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ABSTRACT

Do More Educated Leaders Raise Citizens' Education?*

This paper looks at the contribution of political leaders to enhance citizens' education and investigate how the educational attainment of the population is affected while a leader with higher education remains in office. For this purpose, we consider educational transitions of political leaders in office and find that the educational attainment of population increases when a more educated leader remains in office. Furthermore, we also observe that the educational attainment of the population is negatively impacted when a country transitions from an educated leader to a less educated one. This result may help to explain the previous finding that more educated political leaders favor economic growth.

JEL Classification: I21, I25, I28

Keywords: political leaders, primary education, school achievement, political institutions

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1. Introduction

Recent literature has been demonstrated that leaders play an important role by affecting policy and economic outcomes (Jones and Olken, 2005; Dreher et al., 2009; Besley et al., 2011) and that citizens (voters) pay more attention to leaders' characteristics rather than political parties (Besley and Coate, 1997; Osborne and Slivinski, 1996). More specifically, literature shows that leaders' quality, measured by their educational level and personal background, matters for economic growth (Dreher et al., 2009; Besley et al., 2011) and reforms (Dreher et al., 2009; Göhlmann and Vaubel, 2007) in a country.

According to Besley et al. (2011), leaders matters for growth since some of them are more competent than others and are more able to make better policy choices which enhance economic performance. They consider that the return to having more educated leaders comes from the assumption that highly educated leaders are also better citizens and are more likely to act in the benefit of public interest.[1]

The main goal of this paper is analyze whether political leaders would matter for policy outcomes and more specifically those regarding the educational achievement of the population. We consider that one of the key means that the leader has an effect on outcomes is his/her educational attainment. So, a possible explanation to the potential effect of leader's education on economic growth could be through enhancing the education of the population. Human capital is an

[1] Besley et al. (2011) define a 'highly' educated leader as one who has at least a postgraduate qualification.

important input into the production function of a country and has been emphasized as a critical determinant of economic progress.

Our paper contributes to the literature on leaders' characteristics and their impact on countries' outcomes. We look at the contribution of a leader to enhance citizens' education. We investigate how the educational attainment of population is affected while a leader with higher education remains in office. For this purpose, we consider educational transitions of the leaders defined as the change in the educational level of political leader from one mandate to other. Using a dataset for the period 1970-2004 and over 140 countries, we show that there is a significant effect of these transitions on our measure of educational attainment of the population.

Given the aim described above, the paper is organized as follows: Section 2 begins with an overview of literature that highlights the importance of political leader on different policy outcomes and especially those that emphasize education as a major feature of the leader; Section 3 provides the conceptual framework of our hypothesis; Section 4 describes the databases and variables used; Section 5 describes the econometric model and method of estimation; Section 6 presents the results and finally, Section 7 concludes.

2. Literature Review

As mentioned above, recently, a growing body of literature studies the importance of leader's characteristics in explaining outcomes. From a theoretical point of view, as Besley et al. (2011) note, this can be motivated using the citizen-candidate type approach as presented in Besley and

Coate (1997) and Osborne and Slivinski (1996). These authors model political competition as a game between citizens competing to hold public office, where selection based on policy preferences, talent or virtue can affect policy outcomes.

From the empirical side, some studies look at the influence of leaders and their personal characteristics on political and economic outcomes such as economic policy, monetary policy and changes in the form of government. Related to the influence of leaders, i.e. who is the head of government, Jones and Olken (2005) show that the quality of leaders matters for economic growth. They stand the role of national leadership rather than the deterministic country characteristics and relatively persistent policy variables that have been focused in the most econometric work explaining economic growth. This is precisely the conceptual framework we we adopt in this paper. Later, Jones and Olken (2009) investigate the effects of assassinations and assassination attempts against political leaders on the institutional setup within a country between 1875 and 2004. They find that a successful assassination of autocrats will significantly increase the likelihood of a transition to democracy thereafter. A related study by Hayo and Voigt (2011) produce similar results. Hayo and Voigt (2011) find that changes in the constitution can be explained by characteristics of the political system, internal and external political conflicts, and political leaders, whereas economic and socio-demographic variables do not matter. Despite the results of both Jones and Olken (2009) and Hayo and Voigt (2011) demonstrate that the circumstances under which the reign of political leaders is terminated matter for changes in the form of government, their results do not indicate whether individual characteristics of political leaders themselves are relevant for such changes.

Some studies highlight the gender of the leader as a relevant characteristic and investigate the impact of women on economic policy. For instance, Chattopadhyay and Duflo (2004) analyze the influence of women representation in local councils in India on the types of locally provided public goods. They show that council members invest more in infrastructure that is directly related to the needs of their own gender. According to their findings women invest more in infrastructure such as water and roads while men in education.[2] Similarly, Svaleryd (2009) studies whether women's representation in Swedish local councils affects local public expenditure structures and finds a positive relation between the share of women on local councils and the spending on child care and education relative to elderly care. Also, Baltrunaite et al. (2012) analyze the effects of gender quotas in politics on the quality of politicians and show that the increase in female representation increases the average education level of elected politicians.

Other relevant characteristics are leaders' educational attainment and professional background. Our study is framed in the literature that stresses the impact of leaders' education on economic outcomes. Göhlmann and Vaubel (2007) find strong evidence that the inflation preferences of members of the central bank council depend on their education and professional experience. According to their findings, more law graduates in the council come along with higher inflation rates compared to economists while former members of the central bank staff are accompanied by significantly lower inflation rates than former politicians. Dreher et al. (2009) studied the impact of education and profession on implementation of market-liberalizing reforms and found that entrepreneurs, professional scientists, and trained economists are significantly more reform oriented. For these authors when it comes to designing reform policy, politicians' education and

[2] This paper is framed for studies on the effect of political reservation, i.e. reserving political office for particular groups in the population. Chattopadhyay and Duflo (2004) studied reservations for women and they argue that reservation matters by changing the identities of those elected to office.

professional experience is likely to be important. Congleton and Zhang (2009) use a similar approach and analyze the influence of U.S. presidents on economic growth. Their results indicate that higher levels of education and specific professional experiences of a president substantially increase economic growth. Constant and Tien (2010) show that foreign education of the leaders matters for Foreign Direct Investments (FDI) inflows in their home countries above and beyond standard determinants of FDI which are also essential for a country's economic growth. Finally, Besley et al. (2011) expand the set of random leadership transitions to show that leaders matter for growth as in the previous work of Jones and Olken (2005) and provide evidence supporting the view that heterogeneity among leaders' educational attainment is important with growth being higher by having leaders who are more highly educated.

