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Bharatee Bhusana Dash, J. Stephen Ferris, Marcel-Christian Voia

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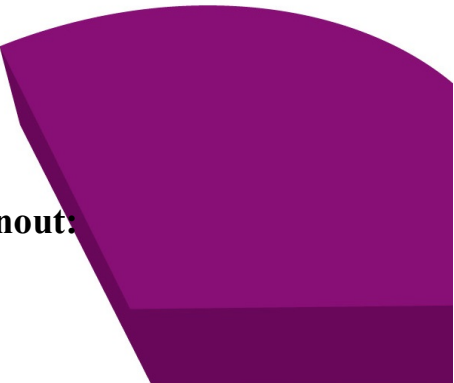
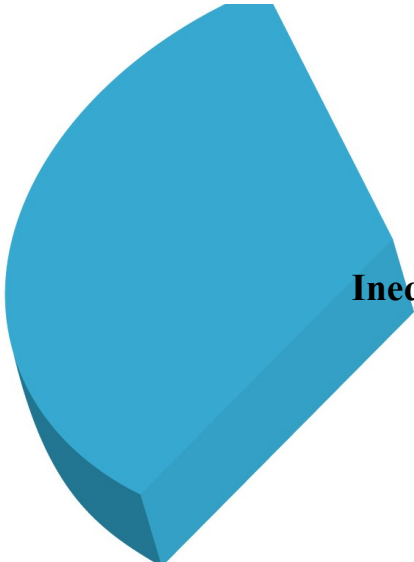
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J. Stephen FERRIS
Marcel-Christian VOIA



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Inequality, Transaction Costs and Voter Turnout: evidence from Canadian Provinces and Indian States *

by

Bharatee Bhusana Dash
School of Economics, XIM University, Bhubaneswar, India
(bharatee.dash@gmail.com)

J. Stephen Ferris
Department of Economics, Carleton University, Canada
(SteveFerris@cunet.carleton.ca)

and

Marcel-Cristian Voia
University of Orleans, LEO, France
(marcel.voia@univ-orleans.fr)

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Abstract

This article tests for the presence of a regularity in the relationship between income inequality and voter turnout in two countries with common Westminster parliamentary systems. We begin by using Canadian provincial data to assess two contrasting monotonic hypotheses: conflict theory that predicts a positive monotonic relationship (inequality promoting conflict and greater electoral participation) against relative power theory that predicts a negative monotonic relationship (inequality leading to political alienation and electoral disengagement). Nesting these hypotheses within a rational choice model of voter turnout, we find that neither hypothesis explains the data convincingly while a search across fractional polynomials finds that the relationship is better described as non-monotonic with an inverted U shape. The generality of this finding is assessed by rerunning the analysis on a panel of 14 Indian states. The commonality of results across countries with similar political structures but widely different demographics and stages of development is striking and consistent with the hypothesis that conflict theory operates at low levels of income inequality before growing inequality leads to voter alienation and lower voter turnout. In the Canadian case the tipping point arises at an income Gini of .32 while the Indian case peaks at consumption Gini of .34.

Key words: voter turnout, income inequality, sub-national panel data analysis, non-monotonic relationships, Canadian provincial and Indian state panel data.

JEL: D72, D78, H62

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1. Introduction

In the literature on voter turnout there are two starkly opposing theories of the relationship between income inequality and voter turnout. The most prominent of these is relative power theory (Goodin and Dryzek, 1980; Dahl, 2006; Solt, 2008). Relative power theory (RPT) argues that as income becomes increasingly concentrated in the hands of higher income individuals whose higher income confers greater political power, political policy makers will respond increasingly to the interests of these higher income groups. Consequently, lower income voters lose interest in politics as a mechanism for advancement and their disengagement is reflected in lower political participation and voter turnout. The opposing approach, conflict theory (CT), builds on the analysis of Meltzer and Richard (1981) who argue that greater income inequality will lead the median voter (whose income lies below the average) to increasingly use its majority position to attempt to redistribute income in its favour. This in turn generates opposition by higher income groups, with the resulting conflict stimulating greater political engagement and higher voter turnout. Given the monotonic nature of the two hypotheses, a test of their respective predictive power would seem easily resolvable. Nevertheless, despite the straightforward nature of the test, the outcome has remained empirically ambiguous (Horn, 2011; Stockemer and Scruggs, 2012; Stockemer and Parent, 2014).¹ Our contribution to this debate is to focus on the possibility that a stable relationship may exist between voter turnout and income inequality that is non-monotonic; one that incorporates elements of both theories and allows the alternatives to dominate at different levels of inequality.

In what follows we nest the relationship between inequality and voter turnout within a rational choice model where voter turnout is viewed as the aggregate outcome of choices made by registered voters whether or not to participate in an election.² By emphasizing participation, we

¹ While recent work tends to find a negative relationship arising between turnout and inequality (Ritter and Solt, 2019), it remains unclear whether that finding is specific to the time-period chosen and/or the methods used to test the hypotheses. Filette's overview (2016, p.72) is that "empirical indications diverge and give rise to competing theoretical arguments to be tested."

² Voter turnout is sometimes defined as the proportion of the eligible population who vote rather than the proportion of those registered who vote in part because there is often more reliable historical data on the population proportion eligible to vote than on voter registrations (Vowles, 2010). When enrollment is not automatic, unlike the Canadian and Indian cases, an explanation of voter turnout needs to deal with the two-stage choice of whether to register and then whether to vote given registration.

separate the two interrelated parts of the individual's decision to vote: first, the choice whether or not to participate in the election process and, second, the choice over which candidate to support once the decision to vote has been made (instrumental voting).³ Our model of why individuals choose to participate in an election follows Riker and Ordeshook (1968) in emphasizing non-instrumental reasons for voting. That is, we argue that in addition to individuals benefiting from having their preferred candidate win, individuals place an additional value on participating in the election for reasons that differ across individuals and in their intensity.⁴ Operationalizing this theory involves finding a set of factors that can explain changes in the instrumental benefit of voting and/or changes in the desire to participate. The predictions of the model and the relationship between voter turnout and inequality are then assessed using data from Canada and India, two countries that have widely different cultural and demographic characteristics but share a common majoritarian political heritage based on the British parliamentary system.

The paper proceeds in section 2 by outlining a set of factors that the literature has found to have influenced voter turnout and uses them as the basis of our analysis. These covariates then form the controls for a turnout model in which income inequality is predicted to play a role. Section 3 presents the empirical form of the model used to test for monotonicity versus non-monotonicity and motivates the expected signs of the coefficients of the other covariates in that test. Our empirical analysis begins by illustrating the outcome ambiguity of a linear test of the competing hypothesized monotonic relationships between income inequality and voter turnout on a panel of Canada's ten provinces over the 1976 and 2019 time period.⁵ Using Stata's fractional polynomial test we consider the possibility that the relationship is non-monotonic and plot the best fitting polynomial for that relationship. The resulting model provides a good overall fit with the data, rejecting monotonicity relative to a non-monotonic (inverted U shaped) relationship

³ In many statements of the turnout problem only the second part of this decision is given serious consideration. Posed this way, the problem of voter turnout encounters the Downsian (1957) voting paradox; why would any individual choose to vote when the likelihood of influencing the election outcome in their favour is close to zero?

⁴ The literature has used reasons such as civic duty, expressive voting, and simply the enjoyment received by participating in the conversation surrounding an election to supplement instrumental voting.

