Economic Leadership and Growth

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Abstract

Economies governed by former economics students grow faster than economies governed by leaders with other education backgrounds; a result which is most evident for presidents. Faster growth (average growth) occurs during an economic leader's first year (entire tenure), primarily through investment. When focusing on *close* elections which "quasi-randomize" economic leadership, I find a large effect that is robust controlling for a leader's advanced education. Investors seem to hasten their activity in anticipation of their economic leader's eventual reduction of the top personal income-tax rate. Overall, the findings suggest that economic leaders improve short-term growth through the anticipation of policy changes.

Key words: Government Leadership, Economics Education, Economic Growth, Anticipation, Government Finance, Tax Cuts.

JEL Classification: A20 (Economics Education), E32 (Short-Run Economic Growth), D72 (Leader Changes and Close Elections), H11 (Government Leadership), H24 (Personal Income Tax Rates), H30 (Anticipation of Policy Changes), I26 (Returns to Education), O23 (Economic Policy and Development).

1. Introduction

Economics is an integral part of government decision-making. However, adverse economic events around the world motivate many to question the governance value of economics (Fourcade, Ollion, and Algan, 2015).[1]

In governance, when ascribing value to economics, there is often an appeal to a framework of skills matching: People exhibit different types of skills (Heckman and Sedlacek, 1985); and an individual performs well when her education background is suited for her job.[2] If economics majors have an advantage in governance (Stigler, 1976), then a government leader who is chiefly responsible for economic policymaking (Brady and Spence, 2010), should perform better than others if he is educated in economics. This framework, however compelling, is imperfect without supporting evidence.

This paper's evidence comes from education background data for 1681 government leaders in 146 economies, collected meticulously for the years 1950 to 2014. Given that most of these leaders are in power for short spells, I study short-run growth to determine the role of economic leadership. Although the cyclical nature of short-run growth is well known (Shapiro and Watson, 1988), this paper finds that a cycle trough tends to occur when leaders change. Moreover, there is a remarkable difference between cases with a change in the economic-leader indicator, and other leader changes: The latter changes are associated with a deterioration in growth, while economic leader changes (e.g. from a non-economic leader to an economic leader) are associated with a large and distinct improvement in growth.

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[1] Josh Zumbrun, "Top Economists Grapple with Public Disdain for Initiatives They Championed," *The Wall Street Journal*, January 8, 2017.

[2] Consistent with this idea of heterogeneous skills, people also choose different areas of education, and these subject areas naturally produce different returns to education (Kirkebøen, Leuven, and Mogstad, 2016; Andrews, Imberman, and Lovenheim, 2017). These returns are more likely to be realized when a person is employed in a job that is matched to her education background (Robst, 2007).

An economic leader is not simply a beneficiary of a concurrently booming economy; and while economic leaders often come to power during periods of slowing growth, these leaders do not benefit from predictable recoveries: An economic leader is no more likely than other leaders to come to power following a recession. In other words, economic leaders do not seem to be "free-riders" of the expected ups and downs in an economy.

Consider an exercise that estimates the economic leadership effect; taking (i) the average difference in annual growth in an economy going from a non-economic leader to an economic leader, minus (ii) the average difference in annual growth going from a non-economic leader to another non-economic leader. This difference-in-differences (DD) exercise produces statistically equivalent growth trends prior to these two leader change events, thus satisfying the parallel-trends assumption (Angrist and Pischke, 2010) for the identification of an economic leadership effect of roughly one percent. Although the estimate is large, the fact that economic leaders come to power during periods of slowing growth—which is often persistent—suggests that this DD estimate is likely to be lower than the true effect (Fair, 1978).

In estimating the true effect for democracies, this paper's main solution is to focus on close elections that produce virtually random assignments of economic leadership (Lee, Moretti, and Butler, 2004; Eggers et al., 2015). After investigating close elections held to replace a non-economic leader, I find that in the first year of the new government, the economic growth rate improves by 1.53% under a new economic leader; under a fresh non-economic leader, the rate deteriorates by 1.24%. This effect of economic leaders (relative to non-economic leaders) is about the same whether it is estimated for the first-year growth rate, or for the average growth rate during the entire time that a given leader is in power. The first-year effect does not occur because of a change in (a) leader education quality, (b) leader age, or (c) democracy, but seems

to occur specifically for leaders educated in economics, regardless of their left or right political ideology. A subsequent comparison of first-year growth differences following close elections with those following other leader changes reveals no statistically significant distinction between these two leader-change samples.

This paper's main result occurs mostly in cases where a leader has greater power to affect an economy through government policies. When investigating one possible policy mechanism behind the result, I find that in anticipation of their economic leader's eventual reduction of the top personal income tax rate (House and Shapiro, 2006; Mertens and Ravn, 2013), agents seem to generate economic activity in the short run.[3]

Overall, the findings suggest that economics matters for governance: Economic leaders have a large and speedy impact on economic performance. The evidence supports the idea that government leadership affects short-run growth in both autocracies and democracies; and implies that skills matching generates returns at the economy level, not just through an advanced education (e.g. years of schooling), but through the discipline of economics.

2. Motivation and Hypothesis Development

Economics can be defined as the study of the production, distribution, exchange, and consumption of goods and services; both at the unitary level and the economy level.[4] The discipline teaches us—among other things—the "house rules" which support a healthy economy;[5] and one of the major public roles of an economic expert (or economist) is to inform

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[3] Mertens and Ravn (2013) distinguish corporate tax cuts from personal tax cuts, and show that personal tax cuts can boost consumption, investment, employment, and overall output.

[4] While Buchanan (1964) prefers a narrow focus on the social activity of exchange and trade, Stigler (1984) is much more flexible regarding the scope of economics. Coase (1978) rejects the idea of economics as a well-defined discipline and asserts that economics is simply "what economists do."

[5] These rules could prove to be important when managing an economy in the short term. Economies experience substantial (short-term) shocks to economic performance (Easterly et al. 1993; Shapiro and Watson, 1988). In addition to changes in institutions, economic policy changes (Slemrod, 2004; House and Shapiro, 2006; Mertens and Ravn, 2013) could explain these growth shocks.

economic policy (Stigler, 1965).[6] As Lyndon Johnson embarked on an agenda to tackle poverty in the United States of America (the U.S.) in the 1960s, Stigler expressed confidence about economics and its role in policy:

> "*I would gloat for one final moment over the pleasant prospects of our discipline. That we are good theorists is not open to dispute… we shall develop a body of knowledge essential to intelligent policy formulation. And then, quite frankly, I hope that we become ornaments of democratic society whose opinions on economic policy shall prevail.*"

Economists later acknowledged, during a challenging economic period in the 1970s, the limitations of the discipline as a vehicle for policy impact (Heller, 1975). For example, in democracies, the main limitation is that economists may struggle to influence the marginal voter (Downs, 1957); who is not an economist, but a policy consumer (Stigler, 1982) with different views about the economy (Sapienza and Zingales, 2013). Despite this major limitation, the "bumpy road" of economic progress has given critics, both inside (Romer, 2016) and outside (Fourcade, Ollion, and Algan, 2015) of the discipline, occasional opportunities to question the policy efficacy associated with economics. For instance, Coase (2012) argues that in a post-crisis world, economic analysis is becoming irrelevant as an "instrument … to manage the economy."

To determine whether economics is a valuable instrument for the management of an economy, this paper investigates cases where a former economics student assumes the greatest responsibility at the economy level (as the head of government, or government leader).[7] In

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[6] Economists are widely recognized as experts (Stigler, 1965) whose "competence exists in understanding how an economic system works." However, by studying all former economics students, this paper's goal is to use a large group that allows one to distinguish the effect of the field from the effect of an advanced education.

[7] The government leader is defined as the head of government. The national leader is subjectively defined as the most powerful person in an economy, and is often the head of state. Contrary to the idea of leader irrelevance, Jones and Olken (2005) find evidence that national leaders matter for authoritarian regimes (or autocracies) and appeal to

democracies, if voters rationally forego the cost of becoming informed about economic policies (Blendon et al., 1997; Besley, 2006), then an economic leader—rather than the typical voter— would determine policy (Brender and Drazen, 2013). In autocracies, it is obvious that an economic leader influences economic policy (Silverman, Slemrod, and Uler, 2014).

Economic leaders should improve economic performance if an economics education provides leaders with an advantage in economic policymaking (Stigler, 1976). While there is evidence that national leaders matter (Jones and Olken, 2005; Easterly and Pennings, 2016; Berry and Fowler, 2017); the evidence regarding the role of economic leaders in the economy is mixed: Dreher et al. (2009) show that professional economists tend to implement much-needed reforms, but Hira (2007) finds no evidence that long-run outcomes improve with a national leader's education background in economics. Whereas Hira (2007) studies national leaders, this paper investigates government leaders[8] and shows that most government leaders are in power for relatively short periods of time; a fact which leads to confounding leader effects when studying long-run growth.

The research question therefore remains unanswered: Compared to a non-economic leader, does an economic leader (a government leader who is educated in economics) improve an economy's growth rate in the short run? For the question to have an affirmative answer, (i) skills matching (through a matching *field* of education) should be present for leaders at the economy level; (ii) government leaders should matter; and most important, (iii) *economics* should matter for governance. To study the question, this paper uses hand-collected government-leader background data.

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researchers to investigate measures of leader quality. In exploring these measures, researchers naturally point to a leader's education background: Besley, Montalvo, and Reynal-Querol (2011) argue that economic growth is affected by the quality of a national leader's education.

[8] See the previous footnote (fn. 7).

3. Data and Sample Statistics

For a sample of economies over the years 1950 to 2014, this paper studies the role of a government leader's economics-education background in her economy's growth rate. The initial sample of economies is extracted from the Financial Development and Structure (FDS) database maintained by the World Bank (WB). Given the considerations regarding data availability, economy size, and institutional quality, the final sample consists of 146 economies governed by 1681 different leaders. The details of the sample construction process, the variable descriptions, and the data sources are presented in Appendix A.

3.1 Leaders

Government leader data are collected by hand. An economy's government leader is defined as the chief executive responsible for domestic government policymaking for *most* of the year. For example, consider a leader transition from Leader [A] to Leader [B] in a given year. If Leader [B] assumes power after the midpoint of the year (normally July 2nd), then Leader [A] is designated as the leader for the year (t), and Leader [B] is designated as the leader for the following year ($t + 1$).

By using government leaders, the focus is not on heads of state (e.g. governors general), but on heads of government. For instance, in Australia, the government leader is the prime minister; while in the U.S., the government leader is the president.[9]

In identifying government leaders, this paper first recognizes the unambiguous cases of single government leaders (i.e. the chief executives who do not share government-leader responsibilities with other executives). The Central Intelligence Agency (CIA) World Factbook is the primary source for determining the single government leader for each economy-year. If an

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[9] Table A.III in Appendix A shows the names of the sample economies by government leader type.

economy modifies its constitution while retaining a single government leader, then I use the government leader under the constitution in place for most of the year.

In addition to the unambiguous cases, there are ambiguous cases of political systems maintaining both a prime minister and a president (i.e. two types of government leaders) for government responsibilities. These political systems exist mostly in Eastern European and African economies (Shugart, 2005).[10] In the majority of these cases, the prime minister is picked as the government leader for the entire sample period, thereby adopting the French convention where the prime minister is responsible for domestic economic policy (Article 5, Title II, of the French Constitution of 1958). There are exceptions to the French convention: For most of the sample period, the president is the dominant domestic economic policymaker in Korea, Mozambique, Russia, and Rwanda. For these economies, the president is picked as the government leader. If an economy abolishes the office of one type of government leader for most of the year, then the other type of government leader is chosen for the year. If an economy experiences military rule for most of the year, then I choose the military leader as the government leader for the year.

Economic leader is a dummy variable equal to one if the government leader was educated in economics prior to becoming the government leader, and zero otherwise. *PhD economist* [*Academic economist*] is equal to one if the government leader received a doctorate (or equivalent) in economics [conducted teaching and research in economics at a university] prior to becoming the government leader, and zero otherwise. *Advanced degree* is a dummy variable equal to one if the government leader received a graduate degree (professional or otherwise)

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[10] In African countries, these systems are often associated with power struggles (Lijphart, 2004). See Otto Bakano, "Kenya's Premier Seeks Annan's Help in Fresh Crisis," *Agence France Presse*, February 16, 2010; "Political Problems No Barrier to Romania," *Euroweek*, September 7, 2012; and "New Somali Cabinet Offers Glimmer of Hope," *All Africa*, February 11, 2015.

prior to becoming the leader, and *Advanced STEM* is a dummy variable equal to one if the government leader received an advanced education in a STEM (Science, Technology, Engineering, and Mathematics) field or a medical degree prior to becoming the leader; each respective variable is otherwise equal to zero. *Leader age* is the age of the government leader. *Right ideology* is equal to one if the government leader is a member of a right-leaning political party. *Regime duration* is the number of uninterrupted years with one unique government leader.

3.2 The Economy

For the economies with available government-leader background data, the national-accounts data used for the economic growth variables are extracted from the Penn World Tables (PWT) version 9.0, and the 2015 World Development Indicators (WDI) database maintained by the World Bank. The data for top tax rates are extracted from the World Tax Database maintained by the Office of Tax Policy Research at the University of Michigan.

This paper relates the calendar-year timing of annual leader changes to changes in the annual, or short-run, growth rate of real gross domestic product (GDP) per capita; thus it becomes desirable to use national accounts data that are presented in calendar-year time. The PWT database uses the official fiscal-year reports of the national accounts, which do not correspond to calendar-year time for all economies.[11] The WDI database however, adjusts all exceptional reporting periods to calendar-year time. Hence *Economic growth*, the growth rate of real GDP per capita, is constructed as follows: First, by using the corresponding indicator from the WDI database; and second, where the data are missing in the WDI database, by using the corresponding indicators from the PWT for calendar-year reporting economies. *Economic*

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[11] The WDI data manual lists the economies with exceptional reporting periods. These economies include Australia, Bangladesh, Botswana, Canada, Egypt, Haiti, India, Indonesia, Iran, Japan, Kenya, Kuwait, Lesotho, Malawi, Myanmar, Namibia, Nepal, New Zealand, Pakistan, Puerto Rico, Sierra Leone, Singapore, South Africa, Sweden, Thailand, the United States of America, Uganda, and Zimbabwe.

growth (WB-PWT) uses the PWT for all types of reporting economies where the data are missing in the WDI database.[12] *Recession* is equal to one if *Economic growth* is negative (regular), less than -5% (deep), or negative for two consecutive years (long); and zero otherwise.

Investment growth is the growth rate of real investment per capita. *Consumption growth* is the growth rate of real household consumption per capita. *Govt. spending growth* is the growth rate of real government-spending per capita. *Export growth* is the growth rate of real exports per capita. These growth types are constructed in a way that is similar to the construction of *Economic growth* (WDI data first, then PWT data for the calendar-year reporting economies if the WDI data are missing). *Top corporate tax rate* is the top income tax rate for corporations; *Top personal tax rate* is the top income tax rate for individuals. All macroeconomic variables are winsorized at the 1% tails to lessen the effect of extreme values.[13] As an alternative to economic growth, *Mean night light intensity growth* is the growth in average nighttime light emission per one million persons.

3.3 <u>Politics</u>

Close election is an election with a margin of victory of 2% or less (or a one-seat difference for parliamentary elections where 2% corresponds to less than one seat).[14] Given that one type of leader, an economic leader or a non-economic leader, emerges as the winner in a close election; the election is valid if an alternative-type candidate is the top candidate other than the winner.

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[12] For the PWT-based measures, this paper uses the PWT 9.0 national accounts data. Compared to growth derived from earlier PWT versions, this paper's growth measures are less sensitive to the main problem presented in Johnson et.al. (2013).

[13] Here the concern is to lessen the effect of extreme values that could be impacted by leadership. For the outlier collapse-and-rebound growth shocks driven by conflict in Libya in 2011, and genocide in Rwanda in 1994; this paper's sample recognizes these shocks as missing values (2011 and 2012 in Libya; and 1994 and 1995 in Rwanda). Likewise, Somalia experienced a civil war in the late 1990s and was essentially leaderless from 1997 to 2000; for these years, this paper's sample recognizes the leader background variables as missing values.

[14] An election with multiple rounds of voting is considered close if the margin of victory is 2% or less for any of the voting rounds. Close elections also include outcomes where the government leader emerges from a minority party as part of a governing coalition. For parliamentary elections, I require that each party's candidate for government leader is known to voters prior to the election; these candidates are often the party leaders themselves.

Polity is the POLITY2 variable from the Polity IV Project maintained by the Center for Systemic Peace and is a measure of regime authority; the variable is a score ranging from –10 to +10, with larger values indicating democratic institutions of better quality. *Autocracy* is a dummy variable equal to zero if the polity variable is greater than zero, and one otherwise. *Presidential system* is a dummy variable equal to one if there is a presidential system of government, and zero otherwise.

3.4 <u>Sample Statistics</u>

The sample consists of an unbalanced panel of 6980 economy-year observations for the years 1950 to 2014 where *Economic growth* and *Economic leader* are non-missing. The panel is unbalanced because some countries do not have the relevant data throughout the entire sample period. For example, Latvia, which effectively lost its independence in 1940, had independence restored in its sample-start year of 1990. The variable definitions are presented in Table I with the sample summary statistics for the economy-year observations shown in Panel A.

