

# Empowering the Knowledge: Political Leaders, Education, and Economic Liberalization

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## Abstract

The recent literatures report significant political leader effects in driving performance and policies but do not provide an exhaustive answer as to why. This paper argues that formal educational backgrounds play a vital role in shaping leaders' ideas and personal networks, which in turn matter for policies in the long run. Using cross-country data on economic liberalization, the paper finds a strong positive association between leaders' educational attainment and faster liberal reforms. The effects are most telling for leaders with majors in economics and natural science. Moreover, the results are robust to a set of tests taking into account endogeneity problems and alternative channels of political regimes, dynamic patterns, partisan politics, geopolitical factors, and public opinions.

**Keywords:** Political leaders, Education, Economic liberalization, Ideas

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“The ideas of economists and political philosophers, both when they are right and when they are wrong are more powerful than is commonly understood. Indeed, the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually slaves of some defunct economist.”

— John Maynard Keynes, *The General Theory of Employment, Interest and Money*

## 1 Introduction

How do political leaders drive policies? The literature provides two views. The first, representation view, holds that leaders serve specific interests. Hence, policy divergence among leaders reflects fundamental social and economic divisions (Lipset and Rokkan, 1967; Roberts and Wibbels, 1999; Roemer, 2009). The second view enrolls in Schumpeter’s theory of democracy, emphasizing that leaders are to a large extent autonomous, and they exert a direct impact on the formation of policy agendas in a society (Jacobs and Shapiro, 2000; Schumpeter, 2010).

These views allude to quite different focuses on the politics of economic policies. If political leaders, according to the first view, behave as agents of voters and interests groups, the variation in policies should be explained by a society’s socioeconomic structure. In turn, the key variables being identified in the literature of the representation school include income inequality, industrial structure, and the political cleavages associated with those structures (Anderson and Beramendi, 2012; Ansell and Samuels, 2014; Grossman and Helpman, 1996; Meltzer and Richard, 1981). By contrast, if leaders are able to follow their own will and guide the policy direction of the society, their personal characteristics should matter.

In the recent years, a growing literature has been developed along the second route to examine the personal effects of political leaders. Among the many factors, educational background stands out as a tangible subject. An influential research by Besley, Montalvo and Reynal-Querol (2011) focuses on the quasi-random leadership transitions induced by predecessors’ death in office, and reports that more highly educated leaders produce faster economic growth. This finding is echoed by studies linking Western educated authoritarian leaders to a higher likelihood of democratization (Gift and Krcmaric, 2015; Spilimbergo, 2009). However, Carnes and Lupu (2016) find that leaders with a college degree does not over-perform those without in a broader range of political and policy context. Hence, the issue of whether leaders’ educational background indeed matters merits further scrutiny.

This paper studies how leaders’ educational backgrounds affect economic liberalization.

The triumph of capitalism is one of the most important events in the 20th century (Frieden, 2007). Liberalization becomes a compelling choice of economic reform notwithstanding the controversies on its growth impacts (Estevadeordal and Taylor, 2013; Heybey and Murrell, 1999; Rodrik, 2006; Stiglitz, 2000). Conventional wisdom attributes the prominence of the liberalization paradigm to geopolitical and partisan factors (Berger et al., 2013; Dutt and Mitra, 2005; Haggard, Webb et al., 1994; Rodrik, 1995; Shleifer and Treisman, 2001; Trefler, 1993). Some researches draw on the modernization theory, suggesting an interaction between political and economic liberalizations (Giavazzi and Tabellini, 2005; Giuliano, Mishra and Spilimbergo, 2013). The conventional explanations, however, are pretty silent on what roles political leaders played in those processes. After all, politicians from different ideological spectrums often converge on liberalization (Przeworski, 2014; Shleifer, 2009; Stokes, 2001), and leaders may reach out to international organizations to pursue structural reforms in the absence of external pressures (Barro and Lee, 2005; Przeworski and Vreeland, 2000).

So why education matters? We construe educational background as a major source of ideas (besides ability), a focal awareness about how economy works. This awareness may shape leaders' policy choices in the long run. It is true that politicians are strategic, and they behave under the constraints of political institutions and economic conditions. However, politicians are also motivated by what they believe would work out as a good economic model (Rodrik, 2014). In turn, politicians may try to lead, rather than pander to, popular opinions, deciding policies based on reputation and legacy concerns (Fearon, 1999; Maskin and Tirole, 2004). Leaders with higher education have more exposures to modern economic curriculum. They also maintain a close tie with upper echelons in business and politics, who are likely to befriend with the market. Decade after decade, economic liberalism presents to the leaders a strong paradigm for reforming market institutions.

We combine two sources of data sets for the empirical analyses. The first is a data set on the biographic information of national leaders. We build the data based on several previous biographic data on leaders, and supplement them with manually collected information. The data documents the level of educational attainment, total years of education, as well as college majors received by leaders. Secondly, for the measurement of liberalization, we rely on a data set constructed by the Research Department of the International Monetary Fund. This data documents structural reforms in nearly 140 countries from 1960 to 2005 (Giuliano, Mishra and Spilimbergo, 2013).

Our analysis reports a positive relationship between leaders' education and economic liberalization. The effect is robust regardless of the regime type: highly educated leaders

in autocracies promote liberalization as well as those in democracies, and the patterns are similar in parliamentary and presidential systems. We do find, though, heterogeneous effects stemming from college majors. Highly educated leaders promoted economic liberalization only when they had certain majors: economics, science, and social science. By contrast, the effect does not exist if leaders had majored in engineering, humanity, and the military institutions.

We conduct tests to address the tangible issue of nonrandom selection of political leaders. The first set of tests focus on the dynamic patterns of economic liberalization and political selection. The underlying idea of the test is to distinguish any unobserved structural changes that induced liberalization and occurred right before the entry of highly educated leaders. We find no evidence supporting that economic liberalization may be “predicted” by the preexisting growth trajectories or the educational attainments of forthcoming leaders. A more full-fledged test for the dynamic effects shows that leaders’ education is uncorrelated with reforms prior to their assumption of power, but has a positive and persistent impact of inducing reforms throughout leaders’ tenure. In addition, we follow Jones and Olken (2005) and Besley, Montalvo and Reynal-Querol (2011) to focus on quasi-random leadership transitions. We find that transitions to leaders with higher education are associated with a stronger increase in liberalization, and the magnitudes of this effect are considerably larger than in the baseline results obtained from the full sample.

We test for alternative channels that may confound the effects of education. We find the following. First, the results can not be explained by the conventional channel of partisan politics in policy making. Second, geopolitical factors do not seem to be solely responsible for the correlation between education and liberalization. Third, the relationship is unaffected by leaders’ propensity of pandering to pro-market public opinions. Altogether, the results suggest a robust causal relationship between leaders’ education and their inclination on economic policies.

The remainder of the paper is organized as follows. Section 2 provides a summary of the relevant literature. Section 3 describes the overall patterns of leaders’ education and economic liberalization from the 1960s, and discusses the potential mechanisms. Section 4 introduces the data. Section 5 discusses the empirical strategy. Section 6 reports the baseline results, which is followed in section 7 by tests on the dynamic effects of education. Section 8 provides additional robustness checks. Section 9 concludes.

## 2 Literature

The political science researches on leaders center around the interaction between leaders and wars. The idea that leadership matters for war outcomes goes back to Machiavelli (2005), who argues that military experience is indispensable for leaders to guide war decisions. Chiozza and Goemans (2004) and Debs and Goemans (2010) assemble biographic data on national leaders and study the relationship between leaders' political survival and interstate conflicts. Horowitz and Stam (2014) find that leaders with a previous career in the military sector are more likely to wage a war. Dube and Harish (2015) find that female monarchs tend to fight wars more often than males through coalition-building tactics. These researches mainly focus on the incentive to maintain political survival as a driver of policy making, abstracting away from the effect of leaders' personal backgrounds.

The economic researches on leaders stem from Glaeser et al. (2004)'s argument that political leaders are more effective than institutions in driving economic growth of developing countries. Jones and Olken (2005) first employ the quasi-random leadership transitions to identify strong leader effects in determining growth. Besley, Montalvo and Reynal-Querol (2011) adopt a similar strategy, finding that education is an important channel responsible for the variation in leaders' contribution to growth. Neither of them places the channel of leaders' effects on policies as a central focus.

