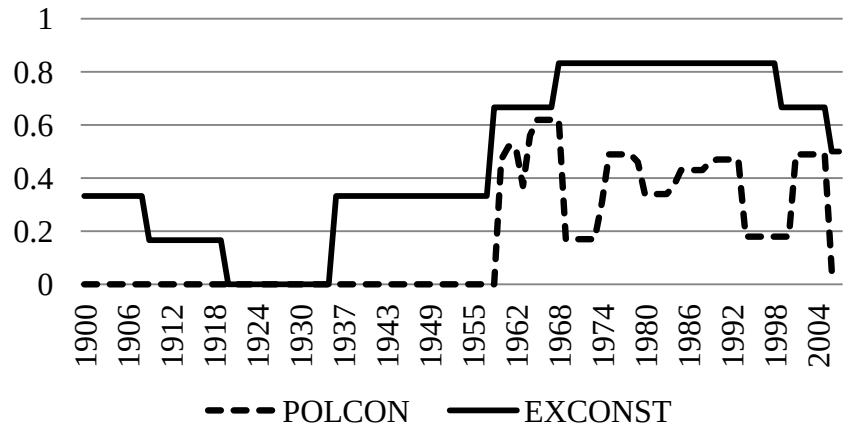


Figure 2.2: Map of Latin America with Geographic Variables

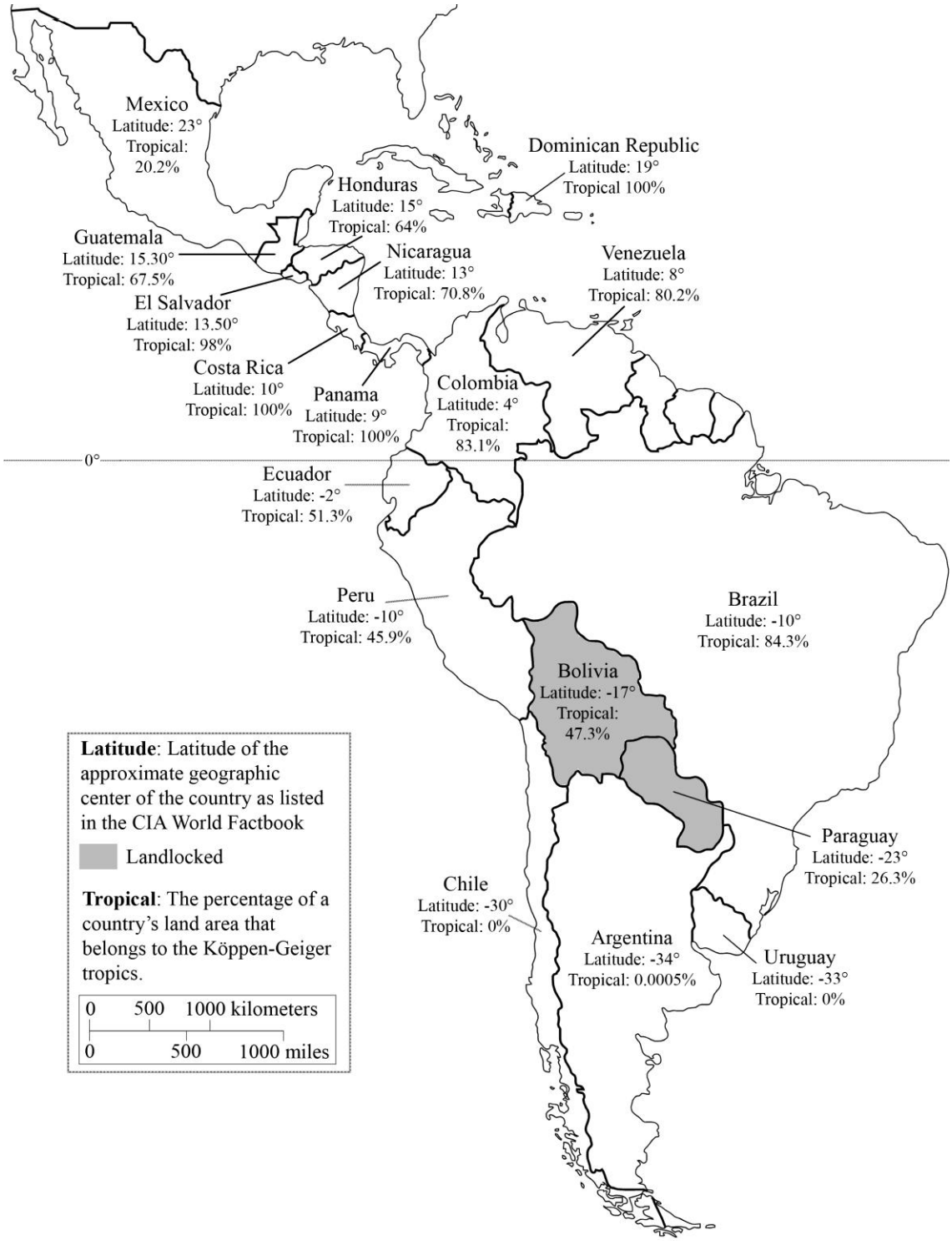
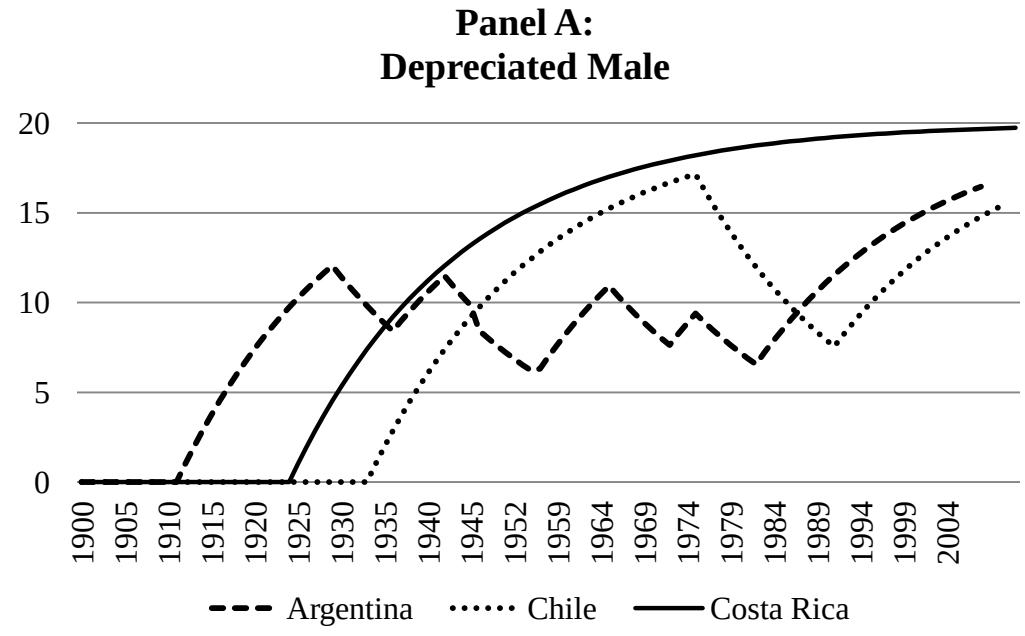
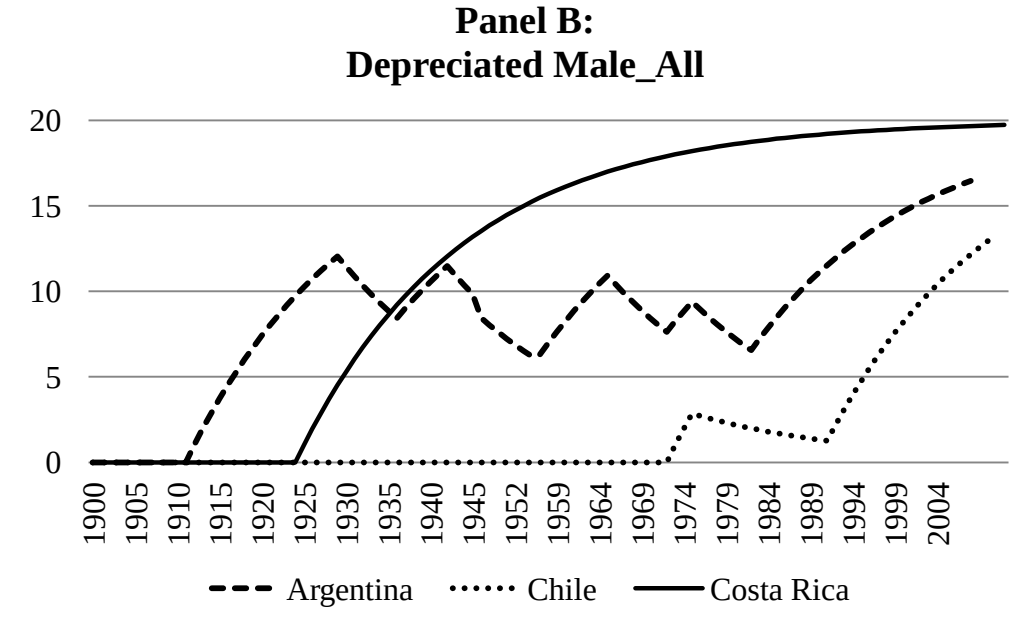
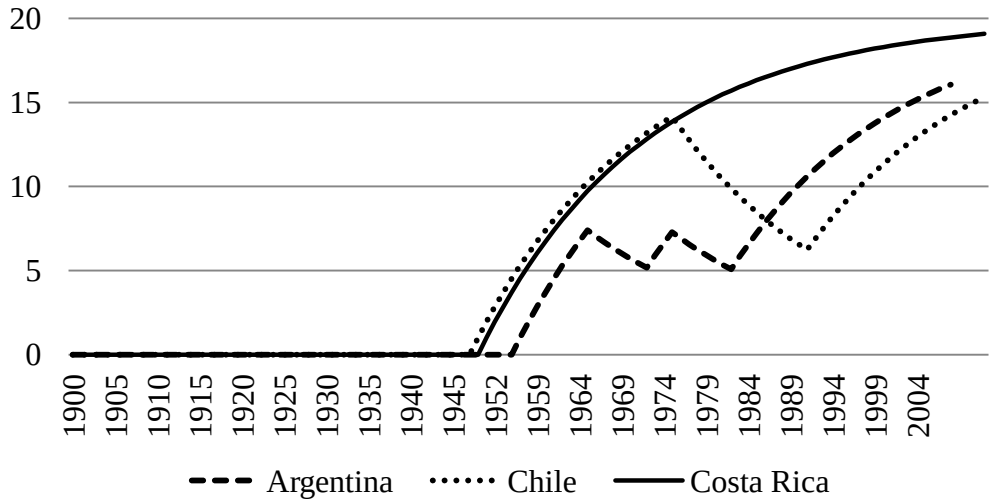