⁵ The time period was determined by the availability of annual observations on Gini coefficients in Canada (1976 to 2019). The ten Canadian provinces (from west to east) are: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia and Newfoundland and Labrador.

arising between income inequality and voter turnout. This is shown to compare favourably to a quadratic representation of the relationship, a form that is more often used in the literature to test for nonlinearity. To answer whether the relationship found for Canada is unique or may apply more generally, we re-do the analysis in section 5 for a panel of 14 major Indian states over a somewhat longer time period (1957 – 2018).⁶ India provides a useful challenge to the generality of our findings since India shares with Canada a majoritarian electoral system with similar political institutions and conventions but presents widely different cultural and demographic characteristics that allow for the incorporation of greater heterogeneity in the dimensions of the test. The results confirm the non-monotonicity of the Gini's effect on voter turnout along with the control predictions of the other covariates. In Section 6 we propose a transaction cost re-interpretation of the two theories that allows the nonlinear relationship to arise at different stages of a unified model. Section 7 summarizes our conclusions.

It is important to recognize that while we find evidence consistent with the causality implied by the hypotheses being tested, the complexity of economic and political interactions suggests that some degree of endogeneity will be present and that the correlations found may be susceptible to alternative explanation. Nevertheless, the robustness of these correlations provides a useful challenge to those working on the impact of income inequality on economic and political aggregates and, more generally, to the assumed monotonicity of any hypothesized relationship.⁷

2. The elements of an aggregate model of voter participation

With the growing concern that has arisen over the decline in voter turnout that has developed across many developed countries over the past twenty years (Hooghe and Kern, 2017), there has arisen a large and growing literature on the factors that influence voter turnout (see, for example, the meta-analyses of Cancela and Geys, 2016 and Stockemer, 2017). Much of that literature is cross sectional in nature, wherein cross-country differences in political institutions and electoral practices are used to explain corresponding differences in turnout (Blais, 2006; Eichhorn and

⁶ The 14 states in our empirical analysis are: Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal.

⁷ For other challenges to monotonicity, see Leonida et. al. (2013) who find non-monotonicity (U shaped) in the relationship between political competition and economic freedom and Leonida et. al. (2015) who find the same relationship between political competition and economic growth.

Linhart, 2021). Other studies have used longitudinal data on individual specific behaviour, exploiting variables like age, years of education, occupation, and social class (Smets and van Ham, 2013). In this paper we look sub-nationally at a panel of Canadian provinces and Indian states to highlight time series factors that are expected to influence voter turnout. The availability of good quality Canadian data on voter turnout and the presence of annual data on Gini coefficients, our measure of income inequality, led us to first formulate and test the monotonic and non-monotonic versions of our model on Canadian provincial data covering the 114 provincial elections that have arisen between 1976 and 2019.^{8,9} While many of our demographic and economic variables are available annually, annual values for election variables in the years between elections were constructed by interpolating between election dates.¹⁰ In Figures 1 and 2 we present the temporal movement of our two variables of interest for a sample of the 5 largest Canadian provinces.

-- insert Figures 1 and 2 about here --

At first glance the pattern revealed by the two diagrams seems broadly consistent with RPT's linking of a decline in voter turnout to the growth in income inequality.¹¹ Across our sample of Canadian provinces, provincial total income Gini measures have trended upwards from the mid 1980s through the 1990s before stabilizing at a higher level while voter turnout has varied widely and generally trended downwards. Nevertheless, many of the cross-country studies that have focused on many countries and varying time periods and as part of a broader model of voter turnover have found little evidence of a negative relationship arising in Western economies (see for example, Fumagalli and Narciso, 2011 and Stockemer and Scruggs, 2012). In the case of Canada in particular, studies by Mahler (2008) and Sealey and Anderson (2015) find evidence more supportive of CT by pointing to a positive relationship arising between voter turnout and

⁸ An earlier version of this paper based solely on Canadian federal elections had too few observations to do more than suggest the likelihood of an inverted U shape for the voter turnout/income inequality relationship. The use of annual provincial data here has increased the number of observations tenfold. We note that the panel is unbalanced because the last provincial election is often prior to our ending date and data is sometimes missing on elections prior to 1976.

⁹ The time period of the panel reflects the current availability of annual observations on the Gini coefficient. The Gini coefficient used in the Canadian tests is based on adjusted total income (as opposed to market or after-tax income).

¹⁰ That is, we treat election values as providing point estimates of an ongoing continuous process of political change.

¹¹ The simple correlation between voter turnout and Gini coefficient is -0.5848.

the scale of party redistributive programs. Other specifically Canadian studies find evidence more in line with RPT by finding that voter attitudes towards politicians and politics can be inversely affected by growing income inequality (Perrella et al, 2016) while Nadeau et al (2019) on the other hand show that greater wealth is associated with greater voter participation. In the most recent work done on voter turnout in Canada, Polacko (2020) tests RPT against CT and uses individual specific information to find evidence of a significant negative relationship in Canada's ten provincial and federal elections over the 1985-2015 time period. Our analysis extends the time period and controls for a range of aggregate influences that have been documented to have influenced voter turnout.

The first of the variables used to form our model of voter turnout is derived from Downs' (1957) focus on instrumental voting and its predictions for voter turnout (Hansen et al, 1987; Tavares and Raudla, 2018). While the participation of others might be expected to heighten interest in individual participation, Downsian reasoning argues that the larger the number of voters in a constituency, **Constituency size**, the lower is the likelihood that any one voter will be decisive and hence the smaller will be the expected benefit from voting in the upcoming election (Gorecki and Gendzwill, 2020).

To this we add other variables that have been associated with making voter participation in the election more interesting/valuable. For example, the more competitive or close the party race in an election is expected to be, the larger is the probability that the individual's vote could be decisive (Eichhorn and Linhart, 2020) and the more interesting it is to participate in the event. To measure degree of electoral competition we follow authors such as Padovano and Ricciuti (2009), Boulding and Brown (2014) and use the winning margin (**Winning margin**) measured as the difference between the seat shares won by the winning and the second-place party. Because the significance of that margin depends upon the degree of volatility in the winning margin, we control by using Pedersen's (1979) measure of seat share volatility (**Volatility**). We also note that volatility has been used independently as a measure of intertemporal competitiveness (Ashworth et. al., 2014; and Dash and Ferris, 2021) and as a measure of the uncertainty associated with being the decisive voter (Tavits, 2008).

Changes in a country's demographics are also found to have mattered in relation to voter turnout. For example, younger age cohorts are seen as less interested and engaged with the political process and so participate with lower frequency in elections than do individuals in older age cohorts (LeDuc and Pammett, 2014; Dassonneville, 2017). The effect of changes in the relative size of the younger voting pool on voter turnout is tested for in Canada by using the proportion of eligible voters who are between the ages of 20 and 24 (**Young**). In the second stage of our analysis on India we use the inverse, the percentage of the population 60 or older, **Old**, and because the minimum voting age in India was lowered in 1988 from 21 to 18, we test for the effect of this institutional change in voting rules by using the dummy variable, **Voting age 18**, equalling 1 in 1989 and later, 0 earlier.¹²

Whether or not a particular candidate is likely to win, disappointing economic outcomes over a governing tenure may be a potent driver of participation through voters' desire to reflect their disapproval publicly. If voters are more concerned with economic downturns than upturns, worsening conditions would generate more political dissatisfaction and hence elicit greater participatory response.¹³ Here we use two aggregate indicators of worsening conditions: increases in the unemployment rate (**Urate**) and/or a fall in the rate of growth of per capita income (**Growth real income**) should decrease support for the party in power and increase the demand for alternative programs and parties.¹⁴

The primary focus of our paper is the form of the relationship between income or consumption inequality and voter turnout. More specifically, is that relationship consistent with either of the monotonic directions predicted by one of two opposing theories: RPT, predicting that increased economic differences across individuals will lead to greater voter alienation and withdrawal from electoral participation, versus CT, predicting that increased difference will stimulate greater political activism and induce greater electoral involvement (Horn, 2011; Stockemer and Parent, 2014)? Alternatively, is the relationship non-monotonic with the different theories becoming

¹² In Canada the minimum voting age was lowered from 21 to 18 in 1970 (prior to our starting date) and has since remained at that level since.