3. Hypothesis

Our hypothesis is derived from the findings described in the previous section. It has been found that the elected representative (leader), at least to some degree, can pursue his or her own interests (Svaleryd, 2009). For instance, a general finding is that women prefer higher social spending than men (Lott and Kenny, 1999; Abrams and Settle, 1999; Aidt and Dallal, 2008). [3] Also, Hayo and Neumeier (2012) found that governments led by prime ministers from a poor socioeconomic background spend significantly more on social security, education, health, infrastructure, and public safety. Since these results support the idea that leaders spend more in certain areas

[3] Abrams and Settle (1999), Aidt and Dallal (2008) and Lott and Kenny (1999) study the effect of women's suffrage on the growth of welfare state and the scope of government. Their findings show that social spending is systematically higher where women have and use the right to vote.

according to their preferences, we expect that more educated leaders invest more in education issues.

As mentioned before, some authors highlight the impact of the educational level of leaders on economic growth, but they did not give further explanation on the 'why'. We hypothesize that a potential explanation for this link is that more educated leaders will take decisions and promote policies that will increase the human capital of the population. A greater stock of human capital implies a more skilled and productive workforce, which in turn will increase country's output (Barro and Lee, 2001).

Economic theory suggests that human capital is an important determinant of growth, and empirical evidence for a broad group of countries confirms this linkage (Barro, 1991; Benhabib and Spiegel, 1994; Romer, 1986, 1989; Lucas, 1988; Jones and Manuelli, 1990). According to these theories, human capital can boost growth through stimulating technological creation, invention and innovation, as well as facilitating the uptake and imitation of new technologies. Also, countries that start with a higher level of educational attainment in their population grow faster for a given level of initial per capita GDP and for given values of policy-related variables (Barro, 1991).

While there is little doubt of the theoretical importance of human capital for economic growth, and that only by providing more and more education countries can continue to prosper in a globalized economy, there has yet to emerge a consensus among empirical growth researchers on how to measure and model human capital in growth regressions. Some authors consider that

education contributes to economic growth and productivity, but beyond a threshold its contribution is small and uncertain. For instance, Wolf (2002) argues that high private returns to education are not matched by high or consistent social returns, and that even if some education has a positive impact cannot be extrapolated endlessly as education expands. Sala-i-Martin et al. (2004) create a list of variables that are robust in explaining long-term economic growth, in this list one of the most important variables is the primary education enrollment rate.

4. Dataset and variables

Our dataset on political leaders contains information for 214 countries over the period 1848-2004. However, for country level educational attainment there is only available data after 1970. Therefore, we restrict our study to the period 1970-2004 and over 140 countries. The database was constructed from different sources as explained below. In order to identify the primary ruler in each country and year we use Archigos data.[4] This database identifies the effective leader of each independent state and year based on the characteristics of the political system in place between 1875 and 2004 for 188 countries where two rules are generally followed: *i*) in Parliamentary regimes, the prime minister is coded as the ruler while in Presidential systems, it is the president; *ii*) in communist states, the Chairman of the Party is coded as the effective ruler.

The educational data for the leaders has been collected by Besley and Reynal-Querol.[5] This dataset contains information on leaders' educational attainment for a core sample of 1,672 leaders in 193 countries between 1847 and 2004. The database provides, as a measure of educated

[4] For more details about this data see Goemans et al. (2009).
[5] We thank Besley and Reynal Querol for providing their database.

leaders, a core variable called *College degree* which is a dummy variable equal to 1 if the leader has college or post-graduate education (i.e. master's degree or PhD).[6] We use *College degree* to construct the educational transitions which are explained in more detail below.

For population's educational attainment at country level, income per capita and other country characteristics we use World Bank data.[7] Following Persson and Tabellini (2009), our measure of democracy is based on the Polity IV data covering all major independent states in the global system over the period 1800-2012. This data provides a measure of democracy (POLITY2) which capture three different dimensions: how competitive and open the recruitment of chief executive is; the extent to which the chief executive is constrained institutionally; and how competitive and regulated political participation is (Besley et al. 2011). Finally, we assemble a new database which contains information on 587 leaders and 165 countries where the primary completion rate was available (2800 obs.).

Table 1 contains the description of the outcome variable and the explanatory variables used in this work. Our outcome variable is population's primary education completion rate (hereafter *PCRT*). This variable is constructed as the ratio, expressed in percentage, between the total number of new entrants in the last grade of primary education, regardless of age, and the total population of the theoretical entrance age to the last grade of primary. It is calculated by taking the total number of students in the last grade of primary school, minus the number of repeaters in that grade, divided by the total number of children of official graduation age. The ratio can exceed 100% due

[6] See Besley and Reynal-Querol (2011) for more details on the construction of this dataset.
[7] Education data comes from wbopendata avaible in Stata developed by Azevedo (2011).

to over-aged and under-aged children who enter primary school late/early and/or repeat grades. This variable is the one which is available for a broader sample of countries and years.

—Insert Table 1 here—

In order to assess the impact of changes in the education of political leaders, we create two types of transitions: positive and negative. A *positive transition* is picked-up by a dummy variable that takes the value 1 when a country transitions from a non-educated leader (a leader with no college education) to an educated one (a leader with at least college education) until the end of the period in our sample. Analogously, a *negative transition* is picked-up by a dummy variable that takes the value 1 when a country transitions from an educated leader (a leader with at least college education) to a non-educated one (a leader with no college education) until the end of the period. Countries that experience both types of transitions are excluded from the sample. As we will explain latter, countries that do not experience any transition will be used as a control group to assess the impact of leaders educational transitions.

The leader characteristics we control for are education, age and time the leader remains in office (*tenure*). Country controls are GDP per capita, number of grades (years) required to complete primary education (*duration of primary*) and whether country's political regime is a democracy or not. In Table 2 we show a summary statistics of our data. In our sample, on average, the primary completion rate is 73.3% and the duration of primary is about 5.75 years. In 52.1% of the years there is a positive transition and in 7.9% of the years there is a negative transition. In 46.1% of the country-year observations the regime is democratic. The average age of a leader is about 56 years

and the average number of years in office is about 8.52. We can observe that all of them vary across countries and time.