Figure 2.3: Illustration of Depreciated Suffrage Instruments Through Time

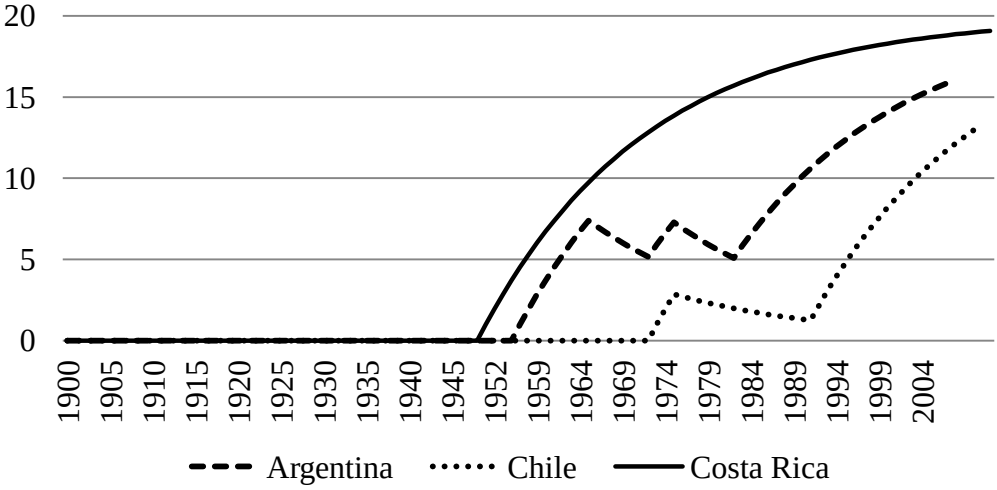




Panel C:
Depreciated Female



Panel D:
Depreciated Universal



Chapter 3: Bittersweet Relationship: Political Instability and International Commodity Prices in Latin America

"As long as oil prices remain high, Chavez seems likely to continue in power. But when they fall, Venezuela faces a reckoning."

Michael Reid
Forgotten Continent (2007)

3.1 Introduction

The Atacama Desert, in what is now Northern Chile, is one of the driest areas in the world. Under normal circumstances, such a desolate piece of land would not be a source of international dispute. However, the discovery of sodium nitrates in the 1860s made this region as valuable to the international community then as oil fields are to us today. Between 1879 and 1883, Chile, Bolivia, and Peru fought in the War of the Pacific for control of this desert. As a consequence of the war, Chile won the disputed territory and with it a monopoly on the supply of nitrates (Sater, 1986). At the time, demand for nitrates was high and so was the price that buyers were willing to pay for it. The conflict decided which country would control the area that produced large rents for the mining companies and/or governments.[55] In other words, high world prices of nitrates were a factor in the war. As this episode illustrates, world prices of export commodities can have an influential effect on a country's or a region's political stability, especially in countries that depend heavily on commodity exports as a source of revenue.

[55] When the war broke out, Bolivia had nationalized the mining companies in its territory and therefore rents accrued to the government.

Nitrate is just one in a long list of commodities that Latin American countries have exported. All of the nations in the region have relied on a multitude of commodity exports since their independence. Today, many Latin American countries still export large amounts of primary commodities and are therefore vulnerable to movements of international commodity prices. If anything, this dependence has grown. Recent work has found that for many countries in the region, commodity export revenues have been growing in importance since the 1990s (Sinnott, 2009). Since the War of the Pacific, no international war has broken out in the region over control of a commodity. However, many countries have experienced internal political instability. Given the historical and current importance of commodities for Latin American countries, it is worth examining to what extent the political stability of the region is affected by the fluctuations in commodity prices.

Using various commodity price indexes, I test whether commodity prices have an effect on the political stability of 18 Latin American countries between 1919 and 2000. Based on the result from a probit model, I find that changes in a country's total commodity price index have a significant effect on political instability. The results when disaggregating each country's commodity price index into point source commodities (i.e. capital intensive, appropriable, or easily taxed commodities such as natural resources and plantation crops) and diffuse commodities (i.e. small holder owned, difficult to tax commodities such as small farm production and livestock) are similar and robust to the use of a count model

(i.e. zero-inflated negative binomial model).[56] Further disaggregation of the point source commodities into its mineral and agricultural components reveal that the point source effect is driven primarily by increases in mineral prices.

The rest of the paper is organized as follows. Section 2 the reviews related literature. Section 3 discusses why a Latin American regional focus is appropriate. Section 4 describes the measurement of political instability, commodities, the construction of commodity price indexes, and the control variables. Section 5 presents the estimation framework and the main results. Alternative indexes and an alternative estimation strategy are discussed and their results are presented in Section 6 and Section 7 concludes.

3.2 Literature Review

There has been a great deal of work done on the relationship between natural resources and the onset/duration of civil wars.[57] Ross (2004) summarizes the literature into four general findings. The first is that oil exports increase the likelihood of conflict, especially separatist conflict since secession can be economically advantageous to those in an oil producing region of a country.[58] The second is that "lootable" resources prolong the duration of conflict but are not the cause of conflict. The availability of easily extracted resources allows for factions

[56]Point source refers to natural resources "extracted from a narrow geographic or economic base, such as oil and minerals" as well as plantation crops and diffuse refers to natural resources "relying primarily on livestock and agricultural produce from small family farms" (Isham, Woolcok, Pritchett, and Busby, 2005).
Appendix 1 lists the countries and years in my sample
[57] See for example Besley and Persson (2008), Buhaug and Gates (2002), Collier and Hoeffler (2002; 2004; 2006) Fearon (2004), and Lujala et al. (2005).
[58] See for example Collier and Hoeffler (2004; 2006)

to easily acquire and sell these resources to fund their campaign.[59] The third finding is that agricultural commodities are uncorrelated with civil wars and the fourth is that primary commodities are "not robustly associated" with civil wars.[60] In contrast to this last point, more recent work has found a significant relationship between primary commodity prices and the onset of civil war. In a sample of 124 countries, Besley and Persson (2008) find that higher world prices of both imports and exports increase the likelihood of civil wars. Brückner and Ciccone (2010) focus on 39 Sub-Saharan African countries and find that civil wars are more likely to begin following downturns in the world prices of a country's main commodity exports.