¹³ A number of writers have found that voters respond more to bad versus good economic outcomes. See, for example, Nannestad and Paldam (1997), Dassonneville and Lewis-Beck (2014) and Dash and Ferris (2021).

¹⁴ The former was found more effective in Canada (Nadeau and Blais, 1993), whereas the absence of unemployment data for Indian states led us to use the growth rate of state per capita income.

more relevant and active at different levels of inequality? To test these alternatives, we use as our Canadian measure of inequality the total income Gini coefficient, **Gini**. The absence of information on individual incomes in India led us to use consumption data to construct an inequality index. The Data Appendix to the paper includes detail on its construction as well as the descriptive statistics and data sources for the variables used in the tests.¹⁵

3. Empirical specification and tests in relation to Canadian Provincial Data

We begin our empirical analysis by testing a linear version of the model of voter turnout described in section 2. This allows us to illustrate the ambiguity that has been associated with a test of RPT versus CT and sets the stage for the generalization of the test to allow the possibility that the relationship between inequality and voter turnout is nonlinear, either monotonic or non-monotonic. Using a panel of data from 10 Canadian provinces over the 1976 to 2019 time period, we estimate a fixed effects regression model of the form:

$$Voter\ turnout_{it} = \alpha_0 + \alpha_1 Constituency\ size_{it} + \alpha_2 Winning\ margin_{it} + \alpha_3 Volatility_{it} + \alpha_4 Young_{it} + \alpha_5 Urate_{it} + \alpha_6 Gini_{it} + \alpha_7 p_i + \alpha_8 y_t + \varepsilon_{it}, \quad i = 1..10; t = 1976..2019 \quad (1)$$

where i refers to the province and t the time period (1976 to 2019) and the coefficient estimates on the control variables α_1, α_2 and α_4 are expected to be negative in sign while α_3 and α_5 are expected to be positive. The α_7 and α_8 represent the effects of dummy variables capturing fixed provincial and time period differences in the panel while the ε_{it} is a white noise variable. In this context the test of the role of income inequality concerns the sign and significance of the α_6 estimate; the data is consistent with CT (RPT) if α_6 is found to be greater than (less than) zero. The results of two versions of a fixed effects version of this regression model are presented as columns (1) and (2) of Table 1.

-- Table 1 about here --

The results appearing in columns (1) and (2) are broadly consistent with the set of hypotheses advanced implying that a rational choice model of voter turnout works well as an explanation of voter turnout at the Canadian provincial level. Fully 8 of the 10 covariate coefficients serving as control variables are found to have their both predicted sign and be significant at 5 or 1 percent

¹⁵ The panel datasets used in these tests are available online at Carleton University's Dataverse site (Ferris, 2021).

while explaining over eighty percent of the variation in provincial voter turnouts over the 1976 - 2019 time period. Moreover, the coefficient estimates of the control variables are broadly similar across models implying stability in the underlying estimated model. The results are then consistent with provincial voter turnout being higher when provincial unemployment rates and provincial party seat volatility are higher and lower when winning margins (greater political competition) and the voting size of provincial constituencies are larger. The prediction not supported by the Canadian data is the prediction that voter turnout and the percentage of the population that is young should vary inversely. In Canada, both have declined throughout our time period.

When we turn to examine the results with respect to the Gini coefficient, the ambiguity found in the literature becomes apparent. When the model is run with provincial fixed effects alone the coefficient estimate is found to be negative and thus consistent with RPT, but significantly different from zero only at the 10 percent significance level. Moreover, when the model is extended to account for time period fixed effects, the negative finding disappears with the coefficient estimate now found to be both positive and insignificantly different from zero.

4. Monotonicity versus non-monotonicity

The inability to find a strong positive or negative linear relationship between inequality and voter turnout need not preclude the existence of a nonlinear relationship that would allow for the confirmation of one of the two inequality hypotheses. Hence in this section we generalize the form of the test and use fractional polynomial (fp) regression analysis to determine whether the best fitting relationship in the data is more generally monotonic (and if so in what direction) or whether that relationship is non-monotonic (and if so, what is the estimated shape). Fractional polynomial regression is ideal for this purpose by providing a wide range of shapes that allow determination of the best fitting flexible form without predetermining its shape (as is done when we chose the quadratic for example). In conceptual terms we are following the line of argument used by Leonida et al (2013, 2015) who test for the presence of a nonmonotonic (inverted U shaped) relationship arising between political competition and economic growth as predicted by Acemoglu and Robinson (2006).

Using the optimal fp procedure in Stata, 44 combinations of the powers of $k = (-2 -1 -.5 0 .5 1 2 3)$ are used to find the best fitting second degree fractional polynomial of income inequality (total income Gini) within a regression of voter turnout on our five control variables,

$$Voter\ turnout_{it} = \alpha_0 + \sum_{j=1}^{j=2} \gamma_j Gini_Total_{ijt}^k + \sum \delta_l Z_{lit} + \epsilon_{it}, \quad (2)$$

where the Z_l are the $l = 5$ control variables from equation (1). The results of the test and the best fitting fractional polynomial found are presented in Table 2 together with a graph of the estimated form (and confidence interval) of the relationship between voter turnout and income inequality. The results show a) that monotonicity is rejected relative to non-monotonicity and b) that the best fitting relationship between voter turnout and income inequality has the powers $(-2 -2)$, forming an inverted U shape that is skewed somewhat to the right.

-- inset Table 2 about here --

While the data reject both RPT and CT as singular explanations of the observed relationship between voter turnout and income inequality across Canadian provinces, the data is consistent with a more nuanced view of their interaction. That is, the data is consistent with the hypothesis that at relatively low levels of income inequality (below the tipping point of .32) greater income inequality provokes greater political involvement and voter turnout as hypothesized by CT, but as income inequality rises further voters, particularly lower income voters, find political involvement to be ineffective leading to voter disillusionment and lower voter electoral turnout. Under this hypothesis the pattern of voter turnout across Canadian provinces as observed in Figure 2 is consistent with the below tipping point behavior associated with CT, the mixed nature of the up and down fluctuation of both voter turnout and the Gini, arising between 1976 and the late 1980s before the set of Ginis decisively cross the tipping point of .32 by 1990. Thereafter the rapid rise of the Ginis through the mid 2000s and its more recent tendency to fall back towards the tipping point is consistent with RPT's prediction of greater inequality leading to a fall, then rise, in voter turnout.

The inverted U shape found under the fractional polynomial analysis suggests a robustness test for the form of the relationship using a quadratic for the Gini coefficient.¹⁶ The use of the quadratic form, however, imposes symmetry about the tipping point which implies that by imposing that form the tipping point should be indicated as being at a larger Gini value than that found for the best fitting fractional polynomial model. Having observed the best fitting shape, the quadratic form should fit the data less well. The result of doing so is reported as column (3) of Table 1.

