

To What Extent Does Economic Growth Affect Political Institutional Quality?

GQXT5

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Abstract

To what extent does economic growth affect the political institutional quality? Existing studies establish the relationship between higher economic growth and democracy, but there are several problems with the measurements of democracy such as Freedom House and Polity IV. A fundamental problem with these measurements lies in their limited conceptions of democracy. This article deals with this empirical challenge using the new Varieties Of Democracy (V-Dem) data, tracking the change in political institutional quality from 1900 to 2016. The analysis shows that a strong positive relationship can be seen between Gross Domestic Product (GDP) per capita and the political institutional quality, measured by Deliberative Democracy Index (DDI). This relationship persists when using fixed effects regression between economic growth and DDI for the same period. The fixed effects estimate is robust even when other measures of democracy is used.

1 Introduction

In 2019, an unusually large number of protests were happening across the world. Some of the issues that perpetuated these protests included economic

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and democracy concerns. Out of 16 countries that had major protests in 2019, nine of them had GDP per capita (PPP) higher than the median world level in 2019 (World Bank, 2020). Only four of the nine, which were all European countries, had Deliberative Democracy Index (DDI) scores higher than the median world level. Therefore, to what extent does economic growth affect the political institutional quality? In other words, when a country becomes rich, are the citizens more likely to demand the ruling elites to improve its democracy?

Currently, there is a robust body of literature that examines the causal effect of economic growth on democracy. For example, Przeworski and Limongi (1997) investigate the relationship between economic development and democracy and argue that there is no exact relationship between the two variables. Although high income countries are not necessarily democratic countries, they argue that having a large per capita income is a strong predictor of whether a democracy can survive. In the income-democracy debate, there are two major strands of research. The first one is the modernization theory, which posits that democracies are more likely to emerge when countries developed economically (Lipset, 1959). Przeworski and Limongi's (1997) paper is part of this first strand of research. The second strand of research is referred to as the critical juncture hypothesis, which posits that institutional change that affects both economic and political development is affected by the differences during certain critical historic events (Acemoglu et al., 2008). The predominant findings of works such as Boix (2003) and Acemoglu et al. (2001) suggest specific past events that effect the institutions of a country persist to the present.

Nonetheless, there are several problems with the current literature. First, while many papers investigate the relationship between economic growth and democracy, it is not clear in what channels the two variables interact. The second problem arises from the measurement of democracy. For example, measures such as Freedom House and Polity IV use experts' assessments which are prone to bias in political ideologies. Another problem concerns the aggregation of separate indicators of democracy. Since democracy is a multifaceted concept, composite indices should address how indicators are aggregated (Coppedge et al., 2011). For example, the Polity index consists of five components: competitiveness of participation, regulation of participation, competitiveness of executive recruitment, openness of executive recruitment and constraint on executive. Although these indicators are disaggregated, the coding methods and the aggregation procedures are not clear. Similar prob-

lem arise if the intercorrelations between components of the measurement are high. For example, inter-correlations between components of Freedom House index are high, which are around 0.86 or higher. The high intercorrelations and ambiguous coding procedures could suggest that the components are not independent of each other.

In this paper, I revisit the relationship between economic growth and democracy by focusing on the political institutional quality. This paper aims to investigate whether the relationships presented in the literature persist when a better measurement of democracy is used. Using Varieties of Democracy (V-Dem) and fixed effects regression. I will estimate the causal effect of economic growth on political institutional quality. V-Dem uses over 450 indicators in multidimensional and disaggregated methods to conceptualize and measure democracy (Coppedge et al., 2020). There are several advantages in using V-Dem data. First, V-Dem uses a multidimensional conception of democracy, some of which is not covered by other measurements of democracy. Second, V-Dem data is collected in a disaggregated method which is useful because indicators that best reflect the political institutions aspect in a democracy can be chosen. Additionally, each indicator in the V-Dem data has been cross-checked and coded by multiple experts, which protects the data from biased value judgements.

For the methodology, this paper adopts the econometric model used by Acemoglu et al. (2008). By using fixed effect regression, country-specific factors that affect both income and democracy can be controlled. A fixed effect estimate is useful as it allows us to move from cross-country variation, which is how countries differ with regards to economic growth and political institutional quality, to within-country variation. Therefore, we focus on the likelihood of a country to have a better quality political institution as it becomes relatively wealthier. The main finding of this paper is there is a strong positive relationship between GDP per capita and the Deliberative Democracy Index (DDI). This positive association persists when fixed effects and covariates are introduced. The model demonstrates that a one per cent increase in the log GDP per capita is associated with a 0.015 point increase in DDI score for a country annually on average. Although the results for ordinary least squares (OLS) regression confirms previous findings, our results suggest that the association between these two variables is stronger than previously suggested.

This paper proceeds as follows. In the literature review section, I will discuss the current debate of modernization theory and critical juncture hy-

pothesis on the relationship between economic growth and democracy. Subsequently, I will discuss the problems with the measurements of democracy used in current literature and will propose the use of V-Dem as the new measurement of democracy. In the methodology section, I will describe the data source for political institutional quality and economic growth. This paper will use the measure of deliberative democracy to represent the concept of political institutional quality. Next, I will describe the data and present the econometric model. In the results section, I will present the findings of fixed effects regression using data between 1900 and 2016 and discuss the assumptions and robustness of the model used, while addressing the limitations of the data. Finally, in the conclusion section, I will summarise the debate discussed in this paper, the results of the models and the policy implications of the results. The appendix contains further information about the indicators used in the Deliberative Democracy Index and its aggregation methods.

2 Literature Review

Modernization theory

Although a vast amount of literature has investigated how economic growth affects democracy, we still lack a complete theory of political transition. Understanding the relationship between these two factors is important when constructing effective development policies. One stream of research originating from Lipset (1959) is called modernization theory. The theory posits that democracies are more likely to emerge as a developed economically (Lipset, 1959; Dahl, 1971; Huntington, 1991; Rusechemeyer et al., 1992). In his paper, Lipset (1959) assesses the conditions associated with the existence and persistence of a democratic society. This study was the first to use a statistical method to argue that the two conditions needed for the formation of democracy were economic development and legitimacy. Although newer studies have shown that there is not enough evidence to support Lipset's argument, his paper was the first one to point out the relationship between economic development and democracy. In *Modernization: Theories and Fact*, Przeworski and Limongi (1997) investigate the relationship between economic development and democracy. They argue that although there is no exact relationship between the level of income and the formation of democracy, per capita income is a strong predictor of a democracy's survival. Hence, economic

development only matters to the regime after a democracy is established. Other research such as Przeworski (2000) also supports this argument.