Another form of instability affected by commodities is regime change or changes between autocracy and democracy. While regime type is not a measure of instability (as is civil war), the democracy literature studies the effect of commodities, more specifically, natural resource endowments on democracy. Haber and Menaldo (2011) find that natural resource booms had more of an effect in keeping countries democratic, or moving them towards democracy than keeping them autocratic or moving them towards autocracy. In contrast, Ross (2001; 2009) finds that oil and mineral wealth have strong anti-democratic effects, that oil wealth prolongs authoritarian rule, and that the effect of prolonging authoritarian rule has become stronger over time. However, he goes on to show that oil-rich countries in

[59] A lootable resource refers to commodities like gemstones and drugs which are easily extracted by unsophisticated means.

[60] See Fearon (2004) for the third point.
Primary commodities are a more general category which includes agricultural goods, oil, and other non-fuel minerals. See Fearon and Latitin (2003) for the fourth point.

Latin America do not follow this trend (Ross, 2010). Instead, he finds that oil production is linked to increased governmental conflict (i.e. conflict over control of the existing state), which is a different type of instability. Similarly, Haber and Menaldo (2010) find that natural resources do not have a significant effect on democracies or autocracies in Latin America – making natural resources in the region neither a curse nor a blessing.

3.3 Latin American Focus

The majority of the literature on civil wars and commodities are either not region specific (e.g. Besley and Persson, 2008) or focus on Africa (e.g. Brückner and Ciccone, 2010). In the first case, the majority of the countries with civil wars are in Africa and the Middle East and only a few incidences of civil war are from Latin America.[61] The fact that there are just a few civil war observations in the region implies that the majority of the political instability takes a different form. If we focus on other forms of instability, Latin America is the most politically unstable region in the world for the better part of the 20th century. [62] More specifically, for 18 Latin American countries between 1919 and 2000 there were more than 690 anti-government demonstrations, more than 570 political assassinations, more than 380 crises that threatened to bring down the current regime, and more than 700 riots. The most politically unstable country, Argentina, had 77 anti-government demonstrations, 67 political assassinations, 54 government

[61] Depending on your definition of civil war, there may not be any civil war observations in the region during the twentieth century.
[62] Instability events are political assassinations, anti-government demonstrations, government crises, and riots.

crises, and 85 riots. Even the most politically stable country, Costa Rica, had 11 anti-government demonstrations, 6 political assassinations, 3 government crises, and 10 riots.[63] Focusing on civil wars hides the regions true level of instability.

Second, while some work has been done on the relationship between commodity prices and civil wars in Sub-Saharan Africa and both Sub-Saharan African and Latin America are primary commodity exporters, their historical backgrounds and cultures are quite different, making it difficult to generalize Africa's results to Latin America.[64] In addition, since most Latin American countries gained their independence before the turn of the twentieth century, there is a large amount of information on sovereign countries in the region, allowing for a longer time period of analysis. This is in contrast to many parts of Asia and Sub-Saharan Africa, which did not attain independence until later in the twentieth century.

In addition to focusing on civil wars and other regions of the world, the natural resource and instability literature focuses primarily on oil producing states and other lootable resources. While Latin America does have oil-producing states, the majority of the region does not export oil, and even though there is an abundance of commodity exports, very few are lootable. By focusing on Latin America, I can use the region's wide variety of primary commodity exports which has a lot of cross-country variation. On the agricultural side, the range of products

[63] All instability numbers come for the Cross-National Time Series Data archive (Banks, 2011).
[64] See for example Collier and Hoeffler (2002), Brückner and Ciccone (2010). Work on specific commodities, such as diamonds, includes mostly African countries and a few other countries in the world. See for example Lujala et al. (2005).

is diverse, ranging from tropical fruits like bananas to temperate grains like wheat. On the non-agricultural side there are minerals ranging from iron ore to petroleum. This variability in commodity exports facilitates the study of the link between certain types of commodity exports and political stability and whether that influence is beneficial or detrimental to the countries in the region.

To study how political instability in Latin America is affected by commodity prices, I consider additional forms of instability beyond civil war as well as a broader set of commodities besides oil.

3.4 Data

Before analyzing the effects of commodity prices on instability in Latin America, it is necessary to define instability, identify the export commodities for each Latin American country for the period of study, and create the appropriate commodity price indexes. In this section, I discuss how these three topics are addressed in the literature and how they are defined or constructed for the purposes of this study.

3.4.1 Defining Instability

The literature on political instability has not come to an agreement on how to measure political instability. However, there are two general approaches. The first is to use principle component analysis to create a single measure of political instability. The measure of instability is based on the principle component of a list of variables that are considered to be indicators of political instability – such as

anti-government demonstrations, assassinations, and riots.[65] The second approach is to use individual instability variables directly in the analysis or by including a dummy variable for the country year in which the event(s) occurred.[66]

The channels through which commodity prices can affect instability may have different effects on different indicators of instability. For example, an increase in commodity prices may increase the probability of anti-government demonstrations but decrease that of government crises. A principle component instability measure may not be able to capture these event specific effects.[67] In order to try and capture these effects, I follow the second strategy by indicating the occurrence of political instability with a dummy variable. This allows me to create dummy variables for each instability indicator. Since there is no one variable in the literature that adequately captures the idea of political instability, I use four different variables – anti-government demonstrations, assassinations, government crises, and riots – all of which are different manifestations of political instability. These measures come from the Cross National Time Series Data Archive and their definitions are listed in Table 3.1 (Banks, 2011). This dataset provides consistent definitions across time and countries with data back to 1919.[68]

[65] See for example Alesina and Perotti (1996), Perotti (1996), Annett (2001), Fosu (2001), Campos and Nugent (2002), Schatzman (2005), and Blanco and Grier (2009).
[66] See for example Cukierman et al. (1992), Alesina et al. (1996), and Blomberg (1996), Camignani (2003)
[67] Also, as I am constructing at least one independent variable (section 3.3), it seems inappropriate to also have a constructed dependent variable.
[68] Data from the Cross National Time Series Data Archive has been widely used in both economics and political science fields. See for example Barro (1991), Burkhart and Lewis-Beck (1994), Easterly and Levine (1997) and Levine and Zervos (1998).

3.4.2 Latin American Commodities

There are twenty five primary export commodities that make up the majority of the commodity export share for Latin American countries during the 20th century. Table 3.2 lists these commodities.

It is important to note that some of these commodities, such as rubber and nitrates, were dominant exports in the beginning of the century while others, such as soybeans and iron ore, are dominant in the latter part of the century. Because this is a study of how primary commodity export prices affect political stability throughout the century, all dominant commodities in the century must be included even if they are only relevant for part of the century. The commodity export data is used to build each country's commodity price indexes.

3.4.3 International Commodity Prices and Price Indexes

International primary commodity price data is available from various sources for the entirety of the twentieth century. Appendix 2 lists the data sources for the primary commodity prices used in the analysis.[69] Even though there is data for all commodities under study, including all twenty five commodity prices would create problems in the specification due to their high level of collinearity.[70] Instead, price indexes based on the Latin American commodities and their international prices must be constructed.

---

[69] Most of the price data comes from the Grilli and Yang commodity data series (Grilli and Yang, 1988). They, and the update of their data by Pfaffenzeller et al. (2007), index all prices to the 1977-1979 average for each series. For consistency and comparability, all price series that are not from the Grilli and Yang series are also index to the 1977-1979 average.

[70] When including all twenty five commodity prices as well as the other control variables, the condition index is many orders of magnitudes larger than the conditional index when using the price indexes. For a discussion of condition indexes see Belsley et al. (1980).

Most price indexes are created by weighting each commodity price in the index by its world export value share for a given base year. Price indexes that focus on a certain region or subset of the world weight the prices by the value share of the region's export of each commodity in the index for a given base year. For example, Grilli and Yang create a commodity price index based on the developing countries' value share of exports and use 1977-79 average as their base year (Grilli and Yang, 1988).

In order to construct a price index in this manner, value shares of the twenty five exports for the eighteen countries that make up the sample would be necessary. Unfortunately, this data is not available. Moreover there is no one year between 1919 and 2000 where all twenty five commodities under consideration are exported. This makes choosing a base year that gives a good set of representative weights difficult. Therefore, a different weighting scheme needs to be used in order to construct the price indexes.