Two things are notable about this equation. First, the quadratic form does indicate the inverted U shape with the coefficient estimates on Gini positive and Gini squared negative and with the estimates significantly different from zero at 5 and 10 percent, respectively. Also as expected, the quadratic form does fit the data less well than the best fitting fractional polynomial and the tipping point is indicated as being larger (.35) than that found for the fractional polynomial (.32). Second, the coefficient estimates of the control variables of the quadratic model are quite similar to those found for the two linear cases in columns (1) and (2) and in the fractional polynomial case in Table 2. This implies that the underlying model of voter turnout model is reasonably independent of the form of the Gini's representation and that the inverted U shape found as a fractional polynomial has not arisen as a result of covariation with the other elements of the model.

5. The case of Indian States

Finding that after the control for other influences on voter participation there exists an inverted U-shape in the relationship between the Gini coefficient and provincial voter turnout across Canadian provinces suggests that while voter turnout increases with income inequality at low levels of inequality, the marginal effect falls until further increases lead to voter disillusionment and falling voter turnout. However, given the specific setting of our tests the question arises

¹⁶ We also explored other nonlinear representations. In the case of Indian states, the inclusion of a cubic term reduces the explanatory power of both inequality and the equation and fp model with three terms indicates that the quadratic representation produces the better fit. In the Canadian case, we used the data to generate a nonparametric fit and found that a nonlinear quadratic fits the data best with no evidence of there being a cubic effect. The nonparametric representation also reinforces the presence of an asymmetry in the shape of nonlinearity is not captured by the quadratic form but revealed by the fractional polynomial model.

whether this transition from CT into RPT as inequality rises is unique to Canada or whether this relationship can be found elsewhere and hence be applicable more generally. To assess whether our outcome is unique to Canada, we redo our analysis on India, a country with a common majoritarian electoral system and parliamentary heritage to Canada but with widely different demographic, cultural and economic characteristics.¹⁷ Unlike the Canadian case where we have access to annual observations on income inequality and with the need to construct a measure of inequality from periodically available consumption data, unit base of our analysis becomes the times and outcomes in Indian state elections between 1957 and 2018.¹⁸ Data from 14 major Indian states then forms the panel for a second test of the voter participation hypothesis outlined in section 2 and a test of the specific form of the relationship between inequality and voter turnout that arose in the Canadian case.

The 14 Indian states in our panel encompass most of its largest states: Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal.¹⁹ It covers the 195 state elections that were held in these states between 1957 and 2018. The economic and demographic variables applicable to each election were obtained from the *Central Statistical Organization* and *Census of India* while Indian election data was collected from the Electoral Commission of India's website (<http://eci.nic.in/eci/eci.html>). The database itself is available online at Ferris (2021). In Table A2 of the Data Appendix we present the descriptive statistics and, when these are compared to their Canadian equivalents in Table A1, it is apparent that the Indian states exhibit considerably more

¹⁷ As mentioned in the introduction, there is a large literature that emphasizes the importance of differences in electoral institutions (parliamentary versus presidential; majority versus proportional voting rules etc.) for voter turnout (see writers such as Jackman (1987) and Blais (2006)). In the case of Canada's provinces and India's states, a common election and governance framework—Westminster parliamentary, majority voting, maximum 5 year governing terms—allows the results not to be biased by important institutional differences. In other Westminster governments, such as the UK, Denmark and New Zealand, the absence of subnational provinces or states (at least until recently in the UK) limits the time frame available (and hence the number of useable observations). In the case of Australia that does have a number of states, compulsory voting makes the comparison of voter turnout numbers problematic.

¹⁸ On the use of consumption versus income inequality, see Attanasio and Pistaferri (2016).

¹⁹ These 14 states cover about 85 percent of the Indian population and exclude states such as Assam, and Jammu and Kashmir that were subject to subdivision, forms of insurgency and other forms of electoral violence. See Diwakar (2008) for a complementary analysis covering all Indian States using macro level data and Panda (2019) who uses political-economic data to analyze voter turnout using individual level data.

variation in the scale and distribution of constituency sizes, per capita income growth rates and Gini coefficients.

Applying the voter turnout model to the Indian data requires some modification of the form of the test both for data availability reasons and to incorporate electoral features specific to India. In terms of the former, state unemployment rates are unavailable in India so that the hypothesis that voters register disapproval with the level of economic performance arising under the incumbent government is now tested for using the average growth rate of state per capita income over the incumbent's governing period (**Growth real income**).²⁰ Voter turnout is expected to be inversely related to the growth rate. Similarly, individual income data is unavailable in India so that our Gini coefficient was constructed from information on consumption expenditures at the household level extracted from nationally representative periodical surveys.²¹ The degree of political competition in constituency elections is measured as the average size of the winning vote share margin across state election constituencies. As earlier, a larger **Winning margin** (holding volatility constant) indicates a less competitive election and hence is predicted to generate lower voter turnout. Because of the exceptionally large potential size of the typical Indian constituency, we enter **Constituency size** both linearly and quadratically and expect that while larger size may first increase voter turnout, the negative marginal effect predicted by Downs will be apparent in the quadratic term. The prediction that voter turnout will be lower (larger) the larger the proportion of the population that is young (old) is tested for in two ways. First, the 61st Amendment to the Indian Constitution lowered the voting age from 21 to 18 (**Voting age 18**) for all elections in 1989 and beyond. Its expected negative effect was tested for through a dummy variable (1 in 1989 and thereafter, 0 before). We also used the percentage of the population older than sixty (**Old**) to test the prediction that older voters are more engaged in the political process and so more likely to vote.²² The Indian Constitution (Article 356) also

²⁰ Dash and Ferris (2021) document a negative relationship between income growth and electoral volatility in Indian states over the 1957 – 2013 period.

²¹ See footnote 24 and the Data Appendix for detail on how the Gini coefficients were constructed from consumption data.

²² Data on state-wise percentage of older population is provided in the Census of India. To extend the data from 2011 to 2018, we used data provided by the World Bank. The World Bank, however, provides data only for the national level. By assuming that the difference between national and state figures in the 2011 census persists, we

gives the central government the right to impose **President's rule** in cases when there is a perceived failure of democratic government (often due to the inability of state parties to form a majority government). In such cases the state is governed directly by the central government in the form of an appointed governor. President's rule are then periods when state voters are essentially disenfranchised and can be expected to be less interested in electoral participation and turnout.²³

With these adjustments, the fractional polynomial test for the best fitting form of the relationship between voter turnout and consumption inequality was run for the panel of Indian states with the results presented in Table 3. Once again, the data reject a linear representation of the relationship along with the nonlinear possibilities represented by one polynomial term in favour of a non-monotonic relationship that incorporates two polynomial terms. The best fitting estimate with powers (-2, -2) is presented as the equation beneath the comparison table and the form of the relationship is presented in the diagram that follows. As can be seen, the relationship for the Indian states has an inverted U shape form that appears more symmetric than its Canadian provincial counterpart.