—Insert Table 2 here—

Figures 1 to 3 depict the evolution over time of different leaders' characteristics (age, tenure and education) for Latin America, Asia, Africa and OECD countries. In each graph of these figures the horizontal line indicates the overall mean of the characteristic for all the period (1970-2004). In Figure 1, we observe that the average age of African leaders upon entering in office is about 46 years , while in Asia it is about 49 years. Latin American leaders are, on average, 52 years old, almost the same as in OECD countries which it is about 53. In the case of Latin America and Asian countries, it can be seen a growing trend in the age of the leaders at taking office. In this sense, more experienced leaders are being elected to rule as the case of OECD countries who present the oldest leader's age for holding office. In terms of the number of years in office, Figure 2 shows that African and Asian leaders spend, on average, more time in office that the heads of government in Latin American and OECD countries. More specifically, on average the term of office for African leaders is 9.79 years, for an Asian leaders is 9.53 years, while for Latin American and OECD leaders are 5.64 and 4.91 years, respectively. Furthermore, we can observe that African leaders, on average, remain in power much longer than their counterparts.

—Insert Figure 1 and 2 here—

Figure 3 looks at the variation over time in the proportion of leaders who have college degree across countries. We observe a growing tendency in the proportion of educated leaders. In this figure, Asian countries experience the more dramatic increment in the proportion of educated leaders ranging from 46% in 1970 to 80% in 2004. On average, OECD and Latin American countries have higher proportions of educated leaders, 85% and 86%, respectively; while these figures in African and Asian countries are 62% and 66%, respectively. It is worth noting, that Latin American and OECD countries present almost the same evolution in the characteristics of the leaders ruling in these countries during the period of our study. The same applies for Asian and African countries.

—Insert Figure 3 here—

Figure 4 displays the evolution of primary completion rate (*PCRT*). In this figure, we observe that, on average, OECD countries have the higher level of educational attainment given that about 96.77% of the students in the last grade of primary complete the primary education, while African countries present the lowest rate (48.91%). For Latin American and Asian countries the rate of students completing the last grade of primary are 77.19% and 80.26%, respectively. Comparing Figures 3 and 4, we observe both an increase in the proportion of educated leaders and an increase in the primary completion rate.

—Insert Figure 4 here—

In order to illustrate the potential effect of the leaders' educational transitions on the educational attainment of the population, Figure 5 shows the evolution of primary completion rate in Italy and indicate when the transitions occurs. In the graph, a solid vertical line indicates the year at which a leader without higher education came to power (negative transition), and a dashed line indicates the year at which a leader with higher education came to power (positive transition). As can be seen in Figure 5, Italy experienced growth in the primary completion rate coincident with the positive transitions and experienced growth reversals in the completion rate when a leader without higher education remained in office (negative transition). However, the linkages between these transitions and particular changes in the primary completion rate may be due to specific events occurring during that period. Therefore, in the next section we test our hypothesis of whether more educated leaders matter for improving the educational attainment of population using more rigorous econometric methods.

—Insert Figure 5 here—

5. Empirical strategy

In order to test the hypothesis that leader's education might have an impact on population's educational attainment, we consider the following empirical model:

$$\Delta y_{ilt} = \alpha + y_{il,t-1}\delta + d_{it}\gamma + Z_{lt}\lambda + X_{it}\beta + \mu_l + \varepsilon_{ilt} \qquad (1)$$

where y_{ilt} is the educational attainment of population (Primary Education Completion Rate) in country *i* at time *t* while leader *l* is in office; Δ is the difference operator; d_{it} picks the transition, the change of the educational level of the political leader in country *i* at time *t*; Z_{lt} is a matrix containing the leaders characteristics; X_{it} is a matrix containing a set of covariates controlling for country characteristics; μ_l is a leader-specific fixed-effect; ε_{ilt} is a time-varying error term, and α, δ, γ, λ and β are a set of parameters to be estimated. Since we are interested in assessing the impact of a characteristic of the political leader (education), the inclusion in equation (1) of leader specific effects μ_l is very convenient. On the one hand, we can control for leader's unobserved heterogeneity, which is not controlled for through the leader characteristics included in Z_{lt}. On the other hand, since one leader can be in office only in one country, the leader-specific effect also absorbs the country-specific effects.

Our main coefficient of interest is γ, which reflects the effect of the educational transition of the leader (positive or negative) on the growth rate of the primary completion rate (*PCRT*). In order to assess the impact of an educational transition of the leader, countries are compared with a control group of countries that not experience any transition. When we analyze the impact of a positive transition (from a leader without to a leader with college education), countries experiencing this type of transition are compared with countries that have non-educated leaders during all period of study. On the contrary, countries experiencing negative transitions (from a leader with to a leader without college education) are compared with countries that have leaders with college education throughout the period of study (see Table 3).

Our outcome variable (y_{ilt}) is the Primary Completion Rate (*PCRT*). In order to capture potential state-dependence in our outcome variable (Δy_{it}), that is, changes in the level of education of the population depends on its initial value when a leader takes office, we include our endogenous variable lagged one period ($y_{i,t-1}$). Those countries that have higher primary completion rate will grow at a lower rate than those countries that have lower completion rates in *t*-1.

The characteristics of the leader we consider are age and years in office (*tenure*). Age is considered since this variable can be associated with cognitive abilities which are important for political decision making and accurately expressing one's political preferences or the level of government responsiveness (Lau and Redlawsk, 2008). Tenure is also important, since is a proxy of the leader's experience. In order to control for differences between income levels across countries, we include the GDP per capita lagged one year, and GDP growth. We also control for democracy status, since the effect of the leader is supposed to be stronger in autocratic environments where there are fewer constraints on a leader's power compared to democratic regimes (Jones and Olken, 2005; Barro, 1999). Finally, we control for the duration of the primary which may affect the primary completion rate, since the longer the duration of primary the more likely to dropout (Angrist and Krueger, 1991).

The econometric strategy used to estimate equation (1) consists of differencing the equation in order to remove the leader-specific effect μ_l. However, differencing means that even strictly exogenous variables can become endogenous, in addition to the presence of non-strictly exogenous variables. Therefore, by construction, in equation (1) we have the lagged difference of our endogenous variable and it may be that the difference of other explanatory variables is

correlated with the error term, which in turn creates a severe problem of endogeneity. Hence, our core specification will include not only correlated and heteroskedastic residuals, but also non-strictly exogenous and endogenous variables as covariates. In this context, a fixed-effects model with the Newey–West corrected covariance matrix provides consistent estimates of the standard errors in the presence of serial correlation and heteroskedasticity in the residuals. However, the presence of endogenous covariates creates severe identification problems in the econometric estimation that in turn lead to inconsistent estimate of model.