In Latin America there are some commodities that are dominant for longer periods of time, such as sugar for Brazil and beef for Argentina whereas others, such as nitrates for Chile, are exported for a relatively short period of time in the 20^{th} century. It stands to reason that when creating a price index for each country, the weights can be calculated by accounting for the number of years that the commodity is produced and exported in that particular country for the time period of the analysis. Given this, sugar in Brazil should get a higher weight than iron ore, which became a dominant export later on in the twentieth century. I create a

weighting scheme for the price indexes based on the idea of country importance measured by the fraction of all years that each commodity is produced within each country (i.e. commodities produced in more years get a higher weight). The commodity weights, ω_{ic}, are therefore calculated as:

$$\omega_{ic} = \frac{\sum_t d_{itc}}{\sum_t \sum_c d_{itc}} \quad (1)$$

where d_{itc} is a dummy equal to one if commodity *c* is produced in country *i* during year *t* and zero otherwise. This weight is unique to each commodity and the sum of all the ω_c for each country is equal to one.

Using this weighting scheme, each price index is calculated in the following way:

$$Commodity\ Price\ Index_{it} = \sum_{c=1}^{n} \omega_{ci} P_{ct} \quad (2)$$

where ω_{ic} is the weight given to each commodity in country *i* that makes up the price index and P_{ct} is the international commodity price for commodity *c* at time *t*. The price indexes created for each country are based on the country's commodities exports. Table 3.3a reports the summary statistics for the various commodity price indexes constructed. The first, Total Price Index (Total PI), is constructed using all of each country's export commodities. This is the most aggregate index in this study. To see the effect of changes in prices of specific subgroups of commodities, I also create the Diffuse Price Index (Diffuse PI) and Point Source Price Index (Pt. Source PI). Table 3.2 lists the commodities in each group. Lastly, I further

disaggregate the Point Source Price Index into its mineral and agricultural components to create the Point Source-Mineral Price Index (Mineral PI) and the Point Source-Agriculture Price Index (Agricultural PI).

3.4.4 Additional Covariates

I include five control variables in the estimation: regime type, growth of real GDP per capita, inflation, population, and a neighborhood effect.[71] All control variables, as well as the commodity indexes, are lagged one year to mitigate any concerns about reverse causality.[72] Table 3.3b lists the summary statistics for all variables.

The first control variable, regime type, is a dummy for democracy. Following Besley and Persson (2008), it is equal to one when the polity2 score for country *i* at time *t* is greater than zero and zero otherwise.[73] Based on this definition, less than half of the country years in the sample qualify as democratic. Various works have studied the effect of regime type on political instability. Some of the findings suggest that democracies experience less instability (Ellingsen 2000; Parsa 2003; Besley and Persson 2008), less violence (Rummel 1995), and less civil

[71] While the results presented here are with all the right-hand side variables lagged one period, the results are still significant when they are lagged two and three periods. These results are available upon request.

[72] Endogeneity of commodity prices could be a problem in the analysis if these countries are price setters. In such a case, instability in the country could lead to higher world prices of the commodities produced in the country as the world market adjusts to the decline in supply. However, I am studying commodities that are produced not only in Latin America, but also in other regions of the world. As such, most of these countries are price takers (there may be an exception in the case of Chile with nitrates and copper prices). I use one year lags of all dependent variables to avoid any potential problems of endogeneity. It is harder to argue that the political instability in a country this year has an effect on commodity prices, population, and GDP last year.

[73] The polity2 variable ranges from -10 to 10 and is the difference between the democracy and autocracy variables in the Polity IV database (Marshall and Jaggers, 2009). Higher values of the polity2 variable means more democratic.
The results are robust to a more stringent (higher polity 2) definition of democracy.

wars (Besley and Persson, 2008). In Latin America, Schatzman (2005) finds that between 1980 and 1993, more democratic regimes appear to experience more rebellions (violent) but less collective protests (non-violent). Based on Schatzman's work, one would expect that, depending on the instability measure, the effect of democracy may be positive or negative.

The second control variable is growth of real GDP per capita. The literature on instability has shown that economic performance has a major influence on political instability. There are two channels through which this effect works. The first is that the opportunity cost of rising up or rebelling is lower when incomes are low or falling (Collier and Hoeffler, 2004; Dube and Vargas, 2010). The second is that deprivation tends to increase when there are hard economic times; this, in turn, fuels the image of government incompetence (Gurr, 1970; Posner, 1997; Nafziger and Auvinen, 2002). Supporting this idea, Alesina et al. (1996) find that lower GDP growth is associated with a higher probability of unconstitutional political change and Besley and Persson (2008) find that poorer countries are more likely to be involved in conflict than richer ones. Both of these channels suggest that negative growth increases the likelihood of instability.

I also control for inflation. Since I am testing for the effect that commodity prices have on political stability through an increase (or reduction) in income that comes from changes in international prices (i.e. the production side), I need to control for domestic prices (i.e. the consumption side). It is very likely that increases in domestic prices of agricultural and energy products (the majority of the

commodities in the study) results in instability as citizens become unhappy with the increasing prices. Cukierman et al. (1992) find that seignorage and political instability are positively correlated. Paldam (1987) finds evidence that in Latin America, military regimes, which he considers to be relatively more unstable than democratic regimes, are correlated with higher levels of inflation. Moreover, few Latin American regimes have survived an episode of hyperinflation and regime change can be a form of instability. In order to disentangle the two effects – the consumption vs. the production effects – the rate of inflation is included to capture the consumption side.

Population size is included in the analysis to control for any potential effect that population size may have on instability.[74] Collier and Hoeffler (2004) find that the risk of conflict is proportional to population size. They suggest that with larger populations, both grievances (ethnic or religious hatred, political repression and/or exclusion and economic inequality) and opportunity to rebel increase.

The last control variable is a neighborhood dummy. This variable takes a value of one if there is at least one instability event in a contiguous country and zero otherwise. This dummy is constructed to match the particular instability event under consideration and information for contiguous countries that are not part of the sample were used to construct this variable (e.g. Haiti). Table 3.3b also reports the summary statistics for all the neighborhood dummies. Between 45 and 61 percent of the country years contain unstable neighbors. Note that only one neighborhood dummy is used in each regression presented below.

[74] Using population growth does not significantly change the results presented below.

3.5 Model and Results

3.5.1 Model

The instability measures are all dichotomous, which means that a simple OLS framework is inappropriate because the predicated values may lie outside the zero-one range.[75] Instead I use a probit model with the following form:

$$Instability_{i,t} = \beta_1 TotalPI_{i,t-1} + \alpha' Controls_{i,t-1} + u_i + \varepsilon_{it} \qquad (3)$$

Where $Instability_{i,t}$ is a dummy variable equal to one when there is an instability event in country i at time t and zero otherwise.[76] The first right hand side variable is the aggregate commodity price index, Total Price Index (Total PI), that is unique to each country and year. $Controls_{i,t-1}$ is a vector containing the control variables previously discussed and u_i are country specific effects.

3.5.2 Results

Table 3.4 shows the marginal effects for the probit results. Each column has a different type of political instability as the dependent variable and the neighborhood dummy captures the same type of instability as the dependent variable. The results show that changes in Total PI have a positive effect on anti-government demonstrations and a negative effect on government crises and riots. More specifically, holding everything else constant, a one standard deviation

[75] The results using OLS are very similar to the marginal effects reported in Table 3.4. The OLS results are available upon request.
I tested for autocorrelation using the Wooldridge test for serial correlation in panel-data models. In all cases in this study, the test fails to reject the null of no serial correlation.

[76] I ran a Wooldridge test for serial correlation and the results using both the dummy instability measures and the count instability measures show that we fail to reject the null of no serial correlation.

increase in the Total PI increases the probability of anti-government demonstrations by 7.1% and decreases the probability of government crises by 4.5% and riots by 5.9%. These results show the general effect that a country's commodity prices have on these measures of political instability. However, keep in mind that there are a wide range of commodities in the Total PI and prices for different commodities do not always move in tandem. So while we can say that commodity prices have an effect on political instability, we cannot say whether a specific subgroup is driving these results. This point is addressed in the next section.

As for the control variables, there appears to be a strong spillover effect. All of the neighborhood coefficients are positive, suggesting that the probability of political instability in a particular country increases when a neighbor experienced the same type of political instability. The democracy variable is also positive across the board meaning that these four types of political instability are more likely under democracies. It is not unusual to think about certain types of political instability being more likely under democracies and others under autocracies. Lastly, GDP growth is negative suggesting that increases in GDP growth decrease the probability of instability. This last result is in line with the findings in the literature.

The results so far show that commodity prices affect political instability. But as the commodity price index used contains many different types of commodities, it is difficult to discern whether specific types of commodities are more likely to affect political instability than others.

3.6 Alternative Indexes and Estimation Framework

3.6.1 Point Source and Diffuse Indexes

Broadly speaking, in the literature there are three general theories about how commodity prices affect political stability – the state as a prize theory, the state capacity theory, and the opportunity cost theory (Bazzi and Blattman, 2011).