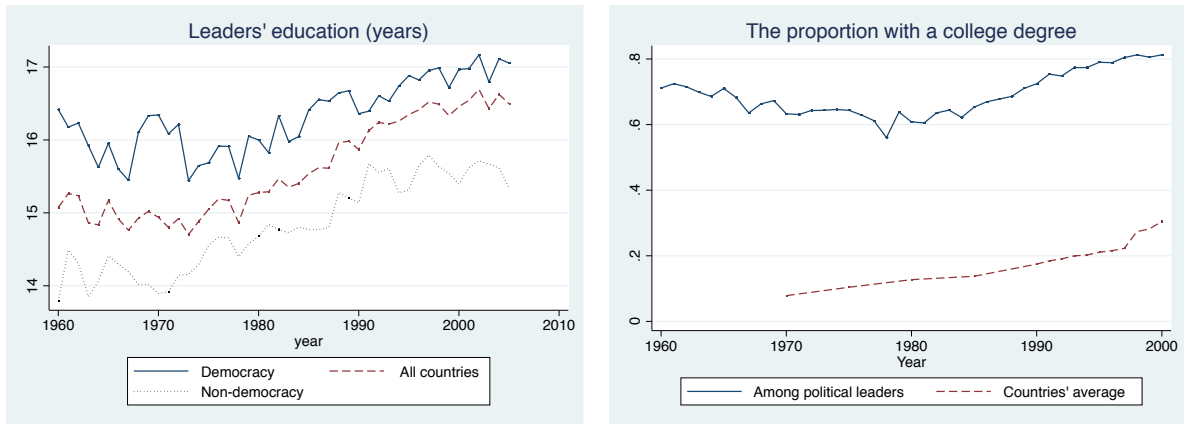
The researches examining leaders' effects on economic policy making have been focused on career, rather than education, experiences. Dreher et al. (2009) report a positive link between private sector experience and secure property rights. Various studies document the impacts of family background and technocratic experience on policy choices of ministers (Göhlmann and Vaubel, 2007; Hayo and Neumeier, 2014; Jochimsen and Thomasius, 2014). The present paper complements the existing ones by highlighting the importance of education, which we interpret as a source of economic ideas and personal beliefs.

## 3 Why Education Matters?

The average educational attainment of national leaders assumed a rising trend during the Post-World War II years. National leaders in the new millennium on average have had 16.4 years of school education, contrasting with 14.5 years in the 1960s. Similarly, in the 1960s, 42 percent of national leaders did not have a college degree; that ratio dropped to 28 percent in the new millennium. Figure 1 plots the average educational attainment of national leaders

over time.

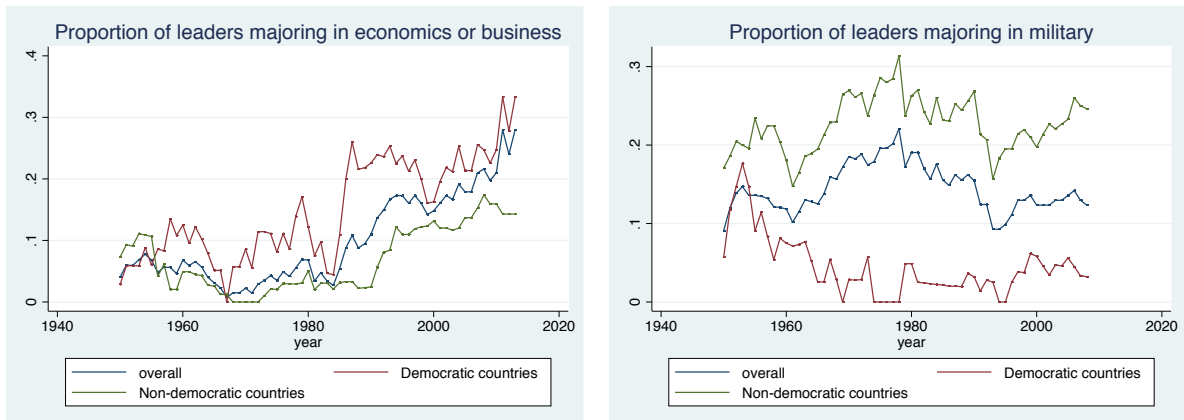
Figure 1: Trends in educational attainment of political leaders



Note: The left panel presents the trends of average educational attainment, measured by years of formal education attained by political leaders, respectively in democratic, non-democratic, and all countries since the 1960s. The right panel presents the proportion of national leaders with a college degree versus the average for all countries. The plots are based on authors' data.

There have been notable changes in the majors of leaders. Figure 2 shows the pattern. Approximately 20% of national leaders held a college degree in economics or business. This ration increased to 40% as of 2010. Meanwhile, the ratio of leaders who had a military major dropped significantly over the decades from the 1960s to 2010s. The decline was most telling in democratic countries.

Figure 2: Economics and law majors versus military majors

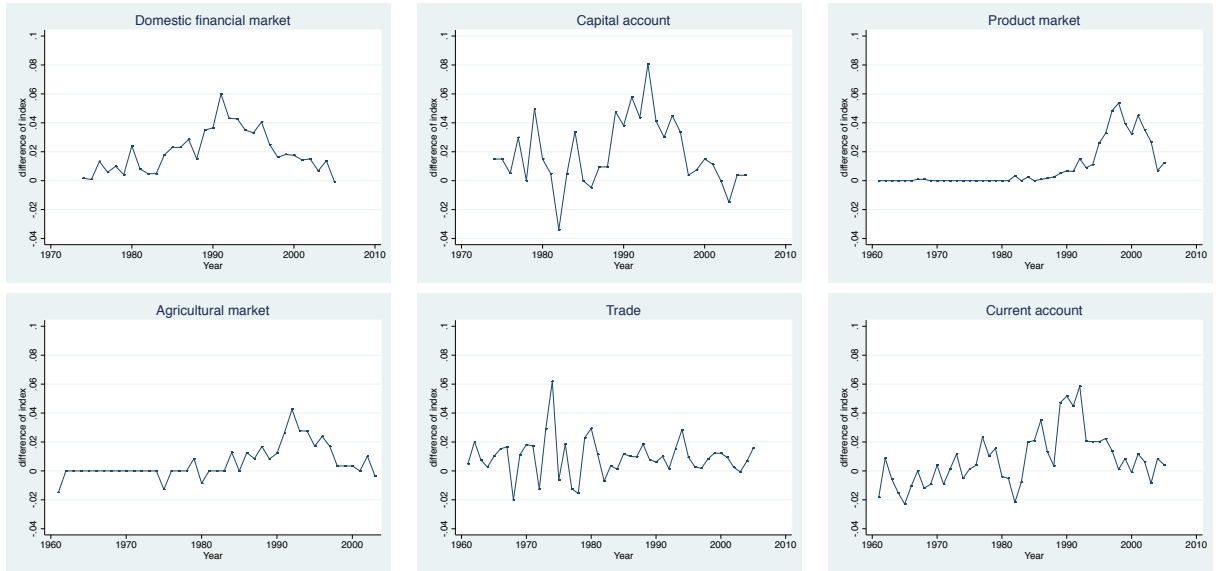


Note: The left panel presents the proportions of national leaders with majors in economics, business, or law. The right panel presents the proportions of national leaders with military majors. The plots are based on authors' data.

The world has become increasingly more liberalized in economic policies. Figure 3 plots annual changes in the world average liberalization index along six policy dimensions, the

specific definitions of which to be discussed in the next section. All policy dimensions register significant positive changes over the decades. The synchronization of leaders' education and economic liberalization renders a natural conjecture about causality. We propose two potential mechanisms linking the two variables.

Figure 3: Changes in liberalization indexes: World average



Note: The graphs show the country average of annual changes in the level of economic liberalization along six policy dimensions: domestic financial market, capital account, product market, agriculture market, trade, and current account. The plots are based on data from Spilimbergo, Prati and Ostry (2009). Details are provided in Sector 4.