Although the median regime duration is three years; most regimes (30%) last for one year only, and many regimes (17%) last for two years only.[15] These numbers suggest that to identify the effect of government leadership on performance, it is better to study short-run growth rather than long-run growth because leader effects could be confounded over a long period of time. The mean for economic growth is approximately 2.15%.

Leader characteristics include age, advanced degree, economic leader, PhD economist, and academic economist. The typical government leader is age 56. Although three out of every four leaders are university educated, only 31% of the economy-year observations are associated with a leader who completed graduate studies. For the entire sample period, roughly 16% of the

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[15] See Figures II and III for an alternative representation of this empirical observation.

economy-year observations are associated with an economic leader; 4% with a PhD economist leader; and 1% with an academic economist leader.

3.5 <u>The Difference in Mean Economic Growth</u>

Panel B of Table I presents the difference in average economic growth between economic leaders and non-economic leaders. Compared to non-economic leaders, economic leaders oversee greater economic growth. The mean for economic leaders is approximately 2.49% and is greater than the mean for non-economic leaders, which is roughly 2.08%. The difference in means is statistically significant at the 5% level.[16]

For all economies, Figure I shows that economic leadership has been increasing over time, not only as a percentage of all leaders, but even more so as a percentage of university-educated leaders. These findings suggest a positive experience of economic leadership.[17]

4. Empirical Methods and Analysis

Given that most regimes last for one year only, this paper examines whether economic leadership is unrelated to annual economic growth.[18] To test the hypothesis, this paper estimates the average difference in growth between economic leader changes and other leader changes. Leader changes (the time dimension) bring about a change in a country's economic leader status (the treatment dimension) when the country experiences a change from a non-economic leader to an economic leader or from an economic leader to a non-economic leader ("Economic" leader change). The alternative is no change in the country's economic leader status ("No Change" leader change).

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[16] See Figure B.III in Appendix B for an examination of growth distributions by leader type.

[17] See Appendix B for separate figures that show economic leadership over time for higher-income economies and lower-income economies.

[18] The empirical growth literature is chiefly concerned with long-run growth (or alternatively, growth for seven-, five-, or three-year spells) and the associated role of policies (Levine and Renelt, 1992). Given that most regimes last for one year only, leader effects can be confounded even over a relatively short period of three years. The study of annual growth is therefore appropriate for leadership research. In this paper, growth is best understood within the context of business cycles (Shapiro and Watson, 1988).

The difference-in-leader-changes (DL) estimate is the average difference between the two leader change events ("Economic" minus "No Change").

This DL approach is closely related to the difference-in-differences (DD) estimation method (Angrist and Pischke, 2010). The key identification assumption of a DD test is that the growth trend is not statistically different between the treatment group and the control group prior to an "exogenous" event (the pre-event parallel trends assumption). In this paper, all else equal, one group receives the treatment of an economic leader change while the control group does not receive the treatment.

Given the identification assumption, this paper's analysis proceeds in two steps: I first estimate the average difference in growth between economic leader changes and other changes, while checking the pre-event parallel trends assumption and acknowledging that leader changes are not economically exogenous events. This exercise is then repeated by using close elections to refine the set of leader changes to produce "quasi-random" assignments of economic leadership.

4.1 The Residual Method of Analyzing the Difference in Leader Changes

A relatively straightforward way of studying growth around leader changes is to organize the data in terms of pre-leader-change observations and post-leader-change observations. Bertrand, Duflo, and Mullainathan (2004) suggest that such a method, which organizes the data relative to an event, addresses the problem of autocorrelation that can lead to inconsistent standard errors in DD regressions.

Consider a specification with a left-hand-side (LHS) variable y_{it} (economic growth). Here $i=1,...,M$ is an index for states (or economies); and $t=1,...,H$, an index for time periods (years). u_{it} is a mean zero noise term. s_i and a_t are economy and year fixed effects.

[1] $$y_{it} = s_i + a_t + u_{it}$$

If economy and year fixed effects determine a baseline economic growth rate, then to study otherwise similar observations, it becomes necessary to remove these fixed effects to produce estimates of abnormal economic growth.[19] These deviations from "normal" economic growth, $\hat{u}_{it}$, are derived as the fitted residuals from the regression.

4.2 <u>An Event-Time Visual Representation of Leader Changes and Growth</u>

To characterize the relation between economic leadership and abnormal economic growth, this paper presents event-time graphs which compare the pre-leader-change pattern in abnormal economic growth to the post-leader-change pattern in abnormal economic growth. For this visual representation, there are two events: "Economic" and "No Change" leader changes. For "Economic" leader change events, there are two types: the change from a non-economic leader to an economic leader (upward) and the change from an economic leader to a non-economic leader (downward). When combining both types to produce an estimate; I use $\hat{u}_{it}$ for upward changes, and $-\hat{u}_{it}$ for downward changes.

In Figures II and III, each event occurs in a new leader's first year. The event time is the difference between the year of observation and the event year (year T or first year of a new administration). Both figures present kernel-weighted local-constant regressions of abnormal economic growth in terms of the event time.

Figure II shows a typical "business cycle" pattern for economic growth when there is no change in economic leadership. An interesting finding from the figure is that changes in leadership are aligned with a low point of the cycle (i.e. a trough). In other words, the business cycle appears to be both a political leadership cycle and an economic cycle. In the event year itself, the change in economic growth is negative.

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[19] Economy fixed effects could also determine educational attainment in an economy through prevailing cultural views (Figlio et al., 2016), and year fixed effects could influence educational attainment through booms and busts (Charles, Hurst, and Notowidigdo, 2016).

The evidence in Figure III offers a clear representation of an economic leadership result. The downward-sloping pre-leader-change growth trend in Figure III is similar to the corresponding trend in Figure II. Yet Figure III shows that for a change in economic leadership—when the economy experiences a change from a non-economic leader to an economic leader or from an economic leader to a non-economic leader—there is no natural continuity in the "business cycle" pattern; there is in fact a discontinuity.

4.3 Leader-Change Regression-Discontinuity Analysis

A formal regression-discontinuity (RD) test of growth around leader changes poses a challenge: Growth is measured annually and the event time is discrete. To produce robust RD estimates, Lee and Card (2008) propose a solution which clusters on the discrete variable. The robust RD approach of Calonico, Cattaneo, and Titiunik (2014) not only allows for clustering, but corrects for bias in the RD estimates. In Panel A of Table II, I implement the approach using linear regressions for the three years prior to a leader change and the first three years after the leader change. For "Economic" leader changes, there is discontinuity of 0.606%, while for "No Change" leader changes, there is a discontinuity of -0.536%; both estimates are statistically significant at the 1% level.[20]

4.4 Symmetric First-Year Leader Differences

The results of the RD analysis in Panel A of Table II suggest that compared to other leaders, an economic leader is associated with faster growth; a result which occurs immediately in the first year. To explore the first-year result, this paper examines first differences in abnormal economic

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[20] Given that the values for *Abnormal economic growth* are generated values rather than true values, Table II also presents results with bootstrapped standard errors (1000 replications) where both stages of the two-step process (residual creation, and discontinuity or difference estimation) are subject to replication.

growth around leader changes by restricting attention to a first-year leader-change subsample to estimate a "local" effect (Imbens and Angrist, 1994).[21]

[2] $$\{\Delta \hat{u}_{it} = \hat{u}_{it} - \hat{u}_{it-1} \mid \text{a leader change in economy } i \text{ and year } t\}$$

For these first-year differences, I simply compare the average leader-change difference in abnormal economic growth for "Economic" leader changes to the average leader-change difference in abnormal economic growth for "No Change" leader changes. The values used for averaging are $\Delta \hat{u}_{it}$ for upward changes and $-\Delta \hat{u}_{it}$ for downward changes.

Panel B of Table II shows that when comparing "Economic" leader changes to "No Change" leader changes, there is no statistically significant difference in the *pre-event* growth trends between these two leader change events. Panel B also presents the means for first-year differences in abnormal economic growth. The average difference for an economic leader change is 0.771% and is statistically significant at the 1% level. The average difference for no change is -0.126% and is not statistically significant. The difference in means between the two growth differences is nearly 0.90% and is statistically significant at the 1% level. Therefore, the first-year economic leadership DL estimate is roughly 0.90%. Given the mean of 2.08% growth for non-economic leader observations in the sample, the economic leadership DL estimate indicates a premium of 43% over the non-economic leader observations.

4.5 <u>Asymmetric First-Year Leader Differences</u>

The analysis in Figures II and III and in Panel B of Table II assumes that the estimate for upward economic leader changes is similar to that for downward economic leader changes. Panel C of Table II relaxes that assumption to study upward and downward changes separately using $\Delta \hat{u}_{it}$ for both types of changes.

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[21] First differences also remove economy fixed effects; I obtain similar results when generating residuals using year effects only.

Panel C of Table II shows that when comparing upward "Economic" leader changes to upward "No Change" leader changes, there is no statistically significant difference in the *pre-event* growth trends between the two leader change events; hence the pre-leader-change parallel-trends assumption for identification (Angrist and Pischke, 2010) is statistically satisfied for these leader changes. However, the average difference for an upward economic leader change is 0.982% and is statistically significant at the 5% level; while the average difference for no change is -0.147% and is not statistically significant. The difference in means between the two growth differences is nearly 1.13% and is statistically significant at the 1% level. Therefore, the first-year economic leadership DL estimate for upward changes (i.e. the upward economic leadership estimate) is roughly 1.13%.

The estimate for downward changes is not as pronounced: The average difference for a downward economic leader change is -0.546% and the average difference for no change is -0.185%. However, the difference in means between the two growth differences is -0.361% and is not statistically significant. Taken together, the findings in Panel C of Table II suggest that the effect of an economic leader might endure even after the economic leader is no longer in power.

4.6 <u>Recessions and the Selection of Economic Leaders</u>

This paper's findings suggest that for upward leader changes, economic leaders (relative to non-economic leaders) engender faster short-run economic growth. For an alternative interpretation, consider the case of the Netherlands in the early 1980s: Dries van Agt (a non-economic leader) stepped away from his position as the government leader, thus paving the way for Ruud Lubbers (an economic leader) to become the new government leader. Challenged by an acute economic downturn,[22] Ruud Lubbers, then a 43-year-old business heir and economics graduate of Erasmus University; endorsed spending cuts, tax increases on individuals and tax incentives for

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[22] Walter Ellis, "Economic Outlook Gloomy for Dutch," *Financial Times*, June 9, 1982.

businesses, along with reduced working hours to placate labor leaders.[23] Labor unrest roiled nonetheless and unemployment rose to 17%. The economy however, quickly turned around, rising from -1.15% abnormal economic growth in 1982 to 1.69% abnormal economic growth in 1983.[24]

At first glance, the case presents former prime minister Ruud Lubbers as an effective economic leader who supported tough policies and saved the economy. This simple view might be flawed if a recession made the economics major unusually electable (Hallerberg and Wehner, 2013) with growth showing a mean reversion back to the economy's natural rate. In Table III, I investigate whether economic leaders are more likely to come to power following recessions. The recession dummy variable is equal to one if there is a contraction in the economy (alternatively, a deep contraction of 5%; or a long recession of contractions in two consecutive years). The sample is limited to observations where a leader experiences his first year in power.

Overall, the results in Table III suggest that the relation between first-year economic leadership and a prior-year recession is positive, but not statistically significant.

4.7 First Difference (FD) Panel Regressions with Asymmetric Leader Changes

The residual method goes a fair way in developing an understanding of the effect of economic leadership on economic growth, but it is limited in its scope for multivariate analysis. Regression analysis is appropriate when relating economic growth to multiple variables at the same time.

For a growth regression which studies many economies through time (a panel regression), consider a specification with LHS variable y_{it} (economic growth). Here again

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[23] Walter Ellis, "Dutch Unions Give In: and Now for the Missile Crisis – One Famous Victory Has Not Led the Government Out of the Woods," *Financial Times*, December 16, 1983.
[24] See Walter Ellis, "Financial Times Survey: The Netherlands, Banking, Finance and Investment – Radical Approach to Restore Prosperity," *Financial Times*, September 13, 1983. Moreover, in the spring of 1984, there was widespread recognition that the economy had turned a corner (Walter Ellis, "Recession Leaves Dutch Holding Grudge against EEC," *The Globe and Mail*, May 28, 1984).

$i=1,...,M$ is an index for states (or economies); and $t=1,...,H$, an index for time periods (years). ε_{it} is a mean zero noise term. s_i and a_t are economy and year fixed effects. The RHS variable, $Economic\ leader_{it}$, is equal to one when a former economics student is the government leader, and zero otherwise.

[3]
$$y_{it} = \delta \cdot Economic\ leader_{it} + s_i + a_t + \varepsilon_{it}$$

While [3] serves as a useful starting point, δ does not provide a true difference-in-leader-changes (DL) estimate nor does it account for asymmetric economic leader changes.

To study asymmetric economic leader changes, $Economic\ leader_{it}$ can be decomposed into upward and downward economic leader changes by creating four step functions for each economy. These step functions capture the four types of leader changes for non-economic leaders (NELs) and economic leaders (ELs).

[4] $\quad E/E_{it} = E/E_{it-1} + 1 \times \mathbb{I}(\text{an EL replaces an EL in economy } i \text{ and year } t)$

$\quad E/NE_{it} = E/NE_{it-1} + 1 \times \mathbb{I}(\text{a NEL replaces an EL in economy } i \text{ and year } t)$

$\quad NE/NE_{it} = NE/NE_{it-1} + 1 \times \mathbb{I}(\text{a NEL replaces a NEL in economy } i \text{ and year } t)$

$\quad NE/E_{it} = NE/E_{it-1} + 1 \times \mathbb{I}(\text{an EL replaces a NEL in economy } i \text{ and year } t)$

When employing the first difference (FD) estimator for a panel regression with economy fixed effects, each one of the four leader change variables "switches on" for its respective leader change in the economy.

[5] $\quad y_{it} = \delta_1 \cdot E/E_{it} + \delta_2 \cdot E/NE_{it} + \delta_3 \cdot NE/NE_{it} + \delta_4 \cdot NE/E_{it} + s_i + a_t + \varepsilon_{it}$

$\quad \Delta y_{it} = \delta_1 \cdot E\ to\ E_{it} + \delta_2 \cdot E\ to\ NE_{it} + \delta_3 \cdot NE\ to\ NE_{it} + \delta_4 \cdot NE\ to\ E_{it} + \Delta a_t + \Delta \varepsilon_{it}$

Using [5], the upward DL estimate is $\delta_4 - \delta_3$; while the downward DL estimate is $\delta_2 - \delta_1$.

4.7.1. *First-Year Growth*

Column (1) of Table IV presents the DL estimates produced by a panel regression with leader

changes. Unsurprisingly, the estimates are similar to the results in Panel C of Table II that come out of the residual analysis. In column (1), the upward economic leadership estimate is roughly 1.22% and statistically significant at the 5% level; while the downward economic leadership estimate is approximately -0.49% and is not statistically significant.[25] Similar results are also present in column (3) when constructing the economic growth variable by replacing the missing WDI growth data with the entire growth data from the PWT.

4.7.2. *Average Regime-Level Growth*

Column (1) shows that, in the first year of an economics major taking charge of the government, the economic growth rate improves by roughly 1.22%. Given that many leaders are in power for more than one year, column (2) investigates the economic leadership estimate for the average growth rate during a leader's entire stay in office:[26] The upward economic leadership estimate is roughly 0.73% and statistically significant at the 1% level; while the downward economic leadership estimate is approximately -0.24% and is not statistically significant.

4.7.3. *Accounting Manipulation*

Given the potential for the manipulation of national accounts; column (4) uses, as an alternative LHS variable, the logarithm of one plus the growth in the mean nighttime light intensity (NLI) per capita. Here the upward economic leadership estimate is roughly 6.63 and statistically significant at the 5% level. Given the sample mean of 8.31, the estimate is economically

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[25] I also check pre-leader-change growth trends by including leads; one for each RHS variable of interest. The evidence suggests that the pre-leader-change parallel trends assumption is statistically satisfied for the regression.

[26] An alternative way to investigate multiyear growth would be estimate growth for specific years (e.g. years $T + 1$, $T + 2$, etc.) in a regression. However, the results in Figures II and III suggest that such an alternative would necessarily eliminate important observations from the sample; and the smaller *selected* sample may produce biased economic leadership estimates. Given that the prospect of a removal from office is present for many leaders, voters might be less likely to call for the removal of an impactful economic leader with the expectation of continued improvement in an economy. Alternatively, if there are costs to economic leadership, then political challengers could be more likely to mount a campaign against an economic leader who has "fixed the economy" in his first year of leadership. The regime-mean economic growth rate uses all observations and is arguably less susceptible to the selection issue.

meaningful. The downward economic leadership estimate is nearly -3.97 and is not statistically significant.

4.7.4. *Growth Types*

Columns (5) to (8) present the DL estimates for different types of growth: growth in government spending; investment growth; consumption growth; and export growth. There is no evidence that economic leadership is unconditionally associated with consumption growth or government spending growth.[27]

Rather than a link to government spending that can be negatively related to economic performance (Barro, 1991), an economic leader's association with investment (De Long and Summers, 1991) and trade (Frankel and Romer, 1999) can enhance long-term economic growth (Levine and Renelt, 1992). For investment growth in column (7), the upward economic leadership estimate is nearly 3.66% and statistically significant at the 5% level; while the downward economic leadership estimate is approximately -0.23% and is not statistically significant. For export growth in column (8), the upward economic leadership estimate is roughly 1.83% and the downward economic leadership estimate is approximately -3.96%; both estimates are statistically significant at the 10% level.