The first two theories, the state as a prize and the state capacity, rest on the idea of a rentier state. A rentier state is one that regularly receives external economic rents (Yates, 1996).[77] A good example is an oil producing state which exports the majority (if not all) of its oil. These states regularly receive large amounts of money from external actors. However, as Ross (2001) points out, other minerals also create rents which are captured directly by the state (through export taxes, corporate taxes, and state-owned enterprises). Isham et al. (2005) also make the argument that states are able to easily extract rents not just from all forms of natural resources (i.e. oil and minerals) but also from other resources that have a narrow geographic base such as plantation crops (e.g. through marketing boards and direct procurement by government). They call resources that provide rents for the government "point source resources" and resources whose rents are more difficult to capture, such as small farm production and livestock, "diffuse resources" (Isham et al. 2005).

Rentier states collect higher revenues when the prices of point source commodities increase. This has two different effects on political instability. The

[77]Hazem Beblawi (1987) refined this definition to one where a state receives rents from foreign actors and where only a few domestic actors are involved in the generation of this rent and "the majority being only involved in the distribution or utilization of it"

first is based on the idea that being in power means having control over these large rents. The state becomes a prize to have – state as a prize. This may cause instability as people try to gain control of the state. In other words, higher prices for point source commodities (i.e. higher potential rents for the government) increase the probability of political instability through this channel. On the hand, the increased revenue means the state has more resources to buy out the opposition, decrease taxes, increase spending, and/or increase the strength of the military to quell any unrest.[78] That is, the state has more capacity to deal with instability – state capacity (Bazzi and Blattman, 2011). These two mechanisms, while working in opposite directions, are both influenced by the price of point source commodities.

The opportunity cost theory works through the citizens instead of through the government by increasing or decreasing the opportunity cost of abandoning the productive sectors to enter into the destabilizing activity (be it demonstrating, rioting, etc.). More specifically, a rise in commodity prices may reduce instability or conflict by increasing wages and income, which increases the opportunity cost of abandoning the productive sector in favor of other non-productive and/or destabilizing activities (Dube and Vargas 2010; Becker 1968; Grossman, 1991).

[78] To appease the masses, governments could increase spending on social programs and/or decrease taxes.
For example, the government of Kuwait, with its vast amount of oil revenue is able to function without imposing any income or value added tax on its citizens. In Venezuela, President Hugo Chavez's policies aimed at the poor, such as the Bolivarian Missions, are an example of social spending that targets the masses. The Bolivarian Missions or Misiones Bolivarianas are a list of social programs implemented by the Venezuela government under President Hugo Chavez. They include educational, nutritional and health, electoral, scientific, environmental, and anti-poverty programs (Embajada de la República Bolivariana de Venezuela, 2011).

Because the opportunity cost theory works from the individuals perspective and not the state's, this theory is most likely to work through commodity prices for diffuse resources as these are the types of commodities that are dominated by household production.

To investigate what effect point source and diffuse commodity prices have on political instability, I estimate equation (3) using Pt. Source PI and Diffuse PI instead of Total PI. The results for the index coefficients are listed in Table 3.5a. Just as before, the dependent variable in each column is a different type of political instability.

The first interesting point is that Pt. Source PI for assassinations is now significant, even if only at the 10% level, whereas in the previous estimation, the coefficient for Total PI in the assassination equation was not significant. Now that the commodities are disaggregated, we can see the coefficient on Pt. Source PI is positive while the coefficient on Diffuse PI is negative which might be the reason why the Total PI coefficient was not significant in the previous section. More generally, the results show that an increase in the Pt. Source PI increases the probability of anti-government demonstrations and assassinations and decrease the probability of government crises and riots. Holding everything else constant, a one standard deviation increase in the Pt. Source PI increases the probability of anti-government demonstrations by 6.6% and assassinations by 3.1% and decreases the probability of government crises and riots by 3.5% and 5.4%, respectively. An increase in the Diffuse PI increases the probability of anti-government

demonstrations but decreases the probability of government crises and riots. A one standard deviation increase in the Diffuse PI increases the probability of ant-government demonstrations by 6.3% and decreases the probability of government crises and riots by 5.5% and 4.9%, respectively.[79]

While the simple model being use here cannot say anything about which theory is driving the results (i.e. state as a prize, state capacity and opportunity cost), we can try to interpret the results based on the signs of the coefficients of the two price indexes. A positive sign on the Pt. Source PI would fit with the state as a price theory while a negative sign would fit with the state capacity theory. The opportunity cost theory would fit only when there is a negative sign on the Diffuse PI. Based on the results for the Pt. Source PI, the state as a prize theory could explain the coefficients on anti-government demonstrations and assassinations. That is, when the international prices of point source resources increase, there is an increased incentive to be in power in order to control the increased revenues coming into the government from the commodities. The state capacity effect could explain the sign on government crises and riots. When prices of point source commodities increase, governments receive larger rents from these resources and are able to reduce taxes, increase spending, and/or increase military capacity. All of these tend to decrease instability. The negative sign on the diffuse PI for government crises and riots fit with the opportunity cost theory. That is, increases in the international price of diffuse commodities increase the opportunity cost of abandoning production of these commodities. Higher prices for the legal

[79] The lower bound is the assassination estimate and the upper bound is the estimate for purges.

commodities are an incentive to work in the productive sector instead of engaging in illegal, non-productive, or disruptive activities. However, the positive sign on the diffuse PI for anti-government demonstrations does not fit with any of the theories.

3.6.2 Mineral vs. Agricultural Point Source Commodities

The commodities that make up the Pt. Source PI include agricultural as well as mineral commodities. However, the existing literature consistently finds that changes in mineral prices (e.g. petroleum) are highly correlated with instability (Buhaug and Gates, 2002; Collier and Hoeffler 2002, 2004, 2006; Fearon 2004; Lujala et al. 2005) and only a few studies have found a correlation between instability and agricultural prices (Besley and Person, 2008; Brückner and Ciccone, 2010). In order to see if the Point Source results are driven by the minerals or the agricultural commodities in the index, I split the point source commodities into minerals and agricultural commodities. Table 3.2 lists which of the point source commodities are minerals and which are agricultural. I estimate equation (3) with Mineral PI, Agricultural PI and Diffuse PI instead of the Total PI. The index coefficient results are listed in Table 3.5b. From the results, it appears that the mineral prices are the driving force behind the point source results with the exception of anti-government demonstrations which is driven by the agricultural commodities.

3.6.3 Count Model

So far, the various instability measures are dummy variables that take a value of one when there is at least one instability event in a given country year and

zero otherwise. However, the Banks data gives the total number of each type of event for each country year (Banks, 2011). There are estimation techniques that allow for the use of count data as a dependent variable.[80] The appropriate model for the instability data is a Zero-Inflation Negative Binomial. A discussion of the various count data models as well as evidence supporting the choice of this model over others is presented in Appendix 3. This model has two components – a binary component and a count component. The binary section uses a logistic distribution and within this framework, "success" is a prediction of being a zero count and "failure" a non-zero count. The count/Negative Binomial part models the non-negative integer outcomes which includes zeros.[81]

Table 3.6 shows the zero-inflated negative binomial results using the Pt. Source PI and Diffuse PI. Panel A shows the marginal effects for the negative binomial component (the count part of the model) and Panel B shows the results for the logit component (the binary part of the model). The negative binomial results using the count data model are similar to the probit results. From Panel A we can see that an increase in the Pt. Source PI increases the probability of anti-government demonstrations and assassinations and decreases the probability of government crises and riots while an increase in the Diffuse PI increase the probability of anti-government demonstrations and assassinations.

Focusing on the results presented in Panel B, recall that success in the binary part of the model is having a zero count of instability (i.e. no anti-

[80] Appendix 4 lists the summary statistics for the instability measures in count data form.
[81] A truncated distribution would need to be used if the zeros were not included.

government demonstrations, no assassinations, etc.). The results show that an increase in the Pt. Source PI decreases the probability of having no anti-government demonstrations (i.e. increases the probability of having a positive number of anti-government demonstrations) and increases the probability of having no assassinations (i.e. reduces the probability of having a positive number of assassinations). An increase in the Diffuse PI increases the probability of having no assassinations, no government crises, and no riots. In other words, it decreases the probability of having a positive number of these three events.

Overall, the results from the count model are similar to the results in Table 3.5a. The similarity in the results suggests that the effects of commodity prices are relatively robust regardless of the estimation framework used.