-- insert Table 3 about here --

In addition to confirming the inverted U-shape of the Gini's interrelationship with voter turnout, the model finds support for the Downsian prediction that increases in the size of the pool of registered voters decreases the likelihood of any one voter being the decisive voter and thus will decrease voter turnout at the margin. The data are also consistent with greater electoral competition, measured as the size of the vote share winning margin, increasing voter interest and hence electoral participation and with the hypothesis that voters participate more to register their disapproval rather than approval of current government performance, leading voter turnout to increase as the growth of real income falls rather than rises. On the other hand, neither

generated figures for each state in 2018. Figures for non-census years were generated by interpolating between census years.

²³ There is one important data outlier corresponding to the 1992 election in the Punjab. This election was the first following the imposition of president's rule in the Punjab to counter a Sikh extremist insurgency. The voter turnout in this election was exceptionally low (24% versus an average of about 65%). A dummy variable for this election was used to minimize this election's effect on the other results.

of the demographic variables, the share of registered voters who are older than 60 and the impact of the lower voting age, are found to be significantly different from zero. Even though it helps to control for the meaning of the winning margin, the separate influence of volatility on turnout is found to be insignificant.

A robustness test of the best fitting form of the fractional polynomial model and its rejection of both monotonic versions of CT and RPT relative to its non-monotonic alternative is presented in Table 4 as a series of fixed effects models. In column (1) we present the linear version of the fixed effects model, corresponding to the linear versions used for Canadian provinces in columns (1) and (2) of Table 1. The results for Indian states in column (1) indicate that the linear fixed effects voter turnout model work well overall, explaining over sixty percent of the variation in voter turnout. The sign and significance of the control variables mirror those found for the best fitting fractional polynomial regression of Table 3. However, just as in the Canadian case, the coefficient estimate of the Gini coefficient is found to be insignificantly different from zero and hence is supportive of neither CT nor RPT.

-- insert Table 4 about here --

Columns (2) and (3) present two forms of the quadratic version of the model, with and without election period fixed effects. As in the Canadian case, the two quadratic models fit the data well and the changes made to the representation of the Gini coefficient have made virtually no impact on the coefficient sign and/or significance of the model's control variables. They also replicate the findings found earlier for the best fitting fractional polynomial regression in Table 3. The results found for Gini's quadratic form confirm the inverted U-shape found earlier for the best fitting fractional polynomial. Whether or not election period effects are included, the results in columns (2) and (3) imply that the positive effect of inequality on voter turnout peaks at a Gini of about .336, a result that is consistent with the graphic representation of the fractional polynomial fit shown in Table 3. As inequality rises above that level, voter turnout is impacted negatively.

Whether or not the quadratic form is used for the Gini coefficient, the results for the control variables show remarkable consistency in sign and significance. That is, throughout the data

indicate that voter turnout is negatively associated with the size of the winning party's vote share margin, higher rates of per capita income growth over the incumbent's governing tenure, marginal increases in the size of the voting pool and with the presence of presidential rule. The hypotheses not supported by the data are the hypotheses that increased vote volatility will increase voter turnout and that the age composition of the voting pool matters in predicting turnout. In our case neither the proportion of the population above 60 nor the extension of the voting franchise to individuals between 18 and 21 were found to have any significant influence on voter turnout. In this the results for the Indian states echo our earlier findings for Canadian provinces.²⁴

6. An Interpretation of the inverted U-shape

The emergence of an inverted U-shaped relationship between income/consumption inequality and voter turnout raises the question of whether that empirical relationship is consistent with some combination of the two competing hypotheses. Here we argue that this outcome is not inconsistent with the transaction cost underpinning of the CT and RPT models if combined with a demand by voters for redistribution. In these terms RPT can be viewed as arguing that the cost of coordinating political action is lower for individuals at the upper end of the income distribution than the cost of coordinating the majority of voters at the lower end and that the level and cost of redistribution falls increasingly on higher income individuals as inequality rises. From this it follows that as inequality rises, political action by below median voters to redistribute will become increasingly ineffective leading to frustration with the political system and lower electoral turnout. CT, on the other hand, argues that the number of voters below the median can serve to overcome any political coordinating cost difference and will likely to do so if the expected cost of redistribution facing higher income groups is not high. With a general desire by the

²⁴ Household consumption expenditure survey data in India is available only until 2011-12. To extend the data to 2018-19, we have used the household consumption expenditure collected in the Periodic Labour Force Survey (PLFS) in 2018-19. PLFS survey's primary objective is to collect information on important employment and labour related variables. Since the survey questionnaire and methodology of collecting consumption expenditure information of PLFS survey is different from that of consumption expenditure of earlier surveys, household consumption expenditures from these surveys are not strictly comparable. Jajoria and Jatav (2020) discuss these differences. However, if we restrict our analysis for the period through 2011-12, we find results very similar to those in Tables 3 and 4. These results are available on request.

electorate to use the state to help those who are most disadvantaged, individuals in the upper tail of the distribution have a reduced incentive to oppose relatively small amounts of redistribution. However, as the degree of inequality in the community increases, the greater degree of redistribution demanded becomes increasingly threatening to those with higher incomes, leading those with lower political coordinating costs to oppose redistribution more intensely. For the lower income majority, the higher cost of countering the growing opposition of higher income groups becomes increasingly prohibitive, leading many in the lower income group to see political action as ineffective, fostering political alienation and leading to nonparticipation in the political process. That is, increased inequality leads to an increase in voter turnout at relatively low levels of inequality whereas at relatively high levels of inequality the rising cost of confronting growing opposition leads to disillusionment of lower income voters with the results that can be achieved through political organization and results in falling voter turnout.

While the general pattern of rising and falling voter turnout with increasing inequality can in this manner be expected to arise across democratic communities that redistribute, the point at which political participation peaks will be a function of the institutions governing political participation and the economic and demographic factors underlying the organization costs of different groups. For these reasons we expect this to differ across countries.

7. Conclusion

In this paper we have used panel data to test two competing hypotheses over the relationship between income (consumption) inequality and voter turnout within a rational choice model of voter turnout on 10 Canadian provinces over the 1976 to 2019 time period and 14 Indian states between 1957 and 2018. In both these cases the data reject the hypotheses that voter turnout is monotonically related to the level of income or consumption inequality in favour of the hypothesis that the relationship is non-monotonic. More specifically, the analysis suggests that the data generates an inverted U shapes relationship consistent with the hypothesis that at low levels of inequality increases in inequality will lead to greater electoral involvement as minority groups attempt to use the political process to redistribute and higher income groups oppose (CT) before further increases lead to political disillusionment and falling voter participation (RPT).

Applying this to our cases, Canada appears to have entered into this later stage around 1990, with the recent decline in the Gini in some provinces suggesting a reversal of this process of disengagement. In the Indian case, different states are currently positioned on either side of the .34 tipping point, with the states as a whole experiencing a slow upward trend in the Gini.

In terms of the other elements of the voter turnout model, the results are consistent with the hypotheses that voter turnout increases with the competitiveness of constituency elections, decreases with the economic performance arising over the government's tenure (that is, with higher unemployment or lower per capita growth rates) and decreases with the average voting size of an election constituency (marginal size in the case of Indian states). In the Canadian case, increases in seat volatility increase voter turnout while in the Indian case, vote volatility was insignificant in its effect. Overall, the set of hypotheses explain over eighty percent of the variation in voter turnout in Canadian provinces and about sixty percent in the case of the Indian states.