Although these research show that there are relationships between economic development and democracy, they do not explain the mechanism in which democracies emerge. Boix (2003) argued that there are several limitations to the current statistical analysis on modernization theory, namely, the time frame used and the causal mechanism in which economic development changes the political regime. For example, the data used by Lipset (1959) was limited to the period after WW2. Hence, we do not know whether the correlation persists to the period before the war. In addition, he posits that economic growth is a sufficient condition, but not a necessary one for a country to become a democracy. Both Boix (2003) and Robinson (2006) argue that current literature is limited because the issue of the causal relationship between economic development and democracy is not addressed. Although there is enough evidence to indicate income per capita is associated with democracy, we do not know they are causally related. Arguably, Boix (2003) was the first to explain this mechanism by using the preferences of political actors to different types of political regimes. Using indicators such as the domestic distribution of economic asset, or 'economic equality' and distribution of political resources, he developed and tested a unified model that derived the distribution of different political regimes. Boix posits that democracy prevails when economic equality or capital mobility is high.

Recently, several papers have examined the causal relationship between economic development and democracy. Acemoglu et al. (2008). employed two strategies to investigate the causal relationship between the two variables. When using fixed effect regression and controls for country-specific factors, they found that the positive relationship between income per capita and various measures of democracy disappeared. They found that a ten per cent increase in GDP per capita was associated with an increase in the Freedom House index score by less than 0.007. Next, they employed instrumental variable regressions to estimate the causal effect of income on democracy. They used past savings rates and changes in the incomes of trading partners as instrumental variables. Similarly, they found no evidence of a causal relationship between income and democracy in both instruments. However, the most important contribution that they made was the identification of a cross-country correlation between income and democracy over the past 500 years that simultaneously answers Boix's (2003) criticism on the external validity of Lipset (1959). Using Maddison's (2003) estimates of income per

capita between 1500 and 2000 and Acemoglu's et al. (2005) estimate of the variation in political institutions, they found a strong correlation between the two variables. Nonetheless, the positive relationship between income and democracy disappears when other factors such as measure of early political institutions, constraint on the executive at independence, independence year and presence of religions are included. This identification is necessary for this paper as it introduces the control variables that our regression needs to account for to avoid omitted-variable bias. Furthermore, the evidence from the work of Acemoglu et al. (2008) also supports the new critical juncture hypothesis, which this paper will discuss below. Finally, Acemoglu et al. (2008) uses fixed effect regression to estimate the causal relationship between income and democracy, which this paper will adapt. The specification of this model will be discussed in the methodology section.

Critical juncture hypothesis

Another stream of research is called critical junctures hypothesis which posits that institutional change in both economic and political development is affected by the differences in critical historical events (Moore, 1966; Acemoglu et al., 2001). In *Social Origins of Dictatorship and Democracy*, Moore (1966) investigates the development processes of societies from agrarian to industrial ones. Moore argues that the trajectories of these societies depend on the presence of strong middle class, or 'bourgeoisie'. Moore posits that there are three possible paths for these societies: (1) the capitalist-democratic route, (2) the capitalist-reactionary route or (3) the communist route. In the capitalist democratic route, such as England, France and the United States, societies emerge as the result of the strong bourgeoisie, and the aristocracy either accepted its democratizing efforts or was destroyed in a bourgeoisie revolution. The capitalist-reactionary route taken by countries such as Germany and Japan. These societies develop as a result of bourgeoisie class weaker than that of capitalist-democratic route, leading them to form a coalition with the aristocratic to protect their economic interest from the peasantry. The result was an authoritarian state with characteristics of quasi-democratic rule. Moore argues that if the coalition is unable to reform during economic crises, reactionary leaders would bring about a revolution leading to fascism. Finally, for countries like Russia and China, who took the communist route due to an absence of bourgeoisie and strong peasantry. As a result, communism emerged because the aristocracy was unable to oppose a peasant revolt.

Research has attempted to identify the causal mechanism for critical juncture hypothesis. In their paper, Acemoglu et al. (2001) estimate the causal impact of institutions on the income per capita of European colonies using mortality rates expected in the first European settlers to explain the source of variation in institutions. Using settlers' mortality rates as the instrument, they found that a one per cent increase in average protection against expropriation risk led to a 0.94 increase in income per capita. European settlers adopted different colonization strategies depending on the feasibility of settlement. In places with higher mortality rates, European settlers set up extractive states. If building a settlement was possible, they set up administrative states such as the United States, Australia and New Zealand. However, there are several problems with this paper. Two assumptions needed in an instrumental variable analysis are exclusion restriction and randomisation. Exclusion restriction means the instrument only affects the outcome variable through the treatment variable. In the context of the paper, exclusion restriction implies mortality rates affect income per capita only through the institution channel. Exclusion restriction might be violated because there is a strong correlation between European settlers' mortality rates and current economic output (Assenova and Regele, 2017). Nonetheless, this paper contributes to the literature by isolating the exogenous source of variation in institutions, which could be explained by the difference in colonial experience. The research of Acemoglu et al. (2001) is an important theoretical component to this paper since we can now presume that to find the causal mechanism between economic growth and political institutional quality, one must isolate the potential source of the exogenous variations for the two variables.

To summarise, there are differing views on democratic political transition and how economic growth affect this. The first strand of research originating from Lipset (1959) argues that economic growth is a necessary condition for a polity to transition to democracy. Although there is strong evidence of the association between income and democracy, there is not enough evidence to suggest a causal relationship between the two variables. In other words, we do not know whether having a higher income causes a country to transition to democracy or vice versa. The second strand of research is the critical juncture hypothesis which posits that differences in critical historical events influence the way institutional changes take place. These institutional formations then affect the trajectories of economic and political development of a country. Although the advancement of statistical analysis techniques such

as instrumental variable analysis allows researchers to find causal effects between variables, there are some limitations to it. Scholars have different views on the mechanism in which a country transitions to democracy. For example, Moore (1966) argues that the size and presence of the middle class is a critical factor for political transition. Whereas, Acemoglu et al. (2001) posit the feasibility of a settlement is a critical factor of institutional development. Hence, it is difficult to identify all the possible critical factors that we must consider in the critical juncture hypothesis. Nonetheless, these papers are relevant because they allow us to identify some of the control variables that our models need to take into account.

Problems with literature

Although the studies discussed in the literature use various methodologies and data sources, the strength of their empirical evidence has come under question based on several reasons. One of the problems is the measurement of democracy. Most of the studies discussed in this section employ only one indicator for democracy and do not test whether the conclusions are affected by changes in the measurements of democracy or political institutions (De Haan, 2007). For example, Acemoglu et al. (2008) use two measurements of democracy, Freedom House and Polity IV. The weaknesses of these measurements have been documented, which is discussed in the following section.

Conceptualizing Democracy

Democracy is defined as a set of practices and principles that institutionalise and protect freedom (Kekic, 2007). This definition entails that a democracy must include a government that is based on majority rule and consent of the governed, free and fair election, protection of minorities and respect for basic human rights. One challenge with defining democracy is deciding the scale of the indicators. For example, a dichotomous indicator would mean that a state either has or does not have a free and fair election. A dichotomous indicator would also lump together states that exhibit different regime qualities (Coppedge et al., 2011). For example, Papua New Guinea and Sweden might receive the same score in the “free and fair election” indicator, despite having different qualities of elections. In addition, a continuous indicator of democracy might be more sensitive to gradations of democracy or autocracy because they have more rankings. For example, two countries might score

the same in the “protection of minorities right” indicator, but these scores do not capture the extent to which the countries differ from each other in terms of protecting minorities’ rights.