In order to estimate equation (1), we use a variant of the Arellano and Bond (1991) Generalized Method of Moments (GMM) estimator. Arellano and Bover (1995), Blundell and Bond (1998) and Bond (2002) show that often lags for the levels of these variables are poor instruments, and they suggest suitable conditions for fixing this problem. One alternative is to instrument endogenous and non-strictly exogenous variables with lags of their own first differences, instead of with lags for the variables in levels. The GMM variant of the original Arellano and Bond's estimator used here incorporates these elements. In particular, the method we use here has both one-and two-step versions. We adopt the two-step method as it is the most efficient, though the estimated variances tend to be biased downwards. In order to fix this, we apply the finite-sample correction of the two-step covariance matrix proposed in Windmeijer (2005), without which those standard errors tend to be severely downward biased.[8]

[8] See Roodman (2009) for details.

6. Empirical Results

Table 4 report the results from the estimation of our core model (equation 1) by the Generalized Method of Moments (GMM) . Column (1) presents the results considering just the educational level of the leader by a dummy variable (college degree or not). Columns (2) and (3) show the effects of the positive and negative transitions on the *PCRT*, respectively. As we mention in the previous section, the control group for the *positive transition* are those countries which have non-educated leader all period of study and for *negative transition* are those countries that have leaders with college education throughout the period of study. Hence, the interpretation of all results regarding the impact of the educational transition is relative to these baseline groups. We first comment on the results regarding our control variables, and latter we focus on our variables of interest.

—Insert Table 4 here—

Our results indicates that laggard countries in terms of educational achievement tend to experience a greater growth rate of the *PCRT*, since we find a significant and negative effect of the initial value of the primary completion rate ($PCRT_{t-1}$) for all specifications.

Controlling for leader's characteristics, we find that age and tenure, which are proxies of leader's experience affect positively the educational attainment of the population. This result indicates that the greater the experience of leaders the greater the effect on the educational level of the

population, since they are more able to make decisions given his/her previous experience. We consider a squared polynomial on age of the political leader and obtain that the effect of age is inverted U-shaped. This result indicated that the effect is positive but decreasing.

With respect to country variables, we observe that logarithm of GDP per capita lagged one period and the growth rate of the log GDP per capita exert a positive and statistically significant effect on the growth rate of the *PCRT*. On the contrary, the duration of primary education and democracy has a negative effect on the growth rate of *PCRT*. This negative effect of duration of primary indicates that in countries where students have to spend more years in primary education may also experience higher levels of drop-outs. The negative effect obtained for democratic countries can be explained by the fact that high levels of schooling are both a prerequisite for democracy and a major cause of democratization (Lipset, 1959; Barro, 1999; Glaeser et al., 2004). [9] Therefore, democratic countries with higher levels of primary completion rate will have a lower growth rate compared to non-democratic countries where the educational attainment tend to be lower.

Concerning our specific research question our results reveal that leaders' education indeed affects the education level of population. Column (1) shows that in the annual growth rate of the *PCRT* is larger in countries where the leader possesses a college degree. However, this result could be explained by the fact that in countries more prone to have educated leaders, also exhibit a structural propensity to experience a higher growth rate of the *PCRT*. In order to disentangle this, we also include the impact of both transitions.

[9] According to Acemoglu et al. (2005), education is argued to promote democracy both because it enables a "culture of democracy" to develop and because it leads to greater prosperity, which is also thought to cause political development.

Ours results shows that when a *positive transition* occurs there is an increase in the level of educational attainment, which means that the performance of leaders ruling with (at least) college degree is better than their counterparts without higher education. This result supports the main hypothesis we propose in this study, since the educational attainment of population increases when the country transitions from a non-educated leader to an educated one compared to those countries with non-educated leaders all the time.

Other result that supports our hypothesis is that unlike positive transition, we find that transitioning from an educated leader to a less educated one the educational attainment of population is impacted negatively. We obtain that during the negative transitions, the primary completion rate experiences a growth reversal comparing to those countries which have educated leader all period of study. The statistical significant effect of our two main explanatory variables measuring educational transitions support the finding with the educational level, showing that more educated leaders lead to more educated citizens.

Finally, we also report the Hansen test of over-identifying restrictions, which is a test of the validity of instrumental variables.[10] The Hansen J statistic replaces the Sargan test used in the original one-step Arellano-Bond estimator, since the Hansen test is robust to heteroskedasticity or autocorrelation.[11] We find that the validity of the instruments is confirmed for all the specifications used, since χ^2 statistic is not significant in any model. Alternatively, we also show

[10] Under the null hypothesis the statistic follows a chi-square where the degrees of freedom are determined by the number of instruments used in the estimation.
[11] See Roodman (2009) for details.

the results of the Arellano-Bond test for autocorrelation AR(1) and AR(2). [12] We observe that AR(1) structure cannot be rejected for estimated models in Columns (1) and (2), while the AR(2) structure is rejected for all of them. The results of these tests indicate that there is no serial correlation between the first-differenced variables used as instruments and the first differences of the residuals ε_{ilt}. Therefore, they are good instruments.[13]

7. Conclusions

In this paper we estimate the effect of educational transitions on the educational attainment of population during the period 1970-2004. We find that more educated leaders lead to more educated citizens. We find that the educational attainment of population increases when the country transitions from a non-educated leader to an educated leader compared to those countries with non-educated leaders all the time. On the contrary, a negative transition, i.e. from a highly educated leader to a leader with just secondary education, have a negative impact on the educational attainment of the population. These findings support the main hypothesis we propose in this study. We hypothesize that the positive link between the education of the political leader and the education of the population we find here, is as plausible explanation for the effect of leader's education on economic growth found in the previous literature. We contribute to the literature by providing further evidence in the scant but emerging literature that links leaders'

[12] The null hypothesis is no autocorrelation and is applied to the differenced residuals. The test for AR (1) process in first differences usually rejects the null hypothesis because $\Delta\varepsilon_{ilt}$ is mathematically related to $\Delta\varepsilon_{il,t-1}$ with which it shares a $\varepsilon_{il,t-1}$ term. So, negative first-order serial correlation is expected in differences and evidence of it is uninformative. The test for AR (2) in first differences is more important, because it will detect autocorrelation in levels between the $\varepsilon_{il,t-1}$ in $\Delta\varepsilon_{ilt}$ and the $\varepsilon_{il,t-2}$ in $\Delta\varepsilon_{il,t-2}$.