Perhaps most surprising has been finding that population demographics have produced no significant effect on voter turnout once the other model determinants have been included. In Canada the proportion of voters between 20 and 24 had no significant relationship with voter turnout and in Indian state elections, neither the proportion of voters above 60 nor the discrete extension of the franchise to voters between 18 and 21 in 1989 had a significant effect. Given its prominence in the literature, some effect on voter participation and turnout might have been expected from the continuous fall in the size of the youth vote that has taken place over our time period (from 19.9% to 11.2%) in Canada and/or the rise in the share of the older electorate in India (from roughly 5% to 10%). However, that has not been the case.

Appendix on Data Sources and Derivations

Canadian Provinces:

Provincial Gini coefficients of adjusted total income. Statistics Canada Table 11100134. Cansim II v96439638 online DOI: <https://doi.org/10.25318/1110013401-eng>.

Unemployment rates by province Cansim II v2062815, monthly average.

Percentage of population young (20-24) Cansim Table: 17100005 (formerly CANSIM 051-0001).

Online election data by province: Ontario (elections.on.ca); Quebec (electionsquebec.qc.ca); British Columbia (elections.bc.ca); Alberta (elections.ab.ca); Manitoba (electionsmanitoba.ca); Saskatchewan (elections.sk.ca); New Brunswick (elections.nb.ca); PEI (electionspei.ca); Nova Scotia (electionsnovascotia.ca); Newfoundland and Labrador (elections.gov.nl.ca)

Indian States:

State level Gini coefficients were estimated from household consumption expenditure data collected by The National Sample Survey Office (NSSO) of the Ministry of Statistics and Programme Implementation through periodic nationally representative surveys. Two types of surveys are conducted: quinquennial (or “thick”) rounds done at five-year intervals on a large sample of households and annual/semi-annual (or “thin”) rounds undertaken during intervening periods on smaller samples. The government has made this household level data available for public use, retrospectively from the thirty-eighth round in 1983. Expenditure information from both thick and thin annual rounds were used to estimate Gini coefficients for the Indian states. The last survey in the public domain is for 2011-12 (68th round) so to extend the data series after 2011-12, we have used the monthly per capita consumption expenditure reported in the Periodic Labour Force Survey (PLFS) in 2018-19. To extend the dataset before 1983, we used the Gini coefficients estimated and provided by Ozler, Datt, and Ravallion (1996). Two adjustments were made to make their Gini coefficients compatible with ours: (1) Ozler, Datt, and Ravallion estimated Gini coefficients for rural and urban areas separately; whereas we used rural and urban population weights to generate aggregate Gini coefficients; and (2) official reports were used to provide the number of households in different consumption intervals. There are some disparities between the Gini coefficients estimated from household consumption expenditures and consumption expenditure intervals for the common survey rounds. For most of the states, the pattern of disparity goes in the same direction. We used the disparity ratio to revise the Gini coefficients backward and for years when consumption expenditure information is unavailable, Gini coefficients were generated by interpolating between survey rounds.

Election data: Election commission of India and calculation of authors.

Economic data: Central Statistical Organisation (CSO) and Census of India.

The datasets used in the tests are available online at Carleton’s Dataverse site (see Ferris, 2021).

Table A1

Descriptive Statistics: Canadian Provinces: 1976 - 2019

Variable definition	Mnemonics used in tables	Observations	Mean	Standard Deviation	Minimum	Maximum
Provincial voter turnout (percentage)	Voter turnout	420	68.5	10.55	40.6	89.1
Winning seat share margin- first versus second place finisher	Winning margin	421	.398	.226	0*	1**
Party level seat volatility	Volatility	420	.240	.152	.008	.704
Voter Size of Constituency (in 1000s)	Constituency size	422	25.811	67.209	2.339	1342.80
Unemployment rate	Urate	440	9.34	3.61	3.46	20.19
Gini Coefficient (total income)	Gini (total income)	440	.328	.02	.269	.378
Percentage of the population that is young (20-24)	Young	419	7.59	1.27	5.49	11.99

* a tie in vote shares in the 1998 Nova Scotia election; ** Liberal party under Frank McKenna party captured all the seats in the 1987 New Brunswick election.

Table A2

Descriptive Statistics: Indian States: 1957-2018

Variable Definition	Mnemonics	Observations	Mean	Standard Deviation	Minimum	Maximum
State Voter turnout (proportion)	Voter turnout	195	.627	.109	.24	.86
Constituency vote volatility	Volatility	180	.380	.130	.12	.72
Average voting size of state constituency (in 1000s)	Constituency size	183	134.664	61.65	39.25	371.052
Average growth rate of real per capita income over previous governing term	Growth real income	181	3.13	3.27	-6.42	16.43
Gini Coefficient (consumption)	Gini	183	.323	.032	.24	.43
Average constituency winning margin (first versus second place vote share)	Winning margin	195	.145	.046	.06	.29
Imposition of Presidential rule	President's rule	195	.231	.422	0	1
Percentage of population over 60	Old	183	7.04	1.40	4.97	13.45
Voting age change 21 to 18 (1988 onwards)	Voting age 18	195			0 1957-1988	1 1989-2018
Punjab's 1992 election	Punjab 1992 election	195			0 (otherwise)	1 (in 1992)

