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Abstract

This paper aims to test empirically the predictions of a theory that deals with the effect of different democratic regimes on public good provision. The theory predicts higher provision of public good in proportional electoral systems and parliamentary political regimes in comparison to majoritarian systems and presidential regimes respectively. The tests are performed using cross-country data from the 1990s on health and education quantity indicators of public good. Use of quantity indicators instead of expenditure data, previously used by other researchers, enables a cleaner test of the theory as a higher amount of any quantity measure clearly indicates a higher supply of public good. Overall, the robust results in this paper do not provide enough support for the theory. Electoral system has no effect on any of the public good indicators while except for two indicators under education, the nature of the political regime has no significant effect either.

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1 Introduction

Do political institutions affect economic or policy outcomes? The political economy literature gives an answer to these types of questions. Government policies regarding size of government deficits, burden of taxation across different tax bases, extent of public good provision etc. result from political processes aggregating the preferences of citizens. These processes differ between alternative political institutions because they structure the incentives of political parties differently and thereby make them accountable to the voters in distinctive ways. Hence, recently a great deal of attention has been focused on how governance matters for fiscal policies. This paper falls under that category and specifically looks at the effect of differences in democratic institutions on public good provision. The objective is to test a theory of the effect of political institutions on public good supply by using quantity indicators of public good. The motivation for this paper is to tell whether or not some particular institutional features of the political system facilitate a higher provision of public good and, hence, would suggest whether there is any need for reforms to correct the institutional features.

The two main dimensions along which the democratic institutions vary are electoral rules and the political regimes. Persson et al. [12, 13, 14] formulated a model of "post-election politics" to

predict how the size of the government, provision of public good, and corruption differ between the presidential and the parliamentary regimes. Their model shows that the features of "separation of powers" under presidential regime and legislative cohesion under parliamentary regime entail a more intense competition between the voters as well as between different politicians under the presidential system than in the parliamentary regime. As a consequence, there is a lower supply of public goods in the presidential regime as compared to the parliamentary regime. Unlike the analysis for studying the differences in political regimes, the authors use a model of "pre-election politics" to look at the effect of electoral systems on public good spending. Their model predicts that public good provision is lower in the majoritarian system as opposed to the proportional system. The reason is the same, namely, that the competition is stiffer among the voters as well as between the politicians in the majoritarian system relative to the proportional system though the underlying characteristics giving rise to it are very different.

The empirical analysis is still at a very early stage. Persson et al. themselves confronted their theory with cross-country data on expenditure on various subgroups of public good. The results show that parliamentary regimes and proportional systems spend more on public goods than presidential regimes and majoritarian systems but the effects are not statistically significant. The expenditure data on public good is not a good measure of the level of provision of public good because a higher level of expenditure on the public good does not necessarily imply higher provision of public good. If a country spends more on a public good, it might well reflect that political rents or corruption are higher in that country. This is particularly a problem in this context because Persson et al.'s theory simultaneously predicts that besides the level of provision of public good being lower in the majoritarian and presidential system relative to the proportional and parliamentary systems respectively, the level of corruption or political rents will also be lower in majoritarian and presidential systems. Hence the results from the expenditure data might very well pick up this effect rather than providing evidence in favor of their theoretical prediction regarding public good provision. It is for this ambiguity, that I will be using quantity indicators of public good instead of expenditure measures to test their theory.

The rest of the paper is organized as follows. Section 2 briefly reviews the relevant theoretical and empirical literature. The section concludes by pointing out the pitfalls of their empirical analysis and thereby sets the motivation of this paper. Section 3 discusses the data issues and the

methodology employed to conduct the empirical analysis. Section 4 presents the results. Finally, conclusions are provided in Section 5.

2 Literature Review and Motivation

2.1 Background and Theory

A number of papers look at the effect of electoral system on public policy choices [8, 11, 12]. This section provides a brief overview of these theories with emphasis on Persson et al.'s theory [12]. Persson et al.'s model distinguishes majoritarian and proportional system mainly on the basis of district magnitude. Single district elections are loosely classified as constituting the proportional system while multiple-district elections are regarded as majoritarian systems.[1] To analyze the effect of electoral systems on public choices, the authors used a model of pre-election politics. The policies in question are the overall tax rate, level of provision of a public good, spending on redistribution and political rents retained by the politicians. There are two parties in their model who make binding policy commitments to voters before the elections. Each voter has his own preference for the relative ideological attributes of the political candidates. There are three groups of voters and these groups differ in their average affinities for one political candidate over another and also in the within-group range of variation in their ideological preferences. Crucial to their analysis is the concept of "swing voters" who are indifferent between two ideologically different political parties in the case when they offer the same policies. Persson et al. assumed that the group which on average is ideologically neutral also has the highest number of swing voters and refer to this group as the "middle class group."

