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Forecasting leadership transitions around the world

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ABSTRACT

We use popular non-parametric (CART, TreeNet) and parametric (logit) techniques to identify robust economic, demographic and political conditions that lead to shifts in control in the executive branch of government in 162 countries during the period 1960–2004. We find that institutional aspects of the political system, executive characteristics, demographic variables, economic growth, and economic trade variables are all very important for predicting leadership turnover in the following year. Financial crises are not robustly useful for this purpose, but a vulnerability to currency crises in times of low economic growth implies very high conditional probabilities of job losses for democratic leaders in non-election years. In-sample, TreeNet predicts 78% of leadership transition events correctly, compared to CART's 70%, and TreeNet also generally achieves higher overall prediction accuracies than either CART or the logit model out-of-sample.

1. Introduction

What factors drive shifts in control of the executive branch of governments around the world? A large body of election forecasting literature in political science has employed a variety of statistical methods with the aim of forecasting the outcomes of US presidential and legislative elections, but our knowledge of the drivers of political transitions at the international level is limited at best.[2] Of the few empirical studies that have inquired into the causes of regime change at the international level in political science, the focus has been primarily on *coups d'état* and shifts into and out of democracy. In this vein, Gasiorowski (1995) and Przeworski, Alvarez, Cheibub, and Limongi (1996) demonstrate that recessions increase the probability of a coup significantly. Przeworski et al. (1996), who focus specifically on transitions into and out of democracy in 135 countries around the world, show in addition that growth with moderate inflation, as well as affluence, declining inequality, and parliamentary institutions, increase the probability of a transition to democracy in the following year. Burke and Leigh (2010) study the effects of economic growth on transitions to democracy in international panel data, using instrumental variables techniques, and find significant evidence that higher growth rates are associated with lower probabilities of a transition of the political system to a democracy. A good survey of the economic determinants of electoral outcomes in democracies is provided by Lewis-Beck and Stegmaier (2000).

In the economics literature, a group of recent papers focuses on the effects of currency crises (Frankel, 2005), sovereign defaults (Malone, 2011), economic growth (Burke, 2012), and growth and political institutions (Cáceres & Malone, 2012), respectively, on the probability of a leadership transition in the executive branch. These works are perhaps the most closely related to our own. More generally, there is a larger body of previous work that suggests in particular that faster economic growth rates decrease the probability of a leadership transition.

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[2] See e.g. Campbell (1992, 2008), Lewis-Beck and Rice (1992), Lewis-Beck and Tien (2004), Nadeau and Lewis-Beck (2001), Rosenstone (1983) and Sigelman, Batchelor, and Stekler (1999) regarding forecasting models of US elections, as well as Fair's (1978) early paper linking economic events to the US presidential election outcome.

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As was noted by Burke (2012), studies such as those by Bueno de Mesquita and Smith (2010), Bueno de Mesquita, Smith, Siverson, and Morrow (2003), Carmignani (2002), Londregan, Bienen, and Van de Walle (1995), Londregan and Poole (1996), Marinov (2005) and Malone (2011) report a positive relationship between economic growth and political survival more generally, as does Burke's (2012) own study. Besley and Kudamatsu (2008), on the other hand, conclude that there is little evidence that the state of the economy is important to the timing of the political exits of autocrats. As was noted by Burke (2012), most prior studies have not had a strong focus on identifying a causal effect of growth on political transitions, whether in the executive branch or otherwise; exceptions to this rule include contributions by Brender and Drazen (2008), Burke (2012), Burke and Leigh (2010), Cáceres and Malone (2012), Deaton and Miller (1995), Dell, Jones, and Olken (2008), Leigh (2009) and Wolfers (2002). None of these papers, however, considers the out-of-sample forecasting properties of the models studied, and most papers consider a limited number of explanatory variables for explaining leadership transitions, given that the focus of most of the previous literature has been on the relationship between the state of the economy and the probability of a political transition.