First, education produces chances of immersion in economic thinking, which tends to have a direct impact on recipients' attitudes toward the market. Social science literatures report sizable effects of education on personal belief and ideology (Apple, 2004). Cantoni et al. (2017) investigate how textbook changes impact the political attitudes in China. The authors explore province-level variation in the implementation of the curriculum reforms, and find that college students exposed to those reforms at an earlier stage are more likely to hold positive views about government officials and have more confidence in the Chinese economic institutions. By a similar token, the predominance of economic courses around the world exerted wide influences on individuals' basic mind sets toward the market. After all, economists have consensus on an overwhelming majority of policy issues such as trade, price control, monopoly, and competition (Gordon and Dahl, 2013). Hence, it is natural that highly educated leaders borrow from conventional wisdom of economics to from the first hunch for policies.

Considering economic viability needs not contradict policy mandates of the poor. If the first fundamental theorem of welfare economics is any guide, competition is conducive to efficiency. In turn, redistribution over income is introduced to enhance equality, as the second theorem of welfare economics dictates. Thus, a leader from left-wing spectrum may adopt structural reforms, including fiscal austerity and financial deregulation, which cut down the short-term welfare but increase productivity in the long run (Przeworski, 1996; Stokes, 1996).

Second, leaders develop personal networks from their education experience, which may reinforce the link between education and liberalization. Social proximity may help reduce informational asymmetry and improve political control over executive agencies (Arriola, 2009; Krause and O'Connell, 2016; Lewis, 2009). So, leaders with an elite educational background tend to fill in cabinet positions with those similar. Those leaders also more often consult economic experts. Network is an instrumental angle for explaining pro-business cabinet nomination by left-leaning leaders, such as the Barack Obama's pick of Tim Geithner as Secretary of Treasury (Acemoglu et al., 2016; Green, 2010).

Table 1 lists some notable cases of highly educated leaders adopting sharp liberalization reforms. The Indian prime minister Manmohan Singh (2004-14) is known as a prominent figure of pushing forward economic liberalization in India. Singh obtained a PhD degree in economics after studying economics with Nicholas Kaldor at Cambridge. He implemented massive structural reforms as the Minister of Finance and later as the Prime Minister. All Ministers of Finance and Governors of Reserve Bank of India in the Singh administration had graduate degrees, including Palaniappan Chidambaram (Minister of Finance for two terms) who had MBA from Harvard, and Duvvuri Subbarao (central banker 2008-2013) who had a PhD in economics.

Another example is Greek Prime Minister Andreas Papandreu (1981-89, 1993-96), who earned a PhD in economics at Harvard and became a professor of economics at Minnesota, Northwestern, and Berkeley. Significant increases in the liberalization index were registered during Papandreu's tenure despite his own affiliation with the left-wing Panhellenic Socialist Movement. Similar comovements in leaders' education and economic liberalization can be found in the Philippines under Diosdado Macapagal (Liberal Party, 1961-65), Colombia under Ernesto Samper (Liberal Party, 1994-98), Brazil under Fernando Henrique Cardoso (Social Democratic Party, 1996-2003), and Singapore under GOH Chok Tong (People's Action Party, 1990-2004). Except for the People's Action Party in Singapore, the ruling parties in all the other cases are attributable to either left-wing or center-left positions.



Table 1: Leaders' education and economic liberalization: some examples

Country	Leader	Education	Year leaving office	Agriculture	Product markets	Trade	Capital account	Current account	Domestic financial
Greece	Georgios Rallis	College	1980	N.A.	0.00	72.74	33.33	35.71	16.67
Greece	Andreas Papandreou	PhD	1988	N.A.	0.00	89.62	33.33	42.86	22.22
Philippines	Carlos P. Garcia	College	1961	100.00	N.A.	0.00	N.A.	7.14	N.A.
Philippines	Diosdado Macapagal	PhD	1965	100.00	N.A.	46.66	N.A.	64.29	N.A.
India	Atal Bihari Vajpayee	Master	2003	0.00	45.45	45.00	66.67	50.00	55.56
India	Manmohan Singh	PhD	2005	N.A.	54.55	69.50	100.00	57.14	55.56
Colombia	Cesar Gaviria	College	1993	33.33	0.00	80.83	66.67	78.57	50.00
Colombia	Ernesto Samper	PhD	1997	33.33	63.64	80.50	66.67	85.71	61.11
Brazil	Itamar Franco	College	1994	100.00	0.00	80.17	0.00	14.29	38.89
Brazil	Fernando Henrique Cardoso	PhD	2001	100.00	90.91	78.00	66.67	14.29	50.00
Turkey	Suleyman Demirel	College	1992	0.00	0.00	53.61	100.00	71.43	50.00
Turkey	Tansu ciller	PhD	1995	0.00	18.18	83.29	100.00	71.43	55.56
Singapore	LEE Kuan Yew	College	1990	N.A.	0.00	99.33	100.00	100.00	77.78
Singapore	GOH Chok Tong	Master	2004	N.A.	63.64	100.00	100.00	100.00	94.44

Note: The information about political leaders are from authors' own data. The indexes of economic liberalization are obtained from Spilimbergo, Prati and Ostry (2009).

## 4 Data

### 4.1 Economic Liberalization

The set of dependent variables used in our paper is identical to the one on liberalization indexes adopted by Giuliano, Mishra and Spilimbergo (2013). The data were collected by economists in the Research Department of the IMF to evaluate structural reforms for its member countries. These indexes measures the level of institutional barriers to competition. As Spilimbergo, Prati and Ostry (2009) explain, the codings are based on “policies that increase the role of market forces and competition in the economy.” The documentation of liberalized is based on formal institutions: laws and regulatory statutes, rather than evaluation of outcomes. This focus on the measures helps to disentangle political leaders’ intentions and real policy outcomes, which may be affected by bureaucratic efficacy. Giuliano, Mishra and Spilimbergo (2013) provide a more thorough documentation of all coding schemes and data sources. Here we provide a sketch of definitions of the economic liberalization indexes to be used for the empirical analyses.

Each policy category is normalized to the range  $[0, 1]$ . (1) *Domestic financial market* measures the openness in banks and security markets. A reform is registered as positive change to the index, whenever a policy is adopted to promote competition in the following: interest rate controls, entry barriers, private ownership, proper supervision and regulation, domestic bond and equity markets, and the extent of credit controls. (2) *Capital account* deals with restrictions on financial transactions between residents and nonresidents, external borrowing and lending, and approval requirements for foreign direct investment. (3) *Production market* concerns entry barriers and regulatory burdens in domestic industries. (4) *Agriculture market* captures the elimination of state intervention in imports and exports of agricultural products. (5) *Trade* is based on average tariff rates. (6) *Current account* indicates individuals’ freedom over the proceeds from international trade under the IMF’s Article VIII.

The data is unbalanced cross policy issues, covering a maximum of 142 countries on *Trade* between 1960 and 2005. The coverage varies from 50 to 108 countries for other dimensions, with the liberalization indexes missing for different countries in different years. The unbalanced feature renders a difficulty of aggregation to the country level. We follow Giuliano, Mishra and Spilimbergo (2013) to treat each category as a separate panel, and stack them horizontally in the estimations.

## 4.2 Leaders' Education

Our data on political leaders are part of a data project on the backgrounds of national leaders and the rules for the leadership selection in the post-World War II period (Yao and Xi, 2015). In the political science and economics literature, there has been a cluster of data collection efforts on national leaders (Besley and Reynal-Querol, 2011; Besley, Montalvo and Reynal-Querol, 2011; Goemans, Gleditsch and Chiozza, 2009; Jones and Olken, 2005). We are inspired by the previous literature in designing our project, and we take several steps to revise the coding for leaders' characteristics for our research purposes.

First, we follow Goemans, Gleditsch and Chiozza (2009) as well as Przeworski (2013) to identify the head of the executive branch as the national leaders. Economic policy making often involves deliberation, debate, and bargaining among many ministries within the cabinet, on which the chief executive has more direct impacts than the head of state does. Although the ultimate political power (such as the power to nominate and dismiss chief executives, or to declare a state of emergency) may reside in the head of state, these are not executive powers. It would be impractical, and prohibitively costly, even for dictators to intervene in all policy dimensions and rule single-handedly.

We follow Goemans, Gleditsch and Chiozza (2009) to code the general party secretary in socialist countries as the national leader. However, we do not consider hidden figures, such as Juan Peron in 1973 and Deng Xiaoping in 1996, as an "effective leader," "the person that de facto exercised power in a country", as in Goemans, Gleditsch and Chiozza (2009). Due to the lack of transparency in authoritarian system, it is unclear which kinds of policy impacts hidden or spiritual leaders really had. Identifying hidden leaders has to invoke ad-hoc judgments. Nevertheless, our codings agree with those of Goemans, Gleditsch and Chiozza (2009) in most cases where the chief executive can be unambiguously identified: parliamentary, presidential, or monarchies. For the premier-presidential system, we code in favor of the former if the constitution grants the power of presiding over domestic economic affairs to the premier. The results are robust to different coding schemes.