[13] An AR(1) structure implies that serial autocorrelation is removed after one difference, whereas a higher order structure AR(s), with s≥2, means that a first difference is not enough to remove autocorrelation. Given that the estimation method used here uses as instruments the first differences, the persistence of this correlation after applying a first difference would imply that they are endogenous, and hence bad instruments.

characteristics with countries' performance. All this evidence taken together suggests that the socio-economic background of political leaders may be informative about the type of policies they can be more sensitive. Therefore, this claims for the convenience of the use of "open lists" in democratic countries, where voters can decide not only about the party in the government but also about the individuals in each list.

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Appendix

Table 1. Variables description and sources.

Variables	Description	Source	Period Covered
Dependent variable			
Primary completion rate	Percentage of students completing the last year of primary school. The ratio can exceed 100% due to over-aged and under-aged children who enter primary school late/early and/or repeat grades.	United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics.	1970-2050
Explanatory variables			
Positive transition	Dummy variable that takes the value 1 when a country transitions from a non-educated leader to an educated one until the end of the period in our sample.	Own based on Besley and Reynal-Querol data.	1847-2004
Negative transition	Dummy variable that takes value the 1 when a country transitions from an educated leader to a non-educated one until the end of the period.		
Leaders' Characteristics			
College degree	Dummy variable equal to 1 if the leader has college education or post-graduate qualification (i.e. master's degree or PhD)	Besley and Reynal-Querol data	1847-2004
Age	Age of leader	Archigos data	1875-2004
Tenure	Natural log of Time in office	Archigos data	1875-2004
Country Characteristics			
Duration of primary	Number of grades (years) in primary education	UNESCO Institute for Statistics.	1970-2050
Democracy	1 if the POLITY2 variable has a positive value in the year the leader is selected.	Polity IV data	1800-2010
Log (GDP)	Log of per capita income measured in the year when the leader is selected.	World Bank data	1960-2011

Table 2. Summary statistics.

	Mean	Std. Dev.			Observations	
		overall	between	within	N	n
Primary Completion rate						
Levels	73.321	28.871	26.762	11.209	2800	165
Δ	0.868	5.211	2.250	5.046	2293	158
Positive transition	0.521	0.500	0.423	0.309	817	44
Negative transition	0.079	0.269	0.222	0.115	904	59
College degree	0.718	0.450	0.355	0.288	2800	165
Age	56.274	11.530	8.917	8.186	2800	165
Tenure (years)	8.522	8.283	5.323	5.796	2800	165
Democracy	0.461	0.499	0.424	0.290	2590	147
Duration of primary	5.756	0.825	0.935	0.210	2800	165
Log(GPD per cap.)	7.453	1.498	1.521	0.216	2594	161

Notes: N=Number of observations per Country-years; n=Number of Countries

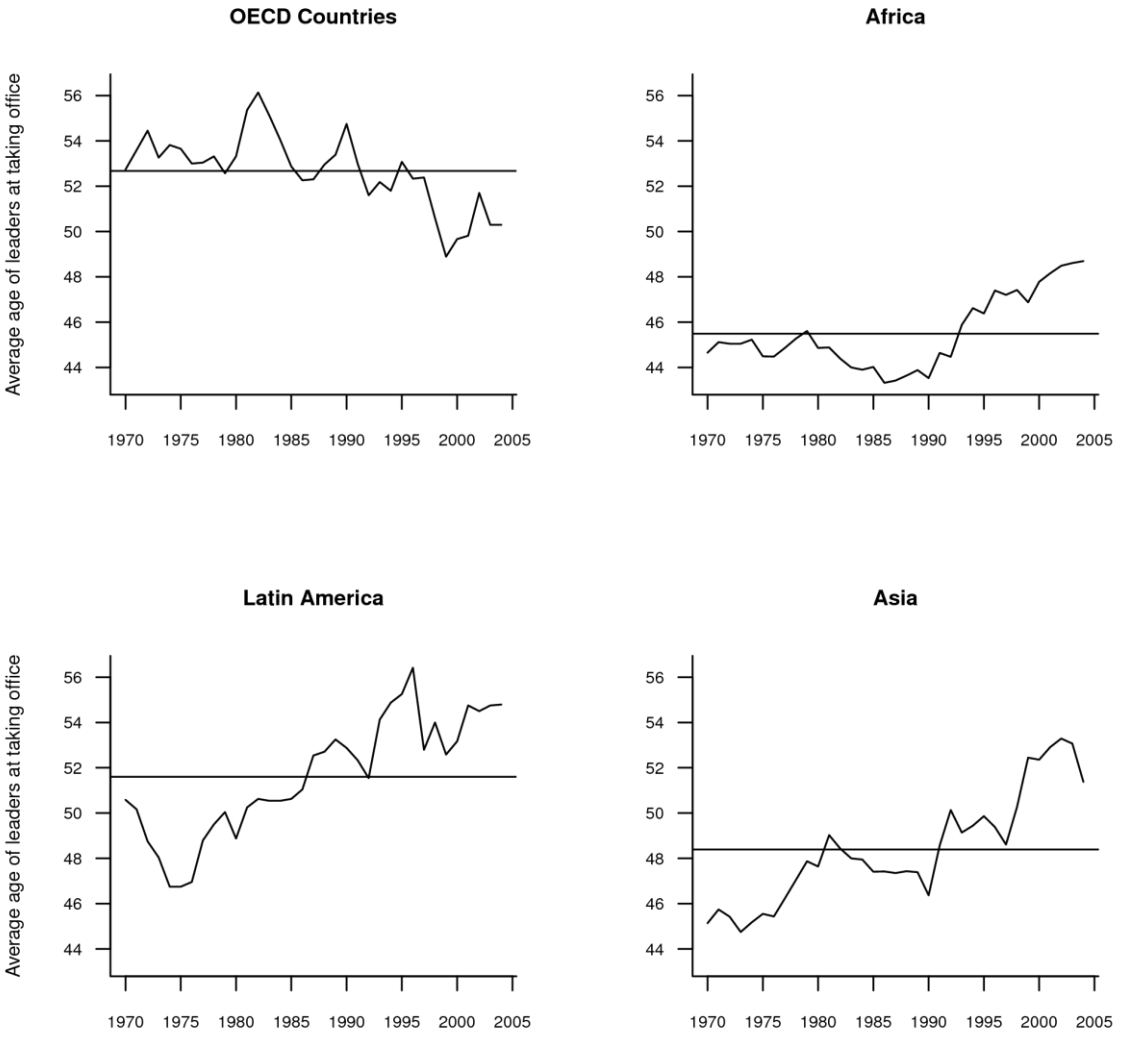

Figure 1. Average age of leaders at taking office.