There are several problems with measuring democracy using Freedom House and Polity IV. One major problem with the Freedom House index is that it uses expert assessment to fill in missing indicators. Although it uses the results of public opinion surveys, these surveys are mostly used in political participation and political culture categories. Meanwhile, experts assessments and survey results for similar countries are used to fill in missing indicators. The Freedom House does not report these expert numbers, nationalities and backgrounds. Therefore, the Freedom House index might be predisposed to value judgements that favour the political ideologies of the experts. Another problem concerns the aggregation of separate indicators. Since democracy is a multi-faceted concept, composite indices should address the way indicators are aggregated (Coppedge et al., 2011). For example, the Polity index consists of five components: competitiveness of participation, regulation of participation, competitiveness of executive recruitment, openness of executive recruitment and constraint on executive. Although these indicators are disaggregated, it is not clear how the indicators are coded, or the aggregation procedures that were used. Similar problems arise when the intercorrelations between components are high. For example, inter-correlations between components of the Freedom House index are high, which are around 0.86 or higher. The high intercorrelations and ambiguous coding procedures could suggest that the components are not independent of each other.

V-Dem

Based on the problems surrounding current measures of democracy and political institutional quality, an alternative approach is to use a new measurement that solves these issues. Hence, this paper contributes to the literature by using the Varieties of Democracy (V-Dem) data to find out the relationship between economic growth and political institutional quality. There is a lack of literature that estimates this causal relationship using V-Dem, as the survey for the dataset only started in 2015.

There are several advantages to using V-Dem data. In their paper, Lindberg et al. (2014) outlined several advantages to this measurement method. First, V-Dem uses a multidimensional conception of democracy, some of which are not covered by other measurements of democracy. These dimen-

sions are electoral, liberal, participatory, deliberative and egalitarian. A multidimensional approach allows researchers to choose the definition of democracy that fits their research purpose. Each category of V-Dem is based on answering different questions that represent different aspects of democracy. The questions are:

Electoral: How responsive are rulers to citizens through competitions for the approval of a broad electoral in a periodic election?

Liberal: To what extent does the institution protect individual and majority rights against 'tyranny of the majority'?

Participatory: How active are the citizens in participating in the political process?

Deliberative: To what extent are political decisions taken based on respectful and reasonable dialogue rather than emotional appeals, parochial interests or coercion?

Egalitarian: Do material and immaterial inequalities inhibit the actual exercise of formal rights and liberties?

Majoritarian: Do the majority of the people have the capacity to rule and implement policies?

Consensual: Do the majority disregard political minorities? In addition, to what extent is each group represented?

Second, data is collected in a disaggregated method and researchers can choose to use disaggregated or aggregated data. Third, there are multiple experts to code each subjective indicator, which allows cross-checking between each component. Therefore, it is very unlikely for each component to be interdependent of each other.

Given this set up, we expect the results of our analysis to be consistent with the evidence established in the literature, particularly Acemoglu et al. (2008). To summarise, this paper seeks to investigate the research question, "To what extent does economic growth affect political institutional quality" using V-Dem data from 1900 to 2016. This paper focuses on electoral

and deliberative conceptions of democracy to represent political institutional quality.

3 Methodology

Data Source

This paper adopts the research methodology used in Acemoglu et al. (2008). The primary data used in this thesis is Varieties of Democracy (V-Dem) and the variables in this paper are documented in the Appendix section. The data has been compiled among 202 countries and has over 450 indicators. For both of the variables of interest, there is 27013 number of observations from 1789 to 2018. The surveys are filled by over 3000 scholars and country experts. As discussed in the Literature Review section, one problem with democracy measurement and coding concerns the use of experts' assessments. V-Dem solves this by dividing data coding task based on different indicator types. All 470 V-Dem indicators are divided to five categories, factual (A) indicators, factual (B) indicators, evaluative (C) indicators, composite indices (D) and Type (E) data (Coppedge et al., 2020). Factual (A) data are coded from existing sources or datasets, while factual (B) data are coded by country-specific experts. Type (C) indicators are coded by experts in political historians as they are mostly historical data. Composite indices (D) are composed of A, B or C variables. Finally, type E is data directly from other sources.

V-Dem main indices or "High Level Democracy Indices" are Electoral Democracy Index, Liberal Democracy Index, Participatory Democracy Index, Deliberative Democracy Index and Egalitarian Democracy Index. We find the measurement that best reflects political institutional quality is the Deliberative Democracy Index. The index is measured in an interval scale, from low to high, or 0 to 1, with 1 representing the ideal deliberative democracy. A country receives the highest score if it comes closest to the ideals suggested by the relevant questions, such as whether rules are responsive to citizens, whether political and civil society organizations can operate freely, whether elections are clean and whether political elites give public justifications for their positions (Coppedge et al., 2020). The index consists of two sub-indices, which are Electoral Democracy Index (EDI) and Deliberative Component Index (DCI). EDI measures the extent to which ideal electoral

democracy is achieved while DCI measures the extent to which political decisions are made for the common good. Both indices use interval scale from 0 to 1. One limitation of this choice is the outcome variable only takes into account ‘electoral’ and ‘deliberative’ conceptions of democracy. Therefore, this measurement is a minimalist approach to the concept of political institutional quality.

Deliberative Democracy Index aggregation formula includes both additive and multiplicative terms. In addition, each term is given equal weightings as there is no good justification to prefer additive terms over multiplicative term (Coppedge et al., 2020). Therefore, the index is aggregated with the following method:

$$\textit{Deliberative Democracy} = 0.25\textit{EDI} + 0.25\textit{DCI} + 0.5\textit{EDI} \times \textit{DCI}$$

Electoral Democracy Index consists of indicators such as freedom of associations (FA), clean elections (CE), freedom of expressions (FE), elected officials (EF) and suffrage (S). The index is aggregating by taking the weighted average of these indicators and five-way multiplicative interaction between these indicators. Similar to DDI, the authors argue that there is no justification to prefer additive over multiplicative term (Coppedge et al., 2020). Therefore, this aggregation is a compromise between equally-weighted average and strict multiplication. The index is aggregated using this formula:

$$\begin{aligned} \textit{Electoral Democracy} = & 0.25\textit{EDI} + 0.25\textit{DCI} + 0.5\textit{EDI} \times \textit{DCI} \\ & + 0.5\left(\frac{1}{8}\textit{FA} + \frac{1}{4}\textit{CE} + \frac{1}{4}\textit{FE} + \frac{1}{8}\textit{EF} + \frac{1}{4}\textit{S}\right) \end{aligned}$$

The GDP per capita (in PPP) between 1789 to 2018 is from Maddison (2018). Other variables we use in the analysis are discussed later in Appendix A. Table 1 contains descriptive statistics for the main variables. The sample period is from 1789 to 2018. The table shows statistics for all countries, such as mean, minimum and maximum values.