Following Besley and Reynal-Querol (2011), we code the level of formal education for political leaders into an eight-way variable. The category *education\_leader* ranges from 1, which means the leader is illiterate, to the maximum value of 8, which corresponds to the case of a leader with a doctoral degree. Between the minimum and maximum, the value of *education\_leader* increases along the ladder of formal education: literate but no formal

education (2), elementary school (3), secondary school (4), any professional school or special training beyond secondary school (5), college (6), and graduate study with a master's degree (7). Because a leader may have multiple degrees at the same level, and because obtaining degrees at the same level can take different lengths of time, we also work with the variable *education\_year*, the total years of formal education a political leader received. The coding for *education\_year* is based on the biographical information of political leaders whenever feasible. Where the precise information is unfeasible, we supplement the variable *education\_year* with manual calculation: 6 years for elementary school, 12 years for secondary school, 14 years for professional school, 16 years for college, 18 years for graduate study with a master's degree, plus one year for each additional master's degree, and finally, 23 years for a doctoral degree. This coding scheme provides an alternative measure of leaders' educational attainment with richer variation. We also use the binary variables *college* to capture the effect of high education. The results are qualitatively similar using alternative measures for education.

In addition to education, we are also interested in studying whether different majors have heterogeneous effects. A background in economics or finance, for example, is likely to nurture pro-market ideas. By contrast, leaders with a background in engineering or the military may be less keen on openness and more supportive of overtaking development strategies. Hence they are likely to accommodate a central planning system. We collect information on whether a leader's college major was in economics and business, social science, natural science, humanities, engineering, or the military. Leaders' majors are controlled together with the dummy *overseas study*, which takes the value 1 if the leaders had experiences of education in foreign countries.

### 4.3 Leaders' Other Characteristics

Aside from education, we also control for personal characteristics of leaders that may confound the incentive and ability to push forward liberalization. Leaders' *age* captures several factors with regard to their resolution to reform. On the one hand, younger leaders may have a higher degree of political will to seek changes. However, younger leaders are sometimes short on experience and political allies to get through a legislative impasse. On the other hand, older leaders with more inside experience may be able to garner more support, but they face a shorter time horizon and hence may have lower incentives to press forward reforms (Bowen et al., 2016). Following this reasoning, we add two more variables along with *age* to account for leaders' incentives. The dummy variable *first term* indicates whether a leader was in his or her first term as the head of government. Inside experience is additionally

controlled by *years in office*, which documents the number of cumulative years a leader had already served in office.

A set of variables on the career path of leaders is included to control leaders' characteristics that may be correlated with liberalization. These variables deal with the work experience of leaders in the public and private sectors prior to a term. A set of dummy variables, respectively, indicate whether a leader had any previous experience serving in the *public sector*, as a state *legislator*, as *governor* (which means chief executive of a local government), and as leader of political *party*.

#### 4.4 Political and Economic Variables

We control for political and economic variables that may potentially drive liberalization. The variables for gross domestic product (GDP) per capita and the growth rate are from the recent version of Penn World Table 8. The construction of the dummy *democracy* follows the routine in the economics literature, using the Polity IV score, with zero being the cutoff value for democracy. We follow Przeworski (2013)'s definition in identifying whether a political regime is *presidential* or not. Because the support for economic openness tends to be positively correlated with education in general, we control for the human capital index based on a weighted average of citizens' primary, secondary, and tertiary education, following Barro and Lee (2013). In section 7, we study the interaction between leaders' education and their partisan affiliations, for which purpose we manually collected information on incumbent political parties. We also employ a set of indicators of public opinion on the state and market from the World Value Survey to study how political leaders interact with the attitude of the public. Table 2 provides a summary of the key variables to be used in the econometric analyses.

## 5 Specification

Our empirical analyses deal with the effects of leaders' education on liberalization of the real and financial sectors. Following Giuliano, Mishra and Spilimbergo (2013), we measure reform in sector  $s$  for country  $i$  in year  $t$  as the first difference in the liberalization index:

$$\Delta y_{ist} = y_{i,s,t} - y_{i,s,t-1}$$

Table 2: Summary statistics

Variable	N	Mean	Standard deviation	Min	Max
Liberalization_index	20395	42.96	37.04	0	100
Change_liberalization_index ( $\Delta y_{ijt}$ )	19779	1.16	8.13	-100	100
Growth	5173	0.02	0.06	-0.44	0.77
Gdp per capita(PWT 8.0)	5073	7164	7450	227.3	52414
Human capital (Barro&Lee, 2013)	4444	2.11	0.62	1.02	3.57
Education_year	5133	15.64	3.62	0	27
Education_level	5194	5.8	1.36	1	8
College	5194	0.67	0.47	0	1
Leader's age	5047	56.5	10.96	18	91
First term	5279	0.69	0.46	0	1
Years in office	5279	7.65	7.68	0	48
Democracy	5091	0.48	0.5	0	1
Overseas study	5621	0.299	0.458	0	1
Economics	5621	0.114	0.317	0	1
Social science	5621	0.108	0.310	0	1
Engineer	5621	0.075	0.263	0	1
Humanity	5621	0.090	0.285	0	1
Military	5621	0.163	0.369	0	1
Science	5621	0.023	0.149	0	1
Party_left	5621	0.120	0.324	0	1
Party_right	5621	0.269	0.443	0	1

The degree of reform,  $\Delta y_{ist}$ , is then estimated as a function of leaders' education, together with other political and economic variables:

$$\Delta y_{ist} = \theta \cdot EDU_{it} + \alpha \cdot y_{i,s,t-1} + X_{it}\beta + \mu_{i,s} + \zeta_t + \epsilon_{i,s,t} \quad (1)$$

$EDU_{it}$  in equation (1) refers to leaders' education, the main variable of interest throughout this paper.  $y_{i,s,t-1}$  is the lagged liberalization index, which we include to address the temporal dependence in liberalization policies.  $X_{it}$  is a set of political and economic variables, such as the level of GDP per capita and the presence of democratic institutions, together with leaders' personal characteristics.  $\mu_{i,s}$  is the country-sector fixed effects identified for each country over a particular policy dimension (sector).  $\zeta_t$  represents year fixed effects. Finally,  $\epsilon_{i,s,t}$  represents the random disturbance term.

Figure 1 in section 2 demonstrates an increasing trend of liberalization around the world. It is possible that the disturbance term,  $\epsilon_{i,s,t}$ , is serially correlated even when the lagged dependent variable is controlled. In that case, the estimates for  $\theta$  may be biased, as  $y_{i,s,t-1}$  is correlated with  $\epsilon_{i,s,t}$ . We cluster the standard error at the country level so as to allow for arbitrary correlations over time within each country cell. We replicate the baseline results in Table 3, while specifying the disturbance term  $\epsilon_{i,s,t}$  by autoregressive models. The results are

quantitatively similar. We also conduct a panel unit root test for the measures of dependent variables and leaders' education. All the tests reject the null by a large margin.

## 6 Baseline results

Table 3 presents the baseline estimates as specified by equation (1). In Column 1, we control only the lagged dependent variable, country-sector fixed effects, and year fixed effects. One additional year of educational attainment is associated with an annual increase in the liberalization by 0.092 percentage point. One standard deviation in years of education is 3.6 years. This amounts to an increase in liberalization by 0.33 percentage point annually, or 28 percent of the average reform ( $\overline{\Delta y_{ist}}$ ). In addition, the lagged liberalization ( $y_{ist}$ ) has a negative sign, suggesting a mean reversion pattern. That is, countries with more liberal economic system reform more slowly.

In column 2, we include a set of control variables for leaders' personal characteristics and socioeconomic conditions. The estimate for the total years of education is similar. The estimates show that liberalization is slightly faster for the first-termed, newer (in an earlier stage of tenure), and younger leaders. These findings are consistent with the argument proposed by (Bowen et al., 2016) about reform fatigue. However, the coefficients for personal characteristics are not statistically significant. In addition, we find that exposure to Western education has a positive but insignificant effect. Previous political career of serving in legislative or executive branches also does not help increase the level of liberalization. The level human capital in a country has positive, albeit insignificant, impact on liberalization.