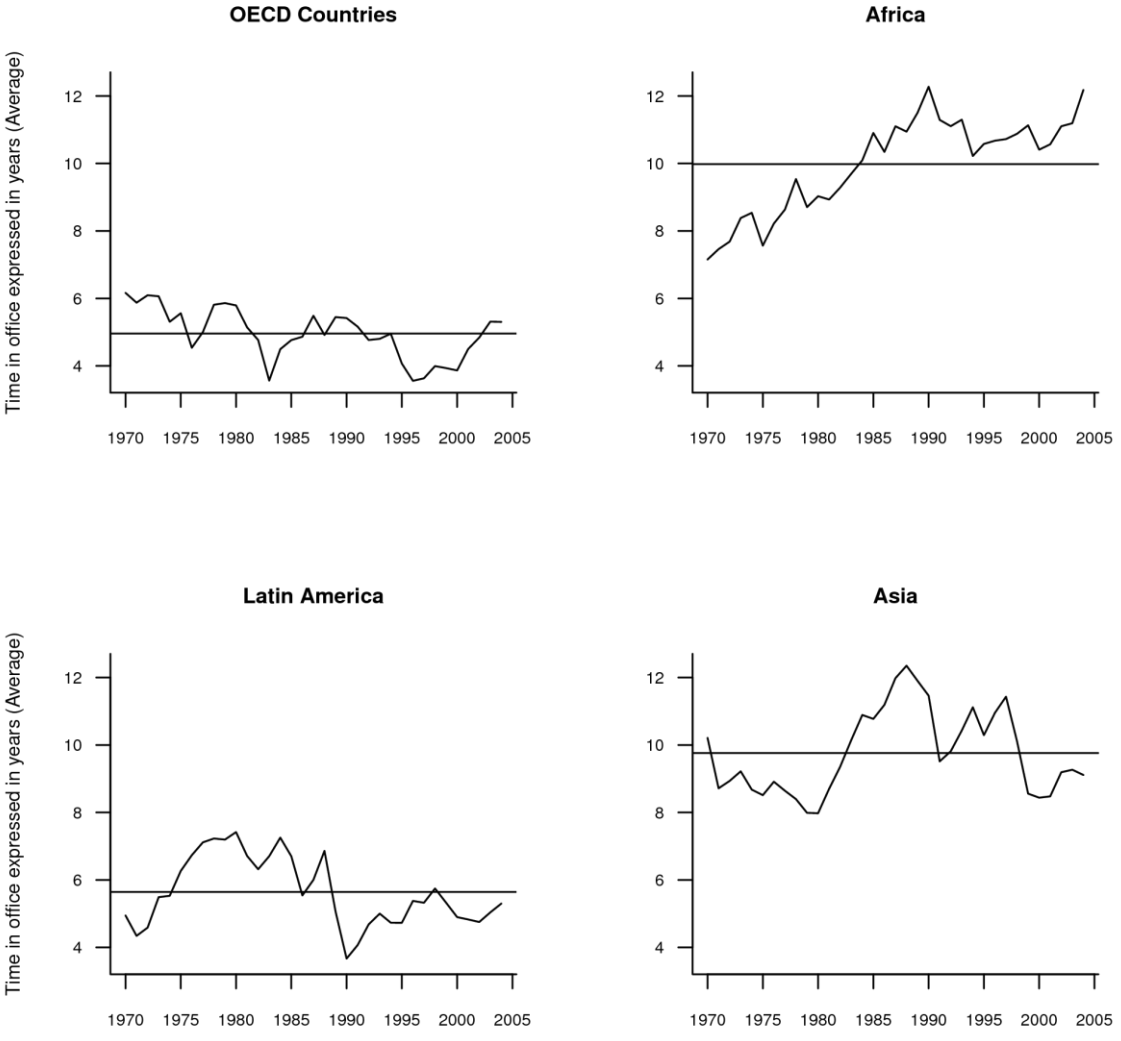

Figure 2. Average tenure of leaders (expressed in years).