Under a proportional electoral system there is a single electoral district. The political party that gets more than 50% of the votes wins the elections. Under the majoritarian elections, there are three separate electoral districts and in order to win the election, one has to get the majority

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[1]However, this way of classification of electoral systems fails to take into account three other important elements of the electoral systems: electoral formula, ballot structure, and electoral threshold [6, 7]. Specifically, the representation of proportional system in the model does not take into account the main feature of the system, which is that the parties receive seats in proportion to the percentage of votes they receive.

in at least two districts. This difference in district magnitude across the two systems results in the differences in public good provision. In majoritarian system, competition among the candidates is more intense and is focused on the pivotal "middle class group." This intense competition in the marginal district ensures that benefits and costs of fewer voters are internalized resulting in lower public good provision relative to the proportional system. However, as the electoral competition among the two candidates is stiffer because of the focus on the marginal district, the equilibrium rents accruing to the politicians are lower.

Milesi-Ferretti et al. [11] also looked at how majoritarian versus proportional system affects the allocation of government spending between public goods and transfer payments. Public goods in their model can be targeted to specific regions but is available equally to all social groups while transfer payments can be targeted to specific interest groups but will be same across regions. The main difference between the two electoral systems is again regarding district magnitude. The broad prediction of the model is that in comparison to proportional systems, majoritarian systems emphasize public good spending relative to transfer payments. The reason is that politicians under majoritarian systems are motivated to pay heed to regional interests since they are elected from each of the several electoral districts. There is no such regional representation in the proportional systems since the whole nation is an electoral district. These predictions disagree with Persson et al.'s predictions though it has to be noted that public goods are treated differently in these two models.[2]

Persson et al. [12, 13] also formulated a model of "post-election politics" to predict how the

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[2]Lizzeri et al. [8] also analyzed how public good provision varies between these two electoral systems. The electoral systems in their model differ in the rewards that accrue to the vote shares. In the majoritarian system, all the "spoils of the office" go to the winner, while in the proportional system, those are divided among the political candidates in proportion to their vote share. Hence, the policy incentives for the parties differ across these two systems. Politicians face a trade-off between providing a pure public good and providing public redistribution. Majoritarian or winner-take-all systems under-provide public good in relation to the proportional systems when the public good has high value. Under proportional systems, vote shares are valued and hence the politicians are sensitive to the benefits people get from public goods. In contrast, under majoritarian systems, except at the fifty-fifty allocation, vote share does not matter and hence the politicians do not internalize the benefits to the citizens from the provision of the public good. This, therefore, leads to their main prediction regarding the under-provision of public good in majoritarian system in relation to the proportional system.

provision of public good differs between the presidential and the parliamentary regimes. Voters choose their re-election strategies after observing how the incumbent politicians performed in the last period. In their model, under presidential regimes, a single district's representative becomes the agenda setter.[3] The agenda setter seeks the minimum winning coalition consisting of only that legislator whose support is the least expensive to get. Knowing that, the two other voting districts compete against each other to provide incentives to the agenda setter to include their district in the winning coalition. The voters of those two districts actually engage in a Bertrand competition with each other. The end result is that they reduce their reservation utilities to such an extent that the demand for redistribution/transfer payments to their district becomes zero. The public good is traded one for one against redistribution to only one district thereby resulting in less than optimal provision of the public good.

Under parliamentary regimes, on the other hand, the agenda setter is not allowed to choose the least expensive legislator but has to satisfy his coalition partner. A majority coalition consisting of two legislators is assigned the veto rights over the policy package. The government breaks down when the veto is exercised.[4] The political influence is, therefore, shared equally between the coalition partners. Redistributive transfers are provided in favor of the districts of the members of the majority coalition. Since now the public good benefits to the voters in the district of the second member of majority coalition are internalized, the public good supply is more than that in case of presidential regimes. The absence of separation of powers in the parliamentary regime leads to a lack of checks and balances and hence competition between the politicians will be now much less. Thus, equilibrium rents for the politicians are more in the parliamentary regimes.

2.2 Empirical Analysis: Results and Drawbacks

Persson et al. conducted an empirical analysis [12, 13] to verify their theoretical predictions. Dummy variables were used to indicate the nature of political institutions. In their empirical specification of the electoral system theory, countries were classified as having a majoritarian system

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[3]This captures the feature of separation of powers, one of the two important dimensions along which the two regimes vary.

[4]This captures the other important dimension along which the two forms of government are differentiated, namely, the presence or absence of legislative vote of no-confidence motion.

when there is plurality rule in single candidate electoral districts and as having a proportional system otherwise. To measure public good spending, the authors used data on government expenditures on transportation, education, police and health and added them up. The results of the regression show that majoritarian elections lead to a lower supply of public good but the coefficient is not statistically significant.

Their empirical test of the political regime theory also produced similar results. Countries were classified as presidential or parliamentary based on rules for formation/breakdown of the government and the degree of veto rights that a president of the country has. The results of the regression show that presidential regimes spend less on public goods but the result again lacks statistical significance.