3.7 Conclusion

Latin America is still experiencing varying levels and types of political instability and at the same time many countries have not reduced their dependence on primary commodity exports. There is a possibility that the region's reliance on revenue from commodity exports could be an influential factor in the region's political stability. This paper studies how the commodity prices of the top twenty five Latin American commodities affect the probability of political instability. Using four different types of political instability, I test whether commodity prices have an effect on the various types of instability.

The results show that commodity prices influence the probability of political instability. However, the direction and magnitude of the effect depends on

the measure of political instability. Based on the result from a probit model, I find that increases in a country's total commodity price index, increases the probability of anti-government demonstrations but decreases the probability of government crises and riots. However, this index is too aggregate to see if specific types of commodities are more prone to instability than others. The results when disaggregating each country's commodity price index into point source commodities and diffuse commodities are similar to the results when using the total commodity price index with the exception that assassinations are sensitive to increases in the point source price index but not in the diffuse price index. These results are similar to the results when using a count model. Further disaggregation of the point source commodities into its mineral and agricultural components reveal that the point source effect is driven primarily by increases in mineral prices with the exception of agricultural prices affecting the probability of anti-government demonstrations.

The finding that commodity prices affect the political stability of the region is important in the formulation of policy. The most important take-away for policymakers is that not all commodities affect stability in the same way. In fact, since increases in diffuse commodity prices have a mostly mitigating effect on instability, policymakers may be able to exploit this information. It may be in the country's interest to establish price stabilizing policies in the agricultural sector in order to reduce unrest. As for policies addressing potential instability from point source commodities, the evidence in this paper suggests that prices for these

commodities, especially the mineral commodities, could affect instability in either direction. This makes it difficult to formulate a policy to generally preempt instability from this source.

Table 3.1: Definitions of Instability Variables

Variables	Definitions
Anti-Government Demonstrations	"Any peaceful public gathering of at least 100 people for the primary purpose of displaying or voicing their opposition to government policies or authority, excluding demonstrations of a distinctly anti-foreign nature."
Assassinations	"Any politically motivated murder or attempted murder of a high government official or politician."
Government Crises	"Any rapidly developing situation that threatens to bring the downfall of the present regime – excluding situations of revolt aimed at such overthrow."
Riots	"Any violent demonstration or clash of more than 100 citizens involving the use of physical force."

Source: Cross National Time Series Data (Banks, 2011)

Table 3.2: Commodity Price Indexes – Component Commodities

Component Commodities			Price Index Name
– Beef – Hides	– Maize/Corn – Soybeans	– Wheat – Wool	***Diffuse*** "those relying primarily on livestock and agricultural produce from small family farms"*
<u>Minerals</u> – Antimony – Copper – Gold – Iron Ore – Lead – Nitrate – Petroleum	– Quebracho Extract – Rubber – Silver – Timber – Tin – Zinc	<u>Agricultural</u> – Bananas – Cocoa – Coffee – Cotton – Sugar – Tobacco	***Point Source*** "those extracted from a narrow geographic or economic base, such as oil, minerals, and plantation crops (such as sugar and bananas)"*

Note: The price indexes for each country are based only on the commodities that are produce in that country.
*Source: Isham et al. (2005)

Table 3.3a
Summary Statistics For Commodity Price Indexes

Variable	Mean	Std. Dev.	Min	Max
Total Price Index	59.609	39.176	4.653	285.28
* Diffuse Price Index	11.572	26.039	0	146.445
* Point Source Price Index	48.379	39.719	0	285.28
– Mineral Price Index	17.717	25.684	0	163.14
– Agricultural Price Index	29.347	29.448	0	157.63

Table 3.3b
Summary Statistics For Other Covariates and Instability Measures

Variable	Mean	Std. Dev.	Min	Max
Anti-Government Demonstrations	0.291	0.454	0	1
Assassinations	0.186	0.389	0	1
Government Crises	0.221	0.415	0	1
Riots	0.312	0.464	0	1
Neighborhood				
Anti-Govt. Demonstrations	0.543	0.498	0	1
Assassinations	0.449	0.498	0	1
Govt. Crises	0.484	0.5	0	1
Riots	0.612	0.488	0	1
Democracy	0.477	0.5	0	1
Population	15072	25274	580	167988
Inflation	13.704	18.944	-42.321	99.313
GDP Growth	1.608	5.177	-22.285	28.346

Note: All variables have 1146 observations

Table 3.4
Marginal Effects From Probit Regression
Using the Aggregate Commodity Price Index

	Anti Govt. Demonstrations	Assassinations	Govt. Crises	Riots
Total PI	0.002***	0.000	-0.001***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Neighborhood	0.089***	0.079***	0.125***	0.169***
	(0.031)	(0.026)	(0.027)	(0.029)
Democracy	0.098***	0.076***	0.060**	0.094***
	(0.032)	(0.026)	(0.028)	(0.033)
Inflation	-0.000	0.001**	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Growth GDP	-0.005*	-0.002	-0.005**	-0.000
	(0.003)	(0.002)	(0.002)	(0.003)
Population	0.000**	-0.000	-0.000	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
χ^2 (1)	154.686***	131.783***	135.077***	163.744***

Note: N = 1146 for all regressions. Standard errors in parenthesis. *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level.

Table 3.5a
Marginal Effects From Probit Regression
Using the Point Source and Diffuse Price Indexes

	Anti-Govt. Demonstrations	Assassinations	Govt. Crises	Riots
Pt. Source PI	0.002***	0.001*	-0.001**	-0.001***
	(0.000)	(0.000)	(0.000)	(0.001)
Diffuse PI	0.002**	-0.001	-0.002**	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
χ^2 (1)	155.448***	137.388***	136.286***	163.379***

Table 3.5b
Marginal Effects From Probit Regression
Using the Diffuse and Disaggregated Pt. Source Prices Index

	Anti-Govt. Demonstrations	Assassinations	Govt. Crises	Riots
Pt. Source:				
Mineral PI	0.001	0.001*	-0.002**	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Agricultural PI	0.002***	0.001	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Diffuse PI	0.002**	-0.001	-0.002**	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
χ^2 (1)	155.786***	137.944***	137.978***	164.959***

Note: N = 1146 for all regressions. All controls discussed in Section 3.4.4 are included. Standard errors in parenthesis. *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level.

Table 3.6
Zero Inflated Negative Binomial Marginal Effects
Using the Point Source and Diffuse Price Indexes

Panel A
Negative Binomial Component

	Anti-Govt. Demonstrations	Assassinations	Govt. Crises	Riots
Pt. Source PI	0.008***	0.014***	-0.008***	-0.008***
	(0.002)	(0.003)	(0.002)	(0.002)
Diffuse PI	0.011***	0.018***	0.001	-0.002
	(0.003)	(0.005)	(0.004)	(0.003)

Panel B
Logit Component

	No Anti-Govt. Demonstrations	No Assassinations	No Govt. Crises	No Riots
Pt. Source PI	-0.023**	0.020*	0.019	0.001
	(0.010)	(0.012)	(0.016)	(0.006)
Diffuse PI	0.005	0.071***	0.054**	0.032***
	(0.010)	(0.024)	(0.024)	(0.009)
χ^{2} [a]	95.48***	241.57***	16.94***	124.05***
Vuong Statistics [b]	3.58***	4.21***	1.52*	4.00***

Note: N = 1146 for all regressions. All controls discussed in Section 3.4.4 are included. Country fixed effects are not included. Cluster robust standard errors in parenthesis. *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level.

[a]Chi-Squared Statistic for the likelihood ratio test compares the Zero-Inflated Negative Binomial model with the Zero-Inflated Poisson Model. A significant statistic implies that there is overdispersion and the Zero-Inflated Negative Binomial is the appropriate technique.

[b]The Vuong test compares the Zero-Inflated Negative Binomial model with the Negative Binomial Model. A significant statistic implies the Zero-Inflated Negative Binomial is a better fit than the standard Negative Binomial

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Appendix A: Data Sources

Chapter 1 Data Sources

Lower and Upper Chamber Election Rules: pr, plurality, appointed, or indirectly elected

- Database of Political Institutions 2009 - (Beck et al., 2001)
- Elections in the Americas - (Nohlen, 2005)
- The Statesman's Yearbook
- Country Profiles - (U.S. Department of State, 2010)

Chamber Size: unicameral, lower, and upper chamber sizes

- The Political Constraint Index (POLCON) Dataset - (Henisz, 2010)
- Elections in the Americas - (Nohlen, 2005)
- Inter-Parliamentary Union - (Inter-Parliamentary Union, 2010)
- The Statesman's Yearbook
- Country Profiles - (U.S. Department of State, 2010)

Legislative Structure: Unicameral or Bicameral

- Constitutions of the World - (Maddex, 2008)
- Elections in the Americas - (Nohlen, 2005)
- Inter-Parliamentary Union - (Inter-Parliamentary Union, 2010)
- The Statesman's Yearbook
- Country Profiles - (U.S. Department of State, 2010)

Other Variables:

- Democracy and Political System (Presidential, Parliamentary, or Mixed): Democracy and Dictatorship Revisited - (Cheibub et al., 2010)
- Government consumption, openness, share of real GDP per capita, real GDP per capita, population and population growth - Penn World Tables - (Heston et al., 2009)
- % of population ages 0-14 and % of population ages 65 and above. (World Bank, 2011)
- Legal Origins – English Common Law, French Civil Law, German, and Scandinavian (La Porta et al., 2008)
- Military Expenditure – Correlates of War: National Material Capabilities (Singer et al., 1972) and from the Stockholm International Peace Research Institute (SIPRI) .