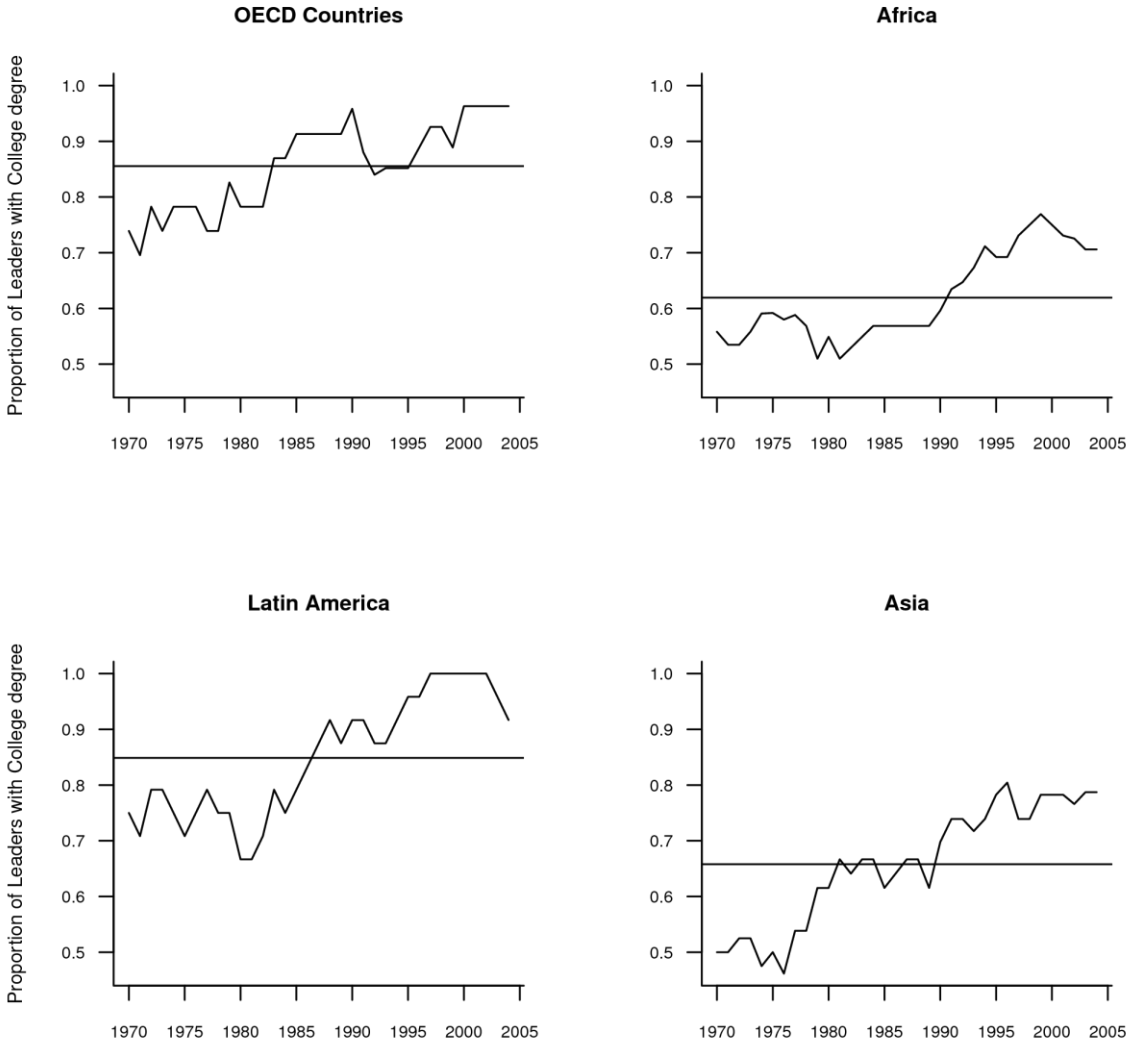

Figure 3. Proportion of Leaders with College degree.

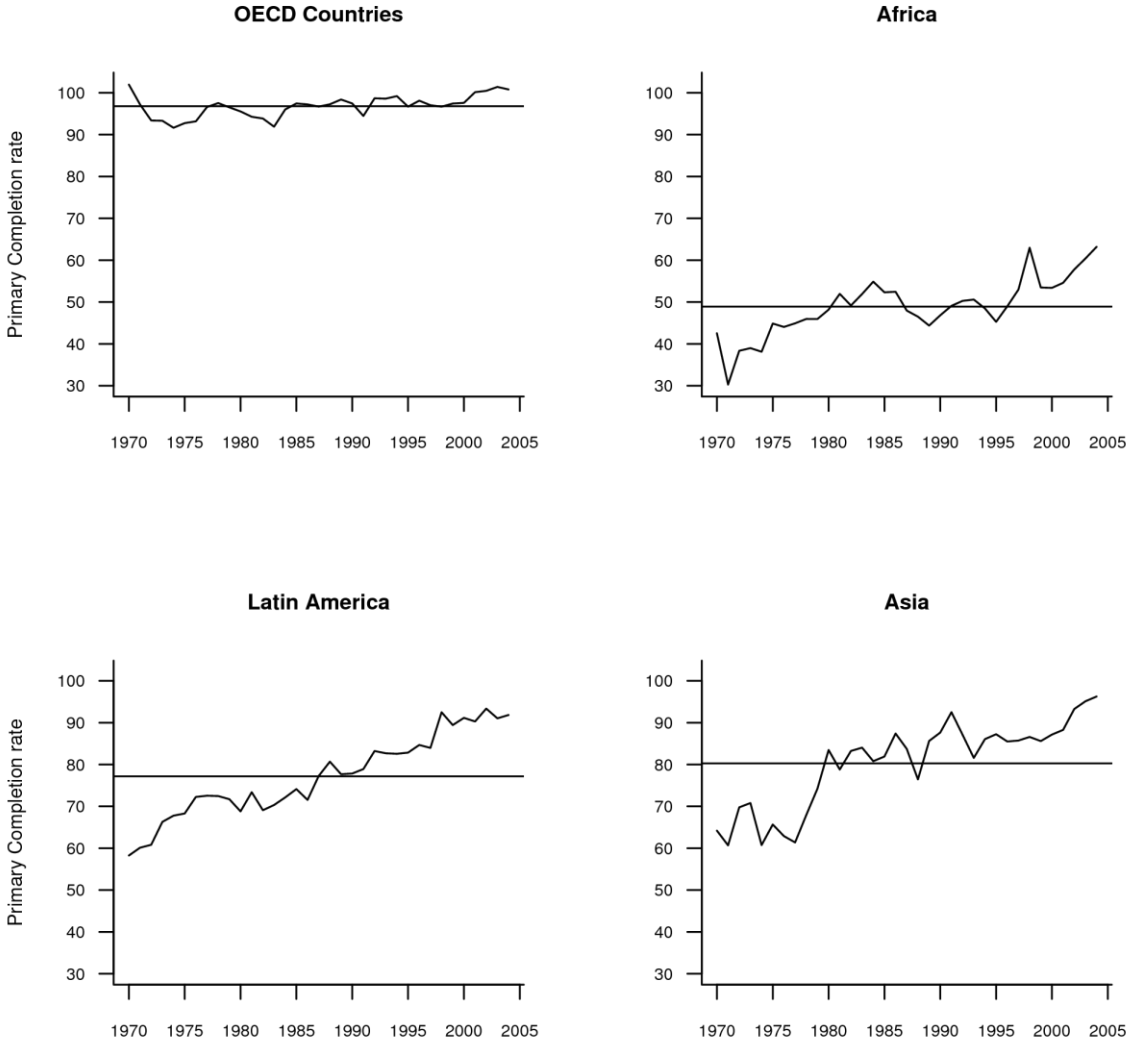

Figure 4. Primary Completion Rate.