In columns 3 and 4, we investigate how the effect of leaders' education interact with political regimes. Because democracies tend to select more educated leaders (Besley and Reynal-Querol, 2011), and previous research finds that democracies are more likely to liberalize the economic system (Giuliano, Mishra and Spilimbergo, 2013), it may occur that the findings are driven purely by the regime type, but not by leaders. To disentangle the effects of leaders' education and the regime type, we divide the sample into two groups, democracies and non-democracies, and separately estimate the model as in Column 2. As Columns 3-4 show, the education of leaders remains to positively affect liberalization in both sample. The coefficients from the two estimations are not distinguishable. It is evident that in autocracies, the increase of liberalization indexes cannot be attributed to constraints on the executive power or other aspects of political liberalization. The finding that education has an equally significant (and slightly larger) coefficient in autocracies lends more supports

Table 3: Baseline: Does Education Matter for Liberalization?

	Dependent variable: Annual increase in the liberalization index ( $\Delta y_{ist}$ )					
	(1)	(2)	(3) democracy	(4) non-democracy	(5) parliamentary	(6) non-parliamentary
Education years	0.092*** (0.026)	0.090** (0.039)	0.119** (0.058)	0.143* (0.079)	0.143*** (0.047)	0.082** (0.039)
1(First term)		0.201 (0.193)	0.273 (0.247)	-0.219 (0.588)	-0.144 (0.400)	0.242 (0.231)
Years in office		-0.017 (0.020)	-0.025 (0.036)	-0.012 (0.042)	-0.003 (0.037)	-0.006 (0.021)
Age		0.003 (0.011)	0.012 (0.015)	0.027 (0.030)	0.041** (0.017)	-0.011 (0.014)
1(Overseas study)		0.123 (0.221)	0.195 (0.304)	-0.176 (0.705)	0.566* (0.316)	-0.045 (0.302)
1(Legislator)		-0.017 (0.230)	0.079 (0.279)	-0.808 (0.510)	0.386 (0.254)	-0.128 (0.326)
1(Governor)		0.114 (0.254)	0.209 (0.310)	0.479 (1.144)	0.142 (0.449)	0.213 (0.331)
1(Party leader)		-0.171 (0.191)	-0.087 (0.247)	-0.71 (0.440)	-0.234 (0.282)	-0.327 (0.250)
Human Capital		1.037 (1.056)	0.072 (1.258)	5.071 (3.204)	-2.732 (1.921)	1.515 (1.300)
Lag log gdp per capita		-1.150** (0.527)	-1.680** (0.794)	-1.416 (1.079)	-2.743*** (0.690)	-1.004 (0.695)
Lag liberalization	-0.120*** (0.007)	-0.118*** (0.007)	-0.131*** (0.009)	-0.185*** (0.026)	-0.135*** (0.015)	-0.121*** (0.009)
Country-sector fixed effects	✓	✓	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓	✓	✓
$R^2$	0.074	0.074	0.08	0.115	0.08	0.077
# countries	139	108	88	68	42	93
Observations	18,659	15,480	9,536	4,959	4,091	11,389

This table presents the estimates for annual changes in the liberalization indexes as specified by Equation (1). *Education years* is the number of total years of formal education received by the leader. *1(First term)* is a dummy variable indicating whether the leader was in his or her first term. *Years in office* is the number of years that the leader had spent in office. *Age* is the leader's current year when in office. *1(Overseas study)* is a dummy variable indicating whether the leader had studied in foreign countries. *1(Legislator)* is a dummy variable indicating whether the leader had once served as a state legislator. *1(Governor)* is a dummy variable indicating whether the leader had once served as a governor. *1(Party leader)* is a dummy variable indicating whether the leader had once served as a leader of political party. *Human Capital* is the index of country-average education obtained from Barro and Lee (2013). The Standard errors clustered at the country level are reported in the parentheses. All are estimated by linear regressions with specified fixed effects. Column 3 is estimated for democratic countries (*Polity* > 0). Column 4 is estimated for non-democratic countries. Column 5 is estimated for countries of parliamentary regimes following Przeworski (2013). Column 6 is estimated for non-parliamentary regimes. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .



Table 4: Does college major matter?

	Dependent variable: Annual increase in the liberalization index ( $\Delta y_{i,t}$ )								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\geq$ College	0.460* (0.264)	0.457* (0.238)	0.537** (0.263)	0.450* (0.263)	0.573** (0.275)	0.617** (0.281)	0.543** (0.271)	0.431 (0.262)	0.016 (0.453)
$(\geq$ College) $\times$ 1(Economics)		0.447* (0.246) [137, 2508]							0.967* (0.491)
$(\geq$ College) $\times$ 1(Law)			-0.09 (0.262) [221, 4652]						0.532 (0.469)
$(\geq$ College) $\times$ 1(Social science)				0.378 (0.366) [80, 2405]					0.867 (0.551)
$(\geq$ College) $\times$ 1(Engineering)					-0.850** (0.408) [64, 1514]				-0.118 (0.580)
$(\geq$ College) $\times$ 1(Humanity)						-0.746*** (0.258) [73, 291]			-0.082 (0.450)
$(\geq$ College) $\times$ 1(Military)							-0.792 (1.010) [15, 503]		-0.161 (1.136)
$(\geq$ College) $\times$ 1(Science)								1.630* (0.888) [27, 1164]	2.154** (0.952)
Lag Liberalization	-0.117*** (0.007)	-0.117*** (0.007)	-0.117*** (0.007)	-0.117*** (0.007)	-0.117*** (0.007)	-0.117*** (0.007)	-0.117*** (0.007)	-0.117*** (0.007)	-0.118*** (0.007)
Country-sector fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
$R^2$	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.074	0.075
# Countries	108	107	107	107	107	107	107	107	107
Observations	15484	15325	15325	15325	15325	15325	15325	15325	15325

This table presents the estimates for annual changes in the liberalization indexes as specified by Equation (1).  $\geq$ College is a dummy variable indicating whether the leader had formal education of the college level or beyond.  $1(Economics)$  and other indicators are dummy variables on whether the leader had studied in specific majors. The results are based on all countries for columns 1-9. The control variables include  $1(First\ term)$ ,  $Years\ in\ office$ ,  $Age$ ,  $1(Overseas\ study)$ ,  $1(Legislator)$ ,  $1(Governor)$ ,  $1(Party\ leader)$ ,  $Human\ Capital$ , and  $Lag\ log\ gdp\ per\ capita$ . Standard errors clustered at the country level are reported in the parentheses. The two numbers in brackets report the number of leaders and leader-years with corresponding majors. All are estimated by linear regressions with specified fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

to the relevance of political leaders in driving liberalization.

In column 5 and 6, we account for the difference between parliamentary and presidential systems. A priori the difference between the two types of regimes on leaders' efficacy to reform is unclear. In presidential systems, executive powers are more often checked by the opposing majority in the congress. However, presidents are more resilient to legislative setbacks than prime ministers in parliamentary systems. So presidents with legislative minority may offer compromise to pass important bills (Cheibub, Przeworski and Saiegh, 2004). The results reported in column 5 and 6 show that the coefficient for education is larger in parliamentary systems than in presidential systems.

The estimates presented in Table 3 attest to the premise that educational attainment of leaders matter for policies. It would be natural to reason that leaders were acquainted with different ideas depending on their educational backgrounds. Hence, the pattern may not be all the same for leaders with different majors. In Table 4, we focus on leaders with education level being college or beyond, and account for the heterogeneous effects of educational backgrounds. Column 1 of Table 4 employs only the dummy variable indicating college education (a bachelor degree or beyond). The coefficient is positive and statistically significant. Then, from Column 2 to 8, we respectively include the interaction term between the college dummy and an indicator about the major.