I have taken several steps to clean the data. After downloading the data from V-Dem Official website, I have subset the variables of interest. These include DDI, EDI, year and country’s name. Overall, the data contains 27,013 number of observations on each variable. Nonetheless, there are a large number of missing values in the data. In the fixed effects regression

model, only 12, 123 observations are used. Therefore, the missing values in the dataset are about 50%.

Descriptive Statistics and Data Visualizations

Table 1 contains descriptive statistics for the variables of interest between 2011 and 2016. The variable appendix is provided at the end of this paper for other indices, indicators and the survey questions used. In each case, we report the mean, standard deviations and number of countries and the total observations.

Table 1: Descriptive Statistics

Variable	N	Mean	Standard Deviation	Minimum	Maximum
Deliberative Democracy Index (2016)	179	0.419	0.256	0.012	0.870
Electoral Democracy Index (2016)	179	0.536	0.256	0.023	0.913
GDP Per Capita in PPP terms (2016)	160	18500	19700	619	14000

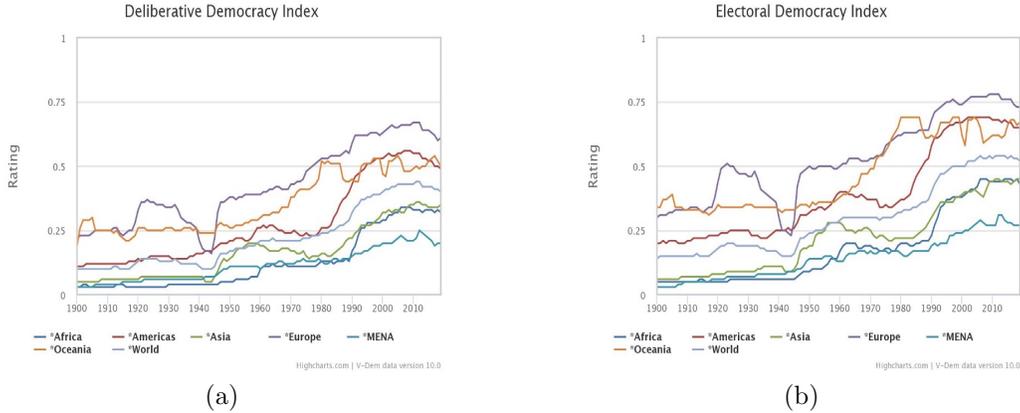


Figure 1: Plot of DDI and EDI 1900-2019 by regions

First, the world's mean DDI decreased from 0.436 to 0.419. Similarly, EDI decreased from 0.538 to 0.536. All regions DDI fell slightly in the mid-2010s. In addition, Europe consistently has the highest DDI compared to other regions, while Oceania overtook the Americas. Similar trends can be observed for EDI in Figure 1a. However, the mean GDP per capita of all the world increase from 17400 to 18500 (in PPP terms). Figure 2a shows the plot of DDI against log GDP per capita in 2016, with a Pearson correlation

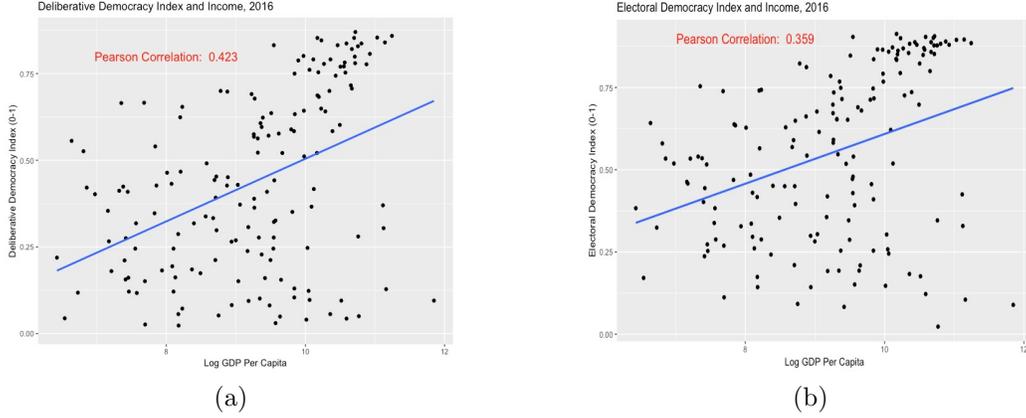


Figure 2: Plot of DDI and EDI against log GDP per capita (2016)

coefficient of 0.423. DDI exhibits a positive relationship with log GDP per capita in 2016. The coefficient of log GDP per capita term is 0.09 (standard error = 0.0154, $N = 160$), which suggests that a one per cent increase in log GDP per capita is associated with 0.09 point increase in DDI, which is statistically significant. Similar result is shown in Figure 2b, when EDI is plotted against log GDP per capita in 2016. Although the Pearson correlation coefficient is lower, which is 0.359, the coefficient of log GDP per capita is 0.15 (standard error = 0.016), which is statistically significant.

Econometric model

This article adopts the econometric model proposed by Acemoglu et al. (2008). The following model is used:

$$DDI = \alpha + \beta \log GDP + \gamma Covariates + \delta + \mu_t + \epsilon$$

where DDI is the Deliberative Democracy Index. The main variable of interest is β , which is the coefficient on log income per capita, which measures the causal effect of economic growth on the political institutional quality. The term γ is the coefficients on covariates and δ is the country specific dummies. The term μ_t is the set of time effects that captures the shocks to political institutional quality at time t . Finally, ϵ denotes the error term. In other words, each country δ has β point effect on political institutional quality at a set of time μ_t

In the Literature Review section, I have addressed the problem in identifying all the possible critical factors in critical juncture hypothesis. Each country may have its characteristics that may or may not influence its political trajectory. For example, Moore's (1966) framework suggests that a country with strong middle class but a weak elite will transition in a capitalist-democratic route. Since it is not possible to know whether this factor affects each country, fixed estimate allows us to remove the effect of time-invariant characteristics (Torres-Reyna, 2007). Therefore, we can assess the net effect of economic growth on political institutional quality. In addition, this approach allows us to estimate within-country variation, rather than cross country variation (Acemoglu et al., 2008). In other words, is a country more likely to have better political institutional quality over time as it becomes richer. Furthermore, this approach is more related to Lipset's (1959) modernization theory, which posits that a country should become more democratic if they are richer, not simply because rich countries should be democratic (Acemoglu et al., 2008).

An assumption of this model is the time-invariant characteristics are unique to each country and should not be correlated with other countries (Torres-Reyna, 2007). Using Moore's (1966) framework, the presence and strength of a country's middle class must not have any effect on another country's middle class. While the assumption is reasonable in the context, it has some implications for the interpretations which I will elaborate in the Discussion section.