In a latter empirical work in 2001 [14], Persson et al. treated the public goods as "universalistic welfare programs." The idea is that proportional systems and parliamentary regimes lead to a shift in the composition of public spending in favor of universal welfare programs which benefit larger sections of populations. The dataset used in this analysis was much more extensive than their earlier dataset. The authors started with a simple OLS regression and used a number of control variables to minimize the extent of the impact of unobservable factors on policy outcomes. Results of the OLS regression show that welfare spending is smaller in presidential and majoritarian countries but the effects are, once more, insignificant.[5,6]

The empirical models use public expenditure data to test their predictions regarding the provision of public good. However, in order to show that the public good supply is higher in parliamentary regime (proportional system) than in the presidential regime (majoritarian system), it is better to examine quantity indicators of public good. The reason is that a country might spend more on a public good but might do little to improve the level of provision of the public good. In other words, results obtained from examining expenditure data instead of representing that parliamen-

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[5]The authors also used two estimation methods—Heckman correction and the IV method—to get rid of the potential omitted variable bias and got similar insignificant results.

[6]Milesi-Ferretti et al. used cross country samples of around 40 OECD and Latin American countries to test their theory. Public good is measured by government spending for consumption plus net investment while the measure of transfer payments include spending on social security, transfers to households and transfers to measure. The degree of proportionality is measured by two alternative indicators. Results suggest that in accordance with their theory, countries with proportional systems spend significantly more on transfers and (insignificantly) less on public goods.

tary regimes (proportional systems) have a higher supply of public good might actually show that political rents are higher in parliamentary regimes (proportional systems). This is because salaries to government officials constitute an important part of political rents or corruption. It has also to be noted that their theoretical model also predicts that political rents will be lower in a majoritarian relative to a proportional system and less in presidential regime than in parliamentary system. Hence, it is unclear that the results from the use of expenditure data are favoring which of these two predictions.

In the democracy-dictatorship literature [2, 3, 5, 10], most of the empirical papers look at quantity indicators of public goods like health, education, infrastructure, etc. Commonly examined indicators are adult literacy rate, student-teacher ratio, access to safe and clean water, child immunization rates, infant mortality rates, density of road networks, etc. All these are physical measures of public good. A higher amount of such a quantity measure clearly indicates that public good provision is higher. My goal is therefore to test the theory of Persson et al. regarding public good provision by examining quantity indicators of public good.

Further, Persson et al.'s procedure of summing up the public expenditures for different categories to get a measure of public good provision is not justified. The underlying demand theory suggests that one should look at the different public goods separately. Therefore, in my paper, I am therefore running separate regressions for each indicator.

3   Data and Methodology

To measure the provision of public good, I am looking at two subgroups under the broad category of public good—health and education. The quantity indicators examined in case of health are DPT and measles immunization rates, life expectancy and infant mortality rates. The immunization measures describe the rate of vaccination coverage of children under one year of age. There are direct government health policies which affect such measures and hence these are good measures of the public provision of health. Indicators like life expectancy and infant mortality rates are also affected by government health policies. The number of births attended by physicians, number of hospital beds in government hospitals, number of government physicians/health staff per patient all have an effect on such rates. Various other variables like the level of development, percentage

of population that is urban, racial segregation etc. can have a significant effect on these variables. These variables are controlled for as discussed below.

Examples of the physical indicators examined for the subcategory education are illiteracy rate, secondary education enrollment rate and pupil-teacher ratio. Secondary school enrollment divided by population of secondary school age or the ratio of the number of pupils to the teachers in primary schools are important indicators of public education because government education policies have a direct effect on such indicators. Illiteracy rate is however significantly affected by various other variables like the level of development and percentage of urban population besides the education policies taken by the government. Controls for the relevant variables are included in the empirical model.

It has to be noted that for the subcategory health, three measures—the two immunization measures and the life expectancy measure—are examples of public good. More of such measures imply that the public good is provided in a higher amount. Infant mortality rate, however, is an example of public bad and more of that measure signifies worse health condition in a country. Similarly for the subcategory education, two out of the three measures—pupil-teacher ratio and illiteracy rate—are examples of public bad and less of those measures reflect a higher provision of the public good of education. The third measure, enrollment rate, is a public bad. The theory tells that in the regression of the effect of institutional characteristics on public good indicators, the coefficients of the institutional variables should have a negative sign for all the indicators except for the public bads, namely, infant mortality rate, illiteracy rate and pupil-teacher ratio.

The data source for these indicator variables is the World Development Indicator (WDI) database. Data is available for 160 countries for the period 1960-1990. Since my analysis focuses on democracies, only those countries are chosen for which the average of "democracy" index from the Polity database compiled by Marshall and Jaggers [9] for the period 1990-1998 is greater than 5. This is a deviation from Persson et al.'s approach because they relied on Gastil index [4] to select the democracies. Polity database is a better source to use for the selection criterion because it is based on the detailed features of political systems in the countries, unlike the Gastil index which also takes into consideration civil rights and liberties. The democracy index can take any values in the 0-10 scale. A higher value of this index indicates a better democracy. This index is based on three essential elements: "competitiveness of political participation, openness and competitiveness of

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executive recruitments and constraints on the chief executive." The dataset consists of 86 democracies. Seventeen new countries are included in this dataset while fourteen countries included in Persson et al.'s dataset are excluded from this new database.[7] The dependent variable in each of the regressions is an average variable from the mid-nineties.