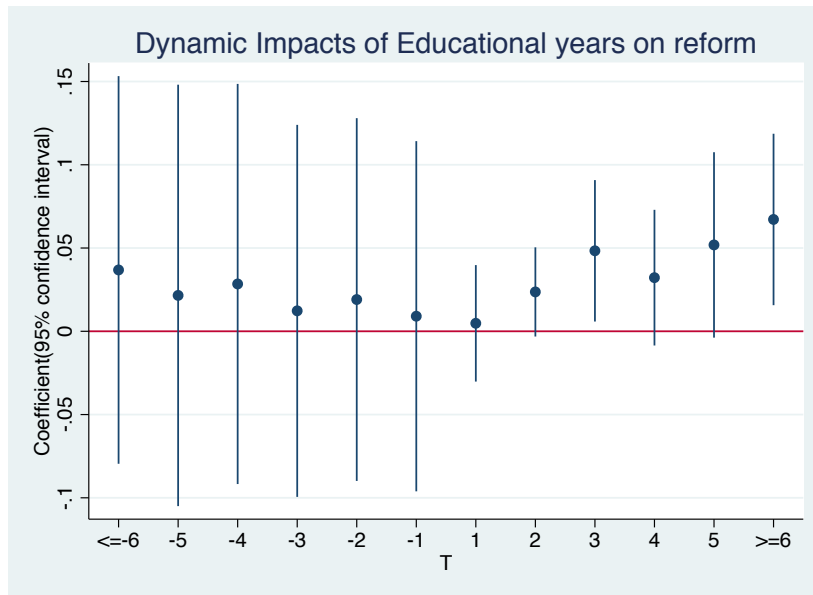
The findings are straightforward. First, economics major gives rise to twice as much as the impact of college education. The interaction term is positive and significant, suggesting that leaders holding an economics degree are more likely to press liberalization than other highly educated leaders with different majors. The effect is even stronger for leaders with a science major. Second, leaders majoring in law, social science, and the military do not differ significantly from the rest of highly educated leaders. It is worth noting that, though, leaders holding a social science or law major has a overall positive impact on liberalization compared with those with lower educational attainment (high school or below). By contrast, leaders with a military background are not distinguishable from lower-educated leaders. Third, it is notable that majoring in engineering or humanity significantly lowers the tendency to pursue liberalization reforms. The interaction terms for both are negative. The heterogenous effects in majors are consistent with the premise that ideas are responsible for the correlation between leaders' education and liberalization.

## 7 Accounting for dynamic effects

A main challenge to credible identification is that political selection is not random. Some countries may select more educated leaders than other countries do in ways systemically correlated with liberalization reforms. One possibility is that economic stagnation may render models of centrally-controlled economy unsustainable and justify liberal reforms (Drazen and Easterly, 2001). In that case, educated leaders may be selected to carry out the mandate of liberalization.

To address this concern, we test whether the estimates in the baseline regressions could be driven by the simultaneity between economic performance and leaders' education. Column 1 of Table 5 presents the estimate for liberalization reform as in Table 3 with additional controls of a set of time-lagged values of growth rate. If reforms are driven by a mandate to enhance economic performance, rather than by leaders, we should observe that the effect of education vanish when growth is controlled. We find that this is not the case. The coefficient for education remains positive and statistically significant. In column 2, we regress liberalization against lagged growth only and also find no significant effects.

Figure 4: Dynamic effects of education on liberalization



Note: This graph shows the dynamic effects of *Education year* on the annual change in the liberalization. The effect of education on the current year,  $T = 0$ , is normalized to zero. The estimated coefficients and the 95% confidence intervals are presented.

We also conduct an intention-to-treat analysis to determine whether highly educated

Table 5: Is liberalization affected by the growth trajectory?

Dependent variable: Annual increase in the liberalization index ( $\Delta y_{ist}$ )					
	(1)	(2)	(3)	(4)	(5)
Education year	0.106*** (0.033)				
Education year(t+1)			0.037 (0.082)		
Education year(t+2)				0.033 (0.050)	
Education year(t+3)					0.019 (0.041)
Lag liberalization	-0.121*** (0.007)	-0.120*** (0.007)	-0.122*** (0.015)	-0.133*** (0.012)	-0.127*** (0.011)
Lag growth	0.913 (2.625)	0.924 (2.613)			
Lag2 growth	-0.057 (2.111)	-0.045 (2.096)			
Lag3 growth	1.916 (1.985)	2.107 (1.963)			
Country-sector fixed effects	✓	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓	✓
$R^2$	0.075	0.074	0.093	0.089	0.082
# countries	105	105	103	103	103
Observations	14,425	14,511	2,748	4,814	6,378

Note: This table reports the regressions of the annual changes in the liberalization indexes on the trajectories of growth and liberalization. *Education year(t+s)* is the number of years for formal education received by the leader in the next sth year ( $s = 1, 2, 3$ ). *Lagt growth* is the annual growth in per capita GDP lagged by  $t$  years. The control variables include *1(First term)*, *Years in office*, *Age*, *1(Overseas study)*, *1(Legislator)*, *1(Governor)*, *1(Party leader)*, *Human Capital*, and *Lag log gdp per capita* in the current year. Columns 1-2 are based on all country-years. Columns 3-5 are based on observations in which the current leader differed from one in the preceding year. Standard errors clustered at the country level are reported in the parentheses. All are estimated by linear regressions with specified fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

leaders “predict” liberalization. The underlying logic is that countries select educated leaders on purpose may have adopted liberalization in the first place. To detect this effect, we regress liberalization indexes against forthcoming leaders’ years of education. Columns 3 to 5 show that liberalization is not affected by future leaders’ education. To fully capture the dynamic patterns, we also estimate the liberalization indexes in a dynamic equation in which the preceding and incumbent leaders’ education variables are interacted with a set of time dummies. Figure 4 shows the time-varying effects of leaders’ education. Evidently, leaders’ education do not “cause” an increase in liberalization before they came into power. Meanwhile, leaders’ education seems to have persistent impacts inducing further liberalization throughout their tenures.

Moreover, we borrow from Jones and Olken (2005) and Besley, Montalvo and Reynal-Querol (2011) to use quasi-random leadership transitions for identifying leader effects. We define a transition as random in cases where the predecessor died in office by accidental or natural causes. Following this definition, we are able to identify 38 cases of random transition between 1960 and 2010 with observations for liberalization. Among the transition scenarios, 13 cases feature a transition to more highly educated, and all of them register a positive change in the liberalization index in each sector. By contrast, among the cases where leaders’ education became lower or stayed the same, policy changes were close to zero. We systemically estimate the changes in liberalization indexes through the following equation.

$$\Delta y_{ist} = \gamma_1(\textit{education\_higher})_{it} + \gamma_2(\textit{education\_lower})_{it} + \alpha y_{i,s,t-1} + X_{it}\beta + \mu_{i,s} + \zeta_t + \epsilon_{i,s,t} \quad (2)$$

The estimations are restricted to the five-year windows around the transitions. The dummy variable  $1(\textit{Education higher})$  indicates the post-transition period with the presence of a more highly educated new leader. Accordingly,  $1(\textit{Education lower})$  indicates the post-transition period with the new leader being less educated. Thus, the coefficients  $\gamma_1$  and  $\gamma_2$  capture the effects of different kinds of transitions distinguished by education. As Table 6 shows, transitions to more educated leaders are associated with a sizable increase in the liberalization indexed. The coefficients are larger than in the baseline results presented by Table 3. Meanwhile, transitions to less educated do not change the level of liberalization. The results presented in Table 6 add to credible causality between leaders’ education and economic liberalization.

Table 6: Random transitions: Difference-in-difference approach

Dependent variable: Annual increase in the liberalization index ( $\Delta y_{ist}$ )			
	(1)	(2)	(3)
Post-transition $\times$ 1(Education higher)	1.158** (0.527)	1.142** (0.467)	1.485** (0.645)
Post-transition $\times$ 1(Education lower)	0.366 (0.538)	0.782 (0.620)	0.189 (0.896)
Lag liberalization	-0.191*** (0.048)	-0.203*** (0.062)	-0.218*** (0.070)
Country-sector fixed effects	✓	✓	✓
Year fixed effects	✓	✓	✓
$R^2$	0.134	0.142	0.159
# countries	38	31	29
Observations	2346	1855	1643

This table presents the estimates for annual changes in the liberalization indexes in the quasi-transition sample as specified by Equation (2). *Post-transition* is a dummy variable indicating the period after the transition. *1(Education higher)* is the dummy variable indicating that the successor received a higher level of education than the predecessor. *1(Education lower)* is the dummy variable indicating that the successor received a lower level of education than the predecessor. The control variables include *1(First term)*, *Years in office*, *Age*, *1(Overseas study)*, *1(Legislator)*, *1(Governor)*, *1(Party leader)*, *Human Capital*, and *Lag log gdp per capita*. Standard errors clustered at the country level are reported in the parentheses. All are estimated by linear regressions with specified fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

## 8 Robustness

In this section, we consider whether the estimates are robust to alternative channels that may promote liberalization. First, liberalization may have been on established agendas of political parties, which in turn select highly educated leaders with pro-market ideas. Second, it is possible that our estimates are driven clustering effects due to geopolitical factors in particular countries and regions. Third, liberalization may be a response to the public demand for economic reform. We address these issues in the following.