4.8 First Difference (FD) Panel Regressions with Asymmetric Close Elections

The initial results suggest that for upward leader changes, economic leaders (relative to non-economic leaders) engender faster short-run economic growth. However, the initial results also suggest that economics majors are chosen to lead governments during periods of slowing growth; with a likely consequence being downward-biased estimates in Panel C of Table II and

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[27] The takeaway from column (6) of Table IV is that an economic leader might not be associated with a uniformly loose or uniformly tight government spending policy in his first year. However, policy changes are often conditional on the economic environment.

in column (1) of Table IV.[28] To address this concern, one solution is to refine the set of leader changes by focusing attention on those which occur after close elections.[29] Given that the outcome of a close election is uncertain or virtually random, the close-election leader change provides a "quasi-random" treatment (Eggers et al., 2015).[30]

Although close elections might help to identify the true economic leadership effect for democracies, not all close elections are valid. A valid close election requires that the voter be able to choose between a competitive economics major and a competitive non-economics major. This paper considers a close election to be valid if an alternative-type candidate is the top vote-getter other than the winner of the election.

Consider the example of an upward economic leader change (going from a non-economic leader to an economic leader). A close election is valid if, other than the economic winner, a non-economics major receives the most votes in the election. Close elections should satisfy the validity condition even if there is no change in an economy's leader background. For example, regarding a non-economic to non-economic leader transition after a close election, the election is valid if, other than the non-economic winner, an economics major receives the most votes in the election. In this paper's sample, there are 41 valid close elections (with 16 for NEL to EL transitions).[31]

To account for close elections in the panel regression, I replace the leader-change

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[28] Acemoglu et al. (2015) find that a similar issue attenuates the effect of democracy on economic growth.

[29] This paper recognizes that close elections might not be purely exogenous. For example, a general dissatisfaction with the direction of the economy might foment the rise of intense political competition. Nevertheless, close elections do allow for the "quasi-randomization" of economic leadership, which is the primary goal of the approach.

[30] For U.S. election data, this approach is often implemented in a regression discontinuity design (RDD) rather than a DD regression (Lee, Moretti, and Butler, 2004). For elections across many economies, the DD regression is preferred in part because the running variable is not well defined for elections with multiple rounds of voting. For example; although the Colombian election of 1994 was obviously close, there were multiple rounds of voting resulting in multiple vote-margin running variables.

[31] The randomized subsample approach is present in other leadership work (Jones and Olken, 2005). For a post-war global panel, Jones and Olken use 57 leader deaths to study the effect of national leadership on economic growth.

variables in [4] with four close-election step functions for each economy.

[6] $\quad E/E^*_{it} = E/E^*_{it-1} + 1 \times \mathbb{I}(\text{an EL wins to replace an EL in economy } i \text{ and year } t)$

$\quad E/NE^*_{it} = E/NE^*_{it-1} + 1 \times \mathbb{I}(\text{a NEL wins to replace an EL in economy } i \text{ and year } t)$

$\quad NE/NE^*_{it} = NE/NE^*_{it-1} + 1 \times \mathbb{I}(\text{a NEL wins to replace a NEL in economy } i \text{ and year } t)$

$\quad NE/E^*_{it} = NE/E^*_{it-1} + 1 \times \mathbb{I}(\text{an EL wins to replace a NEL in economy } i \text{ and year } t)$

[7] $\quad y_{it} = \lambda_1 \cdot E/E^*_{it} + \lambda_2 \cdot E/NE^*_{it} + \lambda_3 \cdot NE/NE^*_{it} + \lambda_4 \cdot NE/E^*_{it} + s_i + a_t + \varepsilon_{it}$

$\quad \Delta y_{it} = \lambda_1 \cdot E \text{ to } E^*_{it} + \lambda_2 \cdot E \text{ to } NE^*_{it} + \lambda_3 \cdot NE \text{ to } NE^*_{it} + \lambda_4 \cdot NE \text{ to } E^*_{it} + \Delta a_t + \Delta \varepsilon_{it}$

Using [7], the upward DL estimate is $\lambda_4 - \lambda_3$; while the downward DL estimate is $\lambda_2 - \lambda_1$.

4.8.1. *Pre-Leader-Change Growth Trends*

To check pre-leader-change growth trends, the specification in column (1) of Table V includes leads; one for each RHS variable of interest. Compared to the pre-leader-change trend of -0.441% for upward economic leader changes in Panel C of Table II, the pre-close-election trend for upward economic leader changes in Table V (the lead for λ_4) is 0.098% and is not statistically significant. Also, the pre-close-election trend difference between non-economic leaders and economic leaders in column (1) of Table V shows an improvement over the pre-leader-change trend difference in Table II.

4.8.2. *First-Year Growth*

Accompanying the improvement in the trend difference is a larger estimate for the first-year effect of economic leadership. When employing a non-trend specification (without leads) in column (2), the upward economic leadership estimate is roughly 2.77% and is statistically significant at the 1% level; this estimate is more than twice as large as the initial leader-change estimate in column (1) of Table IV.

4.8.3. *Average Regime-Level Growth*

Column (2) shows that, in the first year of an economics major taking charge of the government following a close election, the economic growth rate improves by roughly 2.77%. Column (3) investigates the economic leadership estimate for the average growth rate during the entire time that a given leader is in power: The upward economic leadership estimate is roughly 2.84% and statistically significant at the 1% level; while the downward economic leadership estimate is nearly -1.07% and is not statistically significant.

4.9 The Difference in Growth between Close Elections and Other Leader Changes

Although the close-election cases include both lower-income and higher-income democratic economies, one concern with this approach is that economic leader close elections are unlike other leader changes. To investigate whether first-year growth differences following close elections are like the first-year growth differences following other leader changes, Figure IV presents the distribution of first-year growth differences for both samples: economic leader close elections and other leader changes. Although the support of the distribution for economic leader close elections is relatively narrow—an unsurprising result given the wider range of values in autocracies—a Kolmogorov-Smirnov test (for the equality of distributions) produces a p-value of 0.788. The finding suggests that we cannot reject the idea that first-year growth differences following economic leader close elections are like first-year growth differences following other leader changes.

4.10 The Role of Leader Effectiveness

This paper's evidence shows that the upward economic leadership estimate is positive and significant. To understand the role of effectiveness in economic leadership; in Table VI, I investigate leaders under relaxed political constraints.

4.10.1. *Autocratic Rule*

History shows many examples of benevolent dictators who oversee robust economic growth (Treisman, 2015). Alternatively, private economic agents can be constrained under authoritarian regimes (Shleifer, 1997). For example, favoritism, which saps the energies of free enterprise, is more likely to occur during periods of autocratic rule (Hodler and Raschky, 2014). Hence an interesting question is whether effective economic leadership occurs in autocracies.

To investigate the proposed heterogeneity, in Table VI, I interact a dummy variable for autocracies with the leader change variables in [4].[32] In column (1) of Table VI, the upward DL estimate for *democratic-economic* leadership is roughly 0.90% and is statistically significant at the 5% level; while the upward DL estimate for *autocratic-economic* leadership is 3.16% and is statistically significant at the 10% level. Although the estimate for autocracies is larger than the estimate for democracies, the difference between the two estimates is not statistically significant.

Compared to the role that autocratic rule plays in upward economic leadership, the role for downward economic leadership is more pronounced: The downward DL estimate for *autocratic-economic* leadership is roughly -2.18% and is statistically significant at the 5% level. Therefore, relative to the case where a powerful economic leader is replaced with another one; the replacement of a powerful economic leader with a powerful non-economic leader is associated with a reduction in an economy's growth rate. The result suggests that economic leadership could work to limit otherwise slower growth under authoritarian regimes.[33]

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[32] Given that close elections occur in democracies only, I use all leader changes to study the role of autocratic rule in economic leadership.

[33] Appendix C investigates economic improvement over a long period of time and finds evidence that is consistent with this interpretation.

4.10.2. *Presidential Systems*

Compared to parliamentary systems, presidential systems offer greater "staying power" for the chief executive of an economy (Gerring, Thacker, and Moreno, 2009). This idea is supported by the fact that a president usually governs for a fixed term, which allows the leader to credibly commit to her policies. Linz (1990) writes that the presidential system fosters "the personalization of power." Hence presidents tend to be more powerful than parliamentary prime ministers, all else equal. This power can come at a cost if obstinacy causes a presidential system to transition to an autocracy (Stepan and Skach, 1993).

To investigate the heterogeneity with respect to whether an economy uses a presidential system, in Table VI, I interact a dummy variable for presidential systems with the leader change variables in [4]. In column (2) of Table VI, the upward DL estimate for *parliamentary-economic* leadership is roughly -0.35% and is not statistically significant; while the upward DL estimate for *presidential-economic* leadership is 2.73% and statistically significant at the 1% level. The difference between the two estimates is 3.08% and is statistically significant at the 1% level. The findings suggest that the upward economic leadership result is much stronger in presidential systems when compared to the upward result for parliamentary systems.

Overall, the findings in Table VI suggest that the economic leadership result is associated with a leader's ability to impact an economy's growth rate.

5. Economic Mechanisms

This paper's main finding (in Tables IV and V) is that the upward economic leadership estimate is positive and significant. There are at least three mechanisms which could drive this finding: First, faster growth could occur purely due to a psychological response to economic leadership. Second, the finding might be driven directly by economic policy changes in the first year. Third,

in the absence of rapid policy changes, the finding could be driven by economic agents who expect their economic leader to implement growth-enhancing policies in the future.

Given that the economic leadership result occurs mainly through the "rational" channels of investment and exports rather than the "behavioral" channel of consumption, it is unlikely that this paper's main finding is driven purely by a psychological response. In addition, the fact that the economic leadership result occurs mostly in cases where a leader is effective suggests that economic policies could play a significant role (Slemrod, 2004; Auerbach and Gorodnichenko, 2012). One natural interpretation of the main finding is that economic leaders are using the tools of *government* (e.g. fiscal policy) to engender economic growth, even though economic theory is unclear about whether economic leaders should support loose or tight fiscal policy.

Whereas spending policy changes can occur quickly without changes in legislation, tax policy changes often occur through a slower legislative process. Nevertheless, the case of Barbados in 1986 shows that it is possible for an economic leader to reduce taxes shortly after an election: In May of 1986, an economics graduate of the London School of Economics, Errol Barrow, and his Democratic Labor Party (DLP), handed a shocking defeat to Bernard St. John and his Barbados Labor Party (BLP).[34] Having won 24 of 27 seats, Errol Barrow quickly made good on his promise to implement tax cuts, which were in place by August.[35]

Does an economic leader implement rapid tax policy changes? Using all leader changes, columns (1) and (3) of Table VII present results which suggest that economic leaders do not reduce top tax rates significantly in the first year of leadership: In column (1), the upward economic leadership estimate for the top corporate tax rate is neither negative nor is it

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[34] "Barbados Elections: An Upset," *The Globe and Mail*, May 30, 1986.
[35] Paul Knox, "Political Feast: New Barbadian PM Strikes Chord for People Seeking National Dignity," *The Globe and Mail*, August 4, 1986.

statistically significant; in column (3), the upward economic leadership estimate for the top personal income tax rate is negative, but it is not statistically significant.

The case of the U.S. in 2016 shows that for some economies, agent expectations could be important. The controversial Republican candidate, Donald J. Trump, won a hotly contested election in November of 2016. In the month following Trump's victory, the stock market achieved new highs and confidence surged.[36] One popular explanation for this activity is that Donald Trump's proposed policies (e.g. tax cuts and deregulation) encouraged expectations of faster economic growth and greater capital investment.[37]

Likewise, this paper's main finding could occur if an economic leader communicates his preferred tax policies to economic agents who act with the expectation that tax policy changes will occur over time (House and Shapiro, 2006). Columns (2) and (4) of Table VII use all leader changes to investigate whether an economic leader reduces top tax rates over the full course of his tenure. The results in column (2) suggest that an economic leader does not reduce the top corporate tax rate significantly: The upward economic leadership estimate is negative, but it is not statistically significant.[38]

In contrast, column (4) shows that an economic leader eventually reduces the top personal income tax rate: The upward economic leadership estimate for the top personal income tax rate is -3.08% and is statistically significant at the 5% level; the downward economic leadership estimate is positive, but it is not statistically significant. When using close elections in column (5), I find an upward economic leadership estimate of -22.57%, which is statistically

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[36] See Patricia Cohen and Landon Thomas Jr., "Trump's Honeymoon Begins: Confidence in the Economy Is Booming," *The New York Times*, December 9, 2016; and Justin McCarthy, "U.S. Economic Confidence Holds at Nine-Year High," *Gallup*, December 13, 2016.
[37] Justin Lahart, "Big Spenders: Businesses on the Cusp of Capital-Spending Rebound," *The Wall Street Journal*, December 8, 2016.
[38] One possible interpretation of this finding is that corporate tax cuts mainly weaken a firm's incentive to manipulate accounts.

significant at the 1% level.[39] Compared to this strong tax-cut estimate in column (5), the weaker tax-cut estimate in column (4) could occur if economic leaders are wary of increasing deficits during periods of slowing growth.[40] After winning a close election (column 5), an economic leader seems to be less constrained when lowering the top personal income tax rate.

In column (6), I interact the end-of-regime *Top personal tax rate* with the leader change variables in [4] to study the relation between an economic leader's first-year growth and his eventual reduction of the top personal income tax rate. For non-economic to economic leader (NEL to EL) transitions, the coefficient is roughly -0.08 and is statistically significant at the 1% level. Hence each percentage point of an "anticipated" eventual reduction in the personal income tax rate is associated with roughly 8 basis points of faster growth in an economic leader's first year.[41] For other transitions, the coefficients are not statistically significant.

Overall, the results in Table VII suggest that that an economic leader eventually reduces the top personal income tax rate and this reduction is related to his first-year growth. Appendix B presents evidence which suggests that these results are not driven by a "mechanical" relation between top tax rates and past economic growth.

6. Robustness

This paper's main finding (in Tables IV and V) is that the upward economic leadership estimate is positive and significant. Tables VIII to X explore the robustness of the main finding. Is the main finding robust when controlling for leader age, political ideology, autocratic regimes, or an

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[39] I also investigate whether, compared to non-economic leaders, economic leaders experience longer lasting regimes (which would allow economic leaders more time to implement tax policy changes); but there is no evidence to support the idea: Each leader type is in power for roughly 42 months on average.

[40] In addition, for all leader changes, lower-income-economy pro-cyclical fiscal policy could be averaged out with higher-income-economy counter-cyclical fiscal policy.

[41] For the ease of exposition, I report the estimate for all leader changes; however, the estimate for close elections is also roughly 8 basis points. To improve on the estimation exercise, one could investigate the effect of promised tax cuts (as part of a candidate's, or a party's, manifesto) on an economic leader's first-year growth; however, these manifesto data are not readily available.

advanced education? Does the main finding simply reflect an economic leader's ability for quantitative skills? Is the main finding robust when the sample excludes PhD economists, academic economists, or leaders who attended highly selective universities to study economics? Is the main finding robust when using various subsamples?

6.1 <u>Controlling for Leader Characteristics and Political Factors</u>

Could the impact of economic leaders on growth occur because of a change in (a) leader education quality, (b) leader age, or (c) political ideology? If so, then the education field of economics might not really explain the main finding. Another concern is that economic leadership is somehow correlated with regime authority in an environment where democracy is correlated with growth (Barro, 1991; Persson and Tabellini, 2006; Acemoglu et al., 2015).

Table VIII shows the results of the first difference (FD) panel regression analysis after acknowledging these concerns.[42] Consistent with the evidence presented in Besley, Montalvo, and Reynal-Querol (2011), column (4) shows that a leader's advanced education is positively related to economic growth; the coefficient is nearly 0.66% and is statistically significant at the 1% level. Nevertheless, the main finding remains robust.[43]

Overall, the results suggest that the main finding remains robust whether the control variable is leader age, a leader's right-leaning political ideology, autocratic rule, or a leader's advanced education.

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[42] The control variables are first-differenced. For example, in a new leader's first year, the difference in the leader age variable is the new leader's age in year T minus the previous leader's age in year $T-1$.

[43] In this paper's sample, three out of every four leaders are university educated. Hence university education is not a compelling signal of quality. Compared to a leader's university education, a leader's advanced education provides a stronger signal of quality: Only 31% of the economy-year observations are associated with a leader who completed graduate studies.

6.2 Advanced STEM Leadership and Economic Growth

Table VIII presents evidence which suggests that this paper's main finding is robust controlling for whether a leader has an advanced degree. However, there remains a question of whether the field of economics simply attracts social science students with a greater cognitive ability for quantitative analysis. To explore the idea that the main results are driven by scientific or quantitative skills, column (5) investigates government leaders with advanced degrees in the STEM (Science, Technology, Engineering, and Mathematics) fields, or medical degrees.[44] Approximately 6% of the economy-year observations are associated with a leader who received a medical degree, or an advanced education in a STEM field.

Does an economy grow faster when its government leader has advanced training in a STEM field, or a medical degree? I investigate all leader changes and find a marginally significant *negative* DL estimate for upward advanced STEM leadership. The result implies that (a) this paper's main finding is not driven by a leader's cognitive ability for quantitative analysis; and (b) for governance skills, the education field of economics is a better "match" than the STEM fields and medicine.