The variables of interest are the dummy variables indicating the type of electoral system and the nature of political regime. The same indicator variables used in Persson et al.'s analysis are employed here. The variable *Maj* indicates the nature of electoral system and is equal to 1 if there is plurality rule in single candidate electoral districts and 0 otherwise. The form of government is measured by the variable *Pres* which is equal to 1 if there is no existence of the vote of no-confidence motion in the legislature and 0 otherwise. To find the values of the variable Maj for the newly included countries I relied on the database in International Institute for Democracy and Electoral Assistance (IDEA).[8] I adopt the same methodology as employed by Persson et al. and used the information in Shugart's paper [16] to obtain the values of the variable Pres for the newly included countries.

Control variables included in the model are GDP per capita, percentage of population that is urban, ethnolinguistic fractionalization (ELF) index, and age of democracy. WDI database is the source of the first two control variables. The data on ethnolinguistic fractionalization index is obtained from Persson et al.'s dataset. The values for the new countries are obtained from La Porta et al.'s [15] dataset. The data on age of democracy variable is obtained from Polity IV database [9]. The same procedure as used by Persson et al. is adopted to calculate the age.

All these control variables are important determinants of public good provision. Per capita income proxies for the level of development which has a significant effect on public good provision. In order to allow for lagged response, a lagged value of GDP variable is taken. Urban population is relevant because more urban a country is, more will be the awareness of people and hence that will have an positive influence on the public good indicators. Cost of public good provision might

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[7]The newly included countries are Albania, Armenia, Benin, Cambodia, Central African Republic, Georgia, Guyana, Lithuania, Macedonia, Madagascar, Moldova, Mongolia, Mozambique, Lithuania, Panama, Slovenia and Solomon Islands. The excluded countries are Bahamas, Barbados, Belize, Gambia, Iceland, Luxembourg, Malaysia, Malta, Senegal, Singapore, St. Vincent and Grenades, Uganda and Zimbabwe.

[8]See http://www.idea.int/esd/world.cfm

also be lower in urban areas. ELF index is included because it is believed that ethnic fragmentation causes disagreement over specific features of public goods and this therefore results in low levels of public good provision. Age of democracy is relevant because the nature of political institutions will matter more in old democracies.

To start with a simple cross-country OLS regression, there is the potential problem of omitted variable bias. If there are some omitted determinants of the public good indicators which are correlated with the variable capturing the nature of political institutions, then the OLS estimates of the effect of political institutions will be inconsistent. Current political institutions to a large extent are determined by historical, religious and climate related factors. Many of these factors cannot be observed or measured and can also be correlated with public good provision. The fixed effects regression is, therefore, useful in this context because this helps to eliminate unobserved heterogeneity at the country level. However, the fact that political institutions like the type of electoral rule and nature of political regime tend to persist over time, renders the use of fixed effects regression infeasible. This fact, on the other hand, makes the problem of reverse causality of little or no importance. A direct effect of public good provision on constitutions seems hard to be believed because the political institutions remain the same over a long period of time but the public quantity indicators measuring the provision of public good do change over the same period. Hence, we need not be concerned with the simultaneity problem.

In order to get closer to the causal estimate of the effect of nature of democratic institutions on public good provision, the IV estimation method is used. The instruments employed are a measure of colonial history. All together three instruments are used indicating the influence of British colonies, Spanish and Portuguese colonies and other colonies. These are undoubtedly very relevant in explaining the nature of current political institutions [1, 15]. The instruments are used for the two potentially endogenous variables—Maj and Pres. The data on these three indicator variables is obtained from Persson et al.'s dataset. Data for the new countries is obtained from CIA's dataset.[9] However, the IV estimation analysis is based on the exclusion restriction, namely, that the instruments will have an effect on public good provision only via their effect on democratic institutions. This is not testable and it is difficult to rule out the possibility of existence of some

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[9]See http://www.cia.gov/cia/publications/factbook

Table 1: Summary Statistics

Variable Name	Mean	Min	Max	Std. Dev	Obs.	Unit
IMR	30.758	3.800	133.734	31.367	86	per 1000
LE	68.959	41.919	80.168	9.151	86	years
DPT	86.671	45.750	99.834	10.905	85	percentage
Measles	85.358	48.500	99.833	19.914	85	percentage
Pupil	24.402	7.000	63.024	11.705	77	ratio
Illiteracy	17.975	0.200	64.283	11.705	77	percentage
Enrollment	76.067	6.867	145.633	33.148	78	percentage
Maj	0.325	0	1	0.471	86	indicator variable
Pres	0.405	0	1	0.494	84	indicator variable
GDP	7.939	4.895	10.702	1.527	85	logarithmic value
Urban	58.615	10.787	97.083	20.962	86	percentage
ELF	0.286	0.000	0.831	0.260	80	fraction
Age	0.183	0.030	1.000	0.219	85	fraction

unobserved factors correlated with both the instruments and the public good provision. Table 1 provides the summary statistics of all the variables. The definitions are provided in Table 8 in the appendix.