4 Results

Currently, there are different views on democratic political transition and the role of economic growth in the process. The first strand of research in this topic originates from Lipset (1959), who argues that economic growth is a necessary condition for a polity to transition to democracy. Previous literature such as Przeworski and Limongi (1997) and Boix (2003) suggest that although there is strong evidence in the association between income and democracy, there is not enough evidence to identify the relationship as causal. The second strand of research is the critical juncture hypothesis which posits that differences in critical historical events influence the way institutional changes take places. These critical events shape the polity's institutional formations which then affect the trajectories of economic and

political development of a country. This paper adopts the econometric model proposed by Acemoglu et al. (2008) which uses fixed effects model to estimate within-country variation rather than cross-country variation. In the Literature Review section, this paper has identified several covariates to include in the model. These covariates are inequality, education and freedom of religion. The model uses measures of these covariates from the V-Dem data such as average years of education among citizens older than 15, educational inequality, equality in the distribution of resources and freedom of religion index. The measurements and aggregation method for these covariates are shown in the Appendix section. In this section, I re-assess the relationship between economic growth and political institutional quality using OLS and fixed effects regressions. The first two models use DDI and EDI. The results of the OLS regressions show that there are strong relationships between economic growth and political institutional quality for both measures. The relationships are also statistically significant when fixed effects are included. The relationship persists when the model includes other covariates such as inequality and education.

We begin by estimating the fixed effects regression using DDI data for the period 1900 to 2018. Table 2 uses Deliberative Democracy Index and Table 3 uses Electoral Democracy Index. The first column of Table 2 shows the result of OLS regression between DDI and log GDP per capita. The coefficient of log GDP per capita variable is associated with 0.143 point increase in DDI. This association is statistically significant and the effect of economic growth is large. To put in context, the difference in DDI score between the United States and Colombia in 2016 is 0.2. Similarly, column 2 shows the relationship between DDI and log GDP per capita. Although the magnitude of the association decreases, the effect is statistically significant. The coefficient on log GDP per capita suggests that a one per cent increase in log GDP per capita is associated with 0.047 point increase in DDI score for a country in a year. To demonstrate the magnitude of this association, consider South Korea. Between the year 1980 and 1985, its GDP per capita increased from USD\$5645 to USD\$7322, a change of almost 30%. During that period, its DDI score increased from 0.079 to 0.106. Moreover, the relationship persists even when other covariates are taken into account. Column 3 shows the result of the fixed effects regression when we include other covariates. The coefficient on log GDP per capita is 0.015 with a standard error of 0.003, which is statistically significant. The interpretation of this coefficient is one per cent increase in the log income per capita in a country is associated with

an average change of 0.15 point in DDI score every year. All the covariates except average years of education have positive relationships with DDI and are statistically significant. For example, the coefficients equal distribution of resources index and freedom of religion index are 0.265 and 0.1 respectively, which are highly significant. At the country level, 81 countries have a statistically significant relationship at the 0.1 level.

Table 2: Fixed Effects Results using Deliberative Democracy Index as Measures of Political Institutions Quality

	<i>Dependent variable:</i>		
	v2x.delibdem		
	<i>OLS</i>		<i>panel linear</i>
	(1)	(2)	(3)
Log GDP per capita	0.143*** (0.002)	0.047*** (0.003)	0.015*** (0.003)
Education after 15			0.001 (0.002)
Education inequality			0.001*** (0.0001)
Equality of resources			0.265*** (0.010)
Freedom of religion			0.100*** (0.001)
Constant	-0.901*** (0.014)		
Observations	12,123	12,123	9,285
R ²	0.379	0.021	0.410
Adjusted R ²	0.379	-0.002	0.393
Residual Std. Error	0.207 (df = 12121)		
F Statistic	7,398.727*** (df = 1; 12121)	255.555*** (df = 1; 11843)	1,253.827*** (df = 5; 9038)

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 3 reports the model's results using Electoral Democracy Index. Column (1) is the OLS and column (2) is the fixed effect model. Column (3) adds covariates such as inequality and freedom of religion. Similar to Table 2, there is a strong and statistically significant relationship in the OLS and fixed effects regression. Furthermore, when the controls are introduced, the relationship between economic growth and political institutional quality persists. The coefficient on log GDP per capita is 0.017 with a standard error of 0.004, which is statistically significant. In addition, the covariates also have a positive relationship with the outcome variable. Although this paper focuses on political institutional quality rather than democracy as a whole, the results are still consistent when other measures are used. Table 4 and 5 show the results of the model when other conceptions of democracy are

used. Table 4 uses participatory conception of democracy which is measured by Participatory Democracy Index while Table 5 uses egalitarian conception of democracy that utilises Egalitarian Democracy Index. The results of the model are consistent even when other conceptions of democracy are used.

Table 3: Fixed Effects Results using Electoral Democracy Index as Measures of Political Institutions Quality

	<i>Dependent variable:</i>		
	<i>OLS</i>	<i>v2x-polyarchy</i>	<i>panel linear</i>
	(1)	(2)	(3)
Log GDP per capita	0.149*** (0.002)	0.054*** (0.003)	0.017*** (0.004)
Education after 15			-0.006*** (0.002)
Education inequality			-0.001*** (0.0001)
Equality of resources			0.258*** (0.011)
Freedom of religion			0.107*** (0.002)
Constant	-0.854*** (0.014)		
Observations	14,076	14,076	9,285
R ²	0.372	0.023	0.369
Adjusted R ²	0.372	-0.005	0.352
Residual Std. Error	0.216 (df = 14074)		
F Statistic	8,328.565*** (df = 1; 14074)	324.147*** (df = 1; 13685)	1,057.802*** (df = 5; 9038)

Note: *p<0.1; **p<0.05; ***p<0.01

To conclude, I have re-assessed the relationship between economic growth and political institutional quality measured by DDI and EDI. The results of the OLS regression show that there are strong relationships between economic growth and political institutional quality. In addition, the relationships are also highly significant when fixed effects and covariates are included in the model. Although the magnitude of the association decreases, the effect is statistically significant.