Chapter 2 Data Sources

Dependent Variable:

- Log of GDP per capita: Log of GDP per Capita in 1990 International Geary-Khamis dollars. The data can be accessed at http://www. ggdc. net/maddison/

Geography Variables:

- Landlocked Dummy: Dummy variable equal to if country is completely surrounded by land.
- Absolute Latitude: Absolute Latitude divided by 90. It measures the approximate geographic centre of the country as listed in the CIA World Factbook.

- Percent Köppen-Geiger Tropics: Country Geography Data. This data was constructed by Andrew Mellinger and can be accessed at http://www.pdx.edu/econ/jlgallup/country-geodata

Institutional Variables:

- Executive Constraint (EXCONST): The xconst variable from the Polity IV dataset. It captures "the extent of institutionalized constraints on the decision making powers of the chief executives, whether individuals or collectivities" (Marshall & Jaggers, 2009, p. 24). It ranges from 1 to 7 with a higher score indicating more constraints. We standardize the range to be between 0 and 1, with 1 being the most constrained.
- Political Constraint (POLCON): "a measure of political constraints from a simple spatial model of political interaction that incorporates information on the number of independent branches of government with veto power and the distribution of preferences across and within those branches. " From Henisz (2000).

Chapter 3 Data Sources

Commodity Price Data:

- Petroleum - Oxford Latin American Economic History Database
- Antimony, Gold, and Iron Ore – USGS
- Soybean and Natural Gas - CRB Encyclopedia

- Sodium Nitrate and Quebracho Extract - US Department of Commerce - Monthly Summary of Foreign Commerce of the United States (United States Geological Survey, 2011)
- All other commodity price data come from Grilli and Yang (1988) and the update by Pfaffenzeller et al. (2007). Full data was accessed at http://www.stephan-pfaffenzeller.com/cpi.html

Country Commodity Export Data:

- International Historical Statistics: The Americas 1750-2005 – (Mitchell, 2007)
- IMF-International Financial Yearbook – (International Monetary Fund, Various)

Economic Data:

- GDP and Population data comes from Angus Maddison's Statistics on World Population, GDP and Per Capita GDP – (Maddison, 2010)
- Inflation data – Calculated from the country CPIs from Oxford Latin American Economic History Database (Latin American Economic Center, 2011)

Political Variables:

- Cross National Time Series Data Archive - (Banks, 2011)
- Polity IV Database – (Marshall & Jaggers, 2009)

Appendix B: Chapter 1 List of Countries, Years, Chamber Structure, and Average Chamber Size

			year		Chamber	Avg. Chamber Size		
N	Country	code	start	end	Structure	Uni	Lower	Upper
1	Albania	ALB	1992	2007	Unicameral	144	0	0
2	Argentina	ARG	1984	2007	Bicameral	0	256	60
3	Armenia	ARM	1996	2007	Unicameral	146	0	0
4	Australia	AUS	1975	2007	Bicameral	0	142	72
5	Austria	AUT	1975	2007	Bicameral	0	183	63
6	Bahamas	BHS	1975	2007	Bicameral	0	43	16
7	Bangladesh	BGD	1987	2006	Unicameral	332	0	0
8	Barbados	BRB	1975	2007	Bicameral	0	27	21
9	Belgium	BEL	1975	2007	Bicameral	0	188	138
10	Belize	BLZ	1982	2007	Bicameral	0	28	8
11	Benin	BEN	1992	2007	Unicameral	79	0	0
12	Bolivia	BOL	1983	2007	Bicameral	0	129	27
13	Brazil	BRA	1985	2007	Bicameral	0	505	79
14	Bulgaria	BGR	1992	2007	Unicameral	240	0	0
15	Canada	CAN	1975	2007	Bicameral	0	291	105
16	Cape Verde	CPV	1992	2007	Unicameral	73	0	0
17	Central African Rep.	CAF	1993	2002	Unicameral	97	0	0
18	Chile	CHL	1990	2007	Bicameral	0	120	47
19	Colombia	COL	1975	2007	Bicameral	0	181	107
20	Costa Rica	CRI	1975	2007	Unicameral	57	0	0
21	Croatia	HRV	1993	2007	Bi/Uni	152	130	63
22	Cyprus	CYP	1983	2007	Unicameral	54	0	0
23	Czech Rep.	CZE	1993	2007	Uni/Bi	200	200	81
24	Denmark	DNK	1975	2007	Unicameral	179	0	0
25	Dominican Rep.	DOM	1975	2007	Bicameral	0	126	29
26	Ecuador	ECU	1980	1999	Unicameral	78	0	0
27	El Salvador	SLV	1984	2007	Unicameral	77	0	0
28	Estonia	EST	1993	2007	Unicameral	101	0	0
29	Finland	FIN	1975	2007	Unicameral	200	0	0
30	France	FRA	1975	2007	Bicameral	0	548	313
31	Germany, West	DEU	1975	1989	Bicameral	0	496	45
32	Germany	DEU	1991	2007	Bicameral	0	643	69
33	Ghana	GHA	1993	2007	Unicameral	208	0	0

			year		Chamber	Avg. Chamber Size		
N	Country	code	start	end	Structure	Uni	Lower	Upper
34	Greece	GRC	1975	2007	Unicameral	300	0	0
35	Grenada	GRD	1985	2007	Bicameral	0	15	13
36	Guatemala	GTM	1986	2007	Unicameral	114	0	0
37	Honduras	HND	1982	2007	Unicameral	122	0	0
38	Hungary	HUN	1991	2007	Unicameral	386	0	0
39	Iceland	ISL	1975	2007	Bi/Uni	63	41	20
40	India	IND	1975	2007	Bicameral	0	542	230
41	Indonesia	IDN	1999	2007	Unicameral	491	0	0
42	Ireland	IRL	1975	2007	Bicameral	0	162	60
43	Israel	ISR	1975	2007	Unicameral	120	0	0
44	Italy	ITA	1975	2007	Bicameral	0	630	325
45	Jamaica	JAM	1975	2007	Bicameral	0	60	21
46	Japan	JPN	1975	2007	Bicameral	0	502	252
47	Kenya	KEN	1998	2007	Unicameral	224	0	0
48	Korea, Rep. of	KOR	1988	2007	Unicameral	293	0	0
49	Latvia	LVA	1994	2007	Unicameral	100	0	0
50	Lithuania	LTU	1994	2007	Unicameral	100	0	0
51	Luxembourg	LUX	1975	2007	Unicameral	60	0	0
52	Macedonia	MKD	1992	2007	Unicameral	120	0	0
53	Madagascar	MDG	1994	2007	Uni/Bi	143	149	82
54	Malawi	MWI	1995	2007	Unicameral	187	0	0
55	Mali	MLI	1993	2007	Unicameral	148	0	0
56	Malta	MLT	1975	2007	Unicameral	65	0	0
57	Mauritius	MUS	1975	2007	Unicameral	69	0	0
58	Mexico	MEX	2000	2007	Bicameral	0	500	128
59	Moldova	MDA	1994	2007	Unicameral	102	0	0
60	Mongolia	MNG	1993	2007	Unicameral	76	0	0
61	Nepal	NPL	1991	2001	Bicameral	0	196	60
62	Netherlands	NLD	1975	2007	Bicameral	0	150	75
63	New Zealand	NZL	1975	2007	Unicameral	102	0	0
64	Nicaragua	NIC	1987	2007	Unicameral	93	0	0
65	Nigeria	NGA	2000	2007	Bicameral	0	359	108
66	Norway	NOR	1975	2007	Unicameral	161	0	0
67	Pakistan	PAK	1989	1999	Bicameral	0	221	87
68	Panama	PAN	1989	2007	Unicameral	71	0	0
69	Papua New Guinea	PNG	1975	2007	Unicameral	108	0	0