4 Results

To start with, univariate regressions, measuring public good provision on the electoral rules and political regimes, are conducted for each dependent variable separately without controlling for anything else. The results are presented in Table 2.

As witnessed in Table 2, the public good provision as measured by the physical indicators are provided at a higher level in proportional and parliamentary regimes than in majoritarian voting and

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[10]Robust standard errors are reported in the parentheses. * and ** indicate statistical significance at the 10% and 5% levels respectively.

Table 2: Univariate Regressions[10]

| Dep. var | Health | | | | Education | | |
| | Public Bad | Public Good | | | Public Bad | | Public Good |
	IMR	LE	DPT	Measles	Pupil	Illiteracy	Enrollment
Maj	18.12*	-5.366**	-5.303*	-5.553*	7.034*	13.287**	-6.754
	(6.987)	(2.036)	(2.464)	(2.459)	(2.757)	(4.552)	(8.288)
Pres	18.218**	-4.276*	-4.451*	-0.562	8.440**	2.667	-29.386**
	(6.358)	(1.889)	(2.307)	(2.248)	(2.535)	(4.782)	(6.95)

presidential systems respectively, as hypothesized by theory; also, the effects are significant. The exceptions are the cases of enrollment rate where the effect of electoral system is insignificant, and the measles immunization rate and the illiteracy rate on which political regime has no significant effect.

The general variation in the physical indicators across the different democratic institutions is, however, no proof of the theory that public good provision varies across the political systems. The reason is that the constitutional selection is not random. There are many other things that differ among the countries and are also correlated with the political regimes. All such other differences among the countries might explain the observed differences in these indicator variables across different political systems; hence, the estimates in Table 2 are not causal. Thus, it is appropriate to control for as many relevant variables as possible.

The next step is to include the other predictors of public good provision. As mentioned before the control variables are real per capita GDP in logarithmic form, percentage of population that is urban, an index of ethnolinguistic fractionalization and age of democracy. Results of the OLS regressions for the health indicators are presented in Table 3 and those for the education category are demonstrated in Table 4. Table 3 shows that the dummy variable Maj indicating the type of electoral system and the dummy variable Pres capturing the effect of political regime have the expected sign as predicted by the theory for all regressions, but none of the estimates are statistically significant.

For the subcategory education, Table 4 shows that both the dummy variables have the expected

Table 3: OLS Regressions: Health[10]

Dep. var	Public Bad	Public Good		
	IMR	LE	DPT	Measles
Maj	5.273	-1.988	-1.93	-1.665
	(6.024)	(1.782)	(2.51)	(2.354)
Pres	4.219	-0.728	-2.318	-0.404
	(4.325)	(1.258)	(2.476)	(2.111)
GDP	-13.267**	2.735**	1.18	-1.8
	(2.673)	(0.773)	(1.351)	(1.461)
Urban	-0.14	0.041	0.0482	0.241**
	(0.145)	(0.039)	(0.0874)	(0.0882)
ELF	26.387**	-11.183**	-9.142*	-8.741*
	(10.964)	(3.442)	(5.053)	(4.791)
Age	12.632	3.6	-3.365	1.693
	(12.928)	(3.283)	(5.549)	(5.697)
Obs.	77	77	76	76
R-squared	0.723	0.696	0.225	0.257

Table 4: OLS Regressions: Education[10]

Dep. var	Public Bad		Public Good
	Pupil	Illiteracy	Enrollment
Maj	2.441	3.185	-3.243
	(2.094)	(5.185)	(5.944)
Pres	3.236	1.466	-20.443**
	(2.046)	(3.668)	(4.837)
GDP	-4.881**	-8.47**	11.896**
	(1.09)	(2.158)	(2.277)
Urban	-0.076	-0.187	0.42**
	(0.0557)	(0.135)	(0.175)
ELF	9.637*	3.228	8.242
	(4.883)	(7.182)	(9.676)
Age	8.319*	-1.308	8.97
	(4.672)	(12.814)	(12.255)
Obs.	71	57	71
R-squared	0.736	0.607	0.7791

signs as predicted by the theory. However only for the variable enrollment rate, the Pres dummy has a statistically significant coefficient. Thus, though the signs of the coefficients support the theory, most of the estimates are insignificant. This is consistent with previous empirical findings where researchers found expected signs but insignificant coefficients. A small sample size in all these cross-country regressions is definitely of concern.

The control variables that are significant in almost all the regressions are real per capita GDP and index of ethnolinguistic fractionalization, and both have the expected signs. Urban population and age of democracy have the expected signs but the estimates are significant in only a few regressions. Overall the results from the OLS regression provide little support for the theory of the effect of differences in democratic institutions on public good provision.