Figures and Tables in the text

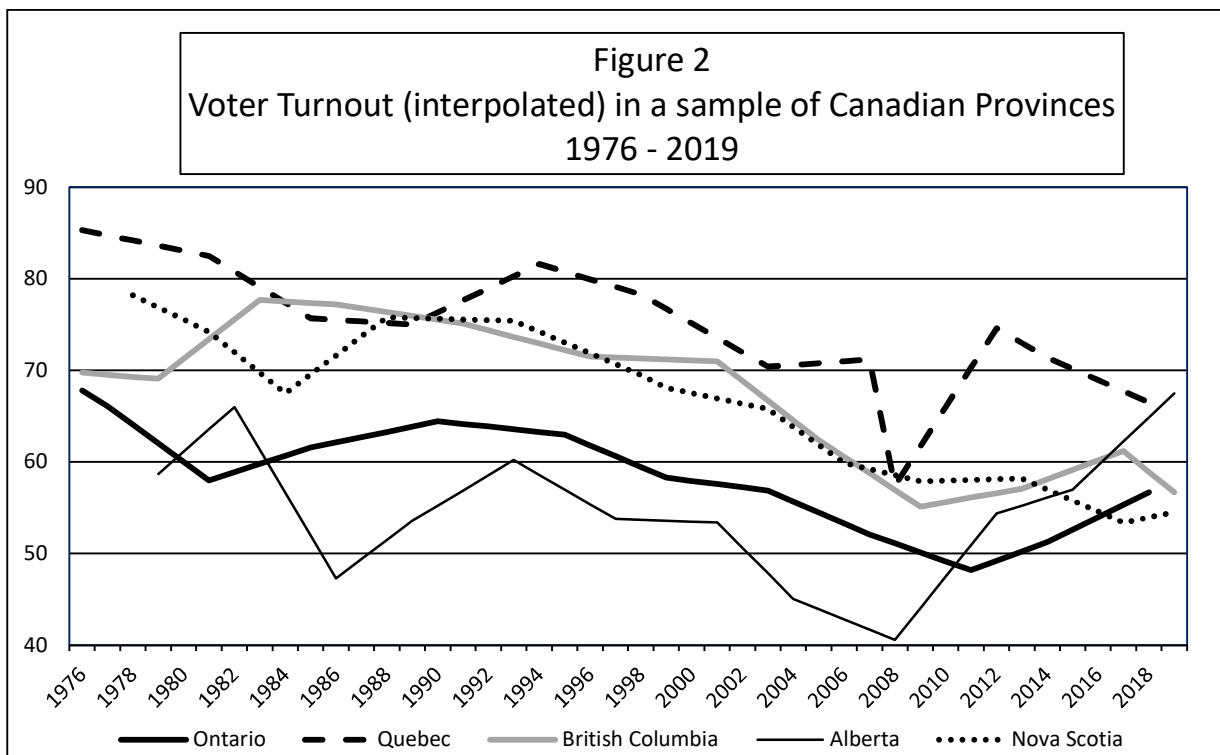
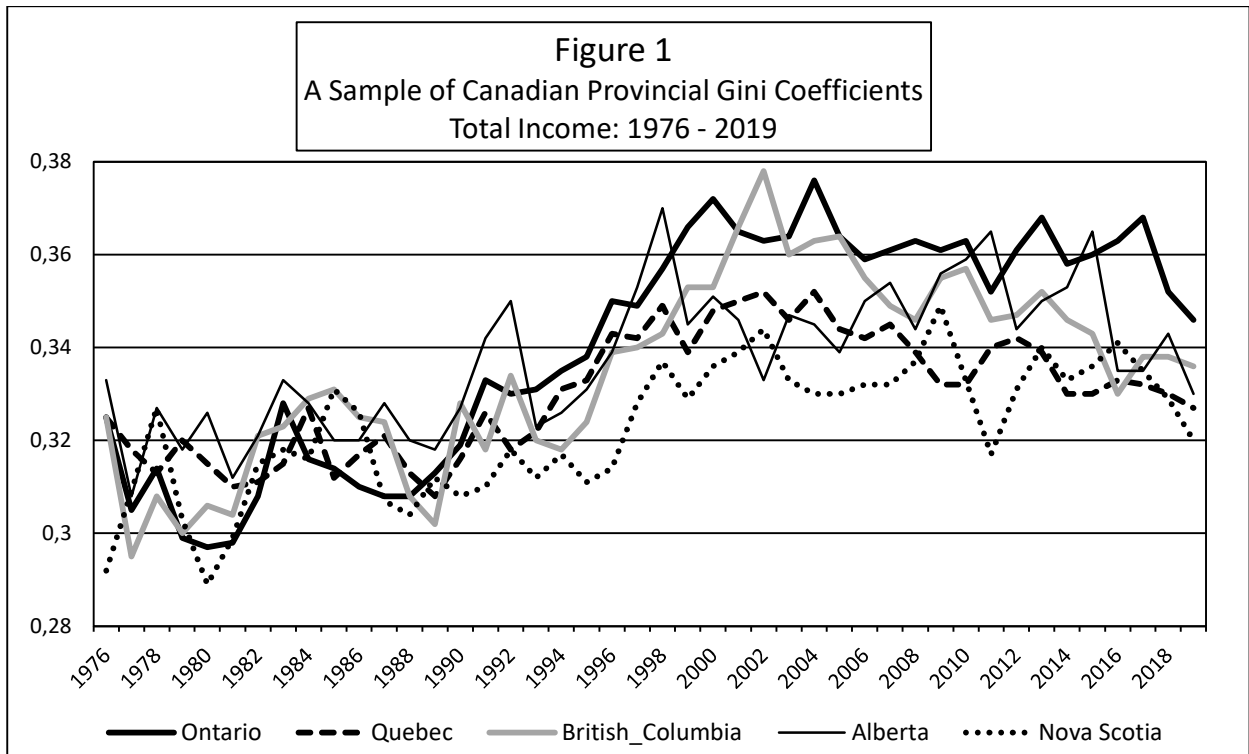


Table 1
Fixed Effects Voter Turnout Regressions
Canadian Provinces: 1976 – 2019
 (White cross-section standard errors)

	Voter Turnout Linear (1)	Voter Turnout Linear (2)	Voter Turnout Quadratic (3)
Constituency size	-0.009*** (0.003)	-0.007*** (0.001)	-0.008*** (0.001)
Winning Margin	-2.765** (1.21)	-3.161** (1.51)	-2.923** (1.48)
Volatility	12.95*** (1.56)	10.65*** (2.10)	10.84*** (2.09)
Young	2.51*** (0.234)	2.15*** (0.630)	2.23*** (0.637)
Urate	1.162*** (0.128)	0.838*** (0.196)	0.880*** (0.199)
Gini (total income)	-34.01* (18.20)	36.01 (20.75)	580.65** (297.4)
Gini Squared			-822.47* (447.4)
Constant	47.9*** (7.24)	31.35*** (8.16)	-59.64 (51.32)
Statistics:			
Number of observations	419	419	419
AdjR ²	.813	.854	.855
Cross-section fixed effects	YES	YES	YES
Period fixed effects	NO	YES	YES
F-statistic	121.93***	43.2***	42.75***
Tipping point			.35

*(**)[***] significantly different from zero at 10%(5%)[1%].

Table 2

Form of Stata fp test used:

fp < gini_total >, scale: reg voterturnout winning_margin volatility constituency_size(1000) young urate
<gini_total> i.provinceid, vce(robust)

Fraction Polynomial Test of 44 alternative polynomial representations
Canadian Provinces: 1976 – 2019

Gini (total income)	Test df	Deviance	Residual std. dev.	Deviance difference	Prob.	Powers (k)
omitted	4	2439.5	4.593	7.309	0.136	
linear	3	2436.1	4.579	3.869	0.296	1
m = 1	2	2435.8	4.578	3.632	0.177	3
m = 2	0	2432.2	4.564	0.000	--	-2 -2

Best fitting linear regression (robust standard errors in brackets):

$$\begin{aligned} \text{Voter turnout} = & -\frac{2.35^{**}}{(1.19)} \text{Winning margin} + \frac{13.17^{***}}{(1.75)} \text{Volatility} - \frac{.009^{***}}{(.001)} \text{Constituency size} \\ & + \frac{2.45^{***}}{(.244)} \text{Young} + \frac{1.183^{***}}{(.118)} \text{Urate} + \frac{19.28^{**}}{(8.47)} \text{Gini}_1 + \frac{11.53^{**}}{(5.16)} \text{Gini}_2 - \frac{30.23}{(24.65)} \end{aligned}$$

Observations = 417; $R^2 = .821$; *(**)[***] report significant at 10%(5%)[1%]; provincial fixed effects.

Component plot of best fitting fractional polynomial model plus 95% confidence interval where component means the linear combination of fractional polynomial terms and constant using the model's estimated coefficients