			year		Chamber	Avg. Chamber Size		
N	Country	code	start	end	Structure	Uni	Lower	Upper
70	Paraguay	PRY	1990	2007	Bicameral	0	78	43
71	Peru	PER	1981	1990	Bicameral	0	180	60
72	Philippines	PHL	1988	2007	Bicameral	0	211	24
73	Poland	POL	1991	2007	Bicameral	0	460	100
73	Poland	POL	1991	2007	Bicameral	0	460	100
74	Portugal	PRT	1977	2007	Unicameral	241	0	0
75	Romania	ROM	1991	2007	Bicameral	0	346	138
76	Saint Lucia	LCA	1980	2007	Bicameral	0	18	11
77	Sierra Leone	SLE	1998	2007	Unicameral	90	0	0
78	Slovak Rep.	SVK	1993	2007	Unicameral	150	0	0
79	Slovenia	SVN	1992	2007	Bicameral	0	90	40
80	Solomon Is.	SLB	1979	2007	Unicameral	43	0	0
81	Spain	ESP	1978	2007	Bicameral	0	350	237
82	Sri Lanka	LKA	1989	2007	Unicameral	225	0	0
83	Suriname	SUR	1991	2007	Unicameral	51	0	0
84	Sweden	SWE	1975	2007	Unicameral	349	0	0
85	Switzerland	CHE	1975	2007	Bicameral	0	200	46
86	Trinidad & Tobago	TTO	1975	2007	Bicameral	0	36	31
87	Turkey	TUR	1984	2007	Unicameral	492	0	0
88	Ukraine	UKR	1994	2007	Unicameral	450	0	0
89	United States	USA	1975	2007	Bicameral	0	435	100
90	Uruguay	URY	1985	2007	Bicameral	0	99	31
91	Vanuatu	VUT	1981	2007	Unicameral	47	0	0
92	Venezuela	VEN	1975	2007	Bi/Uni	166	202	47

Appendix C: Dates of Suffrage Expansion in Latin America

Country	Males*	Females	Illiterates	Secret Ballot
Argentina	1912	1947	1912	1912
Bolivia	1952	1952	1952	1952
Brazil	1932	1932	1988	1932
Chile	1925	1949	1970	1925
Colombia	1936	1957	1936	1853
Costa Rica	1913	1949	1913	1925
Dominican Republic	1865	1942	1865	1865
Ecuador	1861	1929	1978	1861
El Salvador	1883	1939	1883	1950
Guatemala	1879	1945	1956	1956
Honduras	1894	1954	1894	1894
Mexico	1857	1954	1857	1857
Nicaragua	1893	1957	1893	1893
Panama	1904	1945	1904	1946
Paraguay	1870	1963	1870	1911
Peru	1931	1955	1979	1931
Uruguay	1918	1934	1934	1918
Venezuela	1857	1946	1946	1946

* These are the dates in which there were no economic requirements for male voters.
Sources: Nohlen (1993;2005)

Appendix D: Correlation Between Instruments and Institutions

	EXCONST	POLCON
Male	0.5941	0.4953
Male_All	**0.6286**	0.4968
Female	0.5949	**0.5392**
Universal	**0.6362**	**0.5388**

n=266

Appendix E: List of Countries and Years in Chapter 3

	Country	T	Years Included
1	Argentina	76	1919-1939, 1946-2000
2	Bolivia	54	1947-2000
3	Brazil	76	1919-1939, 1946-2000
4	Chile	76	1919-1939, 1946-2000
5	Colombia	76	1919-1939, 1946-2000
6	Costa Rica	57	1938-1939, 1946-2000
7	Dominican Republic	49	1952-2000
8	Ecuador	55	1946-2000
9	El Salvador	56	1939, 1946-2000
10	Guatemala	56	1939, 1946-2000
11	Honduras	57	1938-1939, 1946-2000
12	Mexico	76	1919-1939, 1946-2000
13	Nicaragua	56	1939, 1946-2000
14	Panama	55	1946-2000
15	Paraguay	55	1946-2000
16	Peru	76	1919-1939, 1946-2000
17	Uruguay	64	1931-1939, 1946-2000
18	Venezuela	76	1919-1939, 1946-2000

Appendix F: Count Model Discussion

Using a count variable as the dependent variable opens up a new set of possibilities in terms of the estimation framework. The various political instability measures used in this study are count variables with distributions that are all skewed right and contain a large proportion of zeros. Poisson, Negative Binomial, and their Zero-Inflated counterparts are some of the estimation techniques that try to deal with these characteristics.

The most widely used count models are Poisson and Negative Binomial. The Poisson distribution assumes that the mean and the variance are equal. Overdispersion in Poisson models occurs when the variance is greater than the mean. This violation of the distributional assumption may cause the estimates derived from a Poisson regression to be inefficient (Hilbe, 2007). The Negative Binomial model is an alternative approach that addresses the problem of overdispersion.

In addition to the problem of overdispersion, there is a problem with the large number of zeros in the data. Because the percentage of zeros in the data ranges from 68% (riots) to 82% (assassinations), it can easily be said that there is an excess of zeros. The distributional assumptions of both Poisson and Negative Binomial are violated when there are a large proportion of zeros in the data. Their zero-inflated counterparts – Zero-Inflated Poisson and Zero-Inflated Negative Binomial – can accommodate the large amount of zeros in the data. These models assume that the structural zeros come from a binary distribution (such as probit or

logit) and the non-negative integer outcomes (including zeros) come from a count distribution (such as Poisson or Negative Binomial) (Hilbe, 2007).

To accommodate the overdispersion in the data and the large number of zeros, I use the Zero-Inflated Negative Binomial regression model.[82] This model has a binary section and a count section. A logistic distribution is used for the binary part of the model. Within this framework, "success" is a prediction of being a zero count and "failure" a non-zero count. The log-likelihood function of the logit part of the model is:

$$if\ (y == 0): \sum_{i=1}^{n} \left\{ \ln\left(\frac{1}{1+\exp(-x_i'\beta_1)}\right) + \frac{1}{1+\exp(x_i'\beta_1)}\left(\frac{1}{1+\alpha\exp(x_i'\beta)}\right)^{\frac{1}{\alpha}} \right\} \tag{A.1}$$

The count or Negative Binomial part models the non-negative integer outcomes which includes zeros. The log-likelihood function of the Negative Binomial part of the model is:

[82] I performed to tests on all regressions to see if this was the correct modeling framework. The first is the chi-squared statistic for the likelihood ratio test that compares Zero-Inflated Negative Binomial model with the Zero-Inflated Poisson model. The results support the use of Zero-Inflated Negative Binomial model over the Zero-Inflated Poisson model. The second statistic is for the Vuong test which compares the Zero-Inflated Negative Binomial with the Negative Binomial. The results from this test support the use of Zero-Inflated over simple Negative Binomial. The test statistics for both test are reported along with the results in Table 3.6. These two tests should provide some confidence that the correct estimation framework is being employed

$$if\ (y > 0) : \sum_{i=1}^{n} \left\{ \ln\left(\frac{1}{1+\exp\left(-x_i'\beta_1\right)}\right) + \ln\Gamma\left(\frac{1}{\alpha} + y_i\right) \right. \tag{A.2}$$

$$- \ln\Gamma(y_i + 1)$$

$$- \ln\Gamma\left(\frac{1}{\alpha}\right) + \left(\frac{1}{\alpha}\right)\ln\left(\frac{1}{1+\alpha\exp(x_i'\beta)}\right) + y_i \ln\,[1$$

$$\left. - \frac{1}{1+\alpha\exp(x_i'\beta)} \right\}$$

Using this estimation framework, the regression equations take the following general form:

$$Instability_{i,t} = \beta_1 Pt.Source\ PI_{i,t-1} + \beta_2\ Diffuse\ PI_{i,t-1} \tag{A.3}$$

$$+ \alpha' Controls_{i,t-1} + \beta_0 + v_{it}$$

where Instability is one of the instability count variables listed in Table 3.2. The first two right hand side variables are the point source and diffuse commodity price indexes that are unique to each country and year. $Controls_{i,t-1}$ is a vector containing the control variables discussed in Chapter 3 Section 3.4.4 .

Appendix G: Summary Statistics of Instability Variables in Count Model

Variable	Total Events	Non-Zero Country Years	Mean	Std. Dev.	Min	Max
Anti-Govt. Demonstrations	687	333	0.599	1.291	0	15
Assassinations	566	213	0.494	1.712	0	25
Govt. Crises	357	253	0.312	0.712	0	7
Riots	689	358	0.601	1.280	0	15

Note: All variables have 1146 observations