The IV results are presented next. Three indicator variables are used as instruments to indicate

Table 5: IV Regressions: Health[10]

Dep. var	Public Bad	Public Good		
	IMR	LE	DPT	Measles
Maj	1.053	2.891	-7.235	-0.963
	(18.322)	(7.869)	(9.257)	(6.95)
Pres	6.441	2.336	-8.302	-1.009
	(13.38)	(4.001)	(6.332)	(4.895)
GDP	-13.2**	3.843**	-0.619	-1.864
	(4.309)	(1.773)	(2.441)	(2.079)
Urban	-0.176	0.032	0.084	0.249**
	(0.142)	(0.042)	(0.092)	(0.0897)
ELF	26.653**	-13.01**	-6.532*	-8.714*
	(11.138)	(3.851)	(5.878)	(4.804)
Age	15.767	-1.907	3.19	1.249
	(20.389)	(9.023)	(12.329)	(8.721)
Obs.	77	77	76	76
R-squared	0.717	0.643	0.14	0.255

the influence of British colonial origin, Spanish or Portuguese colonial origin and the influence of others. Following Persson et al.'s approach, the binary variables indicating the influence of colonial history have been converted to continuous ones by discounting them by the time since independence. As a result of such discounting, the colonial history of a country which has gained independence a long time ago is given less weight than colonial history in young independent countries. The results for the subcategory health show no support for the theory and are displayed in Table 5. All the physical indicators except the life expectancy indicator have the expected signs. However, none of the estimates are significant.

There is a little more support for the theory for the subcategory education. As demonstrated in Table 6, the coefficients have the expected signs for the indicators pupil-teacher ratio and en-rollment rates. Electoral system does not have a significant effect on any of these indicators. The

Table 6: IV Regressions: Education[10]

Dep. var	Public Bad		Public Good
	Pupil	Illiteracy	Enrollment
Maj	10.555	-5.675	-10.677
	(6.474)	(20.864)	(25.211)
Pres	10.335**	-3.168	-29.535**
	(4.964)	(13.902)	(11.506)
GDP	-2.464**	-10.061**	9.523**
	(1.757)	(4.894)	(4.311)
Urban	-0.132*	-0.185	0.473**
	(0.069)	(0.163)	(0.174)
ELF	4.732	6.253	12.468
	(6.26)	(11.638)	(15.819)
Age	-1.903	4.406	18.102
	(8.542)	(16.6)	(23.573)
Obs.	71	57	71
R-squared	0.631	0.569	0.763

effect of political regime on pupil-teacher ratio and enrollment ratio is significant. Hence the IV regression methodology does not result in getting significant estimates either.

The results so far do not provide much support for the theory. However, before discussing the results, a few sensitivity analyses done to check whether the results are robust or not are presented. The unobserved heterogeneity at the country level could not be controlled because of the use of cross-section data. Therefore, the first modification that is done is to allow for continent-level fixed effects in the OLS regressions. The main variables of interest still remain insignificant.[11] The variable Pres which earlier had a significant effect on enrollment ratio is no longer significant after including the continental indicators.

The regressions are also run for a sub-sample of countries with better Polity scores. Only those

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[11]Results are summarized in Table 9 in the appendix.

Table 7: Correlation between Maj and Pres (phi-squared=0.0416)

Maj \ Pres	0	1	Total
0	30	27	57
1	20	7	27
Total	50	34	84

countries which have an average Polity index of 7.5 or better for the period 1990-1998 are included. This would ensure that only the better functioning democracies are included where the nature of political institutions would matter more. The sample size reduces by a substantial extent to only 54 countries. Results, however, remain fairly unchanged. The only change is observed in case of pupil-teacher ratio where the electoral system has a significant effect in accordance with the theory. The political regime has a significant and negative effect on the enrollment rate, a finding consistent with the earlier results. For all the indicators the effects are insignificant as found earlier.[12]

The next modification is to use the robust regressions technique. This technique is employed to limit the effect of outliers.[13] The only difference in results after employing this technique is observed in case of the dependent variable pupil-teacher ratio. The institutional variable Pres becomes significant now at 5% level of significance and has the expected sign. However, for all the other regressions, there is no significant change in the results and the main variables of interest remain insignificant.[14]

Multi-colinearity among the institutional variables might also be the reason for getting insignificant effects. Thus, it is a good exercise to find out how independent are the effects of electoral system and political regime on each other. The Pearson correlation coefficient is not a good measure of association between these two institutional variables as they are binary. Instead, the Phi correlation coefficient is used. It classifies the countries into four groups as shown in Table 7.

Hence, (Maj, Pres) can take values $(0, 0)$, $(0, 1)$, $(1, 0)$, and $(1, 1)$. If most of the values fall on

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[12]Results are summarized in Table 10 in the appendix.

[13]The method is a variant of weighted least squares regression technique. The approach is iterative [17]. In the first iteration, the weights are calculated based on the absolute residuals. Then, new weights are computed to downweigh the observations that are far from their prediction values. The process stops when the maximum difference between the weights from one iteration to the next iteration is negligible.

[14]Results are summarized in Table 11 in the appendix.

the main diagonal $(0, 0)$ and $(1, 1)$, then they are positively correlated, while if they fall on the other diagonal, they are negatively correlated. There will be little correlation if the values are scattered. Table 7 reveals that there is indeed much independent variation in the variables Maj and Pres. The Phi correlation coefficient is very low indicating little association between the two variables. So, we can conclude that multi-colinearity is not a serious issue in this context.