Table 4: Fixed Effects Results using Participatory Democracy Index as Measures of Political Institutions Quality

	<i>Dependent variable:</i>		
	v2x_partipdem		
	<i>OLS</i>		<i>panel linear</i>
	(1)	(2)	(3)
Log GDP per capita	0.112*** (0.001)	0.045*** (0.002)	0.010*** (0.002)
Education after 15			0.001 (0.001)
Education inequality			0.001*** (0.0001)
Equality of resources			0.171*** (0.007)
Freedom of religion			0.071*** (0.001)
Constant	-0.701*** (0.010)		
Observations	14,073	14,073	9,285
R ²	0.392	0.034	0.387
Adjusted R ²	0.392	0.006	0.370
Residual Std. Error	0.156 (df = 14071)		
F Statistic	9,085.453*** (df = 1; 14071)	474.386*** (df = 1; 13682)	1,140.632*** (df = 5; 9038)

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 5: Fixed Effects Results using Egalitarian Democracy Index as Measures of Political Institutions Quality

	<i>Dependent variable:</i>		
	v2x_egalDEM		
	<i>OLS</i>		<i>panel linear</i>
	(1)	(2)	(3)
Log GDP per capita	0.143*** (0.001)	0.046*** (0.002)	0.010*** (0.002)
Education after 15			0.007*** (0.001)
Education inequality			0.002*** (0.0001)
Equality of resources			0.368*** (0.007)
Freedom of religion			0.065*** (0.001)
Constant	-0.897*** (0.012)		
Observations	12,123	12,123	9,285
R ²	0.440	0.033	0.481
Adjusted R ²	0.440	0.010	0.466
Residual Std. Error	0.181 (df = 12121)		
F Statistic	9,539.511*** (df = 1; 12121)	400.105*** (df = 1; 11843)	1,671.985*** (df = 5; 9038)

Note:

*p<0.1; **p<0.05; ***p<0.01

5 Discussion

The main finding of this paper is that higher levels of economic growth are associated with measures of political institutional quality. This relationship persists when controlling for country and time fixed effects. The coefficient of interest, β ranges between 0.15 to 0.17(standard error = 0.003), which is statistically significant. The interpretation for the two-way fixed-effects coefficient is the average difference in intra-unit changes in the dependent variable for each one unit variation in the independent variable at time point t , averaged across time points (Hill et al., 2019). To put it simply, one per cent increase in the log income per capita is associated with an average change of 0.15 point in DDI score every year.

In this section, we will discuss the robustness of the result, its limitations and compare it to the previous findings. We utilise two additional tests to further increase confidence in the result. First, the Hausman test is used to examine whether it is justifiable to employ a fixed effects model. A second robustness test examines the possibility of cross-sectional dependence in the model. We employ Pesaran’s (2004) CD test to investigate this. Then, we discuss the limitations in the result, namely (1) high intercorrelation between index values and (2) missing values in the data. Finally, we compare the results to the previous findings and its implication in understanding this topic.

Robustness

One advantage of using a fixed effects model is reducing omitted variable bias. Acemoglu et al. (2008) argue that the major source of potential bias in a regression of democracy on income per capita is country-specific factors that affect both political and economic development. They suggest that if these characteristics are time-invariant, using fixed effects estimation will remove this source of bias. Time-invariant characteristic is defined as any variable that has the same effects across time (Williams, 2018). To check whether it is reasonable to use fixed effects model, I employ Hausman test using the *phptest* function in R *plm* package. The intuition behind the test is that under the hypothesis of no correlation between the error term and independent variables, both random and fixed effects estimators are consistent (Greene, 2018). Therefore, under the null hypothesis, the two estimates should not

differ systematically. The test specification is as the following:

$$Var(b - \beta) = Var(b) + Var(\beta) - Cov(b, \beta) - Cov(\beta, b)$$

where b is the matrix of fixed effect coefficients and β is the matrix of random effects coefficients. Since the covariance of random effect estimator with its difference from fixed effect estimator is zero,

$$Cov[(b - \beta), \beta] = Cov(b, \beta) - Var(\beta) = 0$$

Inserting this in the equation above produces the test statistic:

$$Var(b - \beta) = Var(b) - Var(\beta)$$

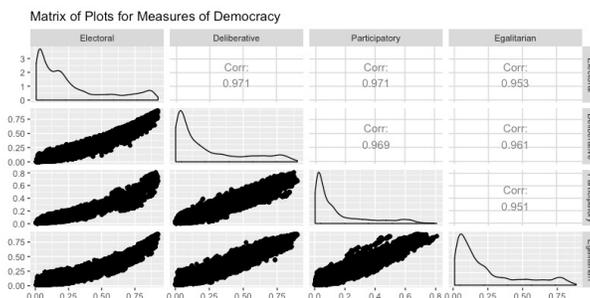
The null hypothesis is rejected as the Hausman statistic is bigger than its critical value. Therefore, it is reasonable to use a fixed effects model for this data because the correlation between the error term and the independent variables in the panel data model is statistically significant.

Next, we test for cross-sectional dependence in the model. Cross-sectional dependence arises if the political institutions' qualities between countries are interdependent (Henningsen and Henningsen, 2019). This may happen if the presence of common shocks and unobserved components that become part of the error term (De Hoyos and Sarafidis, 2006). In the context of political institutional quality, countries may adopt similar systems as they experience increasing economic and financial integration. To test for cross-sectional dependence, I employ Pesaran's (2004) CD test. We obtain a p-value of 0.271, which implies that there is not enough evidence to suggest the presence of cross-sectional dependence in the data.

Limitations

Nonetheless, there are several limitations to the results. The first limitation concerns missing values in the data which results in an unbalanced panel. In the fixed effects model used, almost 50% of the observations are dropped due to missing values. Although the number of observations is relatively large ($N = 9285$), the reduced sample size may decrease the external validity and statistical power of the model. Second, the results may be problematic if the time-invariant factors assumption does not hold. Both Acemoglu et al. (2008) and this paper assume that the factors that affect both the political

Figure 3: Matrix of Plots for Measure of Democracy (2019)



and economic development are time-invariant. Hence, using fixed-effects estimate reduce this source of bias. If this assumption does not hold, it implies that there are unmeasured characteristics that do vary over time. This situation may introduce omitted variable bias due to unobserved heterogeneity.

This paper focuses on political institutional quality and as measure of robustness, we have tested the result using other conceptions of democracy. The results suggest that the coefficient of interest, β is relatively similar. However, this could be a problem since all the measures are highly inter-correlated. Figure 3 shows the pairwise correlation matrix for all measures of democracy, in which all indices have high correlations to one another. One reason for these high correlations is because each measure contains Electoral Democracy Index. Coppedge et al. (2020) argue that the justification for the inclusion of Electoral Democracy Index is because there can be no democracy without elections although it is not a sufficient condition for a polity to be democratic. Because of this, each measure of democracy below contains Electoral Democracy Index and components of deliberation, participation and egalitarian respectively.

Implication

This paper's findings are higher levels of economic growth are associated with measures of political institutional quality and democracy using the new V-Dem data. Recent findings using different methods seem to support these results. For example, using system GMM Heid et al. (2012) find a significant positive relationship between income and democracy for the post-war period of up to 150 countries. Similarly, using the same data set as Acemoglu et al. (2008), Moral-Benito and Bartolucci (2012) find that income has a non-

linear effect on democracy. This effect is stronger for low-income countries but vanishes for high-income ones. Although this paper focuses on political institutional quality, our results and recent findings in the literature suggest that there is more evidence to support modernization theory.