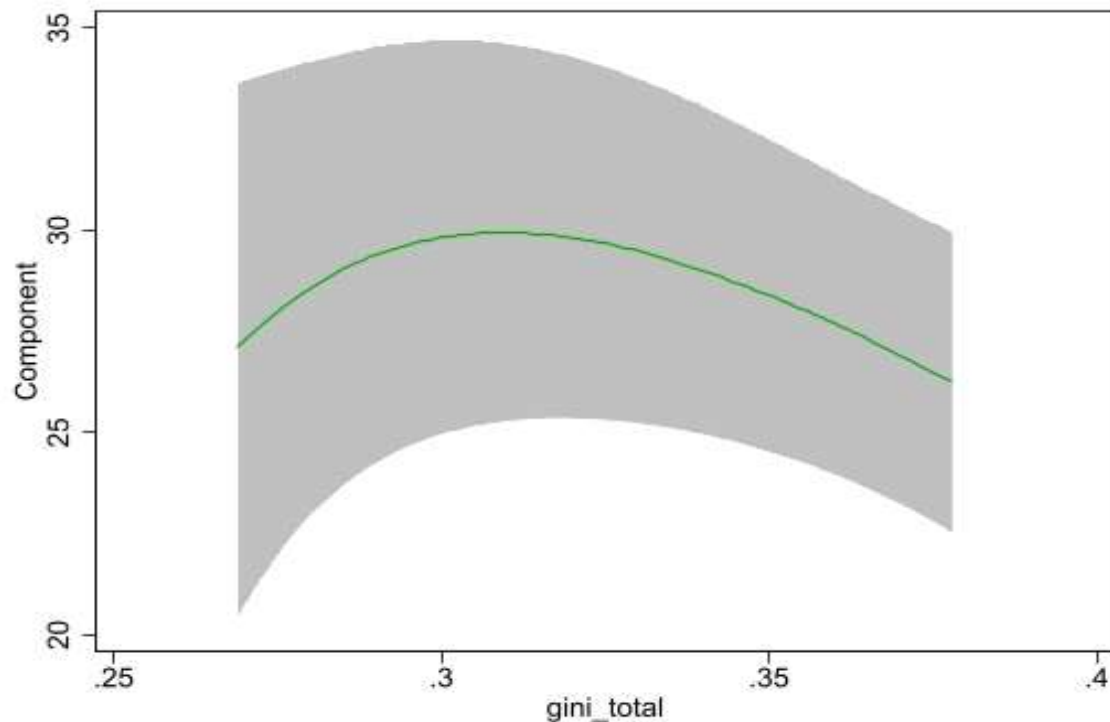


Table 3

Form of Stata fp test used for Indian States: 1957 – 2018.

fp <gini>, scale: xtreg turnout_state constituency size constituency size² winning margin volatility old voting_age_18 Growth of real income President Rule 1992 Punjab election <Gini>, fe vce(robust)

Fractional polynomial comparisons: 14 Indian States, 1957 - 2018

Gini (Consumption)	Test df	Deviance	Residual std. dev.	Deviance difference	P	Powers
omitted	4	-561.34	0.051	13.84	0.011	
linear	3	-561.42	0.051	13.77	0.005	1
m = 1	2	-563.02	0.051	12.16	0.005	-2
m = 2	0	-575.18	0.049	0.000	--	-2 2

Best fitting linear regression (robust standard errors in brackets):

$$\begin{aligned}
 \text{Voter turnout} = & 1.06^{***} + (.0015^{**}) \text{Constituency size} - (.000003^{**}) \text{Constituency size}^2 \\
 & - (.326^{**}) \text{Win margin} - (.015) \text{Volatility} - (.001) \text{Old} - (.014) \text{Voting age 18} \\
 & - (.003^{**}) \text{Growth real income} - (.040^{***}) \text{President's rule} \\
 & - (.434^{***}) \text{1992 Punjab election} - (.026^{***}) \text{Gini}_1 - (2.21^{***}) \text{Gini}_2.
 \end{aligned}$$

Observations = 177; R² = .576; robust standard errors; *(**)[***] report significance at 10%(5%)[1%];

Component plot of best fitting fractional polynomial with 95% confidence interval

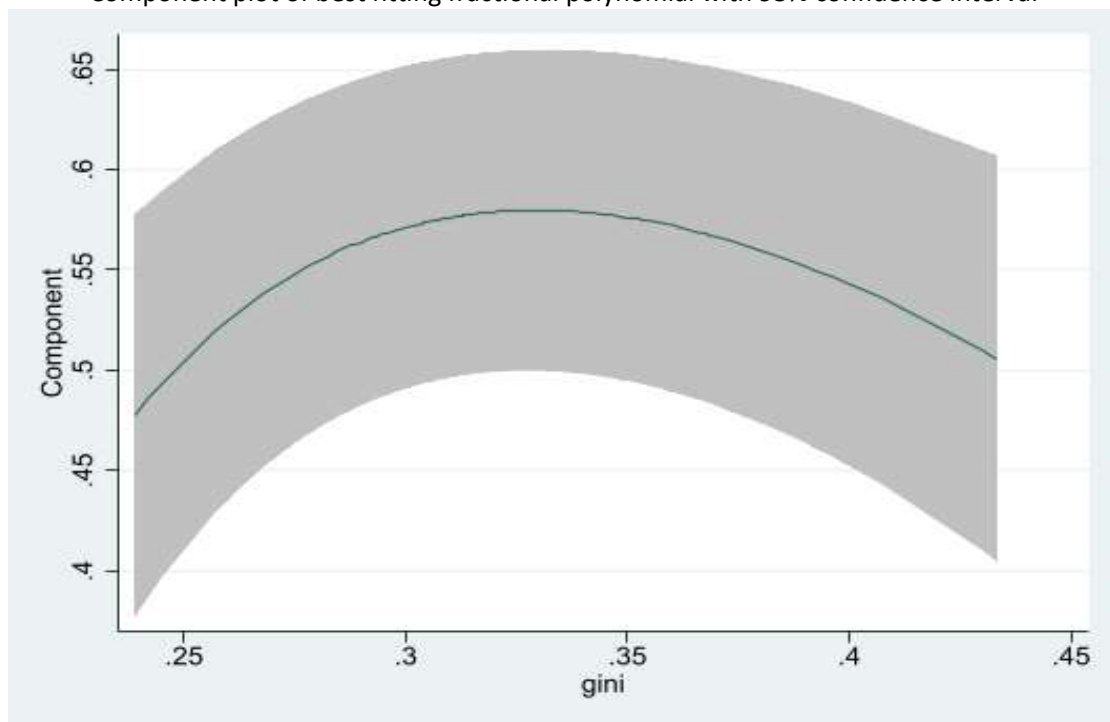


Table 4
Fixed Effects Models of Voter turnout in 14 Indian States, 1957-2018
 (robust clustered standard errors in brackets)

	State Voter Turnout Linear (1)	State Voter Turnout Quadratic (2)	State Voter Turnout Quadratic-two way (3)
Growth real income	-.003* (.001)	-.003** (.001)	-.004*** (.001)
Constituency size	.0013* (.0006)	.002** (.0006)	.002** (.0009)
Constituency size squared	-2.19e-06* (1.26e-06)	-2.65e-06** (1.21e_06)	-4.72e-6** (1.64e-06)
Volatility	-.016 (.033)	-.013 (.030)	.011 (.038)
Gini	.044 (.168)	6.11*** (1.26)	6.22*** (1.37)
Gini squared		-9.10*** (1.88)	-9.25*** (1.98)
Winning Margin	-.322** (.130)	-0.329** (.126)	-.348** (.130)
President's rule	-.044*** (.011)	-.039*** (.011)	-.040*** (.010)
Old	.0002 (.009)	-.0001 (.008)	-.007 (.011)
Voting age	-.010 (.013)	-.014 (.013)	-.022 (.015)
Punjab_1992_election	-.440*** (.013)	-.432*** (.011)	-.437*** (.015)
Constant	.573*** (.078)	-.448* (.235)	-.482* (.250)
Observations	177	177	177
R ² within	.541	.574	.648
R ² between	.001	.003	.004
R ² overall	.238	.269	.263
Gini Tipping Point		.336	.336
Fixed effects 1) State Effects	Yes	Yes	Yes
2) Election Effects			yes

* (**)[***] significantly different from zero at 10 (5) and [1] percent.

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