### 8.1 Partisan affiliation

We first investigate how leaders' education interacts with partisan politics. It is possible that left-wing parties have more leaders of grass-root backgrounds and leaders of right-wing parties tend to come from elite backgrounds and are more educated. The estimates may be partially due to diverged partisan positions on liberalization between left and right. To disentangle the channel of partisan politics, we collect information on the leaders' partisan affiliation and codify it along the left-right dimension. The default category includes centrists and those without clear left-right identification. We estimate the effects of partisan affiliation together with education.

Columns 1 to 4 of Table 8 present the estimates using total years of education. In columns 1 and 2, we control for the left and right partisan affiliation, respectively. The coefficient of the left affiliation is negative, consistent with the intuition that left wing parties advocate more state intervention. Leaders from right-leaning spectrum do not appear to promote liberalization faster than other types. On top of that, the coefficients for education in columns 1 and 2 remain significant and positive. In column 3 and 4, we additionally control for the interaction term between education and the partisan affiliation. The interaction terms do not have a significant coefficient. Moreover, the results for education remain unchanged. In columns 5 to 8, we use the dummy variable for college as an alternative measure and arrive at similar findings.

### 8.2 Regional Heterogeneity

We account for regional heterogeneity to ensure that our findings are not purely driven by geopolitical factors in specific region clusters. One possible scenario may have been the transitions to the market-oriented system in post-communist countries. It is possible that both economic liberalization and the selection of highly educated leaders (sometimes with a

Table 7: Parties versus Personal Education

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: Annual increase in the liberalization index ( $\Delta y_{i,t}$ )								
Education year	0.091** (0.038)	0.091** (0.039)	0.089** (0.041)	0.106** (0.043)				
College					0.430* (0.253)	0.460* (0.263)	0.399 (0.277)	0.366 (0.272)
Left	-1.650*** (0.436)		-2.046** (1.004)		-1.589*** (0.429)		-1.831*** (0.520)	
Right		-0.045 (0.202)		0.804 (0.931)		-0.034 (0.203)		-0.302 (0.422)
Education year $\times$ Left			0.026 (0.062)					
Education year $\times$ Right				-0.052 (0.055)				
College $\times$ Left							0.375 (0.476)	
College $\times$ Right								0.339 (0.517)
Lag Liberalization	-0.118*** (0.007)	-0.118*** (0.007)	-0.118*** (0.007)	-0.118*** (0.007)	-0.118*** (0.007)	-0.117*** (0.007)	-0.118*** (0.007)	-0.117*** (0.007)
Country-sector fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
$R^2$	0.074	0.074	0.074	0.074	0.074	0.073	0.074	0.073
# Countries	108	108	108	108	108	108	108	108
Observations	15480	15480	15480	15480	15484	15484	15484	15484

This table presents the estimates for annual changes in the liberalization indexes as specified by Equation (1). *Left* is a dummy variable indicating whether the leader is affiliated with a left wing political party. *Right* is a dummy variable indicating whether the leader is affiliated with a right wing political party. The control variables include  $1(\text{First term})$ ,  $\text{Years in office}$ ,  $\text{Age}$ ,  $1(\text{Overseas study})$ ,  $1(\text{Legislator})$ ,  $1(\text{Governor})$ ,  $1(\text{Party leader})$ ,  $\text{Human Capital}$ , and  $\text{Lag log gdp per capita}$ . Standard errors clustered at the country level are reported in the parentheses. All are estimated by linear regressions with specified fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .



Table 8: Regional heterogeneity

Dependent variable: Annual increase in the liberalization index ( $\Delta y_{ist}$ )			
	(1)	(2)	(3)
	Exclude Former Socialist	Exclude Latin America	Exclude Both
Education year	0.079** (0.032)	0.098*** (0.036)	0.085* (0.048)
Lag liberalization	-0.114*** (0.007)	-0.112*** (0.008)	-0.122*** (0.011)
Country-sector fixed effects	✓	✓	✓
Year fixed effects	✓	✓	✓
$R^2$	0.071	0.071	0.078
# countries	100	89	57
Observations	14,932	11,881	7,736

This table presents the estimates for annual changes in the liberalization indexes as specified by Equation (1). Column 1-3 are obtained on regressions respectively excluding former socialist countries, Latin American countries, and both. The control variables include  $1(\text{First term})$ ,  $\text{Years in office}$ ,  $\text{Age}$ ,  $1(\text{Overseas study})$ ,  $1(\text{Legislator})$ ,  $1(\text{Governor})$ ,  $1(\text{Party leader})$ ,  $\text{Human Capital}$ , and  $\text{Lag log gdp per capita}$ . Standard errors clustered at the country level are reported in the parentheses. All are estimated by linear regressions with specified fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

background in economics) were simultaneously driven by transitions to democracy. Another source of regional heterogeneity arises from Latin America, where structural reforms followed political cycles (Remmer, 1993).

We first exclude the post-communist countries from the sample. The results are presented in column 1 in Table 8. In column 2, we exclude all Latin American countries. Finally, we exclude post-communist and Latin American countries, leading to a shrinking of the sample size by half. However, for all the estimations, leaders' education has a significant impact on liberalization and the sizes of the coefficients are unchanged. The results suggest that leaders' education plays a key role globally in promoting liberalization.

### 8.3 Public Opinion

Finally, we address the channel that leaders' may liberalize in response to pro-market public sentiments. It is possible that educated leaders liberalize more because they are more inclined to, and more effective in, pandering to public opinions. When that is the case, we should observe a significant effect of the interaction term between leaders' education and pro-market opinions. Lacking systematic information about citizens' attitudes on specific policies, we use the responses from *World Value Survey (WVS)* on attitudes toward the market as a proxy (The contents of all the questions are provided in Table A.4 in the appendix.) The individual responses are aggregated at the country level and re-scaled on

Table 9: Do educated leaders pander to public opinion? Interactive effects

Dependent variable: Annual increase in the liberalization index ( $\Delta y_{ist}$ )						
	(1)	(2)	(3)	(4)	(5)	(6)
Education year	0.189*	0.196**	0.207**	0.247**	0.154	0.236**
Political scale	(0.104)	(0.096)	(0.102)	(0.106)	(0.117)	(0.103)
Income equal	-1.671	-1.586				
	(1.662)	(1.067)				
Government responsible			-2.414**			
			(1.124)			
Competition good				-3.973*		
				(2.285)		
Confidence in government					0.84	
					(1.049)	
Confidence in company						3.338***
						(1.169)
(Education year) $\times$ (poli_scale)	0.075					
	(0.095)					
(Education year) $\times$ (income equal)		0.110*				
		(0.065)				
(Education year) $\times$ (gov_responsible)			0.157**			
			(0.068)			
(Education year) $\times$ (competition)				0.22		
				(0.138)		
(Education year) $\times$ (confidence_gov)					-0.035	
					(0.059)	
(Education year) $\times$ (confidence_company)						-0.186**
						(0.073)
Lag liberalization	-0.197***	-0.194***	-0.200***	-0.202***	-0.194***	-0.200***
	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)	(0.011)
Country-sector fixed effects	✓	✓	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓	✓	✓
$R^2$	0.135	0.133	0.134	0.135	0.135	0.135
# countries	23	25	24	23	22	24
Observations	2,725	2,984	2,842	2,700	2,660	2,842

This table presents the estimates for annual changes in the liberalization indexes as specified by Equation (1). The definitions of all public opinions variables from the WVS are presented by Table A.4 in the appendix. The control variables include  $1(\text{First term})$ ,  $\text{Years in office}$ ,  $\text{Age}$ ,  $1(\text{Overseas study})$ ,  $1(\text{Legislator})$ ,  $1(\text{Governor})$ ,  $1(\text{Party leader})$ ,  $\text{Human Capital}$ , and  $\text{Lag log gdp per capita}$ . Standard errors clustered at the country level are reported in the parentheses. All are estimated by linear regressions with specified fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

the range  $[0, 1]$ . We rely on interpolation to fill in missing values within a country's spell.