6.3 The Role of University Selectivity and the Quality of Economics Education

Although economic leaders do not seem to be associated with a small group of specialized institutions, Table B.I of Appendix B shows that a nontrivial number of leaders received their economics education from highly selective universities such as the University of Oxford and Harvard University. The general concern is that this paper's main finding is driven by "the tail" of prestigious economic leaders.

To address the concern in Table IX, I investigate various subsamples that *exclude* prestigious economic leaders. In most of the cases, the point estimates for upward economic

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[44] This paper uses the U.S. Immigration and Customs Enforcement (ICE) designation for STEM degree programs.

leadership are roughly the same in magnitude compared to the results from the full sample in column (2) of Table V. One exception is column (5) of Table IX where the upward economic leadership effect is smaller (2.46%) when PhD economists are removed from the sample, though the downward economic leadership effect becomes stronger (-2.50%) and statistically significant at the 1% level.

Overall, the results suggest that this paper's main finding is robust when the sample excludes prestigious economic leaders.

6.4 Academic Fraud

This paper's main sample includes economies governed by leaders suspected of academic fraud. In countries like Russia and Ukraine, the popular perception is that many politicians and businesspersons have questionable academic credentials. For example, the doctoral dissertation of Russian leader Vladimir Putin has been heavily scrutinized amid allegations of plagiarism.[45] While not every case of suspected fraud is as severe as plagiarism; the general concern is that very little effort was exercised by leaders to obtain their academic degrees. To address the concern in Table X, I exclude economies with leaders who have received degrees under questionable circumstances.[46] The excluded economies are Kazakhstan, the Kyrgyz Republic, Lithuania, Russia, and Ukraine.[47]

The results in column (1) of Table X suggest that the main finding is robust when the sample excludes the home economies of leaders suspected of academic fraud.

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[45] Valerie Straus, "Russia's Plagiarism Problem: Even Putin Has Done It!" *The Washington Post*, March 18, 2014.
[46] For example, regarding Ukraine, see "Corruption Risks Ranking of Institutions Awarding Academic Degrees in Economics," *VoxUkraine*, May 19, 2015.
[47] This exercise excludes the fraudulent leaders and the credible leaders in these economies.

6.5 <u>Tax Havens</u>

This paper's main sample includes tax havens, but the economic strategy of tax havens differs from the strategies of other economies (Desai, Foley, and Hines, 2006). Therefore, one concern is that the main finding is driven by governance in tax havens. To address the concern, in Table X, the tax havens identified by Hines and Rice (1994) are excluded.[48]

The results in column (2) of Table X suggest that the main finding is robust when the sample excludes tax havens.

6.6 <u>Economies with Unstable Political Systems and Both Leader Types</u>

The World Bank's Database of Political Institutions (DPI) classifies the political system for an economy-year observation as presidential or parliamentary. This paper's sample includes economies with unstable political systems defined as those with a political system change during the sample period. The sample also includes economies that have a president and a prime minister as the government leader at different points in time during the sample period (economies with both leader types).[49]

Economies with both leader types and economies with unstable political systems often come about because of power struggles which fail to achieve a political resolution.[50] Therefore, another concern is that the main sample includes incorrect leaders. To address the concern, in column (3) [column (4)] of Table X, the analysis excludes economies with unstable political

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[48] The excluded economies are Andorra, the Bahamas, Bahrain, Barbados, Cyprus, Grenada, Hong Kong, Ireland, Isle of Man, Jordan, Lebanon, Liberia, Liechtenstein, Luxembourg, Macao, Maldives, Malta, Panama, Singapore, St. Lucia, St. Kitts and Nevis, and Switzerland.

[49] See Table A.III in Appendix A for the names of the sample economies with both leader types. These economies often experience a change in leader type when the post of one leader type is abolished temporarily after the other leader type gains sufficient political power.

[50] The 2007 humanitarian crisis in Kenya serves as an example of how a power struggle can destabilize a country. Hundreds died and hundreds of thousands were displaced before President Kibaki and Prime Minister Odinga agreed to put aside their differences for the benefit of the country (Jeffrey Gettleman, "2 Kenyan Rivals to Share Power in Bid for Peace," *The New York Times*, February 29, 2008). In 2016, China experienced a power struggle over which leader should manage the economy (Lingling Wei and Jeremy Page, "Discord between China's Top Two Leaders Spills into the Open," *The Wall Street Journal*, July 22, 2016).

systems [both leader types]. The results suggest that the main finding is robust when the sample is limited to "correct" (or unambiguous) government leaders.

6.7 <u>Switzerland and Influential Economies</u>

The president of the Swiss Confederation is the head of government in Switzerland and is elected by the Federal Assembly for one year. The Swiss political cycle raises a concern that leaders in Switzerland might be ineffective. To address the concern, column (5) of Table X excludes Switzerland and shows that the main finding is robust.

A related concern—potentially problematic given the number of close elections—is that the economic leadership finding might be driven by a single economy. To investigate the importance of each economy, I remove one at a time, and then run multiple regressions. In all 146 regression cases, the upward economic leadership effect is statistically significant at the 5% level or lower.[51] Out of all the estimates; the smallest, median, and largest effects for upward economic leadership are 2.28%, 2.77%, and 3.30%. Based on this distribution of estimates, 0.096% is the standard error and 29 is the t-stat value.

7. Conclusion

In many economies, mediocre growth motivates policymakers to use innovative methods to improve economic performance.[52] This paper's evidence suggests that a solution to the problem could lie with government leaders who have a very particular set of skills; skills that are acquired through an education in economics. When graphing the business cycle around different leader change events, I find a large and distinct improvement in economic growth for economic leader changes (e.g. from a non-economic leader to an economic leader). While economic leaders seem

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[51] These results are not reported in tabular form, but they are available upon request.
[52] See "Zoellick Warns of Indecisive Leadership," *The Star*, August 15, 2011; Chris Giles, "IMF Warns on Worst Global Growth since Financial Crisis," *Financial Times*, October 6, 2015; and Daniel Ren, "Global Economic Growth Prospects Gloomy, Commerce Minister Tells G20 Trade Leaders Meeting," *South China Morning Post*, July 9, 2016.

to boost short-run growth; leaders with an advanced education in the STEM fields, and medical leaders, are not associated with faster growth.

To identify the effect of economic leadership on short-run economic growth, this paper uses an approach based on difference-in-differences (DD) analysis (Angrist and Pischke, 2010). The analysis confirms that while the difference in the pre-leader-change growth trend between economic leader changes and other changes is not statistically significant; upon replacing a non-economic leader, an economic leader (relative to a new non-economic leader) engenders faster growth in his first year; and faster average growth for the entire time that he is in power.

What type of fiscal policy do economic leaders support? Although an economic leader is not associated with a significant change in fiscal policy in his first year of leadership; over time, he reduces the top personal income tax rate significantly (House and Shapiro, 2006). Here economic leaders, on average, seem to recognize that "demand-side" personal tax cuts can be a powerful tool to stimulate growth in "supply-side" investment, and growth in output overall (Mertens and Ravn, 2013). Each percentage point of an "anticipated" eventual reduction in the top personal income tax rate is associated with roughly 8 basis points of faster growth in an economic leader's first year. The finding highlights the important role of anticipation in the effect of economic policies on economic growth; and suggests that the business cycle is influenced by the *promises* of policy changes by government leaders.

When studying economic and non-economic winners of close elections held to replace a non-economic leader, I find a pre-close-election growth trend for the economic winner which is virtually zero; and no significant difference in the trend between the economic winner and the alternative (non-economic winner). An economy's immediate post-election growth rate however, is vastly different between the two types: Under the economic winner (who eventually cuts the

top personal income tax rate by 19.5%) an economy's growth rate improves by 1.53%; under the alternative non-economic winner (who eventually raises the top rate by 3%) the growth rate falls by 1.24%. This effect of economic leaders (relative to non-economic leaders) is roughly 2.8% whether it is estimated for the first-year growth rate, or for the average growth rate during the entire time that a given leader is in power.

In exploring the "real-world" examples of economic leadership effects, it is easy to find episodes with a ring of truth: Singapore, a country that is well known for its economic success, benefited tremendously from the effective leadership of Lee Kuan Yew throughout his long tenure. Ronald Reagan presided over a 2.8% increase in U.S. economic growth in his first year (1981), and eventually reduced the U.S. top personal income tax rate by 42% (from 70% in 1980 to 28% in 1988). Both of these leaders studied economics.

Former economic students tend to rise to power during periods of slowing growth, but the short-run benefits associated with economic leadership are striking even after accounting for this tendency. The costs of economic leadership however, are not always obvious. One potential cost may have little to do with economics, but more to do with politics: Although some autocrats and presidents seem to be effective economic leaders, autocratic governments and presidential systems could be less stable compared to parliamentary democracies (Linz, 1990). Another potential cost could occur if economic leaders take corrupt actions (Fisman and Miguel, 2010).[53] Given the many possibilities, future research that investigates the costs of economic leadership, may prove useful.

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[53] In the case where an economic leader is also a businessperson, there could be a conflict of interest between policies that enhance social welfare and actions that benefit the leader's business.

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Table I. Economic Leadership: Summary Statistics and the Difference in Mean Growth

Panel A of this table presents the sample summary statistics. The sample period is 1950 to 2014. *Economic growth* is the growth rate of real gross domestic product (GDP) per capita. *Economic leader* is equal to one if the government leader was educated in economics prior to becoming the government leader, and zero otherwise. Panel B presents the difference in the *Economic growth* means based on *Economic leader*. *NE to Economic* is a (within-economy) step function which increases if there is a leader change from a non-economic leader to an economic leader. *NE to NE* is a (within-economy) step function which increases if there is a leader change from a non-economic leader to another non-economic leader. *Economic to NE* is a (within-economy) step function which increases if there is a leader change from an economic leader to a non-economic leader. *Economic to Economic* is a (within-economy) step function which increases if there is a leader change from an economic leader to another economic leader. *PhD economist* is equal to one if the government leader received a doctorate (or equivalent) in economics prior to becoming the government leader, and zero otherwise. *Academic economist* is equal to one if the government leader conducted teaching and research in economics at a university prior to becoming the government leader, and zero otherwise. *Advanced degree* is equal to one if the government leader received a graduate degree (professional or otherwise) prior to becoming the government leader, and zero otherwise. *Advanced STEM* is a dummy variable equal to one if the government leader received an advanced education in a STEM (Science, Technology, Engineering, and Mathematics) field or a medical degree prior to becoming the government leader, and zero otherwise. *Recession* is equal to one if *Economic growth* is negative (regular), less than -5% (deep), or negative for two consecutive years (long). *Abnormal economic growth* is the fitted residual from a regression of *Economic growth* on economy fixed effects and year fixed effects. *Excess economic growth* is the fitted residual from a regression of *Economic growth* on year fixed effects. *Average economic growth* is the regime-level mean of *Excess economic growth*. *Mean night light intensity (NLI) growth* is the growth in average nighttime light emission per one million persons. *Investment growth* [*Export growth*; *Consumption growth*; *Govt. spending growth*] is the growth in real [exports; household consumption; government consumption] per capita. *Top corporate tax rate* [*Top personal tax rate*] is the top income tax rate for corporations [individuals]. *Right ideology* is equal to one if the leader belongs to a right-leaning political party. *Leader age* is the age of the government leader. *Polity* is a measure of regime authority. *Autocracy* is equal to zero if *Polity* is greater than zero, and one otherwise. *Close election* is an election with a victory margin of 2% or less (or by a one-seat difference in parliamentary elections with a small number of seats). *Regime duration* is the number of uninterrupted years with one unique government leader.

Panel A

Variable Name	Mean	sd.	Q50	N
Economic growth	2.145	4.836	2.347	6978
Economic leader	0.158	0.365	0.000	6978
PhD economist	0.041	0.198	0.000	6920
Academic economist	0.014	0.116	0.000	6966
Advanced degree	0.309	0.462	0.000	6783
Advanced STEM	0.061	0.240	0.000	6942
Consumption growth	2.566	5.195	1.348	6357
Govt. spending growth	3.001	7.059	1.526	6414
Investment growth	3.968	14.799	0.189	6376
Export growth	4.619	10.127	2.110	6485
Log (1 + Mean NLI growth)	8.307	41.936	1.547	2563
Top corporate tax rate	36.203	10.922	35.000	2815
Top personal tax rate	42.972	20.636	45.000	1805
Autocracy	0.432	0.495	0.000	6269
Presidential system	0.644	0.479	1.000	4954
Leader age	56.463	10.147	56.000	6978
Right ideology	0.384	0.486	0.000	3131
Regime duration	3.919	3.933	3.000	1600

Panel B

Variable Name		Economic Leader	Non-Economic Leader	Difference
Economic growth	Mean	2.489	2.083	0.408*
	se.	0.132	0.064	0.159
	N	1102	5876	6978

Figure I. Economic Leadership: All Economies over Time

This figure presents a bar chart and kernel-weighted local-constant regressions (Epanechnikov kernel, rule-of-thumb bandwidth) for the relation between *Year* and *Economic leader* for all economies. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].
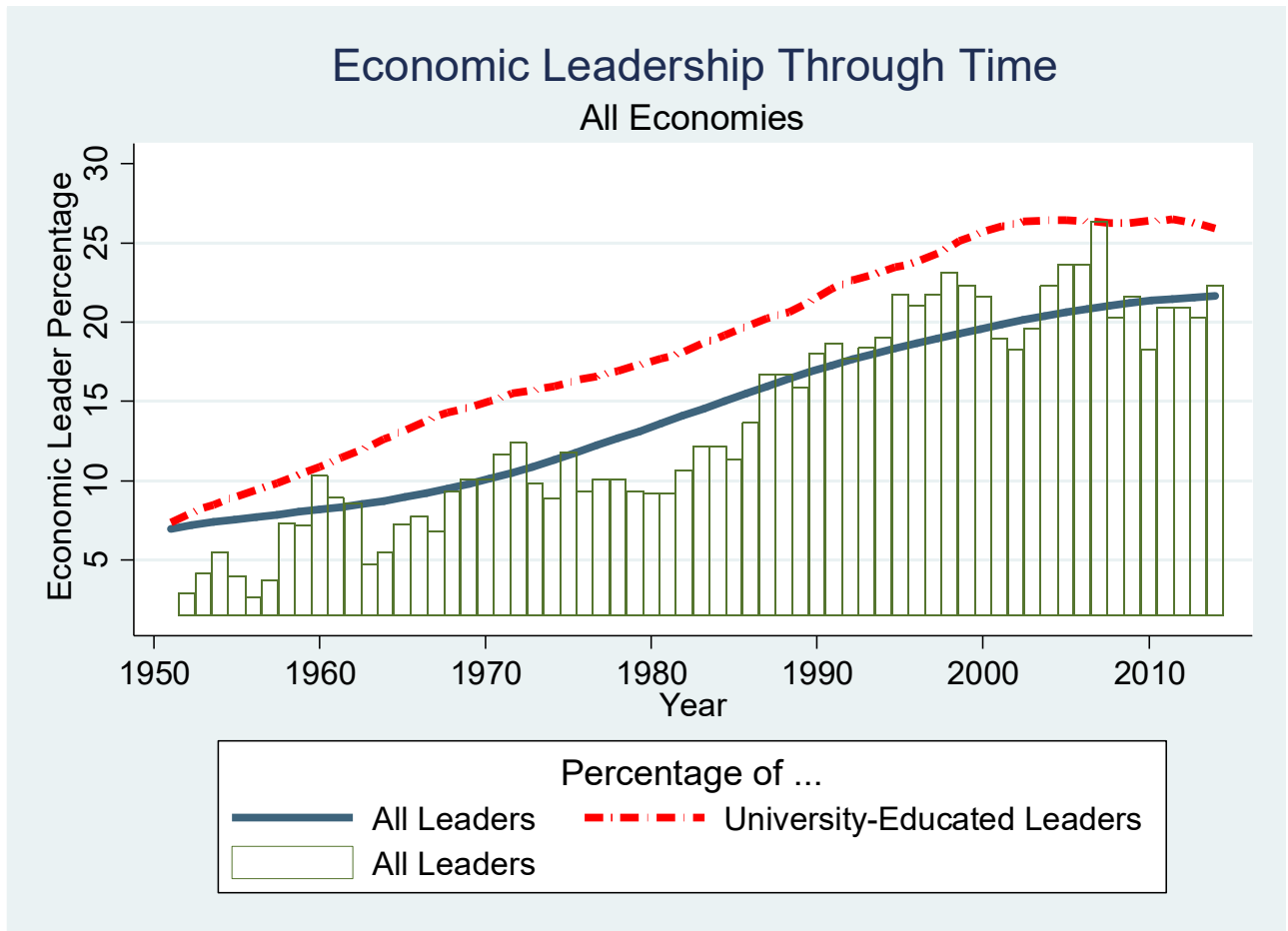
Figure II. Economic Leadership and Growth: A Visual Representation of Growth with No Change in Leader Type

This figure presents a density bar chart for *Event time*; and kernel-weighted local-constant regressions (Epanechnikov kernel, rule-of-thumb bandwidth) for the relation between *Event time* and *Abnormal economic growth* where *Economic leader* does not change from the prior leader to the new leader. *Event time* is the difference between *Year* and the first year of the new leader. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].