Since the effects of the two institutional variables may be additive, an interaction term is included in the next analysis. The marginal effect of each variable now takes into consideration the effect of the second political variable. Results do not change much and the new marginal effects are still insignificant.[15]

The last analysis is done by changing the empirical specification of the electoral system. The variable of interest Maj does not properly capture the effect of majoritarian system relative to proportional system. The left out category contains other variants of the majoritarian systems, namely, block voting, two-round system, majority voting, and variants of mixed systems besides different types of proportional systems. A separate category called *Other* is formed to capture those systems which are not single district electoral system with plurality voting and also do not fall under the proportional system. The variable Maj is now closer to capturing the effect of majoritarian system relative to proportional system. This is a simple exercise that can be done to correct the treatment of electoral variable. Except for one regression, the variable Maj still remains insignificant.[16] It now has a negative significant effect only on the life expectancy indicator under the health category. This approach, however, is not entirely correct since all the types under the Other category cannot be merged together and hence, there will be the potential problem of measurement error as before. Hence, it can be concluded that the insignificant effects of both the electoral system and the political regime on the public good indicators except for two indicators under the subcategory education are robust. Only the indicators enrollment rate and pupil-teacher ratio have significant effects as predicted by the theory.

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[15]Results are summarized in Table 12 in the appendix.

[16]Results are summarized in Table 13 in the appendix.

5 Conclusions

The objective of this paper was to test the theory of the effect of differences in democratic institutions on public good provision by examining quantity indicators of public goods. Previous works which looked at effect of political institutions used expenditure data on public goods. Expenditure data is not a good measure of the level of public good provision because a higher expenditure might be caused by higher level of corruption or political rents. This is more of a concern with regards to testing of Persson et al.'s theory because the theory simultaneously predicts that political rents will be lower in presidential and proportional systems as compared to parliamentary and majoritarian systems. It will be difficult then to interpret the results of the test using expenditure data. If the results suggest that majoritarian (parliamentary) systems spend more on public goods than proportional (presidential) systems, then it is unclear whether this indicate that the level of public good provision is higher in these systems or whether it reflects the higher level of corruption. I tested the theory using quantity indicators of public good under two broad subcategories—health and education. Overall the results of the analysis presented in this paper do not support the theory of the effect of nature of political institutions on public good provision.

The electoral system also does not seem to have any significant effect on the supply of public good. There can be two explanations for this. One is to point out the data limitations. The number of observations is very low because of the focus on only the democratic countries which is limited in number, and it is often very hard to identify any effect from such a small number of observations. The problem of unobserved heterogeneity at the country level might also be responsible for producing such insignificant results. I exploited the IV regression methodology to get consistent estimate. However, the problem there lies in to get instruments which are truly exogenous. There is no way of verifying that the instruments employed in my study satisfy the exclusion restriction.

The second explanation comes from critically reviewing the theory. The crucial assumption of the theory, namely, that the group which on average is ideologically neutral also has the highest number of swing voters might not hold. So the result that all the redistribution goes to the middle class group is questionable. Therefore it remains to be seen whether this theory breaks down in absence of such an assumption. Another problem with the theory is in the way the proportional

system is modeled. The modeling of the system is faulty because it fails to take into account the main feature of the system namely the allocation of seats in proportion to the vote shares received by the party.

The empirical specification is not entirely perfect either. The variable of interest Maj does not capture the effect of majoritarian system relative to proportional system. The left out category contains other variants of mixed systems besides different types of proportional system. The regression model was re-ran by forming a separate category for these systems which are not single district electoral system with plurality voting and also do not fall under the proportional system. The results did not alter after such a change in empirical specification. Thus, instead of just forming a separate category for other types of electoral systems, the theory needs to be reformulated so as to predict the change in public good provision level of systems which are not pure plurality rule or pure proportional systems relative to the pure plurality case. This is an exercise worth pursuing since this will more clearly partition the electoral systems and ease the empirical treatment of the electoral variable.

We now turn to the effect of political regime. Except for the two indicators under the education subcategory, namely, enrollment rate and pupil-teacher ratio, it does not seem to have any effect on public good provision measures. The same weaknesses of the empirical analysis as those just discussed above can be pointed out. The theory as well as the empirical treatment of the main variable of interest is, however, very sound. The main points of distinction between the two political regimes are very clearly specified and agree with the political scientists' view. The theory does a very good job of modeling these two features and explain clearly how the predictions regarding public good provision emerges from these features. The empirical specification carefully captures the main distinction between the two systems driving the differences in public good provision and is not questionable. Therefore, the failure of identifying the effect of political regime as hypothesized by the theory remains a puzzle. Whether the puzzle can be solved by a superior econometric modeling of the problem or by using a better data set is worth investigating.