In Table 9, we interact the public opinion variables with leaders' education to re-estimate liberalization. The WVS data is unbalanced cross countries, so the sample size shrinks considerably. Hence, the results are suggestive. Nevertheless, the results about leaders education remain robust. We do not find evidence that more educated politicians pander to the pro-market views more than less educated leaders do. The only category that seems to promote liberalization is the public's confidence in companies. This effect, however, is neutralized by the negative coefficient of the interactive term, as column 6 shows.

## 9 Conclusion

This paper provides a systemic examination on the impacts of political leaders' formal education on economic liberalization. Using cross country data on liberalization for nearly half century, the paper reports that educational attainment of leaders explains a large portion of variation in the speed of reforms under the same configuration of political institutions and socioeconomic structures. The results are robust to a set of tests taking into account the impacts of political regimes, dynamic effects, partisan politics, geopolitical factors, and public opinions. Moreover, the effects differ significantly for leaders of different majors, with economics and science being most conducive to liberal reforms. These findings suggest that formal education may have a deep long run impact on policies through shaping the ideas and beliefs of political leaders.

The paper speaks to the literature in two regards. First, it accounts for how institutions and leaders interact. In view of the finding that democracies selected more educated leaders (Besley and Reynal-Querol, 2011), formal education becomes a tangible channel through which democracies matter for policies. Second, the paper sheds lights on the debate about leader effects in economic growth (Besley, Montalvo and Reynal-Querol, 2011; Carnes and Lupu, 2016). While our findings show a robust relationship between leaders' education and liberalization, the evidence on the growth impact of liberalization is mixed. Some report that liberalization affect growth positively (Bekaert, Harvey and Lundblad, 2005), but others have attributed large growth heterogeneity to institutional and socioeconomic conditions (Billmeier and Nannicini, 2013; Bumann, Hermes and Lensink, 2013). This may explain why formal education does not translate into a uniform positive growth effect in broader contexts.

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Appendix: Not for publication

Table A1: Unit root tests for key variables

	$\Delta$ (Financial)	$\Delta$ (Capital account)	$\Delta$ (Product markets)	$\Delta$ (Agriculture)	$\Delta$ (Trade)	$\Delta$ (Current account)	Education year	Education level
$\chi^2(256)$	579.12	1378.93	2420.75	1023.77	1193.88	887.21	371.47	326.56
$P > \chi^2$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
# countries	99	123	134	89	68	89	134	134
# Years	44	46	46	33	46	33	46	46

Table A2: Does Education Matter for Liberalization? AR(1) standard error

Dependent variable: Annual increase in the liberalization index ( $\Delta y_{ist}$ )				
	(1)	(2)	(3)	(4)
Education year	0.102*** (0.024)			
Education level		0.209*** (0.073)		
$\geq$ College			0.496** (0.211)	-0.060 (0.465)
$(\geq$ College) $\times$ economics				1.051** (0.488) [137, 2508]
$(\geq$ College) $\times$ law				0.591 (0.466) [221,4652]
$(\geq$ College) $\times$ social science				0.991** (0.476) [80,2405]
$(\geq$ College) $\times$ engineer				-0.25 (0.563) [64,1514]
$(\geq$ College) $\times$ humanity				0.036 (0.512) [73,291]
$(\geq$ College) $\times$ military				0.514 (0.917) [15,503]
$(\geq$ College) $\times$ science				2.273*** (0.639) [27,1164]
Lag liberalization	-0.129*** (0.004)	-0.127*** (0.004)	-0.127*** (0.004)	-0.127*** (0.004)
# countries	139	108	108	107
Observations	18079	14997	14997	14839
Country-sector fixed effects	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓

Note: This table presents the estimates for annual changes in the liberalization indexes as specified by Equation (1). The control variables include  $1(\text{First term})$ ,  $\text{Years in office}$ ,  $\text{Age}$ ,  $1(\text{Overseas study})$ ,  $1(\text{Legislator})$ ,  $1(\text{Governor})$ ,  $1(\text{Party leader})$ ,  $\text{Human Capital}$ , and  $\text{Lag log gdp per capita}$ . The two numbers in brackets report the number of leaders and leader-years with corresponding majors. The standard errors of AR(1) are reported in the parentheses. All are estimated by linear regressions with specified fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Table A3: Random transitions in leadership

Year	Country	Leader	Cause of death
1961	Morocco	Mohammed V	complications during surgery
1963	Thailand	Sarit thanarat	heart disease
1964	India	Jawaharlal Nehru	stroke
1965	Romania	Gheorghe Gheorghiu-Dej	pneumonia
1966	India	Lal Bahadur Shastri	heart disease
1966	Nicaragua	Rene Shick Gutierrez	heart disease
1967	Australia	Harold E. Holt	drowned
1967	Gabon	Leon Mba	cancer
1968	Portugal	Antonio de Oliveira Salazar	not known
1969	Bolivia	Rene Barrientos Ortuna	killed in an accident
1969	Brazil	Arthur Da Costa e Silva	heart disease
1969	Israel	Levi Eshkol	heart disease
1969	Vietnam	Ho Chi Minh	heart disease
1970	egypt	Gamal Abdel Nasser	heart disease
1970	Iceland	Bjarni Benediktsson	killed in an accident
1972	Bhutan	Jigme Dorji Wangchuck	heart disease
1972	Nepal	Mahendra	heart disease
1974	france	George Pompidou	cancer
1974	New Zealand	Norman E. Kirk	heart disease
1975	Spain	Francisco Franco Bahamonde	heart disease
1975	Taiwan	Chiang Kai-Shek	heart disease
1976	China	Mao Tse-Tung	Parkinson's disease
1977	Cyprus	Makarios III	heart disease
1978	Algeria	Houari Boumedienne	Waldenstrom's disease
1978	Kenya	Jomo Kenyatta	natural causes
1980	Botswana	Sir Seretse Khama	cancer
1980	Japan	Masayoshi Ohira	heart disease
1981	Ecuador	Jaime Roldos Aguilera	killed in an accident
1981	Trinidad and Tobago	Eric E. Williams	not known
1982	Russia	Leonid I. Brezhnev	heart disease
1982	Saudi Arabia	Khalid	heart disease
1986	Mozambique	Samora Machel	killed in an accident
1986	Vietnam	Le Duan	lung failure
1987	Niger	Seyni Kountche	cancer
1988	Pakistan	Mohammed Zia Ul-Haq	killed in an accident
1988	Taiwan	Chiang Ching-Kuo	heart disease
1989	Iran	Ayatollah Ruhollah Khomeini	complications during surgery
1992	Laos	Kaysone Phomvihhan	not known
1993	Hungary	Jozsef Antall	cancer
1998	Lesotho	Ntsu Mokhehle	not known
1998	Nigeria	Sani Abacha	heart disease
1999	Jordan	Hussein Ibn Talal El-Hashim	cancer
1999	Morocco	Hassan II	heart disease
2000	Japan	Keizo Obuchi	stroke
2000	Syria	Hafez Al-Assad	heart disease

Table A4: Public opinion with regard to the state and market: WVS

Variable	Range	Options	Wave 1 1981-1984	Wave 2 1990-1994	Wave 3 1995-1998	Wave 4 1999-2004	Wave 5 2005-2008	Wave 6 2010-2012
Self positioning in political scale	[1-10]	1:Left 10:Right	✓	✓	✓	✓	✓	✓
Income equality	[1-10]	1:Incomes should be made more equal 10:We need larger income differences		✓	✓	✓	✓	✓
Government responsibility	[1-10]	1:The government should take more responsibility 10: People should take more responsibility		✓	✓	✓	✓	✓
Competition good or harmful	[1-10]	1:Competition is harmful 10:Competition is good		✓	✓	✓	✓	✓
Confidence: The Government	[1-4]	1:A great deal 2:Quite a lot 3:Not very much 4:None at all		✓	✓	✓	✓	✓
Confidence: Major Companies	[1-4]	1: None at all 2:Not very much 3: Quite a lot 4:A great deal	✓	✓	✓	✓	✓	✓