Figure III. Economic Leadership and Growth: A Visual Representation of Economic Leader Changes and Growth

This figure presents a density bar chart for *Event time*; and kernel-weighted local-constant regressions (Epanechnikov kernel, rule-of-thumb bandwidth) for the relation between *Event time* and *Abnormal economic growth* where *Economic leader* changes from the prior leader to the new leader. *Event time* is the difference between *Year* and the first year of the new leader. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].
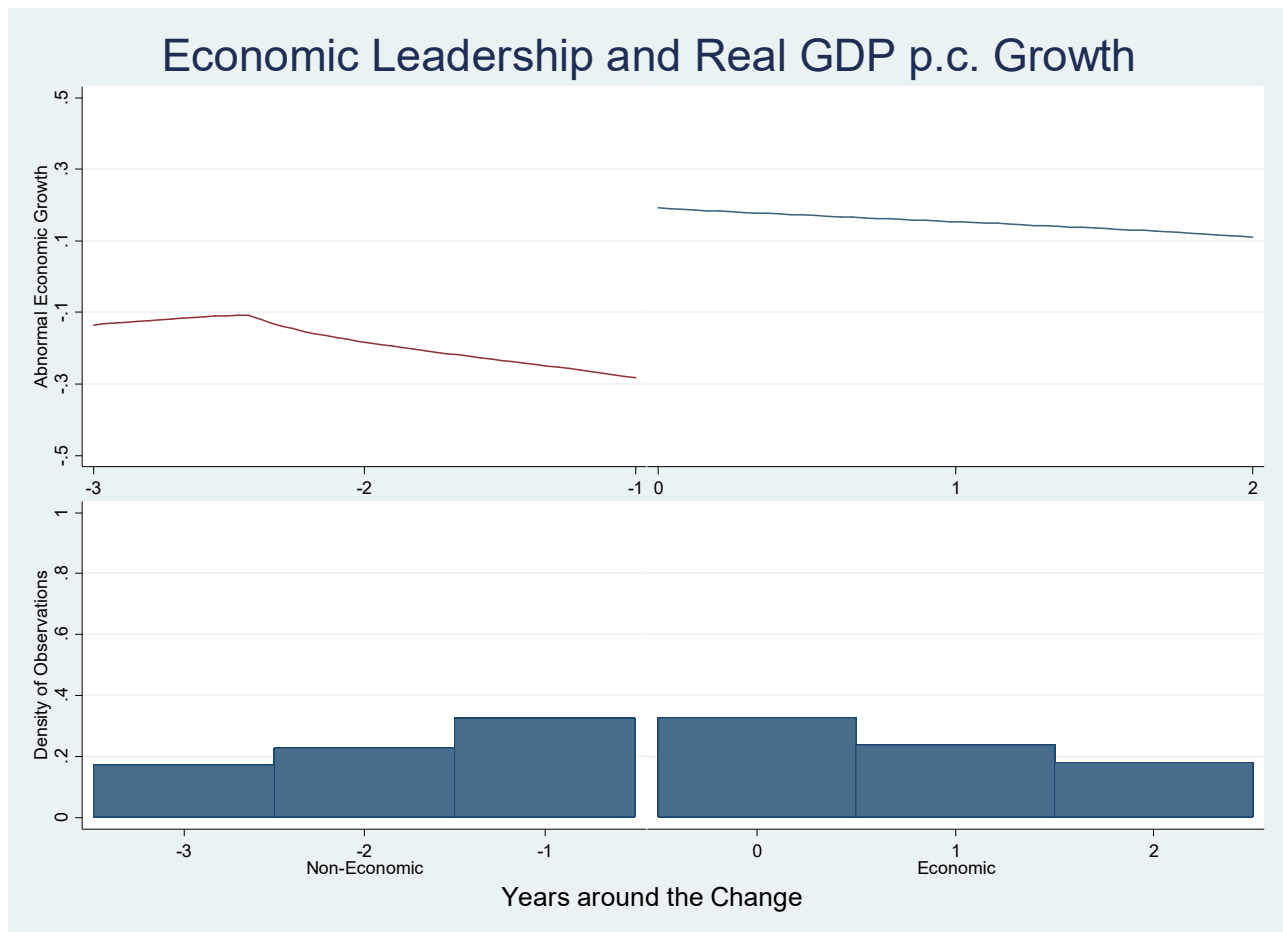
Table II. Economic Leadership and Growth: Robust Discontinuity; Pre-Leader-Change Trends and First-Year Differences in Leader Changes

This table presents robust regression-discontinuity regression results in Panel A; and in Panels B and C, the means for first-year-differences (going from year T - 1, the last year of the prior leader, to year T, the first year of the new leader) and means for pre-leader-change trends. Panels B and C also present the differences in the respective means for *Abnormal economic growth*. In Panels A and B, there are two leader change types: a change in the *Economic leader* variable vs. no change in the *Economic leader* variable; Panel C explores the asymmetry of these leader change types. Bootstrapped standard errors (1000 replications) are also estimated for both stages of the two-step process (residual creation, and discontinuity or difference estimation). The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I]. +, *, ** denote statistical significance at the 10%, 5% and 1% levels.

Panel A

Variable Name		Economic Change	No Change
Abnormal economic growth (discontinuity from T - 1 to T)	Coefficient	0.606**	-0.536**
	se.	0.140	<0.000
	N	3354	10140
Bootstrapped Standard Errors			
Abnormal economic growth (discontinuity from T - 1 to T)	Coefficient	0.606**	-0.536**
	se.	0.068	0.026

Panel B

Variable Name		Economic Change	No Change	Difference
Abnormal economic growth (trend from T - 3 to T - 1)	Mean	0.156	-0.064	0.220
	se.	0.342	0.217	0.417
	N	216	606	822
Abnormal economic growth (trend from T - 3 to T - 2)	Mean	0.291	0.309	-0.017
	se.	0.274	0.201	0.374
	N	216	606	822
Abnormal economic growth (trend from T - 2 to T - 1)	Mean	-0.432	-0.144	-0.288
	se.	0.280	0.183	0.348
	N	283	787	1070
Abnormal economic growth (difference from T - 1 to T)	Mean	0.771**	-0.126	0.897**
	se.	0.237	0.162	0.306
	N	394	1103	1497
Bootstrapped Standard Errors				
Abnormal economic growth (difference from T - 1 to T)	Mean	0.771**	-0.126**	0.897**
	se.	0.075	0.037	0.079

Panel C

Variable Name		Non-Economic to Economic	Non-Economic to Non-Economic	Difference
Abnormal economic growth (trend from T - 3 to T - 1)	Mean	0.023	-0.027	0.050
	se.	0.479	0.226	0.546
	N	115	566	681
Abnormal economic growth (trend from T - 3 to T - 2)	Mean	0.415	0.342	0.073
	se.	0.410	0.213	0.507
	N	115	566	681
Abnormal economic growth (trend from T - 2 to T - 1)	Mean	-0.441	-0.207	-0.234
	se.	0.348	0.191	0.452
	N	150	736	886
Abnormal economic growth (difference from T - 1 to T)	Mean	0.982*	-0.147	1.129**
	se.	0.380	0.169	0.416
	N	203	1035	1238
Bootstrapped Standard Errors				
Abnormal economic growth (difference from T - 1 to T)	Mean	0.982**	-0.147**	1.129**
	se.	0.099	0.039	0.109

Variable Name		Economic to Non-Economic	Economic to Economic	Difference
Abnormal economic growth (trend from T - 3 to T - 1)	Mean	-0.308	0.586	-0.894
	se.	0.488	0.795	0.922
	N	101	40	141
Abnormal economic growth (trend from T - 3 to T - 2)	Mean	-0.150	0.164	-0.314
	se.	0.355	0.457	0.634
	N	101	40	141
Abnormal economic growth (trend from T - 2 to T - 1)	Mean	0.422	-0.764	1.185
	se.	0.450	0.561	0.806
	N	133	51	184
Abnormal economic growth (difference from T - 1 to T)	Mean	-0.546*	-0.185	-0.361
	se.	0.275	0.581	0.576
	N	191	68	259
Bootstrapped Standard Errors				
Abnormal economic growth (difference from T - 1 to T)	Mean	-0.546**	-0.185	-0.361
	se.	0.100	0.157	0.188

Table III. Economic Leadership and Recessions: Do Economic Leaders Come to Power Following Recessions?

This table presents logit regression results for the first-year sample where the left-hand-side (LHS) variable is *Economic leader*. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].

| LHS Variable	Economic Leader				
Sample	*First Year of Leadership*				
Recession (t - 1)	0.012	0.009	0.149	0.148	0.039
	(0.077)	(0.051)	(0.801)	(0.812)	(0.165)
Recession (t - 2)		-0.067			
		(0.459)			
Economy fixed effects	No	No	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes
Recession type	Regular	Regular	Regular	Deep	Long
Number of obs.	1544	1523	1195	1195	1179
Model *p*-value	0.939	0.897	.	.	.

In columns (3), (4), and (5), the coefficient is estimated using the conditional logit fixed-effects estimator where all year-specific variables are cancelled out in the likelihood function. In columns (1) and (2), heteroscedasticity-robust standard errors are estimated and corrected for clustering at the economy level. Columns (3), (4), and (5) use bootstrapped standard errors (1000 replications) corrected for clustering at the economy level. Absolute *t*-statistics are reported in parentheses. Model *p*-value shows the result for a test that all of the coefficients (excluding the fixed effects and the constant) are jointly zero. +, *, ** denote statistical significance at the 10%, 5% and 1% levels.

Table IV. Economic Leadership and Growth: Leader Changes, Average Regime Growth, Growth Types, Alternative Data Sources, and Accounting Manipulation

This table presents first-difference (FD) panel regression results for the sample where the left-hand-side (LHS) variables are alternative measures of real GDP per capita growth in columns (1), (2), and (3); and *Consumption growth* [*Govt. spending growth*, *Investment growth*, *Export growth*, and the logarithm of one plus *Mean night light intensity (NLI) growth*] in column (5) [(6), (7), (8), and (4)]. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].

LHS Variable	Economic Growth	Average Economic Growth	Economic Growth (WB-PWT)	Log (1 + Mean NLI Growth)	Consumption Growth	Govt. Spend. Growth	Investment Growth	Export Growth
[a] Economic to Economic	-0.083	0.024	-0.076	3.717	-1.059	-1.019	-1.114	2.109
	(0.132)	(0.040)	(0.121)	(1.032)	(1.451)	(1.651)	(0.384)	(1.106)
[b] Economic to NE	-0.576	-0.217	-0.598	-0.251	-0.004	-0.578	-1.346	-1.855
	(2.034)*	(0.829)	(2.074)*	(0.105)	(0.010)	(0.926)	(0.790)	(1.848)+
[c] NE to NE	-0.259	-0.002	-0.212	-2.006	-0.055	-0.185	-1.530	0.431
	(1.359)	(0.031)	(1.118)	(0.841)	(0.273)	(0.606)	(2.754)**	(0.973)
[d] NE to Economic	0.962	0.724	0.850	4.628	-0.153	0.299	2.127	2.263
	(2.118)*	(2.989)**	(1.883)+	(2.004)*	(0.412)	(0.443)	(1.183)	(2.324)*
Leader-change type	All	All	All	All	All	All	All	All
Regime-level regression	No	Yes	No	No	No	No	No	No
NE to Economic: [d] - [c]	1.222	0.727	1.061	6.634	-0.097	0.484	3.657	1.832
p-value of the NE-E estimate	[0.014]*	[0.008]**	[0.032]*	[0.022]*	[0.804]	[0.521]	[0.040]*	[0.075]+
Economic to NE: [b] - [a]	-0.494	-0.241	-0.522	-3.968	1.055	0.441	-0.232	-3.964
p-value of the E-NE estimate	[0.482]	[0.746]	[0.458]	[0.368]	[0.225]	[0.625]	[0.945]	[0.076]+
Number of obs.	6714	1482	6982	2466	6164	6231	6188	6304
Model *p*-value	0.035	0.027	0.049	0.116	0.624	0.393	0.031	0.061

The coefficients are estimated using the first difference (FD) estimator, which uses first-differenced variables (capturing economy fixed effects). All regressions use year fixed effects. Heteroscedasticity-robust standard errors are estimated and corrected for clustering at the economy level. Absolute *t*-statistics are reported in parentheses; *p*-values are reported in brackets. Model *p*-value shows the result for a test that all of the coefficients (excluding the fixed effects and the constant) are jointly zero. +, *, ** denote statistical significance at the 10%, 5% and 1% levels.

Table V. Economic Leadership and Growth: Close Elections and Pre-Leader-Change Trends

This table presents first-difference (FD) panel regression results for the sample where the left-hand-side (LHS) variables are *Economic growth* in columns (1) and (2); and *Average economic growth* in column (3). The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].

LHS Variable	Economic Growth		Average Economic Growth
[a] Economic to Economic	-0.255	-0.260	0.019
	(0.280)	(0.285)	(0.008)
[b] Economic to NE	-1.567	-1.550	-1.049
	(2.039)*	(2.019)*	(2.306)*
[c] NE to NE	-1.770	-1.243	-0.991
	(2.503)*	(1.578)	(1.634)
… [e] trend from year (T - 2) to year (T - 1)	-0.244		
	(0.368)		
[d] NE to Economic	1.494	1.528	1.847
	(2.125)*	(2.155)*	(2.433)*
… [f] trend from year (T - 2) to year (T - 1)	0.098		
	(0.110)		
Leader-change type	Close election	Close election	Close election
Regime-level regression	No	No	Yes
NE to Economic: [d] - [c]	3.263	2.771	2.838
p-value of the NE-E estimate	[0.001]**	[0.008]**	[0.003]**
Economic to NE: [b] - [a]	-1.312	-1.290	-1.067
p-value of the E-NE estimate	[0.271]	[0.279]	[0.662]
Pre-leader-change trend difference: [f] - [e]	0.342		
p-value of the PLCTD estimate	[0.769]		
Number of obs.	6541	6714	1482
Model *p*-value	0.000	0.034	0.001

The coefficients are estimated using the first difference (FD) estimator, which uses first-differenced variables (capturing economy fixed effects). All regressions use year fixed effects. Heteroscedasticity-robust standard errors are estimated and corrected for clustering at the economy level. Absolute *t*-statistics are reported in parentheses; *p*-values are reported in brackets. Model *p*-value shows the result for a test that all of the coefficients (excluding the fixed effects and the constant) are jointly zero. +, *, ** denote statistical significance at the 10%, 5% and 1% levels.

Figure IV. Economic Growth, Economic Leader Close Elections, and Other Leader Changes

This figure presents distributions of first differences in *Economic growth* for the first-year sample (for each non-missing value of the valid *Close election* indicator), using a kernel density estimator. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].

First-Year Growth-Difference Distributions

Density — First Difference in Real GDP p.c. Growth

Economic Leader Close Elections — — — Other Leader Changes

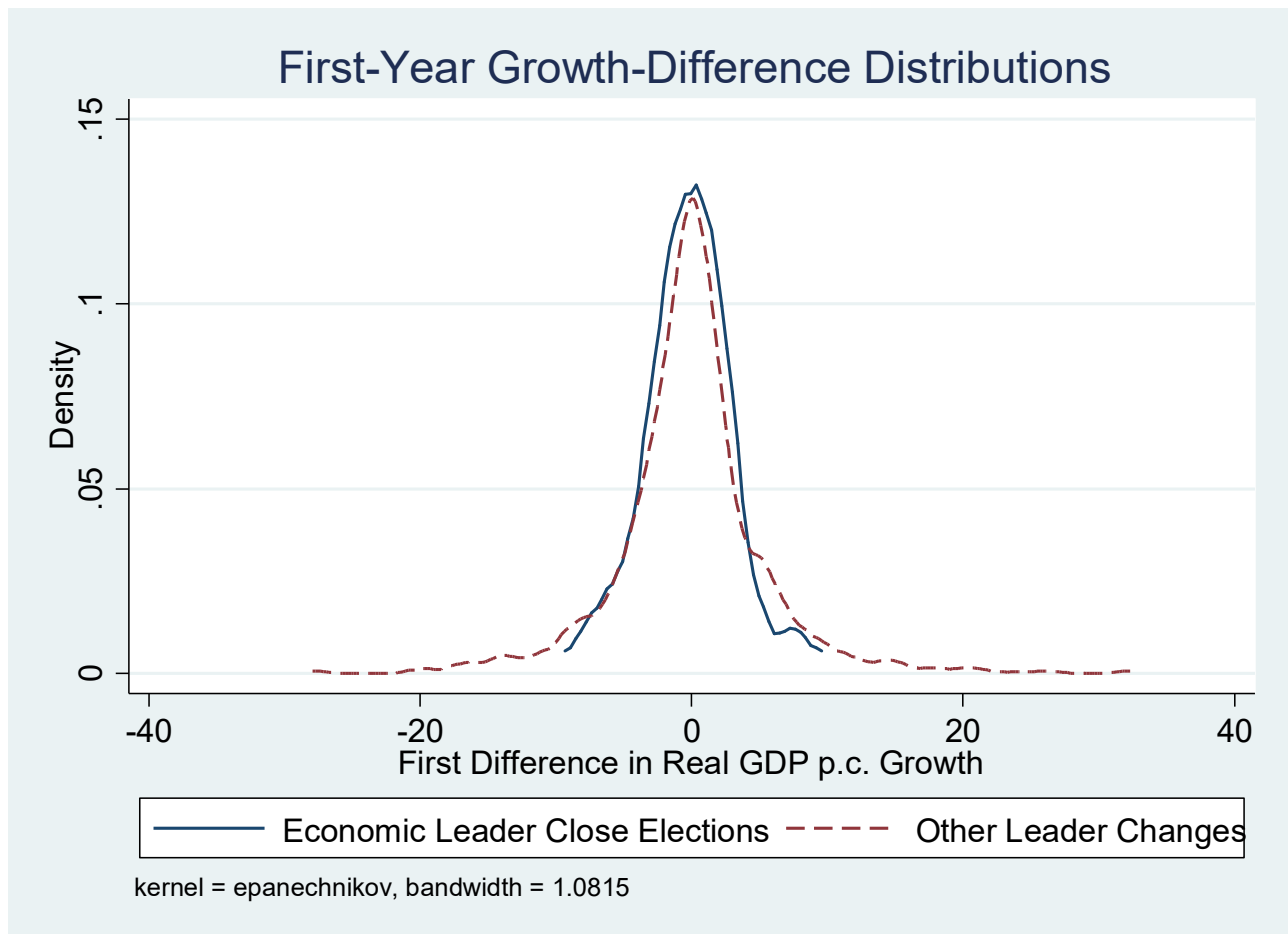kernel = epanechnikov, bandwidth = 1.0815

Table VI. Economic Leadership and Growth: The Role of Leader Effectiveness

This table presents first-difference (FD) panel regression results for the sample where the left-hand-side (LHS) variable is *Economic growth*. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].