As an extension to this paper, I plan to test the theory by using a larger data set. I will look at US cities where the city government comes in two main forms—council-manager form and mayor-council form. The difference between these two types of governments is analogous to the difference between parliamentary and presidential regimes. The advantage is that hundreds of

observations can be obtained as compared to only around 85 observations in the cross-country regression. I will also get rid of the feature of unobserved country heterogeneity that makes it difficult to get a true causal estimate of the effect of political systems on public good provision. Hence, it will be a much stronger test of the theory of the effect of political regimes on public good provision.

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Appendix

Table 8: Variable Definitions[17]

Variable Name	Definition
IMR	Infant mortality rate (per 1000 live births)
LE	Total life expectancy at birth (years)
DPT	Percentage of children under 12 months immunised against DPT
Measles	Percentage of children under 12 months immunised against Measles
Pupil	Pupil-teacher ratio, primary
Illiteracy	Percentage of illiterate people, age 15 and above
Enrollment	Secondary school enrollment rate (percentage gross)
Maj	Electoral system variable
Pres	Political regime variable
GDP	Logarithmic of real per capita GDP in 1992
Urban	Percentage of population that is urban
ELF	Ethno-lingusitic fractionalisation index
Age	Age of democracy

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[17] All variables are averages for the period 1994-1999 unless otherwise noted.

[18] Robust standard errors are reported in the parentheses. * and ** indicate statistical significance at the 10% and 5% levels respectively.

Table 9: OLS Regressions: Inclusion of Continent-level Fixed Effects[18]

| Dep. var | Health | | | | Education | | |
| | Public Bad | Public Good | | | Public Bad | | Public Good |
	IMR	LE	DPT	Measles	Pupil	Illiteracy	Enrollment
Maj	2.286	-1.538	-1.277	-1.147	1.708	0.958	- 1.795
	(5.203)	(2.67)	(2.565)	(1.151)	(1.919)	(4.883)	(5.654)
Pres	2.407	0.463	0.786	-0.325	1.88	0.619	-8.492
	(5.373)	(2.611)	(2.492)	(1.36)	(2.394)	(4.914)	(6.87)
Continent-level Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	77	76	76	77	70	56	70

Table 10: OLS Regressions: Sub-sample of Better Democracies[18]

| Dep. var | Health | | | | Education | | |
| | Public Bad | Public Good | | | Public Bad | | Public Good |
	IMR	LE	DPT	Measles	Pupil	Illiteracy	Enrollment
Maj	3.733	-1.18	-1.863	-1.552	4.81**	6.422	- 4.663
	(4.314)	(1.915)	(2.589)	(2.804)	(1.881)	(6.336)	(6.157)
Pres	1.216	0.232	-2.455	-0.352	2.577	-3.166	-18.231**
	(3.825)	(1.08)	(3.438)	(2.759)	(2.49)	(4.66)	(6.272)
Obs.	49	49	48	48	45	29	46

Table 11: Robust Regressions Method Results[18]

	Health				Education		
	Public Bad	Public Good			Public Bad		Public Good
Dep. var	IMR	LE	DPT	Measles	Pupil	Illiteracy	Enrollment
Maj	3.88	-1.395	-1.284	-0.988	3.032	4.213	-2.995
	(4.441)	(2.583)	(2.33)	(0.873)	(1.923)	(4.475)	(6.128)
Pres	3.05	-2.142	-1.289	-0.329	4.181**	1.59	-41.383**
	(4.175)	(2.467)	(2.182)	(0.821)	(1.799)	(3.914)	(18.189)
Robust Regression Technique	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	77	76	76	77	70	56	70

Table 12: New Marginal Effects in Presence of Interaction Term[18]

	Health				Education		
	Public Bad	Public Good			Public Bad		Public Good
Dep. var	IMR	LE	DPT	Measles	Pupil	Illiteracy	Enrollment
Maj	5.729	-1.477	-1.482	-2.125	2.304	3.742	0.644
	(6.584)	(2.567)	(2.392)	(1.86)	(2.159)	(5.023)	(5.236)
Pres	4.496	-2.123	–0.291	-0.811	1.449	2.119	-17.597**
	(4.677)	(2.452)	(2.134)	(1.33)	(2.048)	(3.698)	(4.606)
Interaction Term of Maj and Pres	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	77	76	76	77	70	56	70

Table 13: Inclusion of "Other" category for all different electoral types other than plurality rule and proportional representation[18]

| | Health | | | | Education | | |
| | Public Bad | Public Good | | | Public Bad | | Public Good |
Dep. var	IMR	LE	DPT	Measles	Pupil	Illiteracy	Enrollment
Maj	12.334	-1.785	-3.954	-5.547*	3.944	7.991	-8.069
	(8.724)	(3.854)	(3.757)	(2.995)	(3.153)	(6.145)	(7.14)
Pres	4.713	-2.174	-1.105	-0.951	3.348	2.119	-21.549**
	(4.393)	(2.565)	(2.28)	(1.201)	(2.052)	(4.122)	(5.041)
Other	-1.015	-2.445	-1.289	1.063	-0.531	-2.189	-3.807
	(5.014)	(2.478)	(3.07)	(1.178)	(2.074)	(5.151)	(6.411)
Obs.	77	76	76	77	70	56	70