The present paper aims to fill this gap in the literature, and differs from the above contributions along three main dimensions: (1) we focus explicitly on evaluating the out-of-sample model forecasting performance; (2) we focus on evaluating the performances of non-linear, non-parametric models vs. logit models in both in-sample and out-of-sample prediction exercises, given our strong prior (justified by our model's results) that any interactions between the main factors affecting leadership transitions are likely to be important and nonlinear; and (3) we consider a significantly expanded set of explanatory variables compared to previous papers in the literature.

To accomplish the above, we construct a database of leadership transitions and 62 explanatory variables for 162 countries over the period 1960–2004. Regarding point (3) above, our explanatory variables can be grouped into four categories: (i) macroeconomic fundamentals; (ii) political and institutional factors; (iii) demographic variables; and (iv) dummy variables for different types of financial crises. The leadership transition variable, $jobloss_{it}$, is coded as one if the head-of-state in country i loses his or her job in year t, and zero otherwise. Years in which job loss by the head-of-state coincided with the natural death of that individual are excluded from the dataset, following Burke (2012) and Cáceres and Malone (2012).

In order to identify robust determinants of leadership transitions, we employ non-parametric Classification and Regression Tree (CART) models, proposed by Breiman, Friedman, Olshen, and Stone (1984), logit models based on robust control variables informed by the CART model results, as did Manasse and Roubini (2009), and robust Multi-Tree, or TreeNet models, invented by Jerome Friedman (2001, 2002). In implementing the CART, logit and TreeNet models, we lag all explanatory variables by one year (excluding a dummy variable for the year of a scheduled executive election, the state of which can be known in advance), in order that our results may be used directly in the prediction of leadership turnover in the following year.

In homage to the literature on early warning models of financial crises (see Berg, Pattillo, & Borensztein, 2005, for a good summary), we employ the CART, logit and TreeNet models for out-of-sample forecasting of leadership transitions, as a first exercise in providing "early warning" of leadership transitions in a sample consisting of the majority of the world's sovereign states. In producing out-of-sample predictions, we took as a baseline training period the window of observations from 1960–1989, ending with the fall of the Berlin wall and the year that may be taken (according to some standards) as the symbolic end of the Cold War, and experimented with both fixed and expanding window schemes, as well as with a more recent out-of-sample test period.

The main conclusions of the paper are as follows. First, out of the 62 candidate variables, only 18 turn out to be robustly useful for classification and prediction in the CART model. These include: the Highest Polity score to date, the election dummy, the Polity (Polity IV) score, trade openness as a percentage of GDP, the growth rate of real GDP per-capita, the ratio of the M2 definition of money to foreign reserves, the real oil price index, a measure of creditor rights, the ratio of foreign direct investment to GDP, the Herfindahl index measure of the concentration of power held by parties in the political opposition, executive constraints (decision rules), a measure of institutionalized democracy, the growth rate of the money supply (both the current year and the moving average), the infant mortality rate, the private sector credit/deposits measure of liquidity, the gross primary school enrollment rate, and the fiscal surplus as a percentage of GDP.

Second, the results from CART confirm widely held theories that institutionalized democracy and regularly scheduled elections, especially in combination, increase the probability of leadership turnover, while autocrats in relatively undemocratic countries without regularly scheduled elections face significantly lower than average probabilities of being ousted from office. Nonetheless, the results from CART also reveal novel insights, such as the fact that, even when not facing a regularly scheduled election, leaders in relatively strong democracies that are open to trade face a very high (52%) probability of being ousted when the economy is experiencing a very negative rate of economic growth and possesses low levels of M2 relative to foreign reserves—conditions which make the economy highly vulnerable to a currency crisis. In addition, the TreeNet results reveal the novel insight that, after controlling for other factors, high levels of gross primary school enrollments are associated with significantly lower probabilities of a leadership transition.

Third, in terms of model performance, the TreeNet model usually (but not always) outperforms both the CART and logit models in overall in-sample and out-of-sample prediction accuracies. For the purposes of comparison with the results obtained using CART for out-of-sample prediction in other fields, we find that leadership transition events are slightly easier to predict[3] than childhood-onset

[3] The CART model predicts between 46% and 69% of leadership transitions correctly in our out-of-sample exercises.