6 Conclusion

The purpose of this paper is to assess the long term effects of economic growth on political institutional quality. While previous research uses older measures of democracy such as Polity IV and Freedom House, this paper uses V-Dem data. Focusing on the political institutional quality aspect of democracy, this paper utilises the Deliberative Democracy Index (DDI) and the Electoral Democracy Index (EDI). By using fixed effects regression, this paper shows that there is a strong positive relationship between economic growth and political institutional quality, even when the within-country variation is taken into account. This paper also demonstrates that factors such as average education years, equality of resources distribution and freedom of religion are associated with political institutional quality. For example, the paper finds that a one per cent increase in the log GDP per capita is associated with a 0.015 point increase in the DDI score for a country. At the country level, 81 countries exhibit this relationship. Therefore, this paper contributes to the literature by using the new Varieties of Democracy (V-Dem) data to find the causal relationship between economic growth and political institutional quality. V-Dem data uses multidimensional conceptions of democracy, which are not covered by other measures. This feature allows this paper to focus on the quality of political institutions aspect of democracy. Nonetheless, there are several limitations to the findings of this paper. First, the fixed effects regression used is unbalanced due to missing values in the data. The second limitation concerns the time-invariant factors assumption.

To conclude, this paper can serve as an important start to a broader conversation. Developmental organisation should focus on developing a country's economy to have better political institutional quality. Another important policy consideration is that governments should invest in better education and reduce inequality in educational attainment. These findings suggest that both developing and developed countries need to tackle other obstacles to development in the process of improving political institutional quality.

7 Appendix

Variables Description and Source

Variable	Description	Source
Deliberative Democracy Index (2016)	Measurement of the quality in the decision making process of a polity	V-Dem
Electoral Democracy Index (2016)	Measurement of the extent to which electoral principle of democracy seeks to embody the core values of making rulers responsive to citizens	V-Dem
GDP Per Capita in PPP terms (2016)	Data for 1900 to 2016 measured as long real GDP per capita from Maddison (2018)	V-Dem

Indices List of V-Dem's Deliberative Democracy Index

Index Name	Description	Question	Weight
Electoral Democracy Index	Measurement of the extent to which electoral principle of democracy seeks to embody the core values of making rulers responsive to citizens	To what extent is the ideal democracy in its fullest sense achieved?	0.25
Deliberative Component Index	Measurement of the quality in the decision making process of a polity	To what extent is the deliberative principle of democracy achieved?	0.25
EDI \times DCI	Interaction term of EDI and DCI	To what extent do both electoral and deliberative principles are achieved?	0.5

Indices and Indicators in Electoral Democracy Index

Index Name	Description	Question	Weight
Additive Pol-yarchy Index	Measurement of the extent to which electoral principle of democracy seeks to embody the core values of making rulers responsive to citizens	To what extent is the electoral principle of democracy achieved?	Weighted
Multiplicative Polyarchy Index	Measurement of the quality in the decision making process of a polity	To what extent is the deliberative principle of democracy achieved?	Weighted

Codes

```
1 setwd("~/Documents/PPE-Third-Year/Dissertation/data-folder/")
2 ## Remove unnecessary variables
3 rm(a2_means, living_cost13, a2_variables)
4
5 #
6 clean.data$v2x_delibdem[clean.data$country_name == "South
  ↳ Korea" & clean.data$year == 1980]
7 clean.data$v2x_delibdem[clean.data$country_name == "South
  ↳ Korea" & clean.data$year == 1985]
8
9 clean.data$e_migdppc[clean.data$country_name == "South Korea" &
  ↳ clean.data$year == 1980]
10 clean.data$e_migdppc[clean.data$country_name == "South Korea" &
  ↳ clean.data$year == 1985]
11
12
13 ## Load and clean data
14 clean.data <- readRDS("clean-data.RDS")
15 str(clean.data)
16
```

```

17 # Clean data
18 length(clean.data$e_migdppcln[clean.data$e_migdppcln ==
  ↪ "NA"])/length(clean.data$v2x_delibdem)
19
20 library("ggplot2")
21
22 ## Plots
23
24 # Plot of DDI against Log GDP Per capita, year 2016
25
26 # Subset data for plot
27 data16 <- subset(clean.data, year == 2016)
28 data11 <- subset(clean.data, year == 2011)
29
30 annotation <- data.frame(
31   x = 8,
32   y = 0.80,
33   label = paste("Pearson Correlation: ",
  ↪ round(cor(data16$e_migdppcln, data16$v2x_delibdem, use =
  ↪ "complete.obs"), 3))
34 )
35
36 ggplot(data16, aes(x = e_migdppcln, y = v2x_delibdem)) +
  ↪ geom_point() +
37   ggtitle("Deliberative Democracy Index and Income, 2016") +
38   geom_smooth(method = lm, se = FALSE) +
39   geom_text(data =annotation, aes(x = x, y = y, label = label),
40             color = "red", size = 5, angle = 0) +
41   labs(y="Deliberative Democracy Index (0-1)", x = "Log GDP Per
  ↪ Capita")
42
43 # Plot of EDI against Log GDP Per capita, year 2016
44
45 annotation.edi <- data.frame(
46   x = 8,
47   y = 0.9,

```

```

48   label = paste("Pearson Correlation: ",
  ↪   round(cor(data16$e_migdppcln, data16$v2x_polyarchy, use =
  ↪   "complete.obs"), 3))
49 )
50
51 ggplot(data16, aes(x = e_migdppcln, y = v2x_polyarchy)) +
  ↪   geom_point() +
52   ggtitle("Electoral Democracy Index and Income, 2016") +
53   geom_smooth(method = lm, se = FALSE) +
54   geom_text(data = annotation.edi, aes(x = x, y = y, label =
  ↪   label),
55           color = "red", size = 5, angle = 0) +
56   labs(y="Electoral Democracy Index (0-1)", x = "Log GDP Per
  ↪   Capita")
57
58 summary(lm(clean.data$v2x_polyarchy ~ clean.data$e_migdppcln))
59
60 # Descriptive statistics
61 # Use mean, sd, min and max
62
63 # Fixed effects regression
64 library(plm)
65 library(lmtest)
66
67 # Change levels to factor
68 # Factor variables are important when using lm function
69 # lm converts factor variables to dummy automatically
70 clean.data$country_name <- factor(clean.data$country_name)
71 clean.data$year <- factor(clean.data$year)
72
73
74 model_fixed_est <- plm(v2x_delibdem ~ e_migdppcln, data =
  ↪   clean.data,
75                       index = c("country_name", "year"),
  ↪                       effect = "twoways")
76 summary(model_fixed_est)
77 model_fixed_est
78