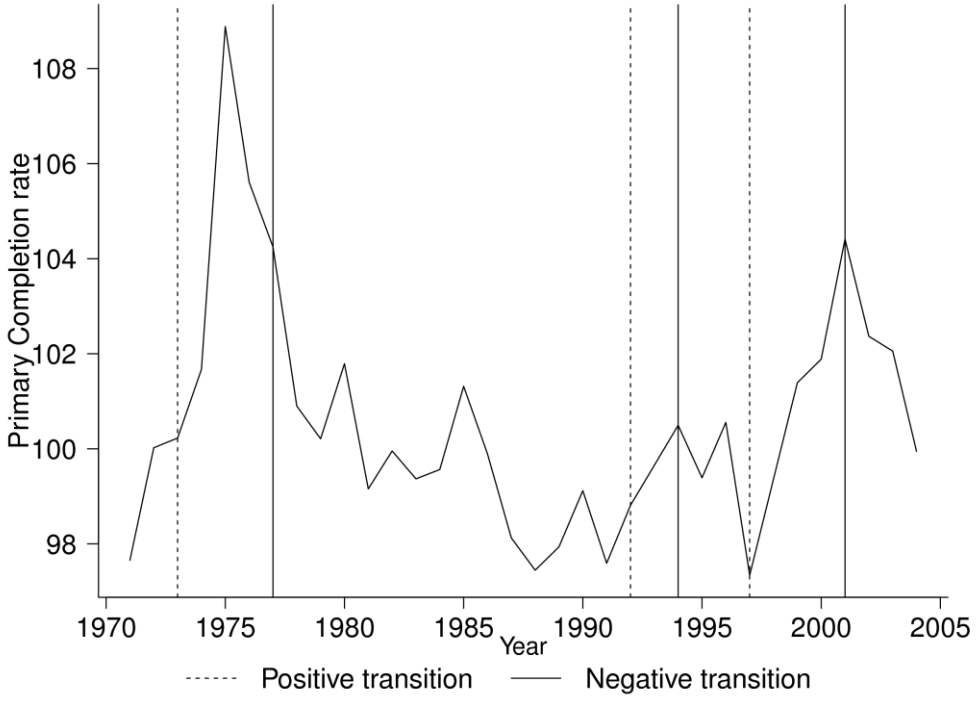

Figure 5. Primary Completion rate and Educational Transitions: Italy.

Table 3. Positive transitions and Negative transitions by Country

Positive Transition	Obs.	Control group: No Transition	Obs.	Negative Transition	Obs.	Control group: No Transition	Obs.
No College → College		No College degree (All period)		College → No College		College degree (All period)	
Bahrain	6	Djibouti	17	Gambia, The	8	Angola	3
Belize	7	Eritrea	10	Lao PDR	7	Armenia	5
Bhutan	11	Kazakhstan	8	Mauritania	20	Austria	8
Bulgaria	14	Kuwait	28	Myanmar	10	Azerbaijan	11
Burkina Faso	15	Mozambique	19	Togo	26	Bahamas, The	4
Burundi	28	Namibia	11			Barbados	6
Cameroon	13	Saudi Arabia	1			Brunei Darussalam	27
Cape Verde	8	Swaziland	35			Canada	3
China	9	United Arab Emirates	31			Chile	15
Congo, Rep.	29					Cote d'Ivoire	27
Dominica	6					Croatia	10
Equatorial Guinea	5					Cuba	31
Gabon	22					Cyprus	33
Guinea	20					Czech Republic	10
Guinea-Bissau	2					Estonia	8
Hungary	12					Finland	18
Iran, Islamic Rep.	12					France	17
Ireland	11					Georgia	9
Jamaica	18					Greece	21
Jordan	5					Guyana	24
Lesotho	10					Iceland	7
Libya	12					Kiribati	7
Maldives	2					Kyrgyz Republic	8
Mali	5					Latvia	9
Morocco	34					Lithuania	9
Nepal	7					Luxembourg	11
Oman	25					Macedonia, FYR	12
Poland	8					Malawi	28
Romania	11					Malaysia	18
Rwanda	23					Malta	34
Sao Tome & Principe	1					Marshall Islands	3
Spain	13					Mauritius	22
Turkey	13					Mexico	29
Vietnam	5					Moldova	7
Zambia	5					Netherlands	19
						Paraguay	33
						Peru	19
						Portugal	6
						Qatar	28
						Senegal	26
						Seychelles	7
						Slovak Republic	12
						Slovenia	12
						St. Kitts & Nevis	6
						St. Lucia	11
						St. Vincent & Grenadines	1
						Sudan	7
						Tajikistan	8
						Tanzania	23
						Tonga	15
						Tunisia	33
						Ukraine	10
						United States	7
						Uzbekistan	8
						Zimbabwe	13

Table 4. GMM Estimation Results: Primary Completion Rate.

	Δ Primary Completion rate					
	(1)		(2)		(3)	
	Coef.	SE	Coef.	SE	Coef.	SE
Constant	-26.249***	(0.354)	-15.550***	(0.715)	1.248	(4.308)
$PCRT_{t-1}$	-0.493***	(0.001)	-0.104***	(0.002)	-0.175***	(0.008)
College degree	0.751***	(0.271)				
Positive transition			2.302***	(0.127)		
Negative transition					-2.260***	(0.742)
Leaders' characteristics						
Age	1.387***	(0.009)	0.796***	(0.029)	0.702***	(0.116)
Age (squared)	-0.013***	(0.000)	-0.006***	(0.000)	-0.005***	(0.001)
Tenure	1.921***	(0.025)	-0.679***	(0.059)	-0.847***	(0.160)
Country characteristics						
Democracy	-1.504***	(0.040)	-2.629***	(0.143)	-0.748	(0.526)
Duration of primary	-6.480***	(0.024)	-1.039***	(0.051)	-2.523***	(0.247)
Δ Log(GPD per cap.)$_t$	17.716***	(0.062)	14.249***	(0.372)	8.717***	(0.612)
Log(GPD per cap.)$_{t-1}$	6.508***	(0.057)	1.434***	(0.022)	1.565***	(0.177)
Hansen Test (stat.)	268.06		73.19		85.02	
Test AR(1) (z-stat.)	-2.54		-3.72		-1.53	
Test AR(2) (z-stat.)	1.01		0.33		0.96	
Sample size	1692		534		491	
Number of Leaders	370		88		103	

Notes: All specifications include Leader-fixed effect. Standard errors in parentheses. *** Significant at 1%, ** Significant at 5%, * Significant at 10%