[a] Economic to Economic (Less effective)	-0.421	-0.165
	(0.574)	(0.239)
[b] Economic to NE (Less effective)	-0.557	-0.422
	(1.746)+	(1.220)
[c] NE to NE (Less effective)	-0.312	-0.095
	(1.523)	(0.412)
[d] NE to Economic (Less effective)	0.589	-0.444
	(1.536)	(0.928)
[e] Economic to Economic (More effective)	1.191	0.156
	(1.498)	(0.178)
[f] Economic to NE (More effective)	-0.990	-0.967
	(1.379)	(1.981)*
[g] NE to NE (More effective)	-0.154	-0.588
	(0.511)	(1.979)*
[h] NE to Economic (More effective)	3.007	2.138
	(1.786)+	(2.900)**
Leader effectiveness variable (included)	Autocracy (Yes)	Presidential system (Yes)
Leader-change type	All	All
(i) NE to Economic (ME): [h] - [g]	3.161	2.726
p-value of the E-NE estimate	[0.069]+	[0.001]**
(ii) Economic to NE (ME): [f] - [e]	-2.181	-1.123
p-value of the E-NE estimate	[0.039]*	[0.295]
(iii) NE to Economic (LE): [d] - [c]	0.901	-0.349
p-value of the E-NE estimate	[0.027]*	[0.531]
(iv) Economic to NE (LE): [b] - [a]	-0.136	-0.256
p-value of the E-NE estimate	[0.868]	[0.735]
Margin of effectiveness (ME - LE): (i) - (iii)	2.260	3.075
p-value of the marginal effect	[0.198]	[0.002]**
Margin of effectiveness (ME - LE): (ii) - (iv)	-2.045	-0.867
p-value of the marginal effect	[0.102]	[0.488]
Number of obs.	6038	4755
Model *p*-value	0.065	0.044

The coefficients are estimated using the first difference (FD) estimator, which uses first-differenced variables (capturing economy fixed effects). All regressions use year fixed effects. Heteroscedasticity-robust standard errors are estimated and corrected for clustering at the economy level. Absolute *t*-statistics are reported in parentheses; *p*-values are reported in brackets. Model *p*-value shows the result for a test that all of the coefficients (excluding the fixed effects and the constant) are jointly zero. +, *, ** denote statistical significance at the 10%, 5% and 1% levels.

Table VII. Economic Leadership and Growth: Corporate Tax Rates and Personal Tax Rates

This table presents first-difference (FD) panel regression results where the left-hand-side (LHS) variables are *Top corporate tax rate* in columns (1) and (2); *Top personal tax rate* in columns (3), (4), and (5); and *Economic Growth* in column (6). Columns (2), (4), and (5) use a subsample that is limited to last regime-years. Column (6) interacts all of the right-hand-side (RHS) variables with *Top personal tax rate* for the last regime year. The sample period is 1950 to 2003. The variable definitions [descriptions] are presented in Table I [Table A.I].

LHS Variable	Top Corporate Tax Rate		Top Personal Tax Rate			Economic Growth
[a] Economic to Economic	0.707	0.191	0.423	-4.379	5.852	0.033
	(2.371)*	(0.216)	(0.413)	(1.433)	(7.650)**	(1.210)
[b] Economic to NE	0.022	-0.508	0.576	-0.786	6.956	-0.015
	(0.057)	(0.797)	(1.932)+	(0.633)	(2.491)*	(0.242)
[c] NE to NE	0.057	0.213	0.450	-0.937	3.042	0.028
	(0.297)	(0.745)	(1.469)	(1.412)	(2.178)*	(0.344)
[d] NE to Economic	0.219	-0.115	-0.216	-4.018	-19.531	-0.080
	(0.668)	(0.152)	(0.423)	(2.996)**	(7.755)**	(2.820)**
Leader-change type	All	All	All	All	Close election	All
Last regime year only	No	Yes	No	Yes	Yes	No
RHS interactions with the last-regime-year Top personal tax rate	No	No	No	No	No	Yes
NE to Economic: [d] - [c]	0.162	-0.328	-0.666	-3.081	-22.573	
p-value of the NE-E estimate	[0.675]	[0.677]	[0.221]	[0.048]*	[0.000]**	
Economic to NE: [b] - [a]	-0.685	-0.699	0.153	3.593	1.104	
p-value of the E-NE estimate	[0.150]	[0.517]	[0.883]	[0.314]	[0.705]	
Number of obs.	2728	818	1634	411	411	1473
Model p-value	0.174	0.835	0.180	0.002	0.000	0.053

The coefficients are estimated using the first difference (FD) estimator, which uses first-differenced variables (capturing economy fixed effects). Columns (1), (3), and (6) use year fixed effects; columns (2), (4), and (5) use five-year fixed effects. Heteroscedasticity-robust standard errors are estimated and corrected for clustering at the economy level. Absolute *t*-statistics are reported in parentheses; *p*-values are reported in brackets. Model *p*-value shows the result for a test that all of the coefficients (excluding the fixed effects and the constant) are jointly zero. +, *, ** denote statistical significance at the 10%, 5% and 1% levels.

Table VIII. Economic Leadership and Growth: Advanced STEM Leadership; and Controlling for Leader Age, Political Ideology, Autocracy, and Advanced Education

This table presents first-difference (FD) panel regression results for the sample where the left-hand-side (LHS) variable is *Economic growth*. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].

[a] Educ_type to Educ_type	-0.341	-1.345	-0.231	0.338	-1.594
	(0.403)	(2.902)**	(0.239)	(0.819)	(1.227)
[b] Educ_type to Non-educ_type	-1.525	-0.873	-1.959	-1.525	-0.363
	(1.914)+	(1.148)	(2.270)*	(1.991)*	(1.444)
[c] Non-educ_type to Non-educ_type	-1.195	-1.877	-1.298	-1.213	-0.026
	(1.532)	(3.256)**	(1.469)	(1.452)	(0.136)
[d] Non-educ_type to Educ_type	1.580	0.853	1.462	1.528	-1.042
	(2.238)*	(1.505)	(1.633)	(2.039)*	(1.926)+
Leader age	0.015				
	(1.206)				
Right ideology		-0.230			
		(0.913)			
Autocracy			0.237		
			(0.402)		
Advanced degree				0.657	
				(2.884)**	
Education type			Economics		Advanced STEM
Leader-change type			Close election		All
NE to Educ_type: [d] - [c]	2.775	2.730	2.760	2.741	-1.016
p-value of the NE-E estimate	[0.007]**	[0.002]**	[0.026]*	[0.013]*	[0.079]+
Educ_type to NE: [b] - [a]	-1.184	0.472	-1.729	-1.863	1.230
p-value of the E-NE estimate	[0.309]	[0.573]	[0.182]	[0.039]*	[0.350]
Number of obs.	6714	2956	6038	6486	6695
Model *p*-value	0.040	0.001	0.087	0.001	0.165

The coefficients are estimated using the first difference (FD) estimator, which uses first-differenced variables (capturing economy fixed effects). All regressions use year fixed effects. Heteroscedasticity-robust standard errors are estimated and corrected for clustering at the economy level. Absolute *t*-statistics are reported in parentheses; *p*-values are reported in brackets. Model *p*-value shows the result for a test that all of the coefficients (excluding the fixed effects and the constant) are jointly zero. +, *, ** denote statistical significance at the 10%, 5% and 1% levels.

Table IX. Economic Leadership and Growth: The Role of University Selectivity and the Quality of Economics Education

This table presents first-difference (FD) panel regression results for various subsamples where the left-hand-side (LHS) variable is *Economic growth*. The sample period is 1950 to 2014. *LSE economics* [*Harvard economics*; *Oxford economics*] is a dummy variable equal to one if the government leader studied economics at the London School of Economics [Harvard University; University of Oxford]. The remaining variable definitions [descriptions] are presented in Table I [Table A.I].

Sample	No LSE	No Harvard	No Oxford	No Oxford, No LSE, No Harvard	No PhD	No Academic
[a] Economic to Economic	-0.267	-0.263	-0.260	-0.270	0.977	1.007
	(0.294)	(0.288)	(0.283)	(0.294)	(2.661)**	(2.862)**
[b] Economic to NE	-1.552	-1.551	-1.560	-1.563	-1.520	-1.546
	(2.021)*	(2.020)*	(2.031)*	(2.034)*	(1.983)*	(2.024)*
[c] NE to NE	-1.223	-1.235	-1.233	-1.209	-1.220	-1.257
	(1.543)	(1.566)	(1.561)	(1.524)	(1.550)	(1.590)
[d] NE to Economic	1.647	1.525	1.489	1.611	1.236	1.534
	(2.102)*	(2.148)*	(1.962)+	(1.904)+	(1.603)	(2.164)*
Leader-change type			Close election			
NE to Economic: [d] - [c]	2.871	2.760	2.722	2.820	2.456	2.791
p-value of the NE-E estimate	[0.009]**	[0.009]**	[0.012]*	[0.014]*	[0.024]*	[0.008]**
Economic to NE: [b] - [a]	-1.285	-1.288	-1.300	-1.293	-2.497	-2.553
p-value of the E-NE estimate	[0.280]	[0.281]	[0.279]	[0.281]	[0.005]**	[0.004]**
Number of obs.	6633	6683	6624	6515	6389	6607
Model p-value	0.038	0.035	0.046	0.052	0.007	0.002

The coefficients are estimated using the first difference (FD) estimator, which uses first-differenced variables (capturing economy fixed effects). All regressions use year fixed effects. Heteroscedasticity-robust standard errors are estimated and corrected for clustering at the economy level. Absolute *t*-statistics are reported in parentheses; *p*-values are reported in brackets. Model *p*-value shows the result for a test that all of the coefficients (excluding the fixed effects and the constant) are jointly zero. +, *, ** denote statistical significance at the 10%, 5% and 1% levels.

Table X. Economic Leadership and Growth: Sample Robustness

This table presents first-difference (FD) panel regression results where the left-hand-side (LHS) variable is *Economic growth*. Column (1) uses a subsample which excludes economies with leaders suspected of academic fraud; column (2) uses a subsample which excludes tax havens (Hines and Rice, 1994); column (3) uses a subsample which consists of economies with stable political systems; column (4) uses a subsample which consists of economies that use one type of government leader for the entire sample period; and column (5) uses an economy sample without Switzerland. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].

Sample	No Fraud	No Tax Havens	Stable Politics	One Leader Type	No Switzerland
[a] Economic to Economic	-0.143	-1.584	-0.375	-0.240	-0.265
	(0.167)	(3.185)**	(0.388)	(0.294)	(0.290)
[b] Economic to NE	-1.554	-1.355	-1.374	-1.514	-1.547
	(2.015)*	(1.946)+	(1.659)+	(2.001)*	(2.013)*
[c] NE to NE	-1.280	-1.290	-1.610	-1.105	-1.236
	(1.630)	(1.631)	(2.271)*	(1.451)	(1.567)
[d] NE to Economic	1.176	1.551	1.588	1.192	1.529
	(1.759)+	(1.908)+	(1.825)+	(1.754)+	(2.149)*
Leader-change type			Close election		
NE to Economic: [d] - [c]	2.456	2.841	3.198	2.298	2.765
p-value of the NE-E estimate	[0.017]*	[0.011]*	[0.006]**	[0.022]*	[0.009]**
Economic to NE: [b] - [a]	-1.410	0.230	-0.998	-1.275	-1.282
p-value of the E-NE estimate	[0.223]	[0.780]	[0.437]	[0.251]	[0.284]
Number of obs.	6606	5781	5138	5239	6651
Model p-value	0.059	0.001	0.042	0.066	0.035

The coefficients are estimated using the first difference (FD) estimator, which uses first-differenced variables (capturing economy fixed effects). All regressions use year fixed effects. Heteroscedasticity-robust standard errors are estimated and corrected for clustering at the economy level. Absolute *t*-statistics are reported in parentheses; *p*-values are reported in brackets. Model *p*-value shows the result for a test that all of the coefficients (excluding the fixed effects and the constant) are jointly zero. +, *, ** denote statistical significance at the 10%, 5% and 1% levels.

Appendix A

A.1 <u>Economy Sample Construction</u>

The initial sample of 159 economies is extracted from the Financial Development and Structure (FDS) database maintained by the World Bank.

This paper uses a sample of meaningful economies with functioning institutions. Table A.II presents the sample construction filters. First, economies with missing economic growth data (Guam, the Democratic Republic of Korea, and Taiwan) are dropped; the filter results in 156 remaining economies. Second, economies that are small—an average population of less than 500,000 persons—with below-average real GDP (U.S. dollars) per capita (Belize, Cape Verde, Kiribati, Marshall Islands, Solomon Islands, Sao Tome and Principe, Tonga, and Samoa) are also dropped; a filter which results in 148 remaining economies.

Economies with dysfunctional institutions are less likely to experience the effects of economic policy changes (Barro, 1991) when compared to other economies with functioning legal, democratic, and economic institutions. I construct a variable for an economy's overall institutional quality equal to the average of the standardized values for the rule of law, polity, and real GDP per capita. The economies in the first percentile of institutional quality (Uzbekistan and Iraq) are then removed from the sample. The final sample consists of 146 economies governed by 1681 different leaders.

A.2 <u>Leader Background Data</u>

For the sample of economies in the years 1950 to 2014, I link each economy's short-run growth rate to the economics-education background of its government leader. An economy's government leader is defined as the chief executive responsible for domestic government

policymaking for most of the year.[i] By using government leaders, the focus is not on heads of state (e.g. governors general), but on heads of government. For example, the government leader is the prime minister in the parliamentary political system of Australia, while the government leader is the president in the presidential political system of the United States of America (the U.S.)

In identifying government leaders, this paper first focuses on the unambiguous cases of single government leaders (i.e. the chief executives who do not share government-leader responsibilities with other executives). The Central Intelligence Agency (CIA) World Factbook is the primary source for determining the single government leader for each economy-year. If an economy modifies its constitution while retaining a single government leader, then I use the government leader under the constitution in place for most of the year.

In addition to the unambiguous cases, there are ambiguous cases of political systems maintaining both a prime minister and a president for government responsibilities. These political systems exist mostly in Eastern European and African economies (Shugart, 2005). In the majority of these cases, the prime minister is picked as the government leader for the entire sample period, thereby adopting the French convention where the prime minister is responsible for domestic economic policy (Article 5, Title II, of the French Constitution of 1958). There are exceptions to the French convention: For most of the sample period, the president is the dominant domestic economic policymaker in Korea, Mozambique, Russia, and Rwanda. For these economies, the president is picked as the government leader. If an economy abolishes the

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[i] This approach differs from an alternative approach which identifies the national leader for each economy-year as the most powerful public official in the economy for the year. Papers that focus on national leaders use the *Archigos* dataset (Goemans, Gleditsch, and Chiozza, 2009) as the primary source of leader information. The focus on a leader's function rather than a subjective assessment of her power is appropriate for cases where a national leader is constitutionally limited in determining domestic economic policy, or less concerned about her economy compared to other matters (e.g. military power, international relations, etc.). To further distinguish my approach from the alternative, I refer to the leaders in this paper as government leaders rather than national leaders.

office of one type of government leader for most of the year, then the other type of government leader is chosen for the year. If an economy experiences military rule for most of the year, then I choose the military leader as the government leader for the year.

A.2.1. *Sources*

Given that a country's constitution is not always static, the World Bank's Database of Political Institutions (DPI) is used to identify each economy that changes its political system (e.g. from presidential to parliamentary) during the sample period.

This paper uses the Central Intelligence Agency (CIA) World Factbook as the primary source for determining the single government leader for each economy-year. Early Factbook editions (prior to 1989) do not distinguish between the head of state and head of government. In these cases where the Factbook does not provide clear government-leader information, I use encyclopedias to identify the single government leader for each economy-year.