```

```

79 # Test for heteroskedasticity for fixed effects
80 # Null hypothesis is homoskedasticity
81 # p-value less than 0.05, hence we reject null hypothesis,
  ↪ the model is heteroskedasticity
82 # Hence, all the coefficients in the model != 0
83 coeftest(model_fixed_est, vcov. = vcovHC, type = "HC1")
84
85 length(summary(fixef(model_fixed_est)))
86
87
88 ## Fixed Effects Results Using DDI
89 ols.ddi <- lm(v2x_delibdem ~ e_migdppcln, data = clean.data)
90 fe.ols.dummy <- plm(v2x_delibdem ~ e_migdppcln, data =
  ↪ clean.data,
91                   index = c("country_name", "year"), effect =
  ↪ "twoways")
92 fe.ols.dummy.controls <- plm(v2x_delibdem ~ e_migdppcln +
  ↪ e_peaveduc + e_peedgini +
93                           v2xeg_eqdr + v2clrelig, data =
  ↪ clean.data,
94                           index = c("country_name", "year"),
  ↪ effect = "twoways")
95
96 # Clustered standard errors
97 library(stargazer)
98 rob_se <- list(sqrt(diag(vcovHC(ols.ddi, type = "HC1"))),
99               sqrt(diag(vcovHC(fe.ols.dummy, type = "HC1"))),
100               sqrt(diag(vcovHC(fe.ols.dummy.controls, type =
  ↪ "HC1"))))
101
102 # Generate table
103 stargazer(ols.ddi, fe.ols.dummy, fe.ols.dummy.controls,
104           digits = 3,
105           header = FALSE,
106           type = "latex",
107           title = "Fixed Effects Results using Deliberative
  ↪ Democracy Index as Measures of Political
  ↪ Institutions Quality",

```

```

108         model.numbers = FALSE,
109         column.labels = c("(1)", "(2)", "(3)"))
110
111 # Generate table for cross country effects
112 country.effects <- summary(fixef(fe.ols.dummy.controls))
113 # se <- sqrt(diag(vcovHC(fe.ols.dummy.controls, type =
114   ↪ "HC1")))
115 stargazer(country.effects,
116           digits = 3,
117           header = FALSE,
118           type = "text",
119           title = "Cross Country Variation",
120           model.numbers = FALSE,
121           column.labels = c("(1)", "(2)", "(3)"))
122
123 ## Fixed Effects Results Using EDI
124 ols.edi <- lm(v2x_polyarchy ~ e_migdppc1n, data = clean.data)
125 fe.ols.edi.dummy <- plm(v2x_polyarchy ~ e_migdppc1n, data =
126   ↪ clean.data,
127                       index = c("country_name", "year"), effect =
128   ↪ "twoways")
129 fe.ols.edi.dummy.controls <- plm(v2x_polyarchy ~ e_migdppc1n +
130   ↪ e_peaveduc + e_peedgini +
131   ↪ v2xeg_eqdr + v2clrelig, data
132   ↪ = clean.data,
133   ↪ index = c("country_name",
134   ↪ "year"), effect =
135   ↪ "twoways")
136
137 # Clustered standard errors
138 rob_se <- list(sqrt(diag(vcovHC(ols.edi, type = "HC1"))),
139               sqrt(diag(vcovHC(fe.ols.edi.dummy, type =
140   ↪ "HC1"))),
141               sqrt(diag(vcovHC(fe.ols.edi.dummy.controls, type
142   ↪ = "HC1"))))
143
144 # Generate table
145 stargazer(ols.edi, fe.ols.edi.dummy, fe.ols.edi.dummy.controls,

```

```

137     digits = 3,
138     header = FALSE,
139     type = "latex",
140     title = "Fixed Effects Results using Electoral
      ↪ Democracy Index as Measures of Political
      ↪ Institutions Quality",
141     model.numbers = FALSE,
142     column.labels = c("(1)", "(2)", "(3)"))
143
144 ## Fixed Effects Results Using Participatory
145 ols.edi <- lm(v2x_partipdem ~ e_migdppc1n, data = clean.data)
146 fe.ols.edi.dummy <- plm(v2x_partipdem ~ e_migdppc1n, data =
      ↪ clean.data,
147                       index = c("country_name", "year"),
      ↪ effect = "twoways")
148 fe.ols.edi.dummy.controls <- plm(v2x_partipdem ~ e_migdppc1n +
      ↪ e_peaveduc + e_peedgini +
149                               v2xeg_eqdr + v2clrelig, data
      ↪ = clean.data,
150                               index = c("country_name",
      ↪ "year"), effect =
      ↪ "twoways")
151
152 # Clustered standard errors
153 rob_se <- list(sqrt(diag(vcovHC(ols.edi, type = "HC1"))),
154               sqrt(diag(vcovHC(fe.ols.edi.dummy, type =
      ↪ "HC1"))),
155               sqrt(diag(vcovHC(fe.ols.edi.dummy.controls, type
      ↪ = "HC1"))))
156
157 # Generate table
158 stargazer(ols.edi, fe.ols.edi.dummy, fe.ols.edi.dummy.controls,
159           digits = 3,
160           header = FALSE,
161           type = "latex",
162           title = "Fixed Effects Results using Participatory
      ↪ Democracy Index as Measures of Political
      ↪ Institutions Quality",

```

```

163         model.numbers = FALSE,
164         column.labels = c("(1)", "(2)", "(3)"))
165
166 ## Fixed Effects Results Using Egalitarian
167 ols.edi <- lm(v2x_egaldem ~ e_migdppcln, data = clean.data)
168 fe.ols.edi.dummy <- plm(v2x_egaldem ~ e_migdppcln, data =
  ↪ clean.data,
169         index = c("country_name", "year"),
  ↪ effect = "twoways")
170 fe.ols.edi.dummy.controls <- plm(v2x_egaldem ~ e_migdppcln +
  ↪ e_peaveduc + e_peedgini +
171         v2xeg_eqdr + v2clrelig, data
  ↪ = clean.data,
172         index = c("country_name",
  ↪ "year"), effect =
  ↪ "twoways")
173
174 # Clustered standard errors
175 rob_se <- list(sqrt(diag(vcovHC(ols.edi, type = "HC1"))),
176               sqrt(diag(vcovHC(fe.ols.edi.dummy, type =
  ↪ "HC1"))),
177               sqrt(diag(vcovHC(fe.ols.edi.dummy.controls, type
  ↪ = "HC1"))))
178
179 # Generate table
180 stargazer(ols.edi, fe.ols.edi.dummy, fe.ols.edi.dummy.controls,
181           digits = 3,
182           header = FALSE,
183           type = "latex",
184           title = "Fixed Effects Results using Egalitarian
  ↪ Democracy Index as Measures of Political
  ↪ Institutions Quality",
185           model.numbers = FALSE,
186           column.labels = c("(1)", "(2)", "(3)"))
187
188 ## Hausman test
189 gw <- plm(v2x_delibdem ~ e_migdppcln + e_peaveduc + e_peedgini
  ↪ +

```

```

190         v2xeg_eqdr + v2clrelic, data =
           ↪ clean.data,
191     index = c("country_name", "year"),
           ↪ effect = "twoways")
192
193 gp <- plm(v2x_delibdem ~ e_migdppln + e_peaveduc + e_peedgini
           ↪ +
194         v2xeg_eqdr + v2clrelic, data =
           ↪ clean.data,
195     index = c("country_name", "year"),
           ↪ model = "random")
196 phtest(gw, gp)

```

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