Multiple research assistants gathered leader background data, and my team made every effort to minimize the risk of coding errors through the double-, and often triple-, checking of questionable cases. However, without third-party verification by historians from each leader's home economy, it is difficult to eliminate the possibility of coding errors.

To determine the background information of each government leader, my research team used many sources of data: Academic books, obituaries, news articles, and hardcopy encyclopedias. For many economies, these primary sources of data were written in languages other than English. In the event that our local libraries were an inadequate information source for a given leader, we consulted with national librarians in the leader's home economy to identify an adequate primary source.

A.2.2. *Coding Economics Education*

Economic leader is a dummy variable equal to one if the government leader was educated in economics prior to becoming the government leader, and zero otherwise. To code the variable, we first determine the following information for each leader: High school name, the subjects studied in high school, the first-degree (or undergraduate) institution name, the focus (or major) of the first degree, the names of the universities for advanced degrees [scholarships, fellowships], and the focus of study for each advanced degree [scholarship, fellowship].

For each leader, *Economic leader* is coded as missing in the case where there was no education background information. *Economic leader* is coded as one if (i) the major of the first degree was economics, (ii) the focus of study for an advanced degree [scholarship or fellowship] was economics (e.g. M.Phil. in economics, Rhodes scholar focusing on economics and politics), or—only in the absence of information about the focus of study—(iii) the name of a school strongly suggests an education in economics. *Economic leader* is coded as zero for the remaining cases.

Table A.I. Variable Descriptions and Sources

This table presents the descriptions and sources of the variables used in this paper.

Variable	Description
	Leaders
Economic leader	A dummy variable equal to one if the government leader was educated in economics prior to becoming the government leader. [Source: Hand collected]
NE to Economic	A (within-economy) step function which increases if there is a leader change from a non-economic leader to an economic leader. [Source: Hand collected]
NE to NE	A (within-economy) step function which increases if there is a leader change from a non-economic leader to another non-economic leader. [Source: Hand collected]
Economic to NE	A (within-economy) step function which increases if there is a leader change from an economic leader to a non-economic leader. [Source: Hand collected]
Economic to Economic	A (within-economy) step function which increases if there is a leader change from an economic leader to another economic leader. [Source: Hand collected]
PhD economist	A dummy variable equal to one if the government leader received a doctorate (or equivalent) in economics prior to becoming the government leader. [Source: Hand collected]
Academic economist	A dummy variable equal to one if the government leader conducted teaching and research in economics at a university prior to becoming the government leader. [Source: Hand collected]
Advanced degree	A dummy variable equal to one if the government leader received a graduate school degree (professional or otherwise) prior to becoming the government leader. [Source: Hand collected]
Advanced STEM	A dummy variable equal to one if the government leader received an advanced education in a STEM (Science, Technology, Engineering, and Mathematics) field or a medical degree prior to becoming the government leader. [Source: Hand collected]
Leader age	The age of the government leader. [Source: Hand collected]
Right ideology	A dummy variable equal to one if the leader belongs to a right-leaning political party. [Source: Database of Political Institutions]
Regime duration	The number of uninterrupted years with one unique government leader. [Source: Hand collected]
	Politics and Institutions
Presidential system	A dummy variable equal to one if there is a presidential system of government in the economy. [Source: Database of Political Institutions]
Rule of law	The strength of the tradition of law and order. [Source: International Country Risk Guide]
Polity	The POLITY2 variable, a score between -10 and +10. [Source: Polity IV Project]
Autocracy	A dummy variable equal to zero if *Polity* is greater than zero. [Source: Polity IV Project]
Institutional quality	A score based on the simple average of the standardized versions of the following variables: *Rule of law*, *Polity*, and *Real GDP per capita*.
Close election	An election with a victory margin of 2% or less (or by a one-seat difference in parliamentary elections with a small number of seats). Given that one type of leader, economic or non-economic, emerges as the winner; the close election is valid if an alternative-type candidate is the top candidate other than the winner. [Source: Hand collected]

Variable	Description
	The Economy
Real GDP per capita	Real gross domestic product per capita (2005 U.S. dollars; calendar-year adjusted and calendar-year reports). [Sources: Penn World Tables 9.0, World Bank WDI 2015]
Economic growth	Growth in real gross domestic product per capita (calendar-year adjusted and calendar-year reports), constant prices. [Sources: Penn World Tables 9.0, World Bank WDI 2015]
Excess economic growth	The fitted residual of a regression of *Economic growth* on year fixed effects.
Abnormal economic growth	The fitted residual of a regression of *Economic growth* on economy fixed effects and year fixed effects.
Average economic growth	The regime-level mean of *Excess economic growth*.
Economic growth (WB-PWT)	Growth in real gross domestic product per capita (calendar-year adjusted and fiscal-year reports), constant prices. [Sources: Penn World Tables 9.0, World Bank WDI 2015]
Mean night light intensity (NLI) growth	Mean nighttime light emission (per one million persons) in the economy (calculated as the average emission of each grid in the economy, divided by the total population in the economy) from the Defense Meteorological Satellite Program-Operational Linescan System (DMSP-OLS) Nighttime Lights Time Series Version 4 (average visible, stable lights, and cloud-free coverages), calibrated to account for inter-satellite differences and inter-annual sensor decay using calibration values from Elvidge et al. (2013). These data are available from 1992 to 2012. [Sources: U.S. National Oceanic and Atmospheric Administration (NOAA) National Geophysical Data Center, U.S. Air Force Weather Agency]
Recession	A dummy variable equal to one if *Economic growth* is negative (regular), less than -5% (deep), or negative for two consecutive years (long).
Investment growth	Growth in real investment per capita. [Sources: Penn World Tables 9.0, World Bank WDI 2015]
Consumption growth	Growth in real household consumption per capita. [Sources: Penn World Tables 9.0, World Bank WDI 2015]
Govt. spending growth	Growth in real government consumption per capita. [Sources: Penn World Tables 9.0, World Bank WDI 2015]
Export growth	Growth in real exports per capita. [Sources: Penn World Tables 9.0, World Bank WDI 2015]
Top corporate tax rate	The top income tax rate for corporations. [Source: University of Michigan Office of Tax Policy Research World Tax Database]
Top personal tax rate	The top income tax rate for individuals. [Source: University of Michigan Office of Tax Policy Research World Tax Database]

Table A.II. Sample Construction

This table presents the construction filters for this paper's sample of economies.

Filter Criteria	Filter Type	Number of Economies	Economies Dropped
Financial Development and Structure (FDS) database [Source: World Bank]	None	159	None
Non-missing growth in real gross domestic product per capita	Missing data	156	Guam, the Democratic Republic of Korea, and Taiwan
Economies with (a) an average population of 500K or greater; or (b) above-average real gross domestic product per capita	Lower-income small economies	148	Belize, Cape Verde, Kiribati, Marshall Islands, Solomon Islands, Sao Tome and Principe, Tonga, and Samoa
Economies not in the 1st percentile of *Institutional quality*	Low-quality institutions	146	Iraq and Uzbekistan

Table A.III. Government Leader Types

This table presents the names of the economies by government leader type.

Government Leader Type	Economies (Leader Title)
Prime Minister	Albania, Andorra, Armenia, Australia, Austria (Chancellor), Bahamas, Bahrain, Barbados, Belarus, Belgium, Bulgaria, Cambodia, Canada, Croatia, Czech Republic, Denmark, Egypt, Finland, France, Germany (Chancellor), Greece, Grenada, Guyana, Hungary, Iceland, India, Ireland (Taoiseach), Israel, Italy (Presidente), Jamaica, Japan, Jordan, Kazakhstan, Kuwait, Laos, Latvia, Lebanon, Lesotho, Liechtenstein, Lithuania, Luxembourg, Macedonia, Madagascar, Malaysia, Malta, Mauritius, Moldova, Mongolia, Montenegro, Namibia, Netherlands, New Zealand, Norway, Papua New Guinea, Poland, Portugal, Romania, St. Kitts and Nevis, St. Lucia, Singapore, Slovenia, Spain (President), Sweden, Switzerland (President), Syria, Thailand, Trinidad and Tobago, Turkey, Ukraine, United Kingdom, Vietnam.
President	Argentina, Bolivia, Botswana, Brazil, Chile, Colombia, Costa Rica, Cyprus, Guatemala, Honduras, Indonesia, Kenya, *Korea, Liberia, Malawi, Mexico, *Mozambique, Nicaragua, Panama, Paraguay, Peru, Philippines, *Russia, *Rwanda, Seychelles, Turkmenistan, United States, Uruguay, Venezuela.
Both Prime Minister and President	Angola, Bangladesh, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Republic of Congo, Cuba, Côte d'Ivoire, Guinea, Haiti, Iran, Kyrgyz Republic, Mali, Mauritania, Myanmar, Niger, Nigeria, Pakistan, Senegal, Sierra Leone, Somalia, South Africa, Sri Lanka, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe.
Other	Brunei (Sultan), China (Premier), Greenland (Governor, Prime Minister), Hong Kong (Governor, Chief Executive), Isle of Man (Chairman of the Executive Council, Chief Minister), Libya (Brotherly Leader), Macao (Chief Executive), Maldives (Sultan, President), Morocco (King, Prime Minister), Nepal (King, Prime Minister), Oman (Sultan), Puerto Rico (Governor), Qatar (Emir), Saudi Arabia (King).

*Under the French convention, the prime minister should be the head of government for most of the sample period. However for these economies, the president is responsible for economic policy for most of the sample period.

Appendix B

B.1 <u>The Degree-Granting Institutions of Economic Leaders</u>

Table VIII presents evidence which suggests that the economic leadership result is robust controlling for whether a leader has an advanced degree. However, there remains a question of whether this paper's main finding is driven by the alumni of a small group of highly selective institutions that focus on economics education. For example, the University of Chicago boasts a significant number of alumni and faculty members who have been awarded a Prize in Economic Sciences.

Overall, economic leaders do not appear to be associated with a small group of specialized institutions. On the contrary, the roughly 270 economic leaders in the sample are associated with over 190 different degree-granting institutions from all over the world. Table B.I presents the top 30 institutions from which economic leaders receive their degrees associated with economics; sequentially ranked, first by the number of associated economic leaders in the sample, and second by the (cross-sectional) average of the regime-level (time-series) mean of abnormal economic growth for these economic leaders. The list of institutions includes selective "global goliath" universities, magnet institutions for potential leaders of former colonies, and "local champion" universities. Many of the institutions on the list are each associated with two economic leaders only. The top university on the list, University of Oxford, is associated with 16 economic leaders.

B.2 <u>Economic Leadership over Time for Higher-Income and Lower-Income Economies</u>

Figure I shows that for all countries, economic leadership has been increasing over time; a finding which suggests a positive experience of economic leadership. For higher-income economies, Figure B.I shows that economic leadership increased sharply in the 1970s, peaked in

the mid-1990s, and has since retreated to its early 1980s level. For lower-income economies, Figure B.II shows that economic leadership did not really take off until the late 1980s, but has since become just as—if not more—prevalent than economic leadership in the higher-income economies.

B.3 <u>The Distribution of Annual Growth by Background Type</u>

This paper studies the role of economic leadership in annual economic growth. However, annual growth can exhibit extreme values. Although this paper uses a winsorized measure of annual growth, one concern is that the difference in growth between economic leaders and non-economic leaders is driven by extreme values. For a deeper investigation of this difference, Figure B.III shows the growth distribution for each type of leader. The main finding is that the difference in growth between economic leaders and non-economic leaders occurs for moderate, rather than extreme, values of annual growth.

B.4 <u>Economic Leadership Controlling for Economic Leader Close Elections</u>

Table V shows that for upward leader changes, an economic leader (relative to a non-economic leader) brings about faster economic growth. Although economic leader close elections are obviously orthogonal to other leader changes, there is no explicit control for economic leader close elections in Table V. In Table B.II, I investigate the economic leadership result for both economic leader close elections and other leader changes. The results suggest that the main finding is robust when controlling for economic leader close elections explicitly.

B.5 <u>Top Tax Rates and Past Economic Growth</u>

Table VII shows that for upward leader changes, an economic leader (relative to a non-economic leader) eventually reduces the top personal income tax rate. However, if past growth *affects* top tax rates in general, then the results in Table VII could be driven by a "mechanical" relation

between economic leadership and first-year growth. In Table B.III, I investigate whether top tax rates are related to past economic growth. The results suggest that there is no statistically significant relation in general.

Table B.I. The Degree-Granting Institutions of Economic Leaders

This table presents the names of the economic-leader degree-granting institutions ranked sequentially based on the total number of associated economic leaders; and then on the average regime-level mean of *Abnormal economic growth*. The list is limited to the top 30 institutions.

Rank	University	Economy	Number of Economic Leaders	Regime-Mean Abnormal Growth
1	University of Oxford	United Kingdom	16	-0.320
2	London School of Economics	United Kingdom	11	0.803
3	University of Paris	France	10	0.518
4	University of Dakar	Senegal	7	0.581
5	Sciences Po	France	6	-0.589
6	Bucharest Academy of Economic Studies*	Romania	6	-3.029
7	Yale University	United States	5	-0.850
8	KU Leuven*	Belgium	4	-0.387
9	Columbia University	United States	4	-0.448
10	University of Copenhagen*	Denmark	3	1.156
11	University of Oslo*	Norway	3	0.632
12	University of Chicago	United States	3	0.514
13	University of Costa Rica*	Costa Rica	3	0.413
14	Harvard University	United States	3	0.338
15	University of Economics, Prague*	Czech Republic	3	0.178
16	University of Michigan	United States	3	-0.140
17	Stanford University	United States	3	-0.712
18	University of Geneva	Switzerland	3	-1.727
19	University of Ljubljana*	Slovenia	3	-2.127
20	The State University of Management	Russian Federation	2	3.126
21	University of London	United Kingdom	2	2.436
22	Kyiv National Economic University*	Ukraine	2	2.260
23	American University of Beirut*	Lebanon	2	2.121
24	University of Cambridge	United Kingdom	2	2.103
25	Corvinus University	Hungary	2	2.092
26	University of Orléans	France	2	1.733
27	Moldova State University*	Moldova	2	1.621
28	Ateneo de Manila University*	Philippines	2	1.512
29	St. Cyril and Methodius University*	Macedonia	2	1.477
30	National University of Benin*	Benin	2	1.214

*Economic leaders from these universities govern only in the economies where the respective universities are located.

Table B.II. Economic Leadership and Growth: Controlling for Economic Leader Close Elections Explicitly

This table presents first-difference (FD) panel regression results for the sample where the left-hand-side (LHS) variable is *Economic growth*. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].

[a] Economic to Economic (Other leader changes)	-0.078
	(0.122)
[b] Economic to NE (Other leader changes)	-0.491
	(1.652)
[c] NE to NE (Other leader changes)	-0.251
	(1.307)
[d] NE to Economic (Other leader changes)	0.919
	(1.906)+
[e] Economic to Economic (EL close elections)	-0.257
	(0.281)
[f] Economic to NE (EL close elections)	-1.568
	(2.040)*
[g] NE to NE (EL close elections)	-1.276
	(1.621)
[h] NE to Economic (EL close elections)	1.502
	(2.113)*
NE to Economic (ELCE): [h] - [g]	2.778
p-value of the E-NE estimate	[0.008]**
Economic to NE (ELCE): [f] - [e]	-1.311
p-value of the E-NE estimate	[0.271]
NE to Economic (OLC): [d] - [c]	1.170
p-value of the E-NE estimate	[0.026]*
Economic to NE (OLC): [b] - [a]	-0.413
p-value of the E-NE estimate	[0.566]
Number of obs.	6714
Model *p*-value	0.028

The coefficients are estimated using the first difference (FD) estimator, which uses first-differenced variables (capturing economy fixed effects). All regressions use year fixed effects. Heteroscedasticity-robust standard errors are estimated and corrected for clustering at the economy level. Absolute *t*-statistics are reported in parentheses; *p*-values are reported in brackets. Model *p*-value shows the result for a test that all of the coefficients (excluding the fixed effects and the constant) are jointly zero. +, *, ** denote statistical significance at the 10%, 5% and 1% levels.

Table B.III. Top Tax Rates and Economic Growth: Does a Change in Economic Growth Lead to Changes in Top Tax Rates?

This table presents first-difference (FD) panel regression results where the left-hand-side (LHS) variables are *Top corporate tax rate* in columns (1) and (2); and *Top personal tax rate* in columns (3) and (4). The sample period is 1950 to 2003. The variable definitions [descriptions] are presented in Table I [Table A.I].

LHS Variable	Top Corporate Tax Rate		Top Personal Tax Rate	
Economic growth (t - 1)	0.005	-0.004	0.011	0.013
	(0.483)	(0.317)	(0.550)	(0.570)
Economic growth (t - 2)		-0.018		0.002
		(1.199)		(0.103)
Number of obs.	2634	2597	1598	1589
Model p-value	0.630	0.470	0.584	0.814

The coefficients are estimated using the first difference (FD) estimator, which uses first-differenced variables (capturing economy fixed effects). All regressions use year fixed effects. Heteroscedasticity-robust standard errors are estimated and corrected for clustering at the economy level. Absolute t-statistics are reported in parentheses; p-values are reported in brackets. Model p-value shows the result for a test that all of the coefficients (excluding the fixed effects and the constant) are jointly zero. +, *, ** denote statistical significance at the 10%, 5% and 1% levels.

Figure B.I. Economic Leadership: Higher-Income Economies over Time

This figure presents a bar chart and a kernel-weighted local-constant regression (Epanechnikov kernel, rule-of-thumb bandwidth) for the relation between *Year* and *Economic leader* for higher-income economies. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].
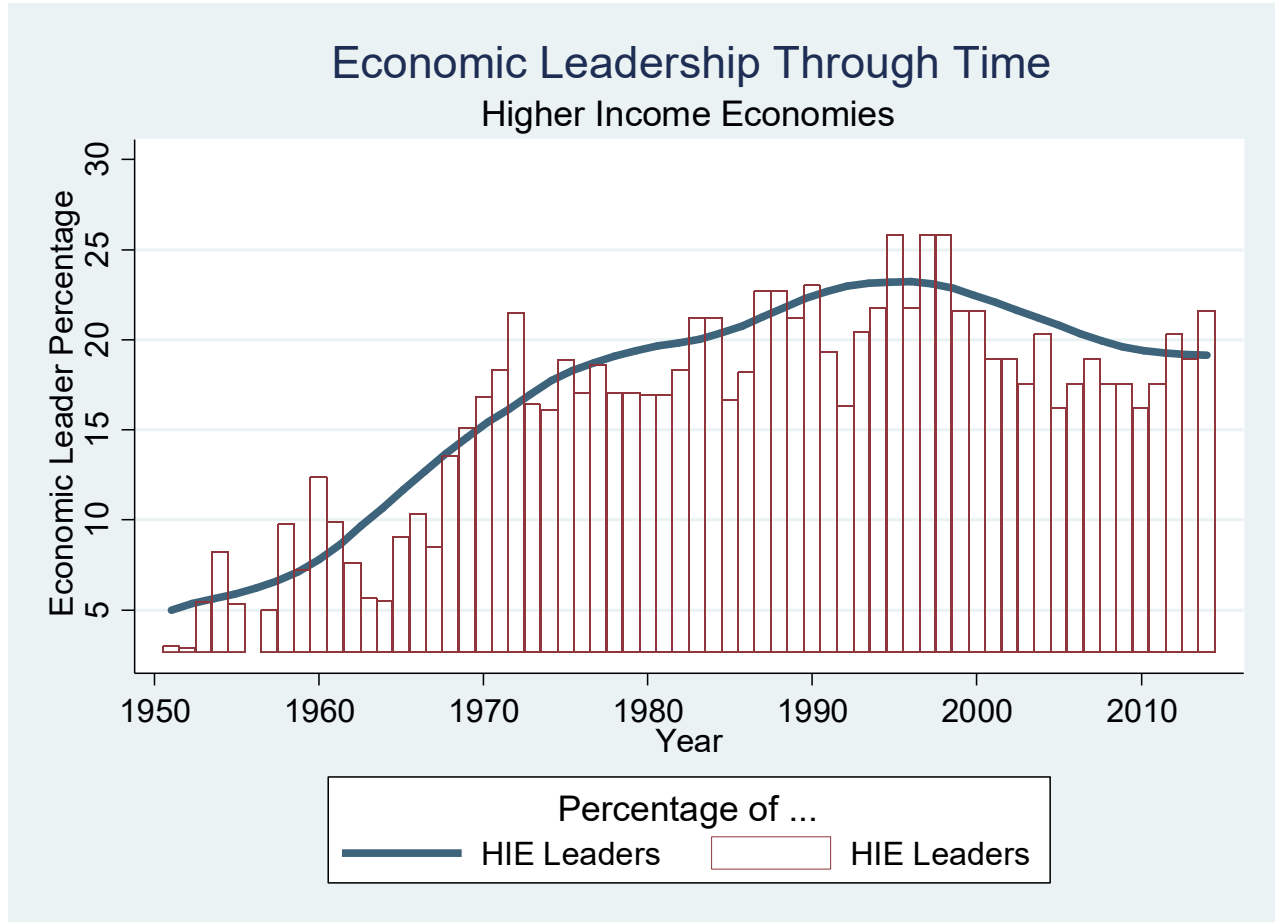
Figure B.II. Economic Leadership: Lower-Income Economies over Time

This figure presents a bar chart and a kernel-weighted local-constant regression (Epanechnikov kernel, rule-of-thumb bandwidth) for the relation between *Year* and *Economic leader* for lower-income economies. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].
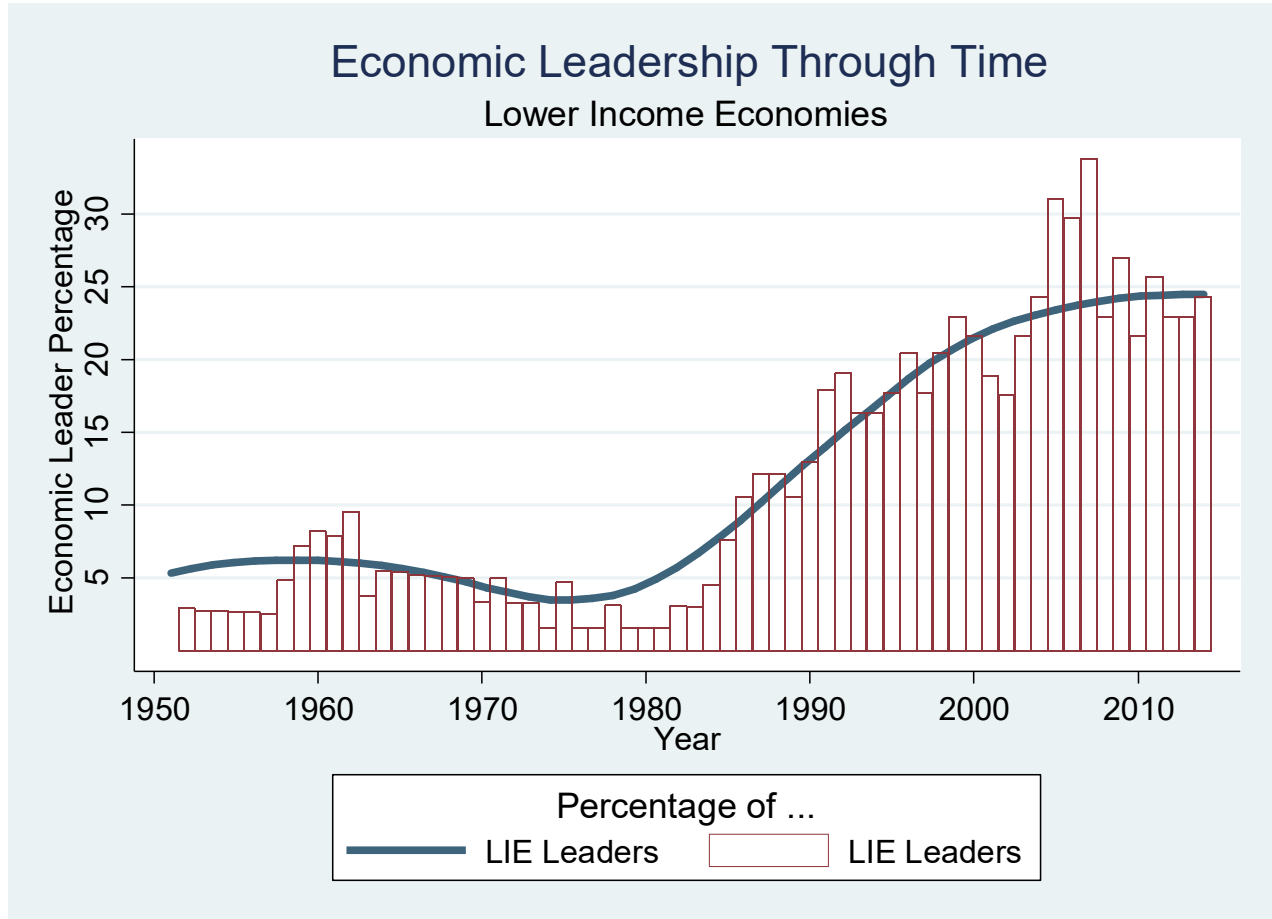
Figure B.III. Growth Distributions by Background Type

This figure presents distributions of *Economic growth* for the economy-year sample, by *Economic leader*, using a kernel density estimator. The sample period is 1950 to 2014. The variable definitions [descriptions] are presented in Table I [Table A.I].

Growth Distributions by Background Type

kernel = epanechnikov, bandwidth = 0.5812
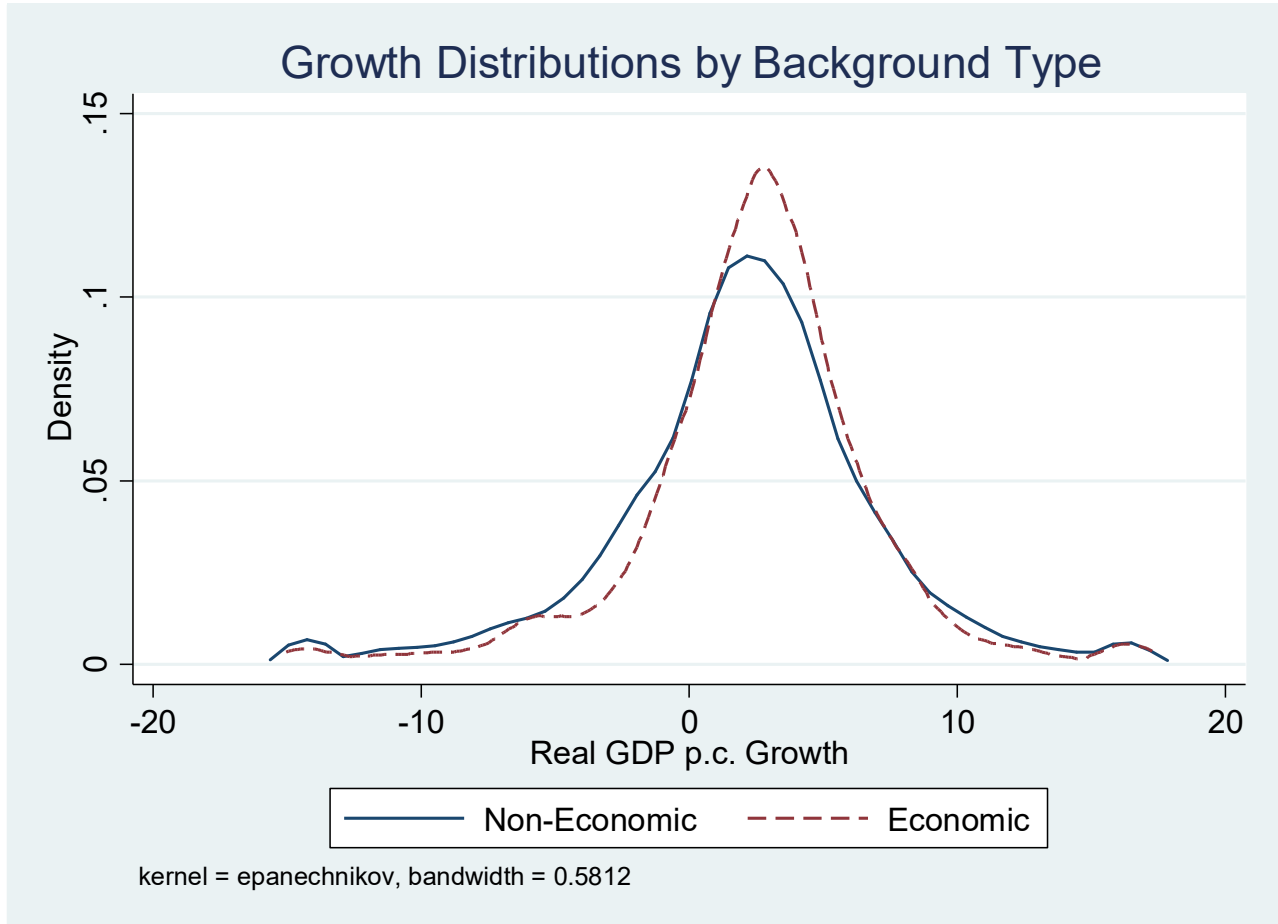
Appendix C

C.1. <u>Effective Economic Leaders and the Change in the Economy Rankings over a Long Time</u>

The results in Table VI suggest that effective economic leaders are associated with an increase in economic growth in the short run. However, there remains a question of whether effective economic leadership is associated with an economy's improvement over a long period of time.[i] In Table C.I, the sample economies with non-missing data from 1970 are ranked based on real GDP (U.S. dollars) per capita in 1970 and in 2013.[ii] The economies are then grouped based on whether they experienced a percentage of economic-leader years greater than the economy-sample median. To explore the role of economic leadership conditional on effective leaders, this exercise is limited to economies where the percentage of presidential or autocratic years is greater than the economy-sample median (or economies with effective leaders).

Panel A of Table C.I shows the names of the economies which were (i) governed under a greater number of years of economic leadership, and (ii) experienced a greater *relative* level of development in 2013 compared to 1970. These economies might have benefited from economic leadership; and are examples that are consistent with a "long-run" economic leadership result. Near the top of the list in Panel A is Singapore which thrived under the leadership of Prime Minister Lee Kuan Yew. Singapore, between 1970 and 2013, experienced 35 years of economic leadership and vaulted 20 places in its real GDP per capita ranking from 1970 to 2013. Other success stories in Panel A include Chile under the economic leadership of the Presidents Ricardo Lagos and Sebastián Piñera Echenique, and Egypt under the leadership of Prime Ministers Atef Sedki and Kamal Ganzouri. Panel B of Table C.I shows the names of the economies which were

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[i] The findings of Hira (2007) suggest that national economist leaders are not associated with greater economic performance in the long run.

[ii] Rather than choose an earlier ranking year, I choose an initial ranking year of 1970 because a nontrivial number of interesting cases (e.g. Singapore) achieved independence in the 1960s.

(i) governed under a greater number of years of economic leadership, and (ii) experienced a lower relative level of development in 2013 compared to 1970. These economies might not have benefited from economic leadership; the counterexamples include Liberia, Mongolia, and Lebanon.

Panel C of Table C.I shows the names of the economies which were (i) governed under fewer years of economic leadership, and (ii) experienced a lower *relative* level of development in 2013 compared to 1970. These economies might have suffered from a lack of economic leadership. Panel D of Table C.I shows the names of the economies which were (i) governed under fewer years of economic leadership, and (ii) experienced a greater relative level of development in 2013 compared to 1970. These economies might have thrived despite a lack of economic leadership. Here the top counterexamples include China, Korea, and Syria.

Although the presentation in Table C.I is merely suggestive, the economies in Panel A (15) outnumber those in Panel B (11); and to a greater extent, the economies in Panel C (22) outnumber those in Panel D (14). Overall, the groupings in Table C.I suggest an interesting story about the long-term benefits of economic leadership. While autocratic governments and presidential systems offer the promise of strong leadership, the risk of relative decline is significant in the absence of meaningful economic leadership (the odds of success are 7 to 11). Economic leadership could offer these economies an opportunity to prosper (the odds of success double to become 15 to 11). In other words, if an economy has powerful leaders, then its people could stand better odds of relative long-term success if their leaders are former students of economics.

Table C.I. Economic Leadership and the Change in the Economic Well-Being Rankings

This table presents the names of the economies sorted based on the change in the real per-capita GDP ranking from 1970 to 2013. The economies are (i) limited to economies that experienced a greater percentage of years of autocratic government, or a presidential system, between 1970 and 2013; and (ii) grouped based on the real per-capita GDP change rank and the percentage of years with economic leaders. Economies with no change in rank (Argentina, Honduras, and Oman) are dropped.

Panel A: More economic-leader years; higher real per-capita GDP ranking

Economy	Rank in 1970	Rank in 2013
Indonesia	96	70
Singapore	38	18
Egypt	91	75
Chile	51	36
Pakistan	95	86
Burkina Faso	101	93
Tunisia	66	58
Colombia	60	55
Costa Rica	53	49
Brazil	54	50
Philippines	77	73
Kenya	94	91
Malawi	104	102
United States	8	7
Mexico	39	38

Panel B: More economic-leader years; lower real per-capita GDP ranking

Economy	Rank in 1970	Rank in 2013
Liberia	71	103
Mongolia	48	71
Lebanon	20	42
Madagascar	86	101
Bulgaria	42	54
Romania	40	48
Mauritania	76	84
Togo	90	97
Senegal	78	85
Benin	87	90
Sierra Leone	92	94

Panel C: Fewer economic-leader years; lower real per-capita GDP ranking

Economy	Rank in 1970	Rank in 2013
Jordan	31	64
Guinea	69	99
Tanzania	65	92
Brunei Darussalam	1	23
Lao PDR	68	87
Côte d'Ivoire	62	80
Iran	46	63
Nicaragua	59	76
Central African Republic	88	104
Albania	44	59
Venezuela	34	46
Zambia	70	81
Niger	89	100
Saudi Arabia	21	30
Poland	29	35
Guatemala	61	66
Chad	85	88
Burundi	102	105
Bolivia	74	77
Peru	55	57
Congo, Rep.	67	68
Cameroon	81	82

Panel D: Fewer economic-leader years; higher real per-capita GDP ranking

Economy	Rank in 1970	Rank in 2013
China	105	62
Korea, Republic of	57	25
Syrian Arab Republic	82	61
Lesotho	98	83
Paraguay	79	67
Morocco	75	65
Uruguay	47	40
Cuba	58	52
Cyprus	32	26
Nepal	103	98
Mali	99	95
Rwanda	100	96
Maldives	56	53
Nigeria	80	79